

Wetland Mitigation Site Plan

River Bend
Caswell County, North Carolina

State Project No. 8.1380501
TIP Project No. R-2241

North Carolina Department of Transportation



January 2003

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North Carolina Department of
Transportation

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Executive Summary

In order to offset jurisdictional resource impacts from future roadway improvement projects in the Caswell County area, the North Carolina Department of Transportation (NCDOT) selected a property adjacent to the Dan River as a potential wetland mitigation bank site. The NCDOT purchased this site from the landowners in 2001. The site is located along SR 1580 (River Bend Road) near the intersection with NC 57, northwest of Milton, North Carolina. A North Carolina Wildlife Resources Commission (NCWRC) boat ramp and parking lot are located adjacent to the NC 57 bridge at the Dan River, at the east property boundary of the site. The property, which covers 193 acres north of the Dan River, has been in agricultural production for several decades, with cattle as well as row crops produced on the land. Currently, the site includes approximately 5 acres of bottomland forest, 14 acres of levee forest, and 174 acres of agricultural fields.

Based on a wetland delineation conducted throughout the site and verified by the U.S. Army Corps of Engineers (USACE), approximately 3 acres of the site were determined to be jurisdictional wetlands. These jurisdictional wetland areas include a 2.5-acre bottomland forest wetland located near the corner of River Bend Road and NC 57, and a 0.5-acre floodplain pool wetland located at the western-most property boundary of the site. The remaining 190 acres of the site, including the drainage channels and ditches, were determined to be non-jurisdictional based on their prior-converted use for agricultural lands.

The bank will provide for the restoration of approximately 77 acres of bottomland forest, 5 acres of floodplain pools, and 92 acres of dry-mesic oak/hickory forest at the site; and the preservation of 4.5 acres of bottomland forest, 0.5 acres of floodplain pool, and 14 acres of levee forest wetlands. A vegetation plan was developed which includes recommendations for herbaceous, woody shrub and tree species appropriate for planting in the saturated to seasonally saturated, or drier, soils of each proposed vegetative community. After all mitigation activities are completed and the site is determined to be successful, final dispensation of the property will go to the NCWRC for long-term management.

1. Introduction

1.1 Project Location

The NCDOT is currently in the process of identifying and developing wetland mitigation banks throughout the state that will offer pre-construction mitigation for multiple roadway improvement projects within the foreseeable future. The River Bend Wetland Mitigation Bank site was identified during a search conducted in 1997. It is situated approximately one-half mile west of the Town of Milton adjacent to the Dan River in Caswell County, North Carolina (Figure 1). The mitigation bank site is bordered to the north by SR 1530 (River Bend Road), the south by the Dan River, and by NC 57 to the east. A NCWRC boat ramp is located on a small out-parcel along the northeast corner of the property adjacent to NC 57. The land west of the site is comprised primarily of agricultural, pasture, and forested lands.

ARCADIS G&M of North Carolina, Inc. (ARCADIS) was retained by NCDOT to study the feasibility of wetland mitigation at the River Bend site and to develop a Wetland Mitigation Site Plan, if applicable. The NCDOT currently owns the 193-acre site situated along the Dan River at the North Carolina and Virginia state line. The River Bend site will service the Western Roanoke River Basin portion of the Roanoke River Basin in North Carolina, which includes U.S. Geological Survey (USGS) Hydrologic Unit 03010104 and North Carolina Division of Water Quality (NCDWQ) Sub-basins 03-02-04 and 03-02-05.

1.2 Methodology

Qualified scientists conducted numerous field investigations throughout the project area between 1999 and 2002. Pedestrian surveys were undertaken to confirm both physical and natural resource conditions and to document existing land use, jurisdictional issues, and environmental hazards. Land surface elevations were surveyed across the site by the NCDOT. These elevations were used to establish the changes in topography and the degree of slope between River Bend Road, the Dan River, and the NCWRC boat ramp.

Published information regarding the project area and region was derived from a number of resources including: USGS 7.5-Minute topographical quadrangle map (Milton, North Carolina), United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) map, and the Natural Resources Conservation Service (NRCS) soil survey of Caswell County (1910). Water resources information was

obtained from publications of the NCDWQ. Information concerning the occurrence of federal and state protected species within the project area and vicinity was gathered from the USFWS list of protected species and the North Carolina Natural Heritage Program (NCNHP) database of rare species and unique habitats.

A Phase 1 Environmental Site Assessment (ESA) Transaction Screening was also completed for this property. This Phase 1 ESA Transaction Screening was conducted in accordance with the American Society for Testing and Materials (ASTM) Standard E 1528-00 Standard Practice for Environmental Site Assessment: Transaction Screening Process. ARCADIS subcontracted Environmental Data Resources, Inc. (EDR), to conduct a search of applicable and accessible databases for any environmental hazards occurring at or surrounding the study area.

Jurisdictional wetland determinations were performed using the three-parameter approach as prescribed in the *1987 Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987). Supplementary technical literature describing the parameters of hydrophytic vegetation, hydric soils, and hydrological indicators were also utilized. To determine the extent of jurisdictional and non-jurisdictional wetlands, a site-wide delineation was conducted during 1999 and verified by the USACE. Two jurisdictional wetland areas were determined to exist at the site: one is located in the northeast corner of the site, adjacent to the NCWRC boat ramp parking lot and the other is located in the central portion of the site at the western property boundary.

2. Objectives of the Bank

2.1 Bank Location

The NCDOT is required to provide wetland mitigation in order to offset jurisdictional resource impacts from roadway improvement projects. The NCDOT is also in the process of identifying and developing wetland mitigation banks to provide pre-construction mitigation for regions of the state projected to receive multiple roadway improvement projects within the foreseeable future. In order to meet these objectives, the NCDOT identified a 193-acre agricultural site previously owned by the Barnett family, located along SR 1530 (River Bend Road) at NC 57, near the town of Milton, in Caswell County, as a potential wetland mitigation bank site. It is approximately one-quarter mile northwest of Milton, 15 miles northeast of Yanceyville, and 10 miles southeast of Danville, Virginia. For the purposes of this Wetland Mitigation Site Plan, the site will be referred to as River Bend throughout this report. The River Bend site, which is within the western portion of the Roanoke River Basin, is within USGS Hydrologic Unit 03010104.

2.2 Bank Goals and Objectives

River Bend was originally identified in 1997 as a potential mitigation bank site that would offset impacts to jurisdictional resources associated with future projects in Caswell and Person Counties. It is expected that the River Bend site will provide wetland and upland restoration credits that will be applied toward meeting future, unidentified mitigation requirements in these counties.

2.3 Bank Ownership

The River Bend site was purchased in 2001 by the NCDOT. Prior to NCDOT's purchase, the property was owned by Willard and Gertie Burnett, Larry and Lucinda Burnett, and Willard Ray Burnett. According to land records, ownership of the property has transferred approximately six times since the early 1900s. Past land uses have consisted of both agricultural and pasture lands.

The current primary point of contact regarding ownership and stewardship issues is

William D. Gilmore, P.E., Manager
Project Development and Environmental Analysis Branch
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1548 Mail Service Center
Raleigh, North Carolina 27699-1548

3. Existing Site Conditions

3.1 Site Description and Land Use

Caswell County covers an area of 256,000 acres, or about 425 square miles. It is in the north central section of the state and is about 40 miles northeast of Greensboro, 40 miles northwest of Durham and 10 miles south of Danville, Virginia. The highest elevation in the county is found on the north summit of Stony Creek Mountain, which has an elevation of 880 feet above Mean Sea Level (MSL). The lowest elevations are found along the Dan River in the northern part of the county, which has an elevation of 350 feet above MSL. The local topography consists of a high upland plateau that has been dissected and eroded in many places, thus creating a number of undulating, rolling, and hilly surface features.

The River Bend site is located on the north side of the Dan River in the northeast corner of Caswell County near the town of Milton and the North Carolina and Virginia state line. The eastern edge of the project is bounded by the NC 57 bridge over the Dan River and a NCWRC boat ramp and parking lot at the southwest corner of the bridge. River Bend Road forms the northern site boundary and an agricultural field forms the westernmost property line. Elevations vary across the site, ranging from approximately 380 feet above MSL along River Bend Road up to approximately 368 feet MSL along the levee adjacent to the Dan River. The average elevation near the center portion of the site is about 358 feet MSL, and the Dan River elevation is at 350 feet MSL.

Primary land use within the project area has been agriculture, with dual uses for pastureland along River Bend Road and agricultural land for row crops adjacent to the river. Trees are present only along portions of the pasture, the drainage ditches, and on the levee adjacent to the Dan River. According to maps published in the 1910 Soil Survey of Caswell County, River Bend Road was previously located near the middle of the property rather than in its current location above the floodplain. No structures or ruins were noted at the site; however, based on the linear arrangement within the trees surrounding the central east/west ditch, this is likely the location of the old roadbed.

A high-voltage transmission power line owned by Carolina Power and Light (CP&L) crosses the site diagonally, between the northwestern property corner and the southeastern edge of the site at the Dan River. Six freestanding metal towers, located approximately 500 feet apart, carry the power line between Danville, Virginia, and Hyco Lake. An unimproved power line access road enters the site from River Bend

Road near the northwestern property corner and crosses the site from north to south to the river levee.

3.2 Physical Resources

3.2.1 Physiography

Caswell County is situated within the Piedmont physiographic province of North Carolina. The Piedmont province is located in the central third of the state and stretches between the Coastal Plain and the Blue Ridge Mountains, making up about 45 percent of the state's area. It is underlain by metamorphic rocks of various origins. These rocks were folded during the Paleozoic as the North American and African plates converged.

Since relief varies across the Piedmont province, two sub-regions are generally recognized: the outer piedmont, which is characterized by low relief and the inner piedmont, which is characterized by high relief. The outer piedmont is a gently rolling upland with elevations ranging from 300 to 600 feet above MSL (NCDENR 2002). Erosion and deep weathering have long since obliterated surface indications of the folded bedrock beneath. In this outer piedmont area, narrow rift valleys formed during the Triassic period of the Mesozoic era. These valleys are called Triassic lowlands and are filled with sandstones and basalts that have been extensively weathered. The inner piedmont is an area of rugged terrain where erosion has not yet leveled the most resistant of the metamorphic rocks. Elevations gradually rise to about 1,500 feet above MSL at the foot of the Blue Ridge Mountains. Softer materials have been worn away leaving erosional remnants that form a discontinuous belt of mountains termed monadnocks (NCGS 2002). The River Bend site is located within the outer piedmont subregion.

The River Bend site is situated between the Dan River and several steep sloping ridges that run parallel to the river. The NCDOT surveyed the site to establish a detailed delineation of elevation changes across the 193 acres. Based on this detailed survey, the elevations range from 360 feet above MSL within the central portion of the site along the ditch running parallel to the river, to 368 feet above MSL along the top of the levee adjacent to the river. The steepest areas at the site are located along River Bend road and are 382 feet above MSL.

The difference between the elevations within the drainage ditch channels and the water surface at the Dan River were used to establish the depth of these channels and the

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confluences with the river. The depth of the central ditch, which flows to the river near the east side of the property, ranges from 4 feet deep near the center of the site to more than 10 feet deep above the confluence with the river. A deep head-cut has formed at the confluence of this channel with the Dan River, which has a depth of over 12 feet. The depth of the drainage channel located at the western end of the site ranges from 5 feet deep near the center of the property to over 10 feet deep above the confluence with the Dan River. A deep head-cut at the confluence of this channel with the river is about 15 feet deep.

3.2.2 Geology

According to the *Geologic Map of North Carolina* (NCDLR 1985), the River Bend site is underlain by metamorphic rock associated with the Milton Belt. These rocks consist of biotite, gneiss, and schist. They are best described as inequigranular, locally abundant potassic feldspar and garnet, interlayered and gradational with calc-silicate rock, sillimate-mica schist, mica schist, and amphibolite. They may also contain small masses of granitic rock.

Parent bedrock determines the type of soil systems that develop within the region. Most of Caswell County, including the River Bend site, occurs within a mixed mafic and felsic rock unit. This unit is a very complex area of granites, diorites, gabbros, and other rocks occurring in close proximity to each other. Both geologic erosion and landform creep have mixed the near surface material so that it is often impossible to determine the association of soil to bedrock (Daniels et al. 1999).

The Piedmont province is an area of varied topography that ranges from lowlands to peaks and ridges of moderate altitude and relief. The metamorphic and igneous rocks of this province range in age from Precambrian to Paleozoic and have been sheared, fractured, and folded. Included in this province, however, are sedimentary basins that formed along rifts in the Earth's crust and contain shale, sandstone, and a conglomerate of early Mesozoic age, interbedded locally with basaltic lava flows and minor coal beds. The sedimentary rocks and basalt flows are intruded in places by diabase dikes and sills (USGS 2002).

The project site is also located within the Dan River-Danville Basin aquifer system. The Dan River-Danville Basin extends from southern Appomattox County, Virginia, about 100 miles southwest into Stokes County, North Carolina. In Virginia, the basin is named Danville, and in North Carolina, Dan River. The basin contains sedimentary rocks of the Upper Triassic Dan River Group, and, in Virginia, the Dry Fork Formation

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is present. The sedimentary rocks in this basin consist of sandstone, siltstone, mudstone, shale, and local conglomerate and may be locally cut by diabase dikes.

3.2.3 Soils

Two soil surveys were used to document and compare soils at the site: the Soil Survey of Caswell County, North Carolina (Hearn and Drane 1910) and the Soil Survey of Pittsylvania County and the City of Danville, Virginia (Nicholson 1994). The Pittsylvania County line borders the River Bend site at its extreme northeast corner. The Pittsylvania County soil survey contained more detailed information associated with floodplain soils as compared with the out-of-date Caswell County soil survey.

The site is covered by the Congaree-Chewacla-Wehadkee soil association (Daniels et al. 1999; Kleiss 2001). Soil associations generally consist of one or more major soils and some minor soils or miscellaneous areas. These associations provide a broad perspective of the soils and landscapes in a particular area. They establish a basis for comparing the potential of large areas for general kinds of land use. Soils occurring along large river valleys and floodplains in the northern Piedmont of North Carolina are generally derived from a felsic crystalline parent material (Daniels et al. 1999).

The Congaree-Chewacla-Wehadkee association is composed of nearly level, somewhat poorly drained, and poorly drained soils that have a mineral surface layer with a loamy or clayey subsoil. This association occurs along large river valleys and adjacent floodplains. The soils are typically comprised of 70 percent Congaree soils, 20 percent Chewacla soils, 2 percent Wehadkee soils, 4 percent State soils, and 4 percent Buncombe soils.

Based on field investigations, five soil map units cover the project site. Each map unit is listed and briefly described below. Three of these soils are considered to be hydric or exhibit hydric inclusions: the Wehadkee series is listed as hydric A, while the Chewacla and Congaree series are listed as hydric B. The Buncombe and State series are not hydric soils. Hydric soils are defined as those that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation (Cowardin et al. 1979). Soils referred to as "hydric A" are completely hydric throughout the mapped soil unit. "Hydric B" soils are non-hydric soils that contain inclusions of hydric soils. These inclusions are usually situated in depressional areas or along the border with other soil units.

The Caswell County soil survey was published in 1910 by the Soil Conservation Service. Caswell County is in the process of being re-mapped; however, a new survey has not yet been published. Soils were mapped at the project site during January 2002 to determine the soil series present due to the lack of current soil survey information. Soil profile descriptions were developed by hand augering sample points. Soil information forms were completed for fifty-nine sample points (Appendix A). The soil series were mapped and delineated based on both the soil profile descriptions and landscape position. The sampling locations are shown on Figure 2. Additional information pertaining to each of these series is presented in Table 1.

1. **Buncombe loamy sand (Bu).** *Typic Udipsammments.* Buncombe loamy sand is an excessively well drained and rapidly permeable soil. The soils are derived from sandy alluvium deposited during flood events. Buncombe loamy sand comprises less than 5 percent of the total soils present at the site. The Buncombe series occurs on levees, which are slightly higher than the surrounding landscape. Soils that are generally associated with the Buncombe series are Congaree, Chewacla, and Wehadkee series. The Congaree, Chewacla, and Wehadkee soil series are found on successively lower topographic positions, respectively. The Buncombe series is characterized by its deep profile (greater than 10 feet), its location, and its sandy textures. Buncombe loamy sand is not listed as a hydric soil.

Soils within the portion of Caswell County containing the project area that were formerly identified and mapped as Buncombe soils have been changed to Comus soils as of February 1999. This change in name is due to revision updates for soil classification in the 8th Edition of Keys to Soil Taxonomy, specifically the movement of the mesic line further east than was previously determined.

2. **State silt loam (Se).** *Typic Hapludults.* State silt loam is classified as a well drained soil with moderate permeability, which occurs along stream terraces and floodplains. These soils are derived from loamy sediments, which have been transported by floodwaters. State silt loam comprises less than 5 percent of the mapped area. Soils generally associated with the State series are Chewacla and Cecil. The Chewacla series occurs in lower topographic areas, whereas the Cecil series occurs along adjacent uplands. The State series occupies the highest topographic positions at the River Bend site and subsequently has a more developed profile. State silt loam is not listed as a hydric soil.

3. **Chewacla loam (Cw).** *Fluvaquentic Dystrudepts.* Chewacla loam is characterized as a somewhat poorly drained soil with moderate permeability. This series formed from alluvial material that was transported from upland soils. This material was derived from schist, gneiss, and granite, and several other metamorphic and igneous rocks. Chewacla loam generally occurs along floodplains and in slight depressions and comprises approximately 20 percent of the soils at the site. Chewacla soils are generally associated with the Congaree and Wehadkee series and are generally found on slightly lower topographic areas than the Congaree series. The Wehadkee series is generally found in the lowest topographic areas of the landscape. The Chewacla series has slightly more clay content in the subsurface horizons than the Congaree series. The subsurface horizons generally contain chromas of 2 or less below a depth of 20 inches. Chewacla loam is listed as a Hydric B soil.

Soils within the portion of Caswell County containing the project area that were formerly identified and mapped as Chewacla soils have been changed to Codorus soils as of February 1999. This change in name is due to revision updates for soil classification in the 8th Edition of Keys to Soil Taxonomy, specifically the movement of the mesic line further east than was previously determined.

4. **Congaree loam (Cn).** *Typic Udifluvents.* Congaree loam is classified as a well to moderately well drained soil with moderate permeability. The soils were formed from alluvial loamy sediments. Congaree loam is located on broad floodplains adjacent to the river. The Chewacla and Wehadkee series are common inclusions found with the Congaree series. Congaree loam comprises approximately 70 percent of the soils found at the site. The Congaree soils occur in slightly higher topographic positions than the Chewacla series. Wehadkee are found in depressions, which are generally the lowest elevations of the site. The Congaree series is characterized by deep, dark brown horizons that are generally undistinguishable. Congaree loam is listed as a Hydric B soil.

Soils within the portion of Caswell County containing the project area that were formerly identified and mapped as Congaree soils have been changed to Dan River soils as of February 1999. This change in name is due to revision updates for soil classification in the 8th Edition of Keys to Soil Taxonomy, specifically the movement of the mesic line further east than was previously determined.

5. **Wehadkee fine sandy loam (Wt).** *Fluvaquentic Endoaquepts*. Wehadkee fine sandy loam is classified as a poorly to very poorly drained soil with a deep profile. These soils formed in loamy sediments derived from alluvial material that has been removed from upland areas through flooding. They comprise less than 5 percent of the soils found at the site. Wehadkee soils are generally found as inclusions within the Congaree and Chewacla series. Wehadkee loam occurs in the lowest topographic positions, where conditions are saturated. A dominantly gray profile and redoximorphic features are common to the Wehadkee loam. Wehadkee loam is listed as a Hydric A soil.

Soils within the portion of Caswell County containing the project area that were formerly identified and mapped as Wehadkee soils have been changed to Hatboro soils as of February 1999. This change in name is due to revision updates for soil classification in the 8th Edition of Keys to Soil Taxonomy, specifically the movement of the mesic line further east than was previously determined.

Based on the soil mapping, field crews were able to confirm the presence of the aforementioned series. However, drainage ditches that were installed to utilize all available land for agricultural crops and the steep hydraulic gradient toward the Dan River have modified the soils and hydrology at the site.

Soils associated with riverine systems may be morphologically non-hydric. However, the soils are considered hydric since they have enough water to be ponded or flooded throughout a significant portion of the growing season. Growing season is defined as the number of consecutive days in which the temperature has not dropped below an index temperature for specific vegetation. If vegetation is more resistant to cold temperatures, the index temperature would be lower. The index temperatures used in growing season analysis usually include 24, 28, and 32 degrees Fahrenheit. The depth of the water table above or below the soil surface is affected by numerous factors, including micro-topography, the presence or absence of ditches, minor drainage, and the age and type of vegetation. According to Richardson and Vepraskas (2001), the extra water volume and increased relief of a drainage channel connected to a natural stream or wetland will lower the water table.

Based on the profiles taken at the River Bend site, soils mapped in portions of the lower elevations at the site had soil colors with a 3 chroma or 4 chroma color (Munsell 2000). The area immediately surrounding these profiles had surface ponding or inundation, groundwater welling to within a few inches of the soil surface in the

sample hole, and a dominant cover of herbaceous hydrophytic vegetation. In two sample locations, evidence of faint mottling or iron concretions occurring within 12 inches of the soil surface were found in the soil profile.

Richardson and Vepraskas (2001) have also found that lateral groundwater flow associated with groundwater discharge to ditches or due to a steep hydraulic gradient may cause soils to alternate between hydric and non-hydric morphology. They state that floodplain terrace soils formed in saturated conditions can have few redoximorphic features when they occur in well-drained conditions caused by entrenching of the riverine channel. Another important aspect of a riverine floodplain landscape is that reducing conditions associated with anaerobic or hydric soils may not always occur after flooding. Aerated floodwaters flowing through the soil macropores may be responsible for this situation since these pores allow for a rapid exchange of aerated water and air into the soils (Richardson and Vepraskas 2001). Therefore, the infiltration and subsurface flow of aerated floodwaters at the River Bend site may exchange enough oxygen throughout the soils to prevent development of anaerobic conditions even during periods of floodwater inundation. Distinct morphologic soil features, such as low chroma soil colors and mottling or formation of oxidized rhizospheres and concretions, may not be allowed to develop in the hydric soils mapped at the site.

3.2.4 Water Resources

The surface water features at the River Bend site include several ditched intermittent or perennial channels, as well as the Dan River. All water resources at the site are part of the Roanoke River Basin. The Roanoke River Basin originates in the Blue Ridge Mountains of Virginia and flows in a southeasterly direction into the Albemarle Sound in North Carolina. Over half of the 9,666-square-mile basin is in Virginia. In North Carolina, the basin is divided into two parts: the Dan River and its tributaries in the western section, upstream of Kerr Lake, and the Roanoke River as it enters North Carolina in the eastern section. The site is situated in the Dan River portion of the basin.

According to the Roanoke River Basinwide Water Quality Management Plan (NCDWQ 2001), the River Bend site is located in USGS Hydrologic Unit 03010104 (Lower Dan) and NCDWQ Sub-basin 03-02-04. The NCDWQ Stream Index Number for the North Carolina portion of the Dan River in this subbasin is 22-(39). The watershed for this hydrologic unit covers an area of more than 12,000 acres and includes the Dan River-Danville Basin aquifer, an early Mesozoic basin. Rocks in the

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four southernmost basins in North Carolina contain water sufficient only for domestic supplies in the upper 300 feet. The rocks are similar in composition but are more compact and tightly cemented than those in the basins to the north and do not yield sufficient quantities of water to be considered a principal aquifer (USGS 2002).

All surface waters in North Carolina are assigned a primary water classification by NCDWQ. Supplemental classifications may also be assigned, as applicable. These classifications are assigned to protect uses of the waters such as swimming, aquatic life propagation, or water supplies. According to NCDWQ (2001), the Dan River and its unnamed tributaries adjacent to the site are denoted as Class "C" waters. Class "C" waters are suitable for aquatic life propagation and survival, fishing, wildlife, secondary recreation, and agriculture. The section of the Dan River near Milton, North Carolina, is listed as "Fully Supporting (FS)". An FS designation is given to those streams that fully support its designated uses and generally has good or excellent water quality. A monitoring site used by the NCDWQ to collect water quality and benthic macroinvertebrate samples is located on the Dan River at the NC 57 bridge and the North Carolina/Virginia state line. Data from this site produced a "Good" bioclassification rating for benthic macroinvertebrate collections in 1999 and water chemistry samples indicate a "Good" water quality condition.

Two drainage channels, which flow into the Dan River, account for the majority of surface and groundwater removal at the site. These channels are primarily non-jurisdictional intermittent flows, which have short segments of jurisdictional perennial flow near their confluences with the Dan River. Due to previous soil compression and bank damage from cattle as well as fluctuating water levels within the river, these drainages are incised at their upper reaches and head-cut from their confluences with the river. One of these drainage channels is located on the western portion of the site and flows in a north-to-south direction toward the Dan River. It originates at a 36-inch diameter concrete culvert under River Bend Road, which collects flow from the steep slope north of the roadway. This westernmost channel is approximately 1,500 linear feet in length, with a channel depth ranging from several inches deep near River Bend Road to almost 15 feet deep at the confluence with the Dan River.

The second drainage flows in a west-to-east direction across the central portion of the site, paralleling the Dan River. Near the eastern end of the River Bend site the channel turns toward the south and flows to the river. This drainage originates near the western end of the site and collects flow from several culverts and perpendicular ditches that drain River Bend Road and the steep slope north of the roadway. It is approximately

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3,500 linear feet in length, with a channel depth ranging from a few inches deep to over 12 feet deep at its confluence with the Dan River.

3.2.5 Hydrology

The natural drainage of the River Bend site has been altered to facilitate drainage for agriculture and pasture lands. The existing streams and low areas were ditched to assist with the removal of surface runoff. The drainage area for the River Bend site is estimated to be 240 acres. The primary hydrologic input is precipitation and overland flow from surrounding higher elevations though the site does receive periodic over-bank flooding from the Dan River. Hydrologic outputs are most likely surface runoff, subsurface through-flow, and evapotranspiration.

The Southeast Regional Climate Center maintains a regional weather monitoring station in Danville, Virginia, which is approximately 10 miles northwest of the River Bend site. Based on 48 years of weather data collected at this weather monitoring station, the average annual rainfall for the area is between 43 and 44 inches (SERCC 2002). The highest average annual rainfall recently recorded occurred during 1995 and 1996, when amounts ranged from 52 to 60 inches. The higher amount recorded for 1996 was most likely influenced by Hurricane Fran, which crossed the central Piedmont during September of that year. It should also be noted that substantially lower amounts ranging from 39 inches (in 2000) to 26 inches (in 2001) were recorded, indicating a period of drought for the geographic area during the last few years.

The River Bend site may have minor hydrological trespass issues only with the property immediately to the west. A shallow, intermittent drainage ditch enters the site from this property. Its water carrying capacity is minor as compared with perennial streams; however, surface water associated with this ditch will be transported into the Dan River. Portions of the existing ditch will be re-channeled to accommodate flows associated with this drainage. The new drainage channel will be designed to have bank-height ratios (top of bank/bankfull height) at or near 1.0. As a result, floodwaters above the bankfull stage will be connected with the large floodplain. There are no other known hydrologic trespass issues at this time.

3.2.6 Groundwater Hydrology Model

A groundwater model was developed to estimate current water table elevations at the site and to analyze the expected groundwater response to drainage modifications. The model was completed based on four phases of development. These were (1) a

refinement of the conceptual model for the valley where the River Bend site is located; (2) construction of a two-dimensional numerical flow model for hydrology at the site; (3) calibration of the numerical model to the measured groundwater flow conditions at the site; and (4) evaluation of the effects of altering drainage on groundwater levels for the site. The following sections describe the development of the flow model and hydraulic evaluation of the proposed topography alterations.

3.2.6.1 Drainage Alteration Plan

Appendix B, Figure 1 illustrates the drainage alteration plan for the site. The existing drainage ditches, located perpendicular to River Bend Road, which collect runoff and groundwater discharge from the hillside to the north of the site and convey it to the Dan River, will be filled. The runoff from the hillside that once discharged to the drainage ditches will be collected and redistributed over the central area of the site using a level spreader system. The amount of runoff and discharge to be reallocated was computed to be 35.58 gallons per minute. This equals a 6-inch per year recharge rate over a 115-acre watershed for the ditches on the north side of the site. Two new, shallower drainage ditches will be dug to redirect floodwaters to the Dan River: one will connect to the ditch entering the site from the western property boundary and the other will drain the eastern side of the site.

3.2.6.2 Groundwater Flow Model Construction and Calibration

The MODFLOW (McDonald and Harbaugh 1988) simulation program was used to develop a numerical groundwater flow model for the River Bend site. The three-dimensional model grid developed for the site covers an area of approximately 208 acres and simulates shallow groundwater flow in the overburden. The boundaries for the site are set to coincide with the natural groundwater divides and surface water features such as rivers and drainage ditches. The finite difference grid is composed of 213 columns and 104 rows with one layer for a total of 22,153 nodes. The grid uses a uniform 20-foot spacing pattern over the entire model domain. The River Bend model includes two types of boundary conditions: a "no flow" condition and a "drain" condition (head dependent flow). Appendix B, Figure 2 shows the finite difference grid and the location of the boundaries for the calibrated model based on current conditions at the site. Appendix B, Figure 3 shows the finite difference grid and model boundaries for the proposed drainage alteration simulation.

The model simulates only shallow groundwater flow beneath the site, since only shallow groundwater flow will be primarily affected by the drainage alterations. To

simulate shallow flow conditions for the site, the model used a single hydraulic conductivity value of 7.5 feet per day (2.6×10^{-3} cm/sec) for the model layer. This value is consistent with the range of hydraulic conductivity values in published literature for alluvial sediments (Freeze and Cherry 1979).

The model also consisted of a single recharge zone of 6.5 inches per year, which represents approximately 15 percent of the annual average precipitation. For the drainage alteration scenario, it was assumed that 60 percent of the total water distributed to the central portion of the site would not infiltrate, but would flow overland to the drainage ditches, to the Dan River, or would be evapotranspired. Accordingly, only 40 percent of the total water that is reallocated will recharge the shallow groundwater system. This re-allocation results in an additional 15 inches per year of recharge, giving a total of recharge of 21.5 inches per year for the site.

The groundwater model was calibrated using data collected by the RDS[®] groundwater gauges installed at the site. This data was collected between November 1999 and November 2000 by the NCDOT. The model was calibrated based on current site conditions and drainage patterns. The primary criterion for evaluating the calibration of the groundwater flow model is the difference between simulated and observed water levels for the site. The residual or model error, represented by “ e_i ,” is defined as the difference between the observed and simulated hydraulic head measured at an observation location using the following equation:

$$e_i = \hat{h}_i - h_i$$

where “ h_i ” is the measured value of the hydraulic head and “ \hat{h}_i ” is the simulated value at a specific target location. A residual with a positive sign indicates an over-prediction by the model, such as when the simulated head is higher than the measured value. The model had a residual sum of squares of 17.76 square feet and a mean of -0.026 feet.

Overall, the model accurately reflects the observed flow conditions at the site. Appendix B, Figure 4 shows the simulated water levels and residuals for the calibrated model under existing conditions. Shallow groundwater flows from north to south beneath the site and discharges to the main east/west drainage ditch on the site and eventually into the Dan River. The deflections in the groundwater contours reflect shallow groundwater discharge to the drainage ditches.

3.2.6.3 Drainage Alteration Analysis

Appendix B, Figure 5 shows predicted elevations for the groundwater table in response to the proposed drainage alterations at the site. These alterations do not significantly change the main direction of flow beneath the site. Shallow groundwater is still expected to discharge to the remaining drainage ditches and to the Dan River. The effect of the drainage alterations on the shallow groundwater system is an increase in groundwater elevations between the east/west ditch and the Dan River. The increase in water levels in the center of the site is mainly due to the reallocation of runoff from the hillside slopes toward the central portion of the site and the filling of the north/south ditch near the western property boundary. These proposed alterations increase water table elevations to within 1-foot of land surface.

3.3 Flood Hazard

The site is located in a Federal Emergency Management Association (FEMA) Flood Zone A, areas of flooding, as shown on FEMA Flood Insurance Rate Map of Caswell County, North Carolina, Community-Panel Number 370300 0002A, effective date February 3, 1978. Zone A indicates those areas that are subject to inundation by a 100-year flood, as determined by detailed methods. Mandatory flood insurance purchase requirements apply for structures located within this flood zone.

Sources of water associated with riverine floodplain areas are rainfall, shallow ground water, seepage, and overland flow from adjacent uplands. Since the Dan River borders the River Bend site, periodic inundation from floodwaters is also a likely source of water.

3.4 Biotic Resources

A combination of many biotic and abiotic factors determines the inherent productivity of a forested wetland site and its capacity to support a community of wildlife species. The abundance of wildlife species varies with the temporal context of factors affecting populations. Controlling or limiting factors will have different short-term (months, seasons) and long-term (years, decades) effects. Historical events continue to influence present-day wildlife populations and the range of practicable management options.

Principal abiotic factors in forested wetlands are soil, water, weather, topography, and disturbance. Soils have the major influence on the inherent fertility of a site and reflect other considerations such as the predominant historical role of climate and hydrology.

Abiotic factors are an important determinant of a site's ability to function as wildlife habitat. These factors have both direct and indirect effects on wildlife populations. Direct effects include mortality caused by natural events such as fires, storms, drought, unusual temperatures, and flooding. Indirect effects include adverse impacts on reproduction and survival.

An important stand-scale biotic feature affecting wildlife abundance and diversity in forested wetlands is the structural diversity of vegetation in vertical and horizontal dimensions. Increased structural diversity promotes more opportunities to forage, nest, and escape from predators.

This section describes the existing vegetation and associated wildlife that occur within the project area. The proposed mitigation area is composed of different vegetative communities based on current and historic land use, topography, soils, hydrology, and disturbance. Scientific nomenclature and common names (when applicable) are provided for each plant and animal species listed. Subsequent references to the same organism include only the common name.

3.4.1 Vegetative Communities

Natural vegetative communities present at the site were categorized using *Classification of the Natural Communities of North Carolina, Third Approximation* (Schafale and Weakley 1990). Natural communities are defined as "distinct and re-occurring assemblages of populations of plants, animals, bacteria, and fungi naturally associated with each other and their physical environment." These communities are in a constant state of transition based on current and previous land uses. Some of the community names have been modified to better reflect field observations. Based on field surveys, four natural communities are present at the River Bend site: Piedmont/Mountain Levee Forest, Piedmont/Mountain Bottomland Forest, Floodplain Pool, and Disturbed Lands (agricultural/pasture lands). The USFWS classification system defines these palustrine communities as a bottomland forest (PFO1A), palustrine emergent marsh (PEM1A), and cutover lands/disturbed fields (PSS1A/C), (Cowardin et al. 1979). The NWI map for Caswell County shows several areas in the western portion of the River Bend site, where two perpendicular drainage ditches converge, as freshwater marsh (PEM1A/C/F). This designation is frequently applied to power line rights-of-way and undrained field depressions. Distribution and composition of these communities reflect variations in micro-topography, soils, hydrology, disturbance, and past and present land uses. A classification of these four

communities and the associated acreage is presented below. The locations of these four plant communities are identified in Figure 3.

3.4.1.1 Piedmont/Mountain Levee Forest

The narrow riparian forest corridor adjacent to the Dan River and short segments of the two convergent drainage channels falls are best defined as a Piedmont/Mountain Levee Forest. These forests are found along natural levees bordering rivers and streams on large floodplains. Their hydrology is palustrine, seasonally or intermittently flooded. The periodic input of nutrients in flood-deposited sediment makes levee sites very fertile, and growth is rapid in these communities (Shafale and Weakley 1990). The canopy at the River Bend site is dominated by box elder (*Acer negundo*), green ash (*Fraxinus pennsylvanica*), hackberry (*Celtis laevigata*), American elm (*Ulmus americana*), and river birch (*Betula nigra*). Scattered elderberry (*Sambucus canadensis*) and saplings of the mature canopy account for dominant species in the sparse understory and the vine/herb layer is dominated by poison ivy (*Toxicodendron radicans*) and violets (*Viola* sp.). Approximately 14 acres of levee forest were observed at the River Bend site.

3.4.1.2 Piedmont/Mountain Bottomland Forest

The Piedmont/Mountain Bottomland Forest is found along floodplain ridges and terraces other than active levees adjacent to the Dan River. Its hydrology is palustrine, intermittently flooded (Shafale and Weakley 1990). The jurisdictional forested wetland area immediately northwest of the NCWRC boat ramp at the northeastern corner of the site is best described as a Piedmont/Mountain Bottomland Forest. Dominant canopy species include green ash, sycamore (*Platanus occidentalis*), box elder, sweetgum (*Liquidambar styraciflua*), and Southern sugar maple (*Acer barbatum*). The understory is scattered with silky dogwood (*Cornus amomum*), American elm, and saplings of the over-story species. A small, depressional area within this stand is somewhat open, and has shrubby species such as buttonbush (*Cephalanthus occidentalis*) and black willow (*Salix nigra*) along the edge. Herbaceous species, including lizard's tail (*Saururus cernuus*) and sedge (*Carex* sp.), occur near the center of the wetland. Based on field observations, the original forest was bisected by the construction of NC 57. As a result, additional surface runoff was funneled into this area and the natural hydrologic movement of surface water was reversed to flow in a southwest direction rather than following the river in a northeast direction. The natural flow of groundwater was also likely interrupted due to the compaction of soils underlying the roadway as well as by cattle previously pastured on

the land. Floodwaters from the Dan River may also contribute to hydrology on occasion. This bottomland forest community covers approximately 4.5 acres.

3.4.1.3 Floodplain Pool

Floodplain pool wetlands are found in riverine floodplain depressions and tend to hold water throughout the year (Shafale and Weakley 1990). The hydrology is palustrine, permanently to semipermanently flooded with water inputs from precipitation, overland flow, and seasonal flooding. A wet depressional area found near the western edge of the property boundary is best described as a floodplain pool. It is located near the center of the property at the drainage channel that crosses the western property boundary. This shallow wetland covers approximately 0.5 acre. Dominant vegetation included various species of needle rush (*Juncus coriaceus*), various sedges (*Carex* sp., *Cyperus* sp., and *Rhynchospora* sp.), and false nettle (*Boehmeria cylindrica*).

3.4.1.4 Disturbed Lands

The remaining 174-acre (approximate) area at the site is comprised of agricultural/pastureland fields. The pasturelands are dominated primarily by grasses and various herbs including Johnsongrass (*Sorghum halepense*) and cocklebur (*Xanthium strumarium*) along the drier high elevations and soft rush (*Juncus effusus*), sedge, and false nettle in the lower elevation areas. The agricultural fields were previously planted in row crops, primarily corn (*Maize* sp.).

3.4.2 Wildlife and Wildlife Habitat

Wildlife species observed either directly or by evidence of scat or tracks are denoted by an asterisk. Many birds utilize open habitat areas such as old fields and pasturelands because the diverse vegetation provides foraging and breeding sites. Commonly observed species may include Eastern bluebird* (*Sialia sialis*), Carolina wren* (*Thryothorus ludovicianus*), blue jay (*Cyanocitta cristata*), cardinal* (*Cardinalis cardinalis*), and American crow* (*Corvus brachyrhynchos*). Waterfowl may be found in open water habitats such as the Dan River adjacent to the project site. These species include mallard (*Anas platythynchos*), black duck (*Anas rubripes*), merganser (*Mergus* spp.), and Canada goose* (*Branta canadensis*). Larger birds of prey often nest in large trees adjacent to the open land and water of agricultural fields. These include red-tail hawk* (*Buteo jamaicensis*), sharp-shinned hawk (*Accipiter striatus*), American kestrel (*Falco sparverius*), barred owl (*Strix varia*), and Eastern screech-owl (*Otus asio*).

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The forested portions of the study area are populated with the more familiar woodland birds such as gray catbird* (*Dumetella carolinensis*), wood thrush* (*Hylocichla mustelina*), blue jay, Carolina chickadee* (*Parus carolinensis*), cardinal*, red-bellied woodpecker (*Melanerpes carolinus*), northern flicker* (*Colaptes auratus*), pileated woodpecker* (*Dryocopus pileatus*), mourning dove* (*Zenaida macroura*), downy woodpecker* (*Picoides pubescens*), and white-breasted nuthatch* (*Sitta carolinensis*).

The variety of animal species found at the River Bend site is expected to be low due to the limited habitat diversity and the historic mechanized preparation and clearing that occurs during agricultural operations. Eastern cottontails* (*Sylvilagus floridanus*), raccoon* (*Procyon lotor*), and white-tailed deer* (*Odocoileus virginianus*) may be the most common mammals found in this area. Other species likely to be found in the project vicinity include southern toad (*Bufo terrestris*), bullfrog (*Rana catesbeiana*), green frog (*R. clamitans*), Eastern mud turtle (*Kinosternon subrubrum*), common kingsnake (*Lampropeltis getula*), cottonmouth (*Agkistrodon piscivorus*), marsh rice rat (*Oryzomys palustris*), cotton mouse (*Peromyscus gossypinus*), Eastern gray squirrel (*Sciurus carolinensis*), muskrat (*Ondatra zibethicus*), mink (*Mustela vison*), Virginia opossum (*Didelphis virginiana*), wild turkey* (*Meleagris gallopavo*), woodchuck* (*Marmota monax*), red fox (*Vulpes vulpes*), river otter (*Lutra canadensis*), and black bear (*Ursus americanus*).

3.5 Cultural Resources

Reviews were conducted at both North Carolina State Archaeological Office (NCSAO) and the State Historic Preservation Office (SHPO) in Raleigh, North Carolina, in 1998. According to the NCSAO, an archaeological site is situated north of NC 57 adjacent to the Dan River Bridge. The NCDOT has coordinated with the NCSAO and determined that implementation of the River Bend Mitigation Site Plan would not affect this site. No SHPO properties are present at the site.

3.6 Environmental Hazards

3.6.1 Database Search

Federal, state, and local databases were searched using a designated one-mile radius to determine whether the study area or neighboring areas have a regulatory history of environmental problems that could have an adverse impact on the site. These databases included the following:

Federal ASTM Standard

- National Priorities List (NPL);
- Proposed NPL;
- Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS);
- Resource Conservation and Recovery Information System (RCRIS) which includes information on Treatment, Storage, and/or Disposal (TSD);
- Resource Conservation and Recovery Act Information System—Small and Large Quantity Generator and/or Transporter (RCRA); and
- Emergency Response Notification System (ERNS).

State ASTM Standard

- State Inactive Hazardous Site Program List, known as the State Priorities List (SPL);
- State Landfills (Landfills);
- Leaking Underground Storage Tanks (LUST); and
- Owners of Underground Storage Tanks (UST).

Federal ASTM Supplemental

- Superfund (CERCLA) Consent Decrees (CONSENT);

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- Records of Decision (ROD);
- Delisted NPL;
- Facilities Index System (FINDS);
- Hazardous Materials Incident Report System (HMIRS);
- Material Licensing Tracking System (MLTS);
- Mines Master Index File (MINES);
- Federal Superfund Liens (NPL Liens);
- PCB Activity Database (PADS);
- RCRA Administration Action Tracking System (RAATS);
- Toxic Release Inventory System (TRIS); and
- Toxic Substances Control Act identifying Chemical Substance Inventory List (TSCA).

State or Local ASTM Supplemental

- State of North Carolina Hazardous Substance Disposal Site (NC HSDS) and
- Incident Management Database (IMD).

EDR Proprietary Databases

- Former Manufactured Gas Sites (Coal Gas).

The results of the database search concluded that there are no known environmental hazards at or near the River Bend site. A copy of the EDR report is included in Appendix C.

3.6.2 Transaction Screening

In addition to the database search, a site reconnaissance of the study area was completed for potential environmental hazards, including Recognized Environmental Concerns (RECs). RECs are defined as the presence of any hazardous substances or petroleum products in structures on the property or in the ground, groundwater, or surface water on the property. Based on conversations with the Burnett family, there were no known RECs on the property as of 1998. Due to the site's close proximity to the Dan River, seasonal floodwaters may be responsible for the deposition of some trash items. No significant trash or other materials were observed; however, trash associated with a roadside or public access area was observed along the eastern and northern boundaries of the site. A list of questions associated with the Phase 1 ESA Transaction Screening is provided in Appendix D.

3.6.3 Chain of Title

Deed records in the Caswell County Courthouse were researched prior to NCDOT's purchase of the site. A chain of title was established back to the 1930s, at which time old deed book numbers were no longer recorded with the current deed book. The records review indicated that six families had held ownership of the property. The chain is presented below.

- Willard and Gertie Burnett, Larry and Lucinda Burnett, and Willard Ray Burnett acquired the site in October 1998 from E. F. Clark, Jr., and Patsy M. Clark (Book 257, Page 94).
- E. F. Clark, Jr., and Patsy M. Clark obtained the property in July 1967 from Bernice A. Clark (Book 150, Page 718).
- Bernice A. Clark acquired the property in November 1954 from Everett F. and Verna May Clark (Book 122, Page 30).
- Everett F. and Verna May Clark acquired the site in October 1944 from G. R. Rogers (Book 93, Page 477).
- G. R. Rogers obtained the property in November 1936 from May H. Tucker (Book 96, Page 42).

- There was no deed recorded and no note of deed book for May H. Tucker prior to 1936.

3.7 Jurisdictional Issues

3.7.1 Waters of the United States

Section 404 of the Clean Water Act requires regulation of discharges into "Waters of the United States." The United States Environmental Protection Agency (USEPA) is the principal administrative agency of the Clean Water Act; however, the USACE has the responsibility for implementation, permitting, and enforcement of the provisions of the Act. The USACE regulatory program is defined in 33 CFR 320-330.

Water bodies, including lakes, rivers, and streams, are subject to jurisdictional consideration under the Section 404 program. Wetlands are also identified as "Waters of the United States." Wetlands, defined in 33 CFR 328.3, are those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Any action that proposes to place fill into these areas falls under the jurisdiction of the USACE under Section 404 of the Clean Water Act (33 U.S.C. 1344). Since the site was managed by agricultural practices, it has been exempt from the rules set forth in the Section 404/401 program. However, several areas were determined to be jurisdictional during field investigations. These areas are discussed below.

The NCDWQ defines a perennial stream as a clearly defined channel that contains water for the majority of the year. These channels usually have some or all of the following characteristics: distinctive streambed and bank, aquatic life, and groundwater flow or discharge. Dan River is classified as jurisdictional waters.

Jurisdictional wetlands were observed at the River Bend site: one is best described as a Piedmont/Mountain bottomland forest, and the other is best described as a floodplain pool. The largest is the bottomland forest wetland located in the northeast corner of the site near the intersection of River Bend Road and NC 57 (near the NCWRC boat ramp), which covers approximately 2.5 acres. The other bottomland forest wetland is located near the power line access road at the origination of the east/west ditch and is about 0.5 acres in size. The two floodplain pool wetlands were found between the power line access road at the confluence of two drainage ditches and the western property boundary. Other portions of the site, which have some hydrophytic

vegetation and wetland hydrology characteristics, may be underlain by limited areas of hydric soils. However, these soils showed little or no hydric soil characteristics or development, such as low chroma colors or mottling, when the soil profile delineation was conducted.

3.7.2 Protected Species

The Caswell County endangered species list, published by the USFWS and dated March 22, 2001, includes one endangered (E) species potentially occurring in Caswell County: the James spiny mussel (*Pleurobema collina*). The list also notes three species of concern (FSC) potentially occurring in Caswell County: Atlantic pigtoe (*Fusconaia masoni*), Heller's trefoil (*Lotus helleri*), and Virginia quillwort (*Isoetes virginica*). Species that have been listed as endangered are considered to be in danger of extinction throughout all or a significant portion of their range. Federal species of concern are those species that may or may not be listed in the future. Specific information pertaining to the James spiny mussel is presented below. Information concerning the federal species of concern is presented in Table 2.

The NCNHP identifies another twelve species either of special concern (SC) or significantly rare (SR) as also potentially occurring in the county. Plant and animal species that are considered of special concern in North Carolina require monitoring to determine if they will become eligible for protection as endangered or threatened species. Significantly rare plant and animal species in North Carolina are those that generally have low numbers of populations in the state due to habitat destruction (and sometimes also by direct exploitation or disease). These species are generally more common somewhere else in their range. Table 2 also identifies each state-listed species and its habitat requirements. Descriptions of only the federal-listed species are presented below, and biological conclusions address potential impacts, if applicable, to each species due to project implementation. A review of the NCNHP database was conducted for known populations or occurrences at or near the study area. No species or populations were noted.

James Spiny mussel (*Pleurobema collina*)

Federal Status: ENDANGERED

State Status: Not Listed

The James spiny mussel is one of only a few freshwater mussels where prominent spines can be found on juvenile shells. Adults have a dark brown shell and the

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spines are typically absent or reduced. It is a short-term brooder that releases glochidia in summer (late May through early August). The fish hosts for this mussel are thought to include rosyside dace (*Clinostomus funduloides*), bluehead chub (*Nocomis leptocephalus*), mountain redbelly dace (*Phoxinus oreas*), blacknose dace (*Rhinichthys atratulus*), central stoneroller (*Campostoma anomalum*), rosefin shiner (*Notropis ardens*), satinfin shiner (*N. analostanus*), and swallowtail shiner (*N. procne*).

The James spiny mussel is found in waters with slow to moderate current, a moderate gradient, and relatively hard water on sand and mixed sand and gravel substrates. Based on collection records, the James spiny mussel was endemic to the upper James River drainage north of Richmond, Virginia. It currently is restricted to a few small headwater tributaries in Virginia, West Virginia, and North Carolina. This mussel is suspected to have experienced an approximately 90 percent reduction in range. Threats to the current populations of the James spiny mussel are primarily related to industrial and agricultural development within sensitive watersheds and the increasing populations of Asian clam (*Corbicula fluminea*), which can out compete most of the native mussel species. The state of Virginia restricts in-stream activities for this species between May 15 and July 31.

Biological Conclusion: *No Effect*

Suitable habitat consisting of waters with slow to moderate current, a moderate gradient, and sand and mixed sand and gravel substrates are present in many sections of the Dan River. A review of the NCNHP database of rare species and unique habitats on 26 February 2002 revealed no record for the presence of the James spiny mussel within the project vicinity.

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Proposed Components of the Bank

4. Proposed Components of the Bank

4.1 Bank Size

The River Bend site covers 193 acres of previously farmed agricultural land and pastureland along the Dan River. Based on field surveys, existing conditions at the site include 174 acres of open agricultural fields, 14 acres of levee forest, 0.5 acre of floodplain pools, and 4.5 acres of bottomland hardwoods. A wetland delineation was conducted across the site and a field verification was completed with the USACE. A large portion of the site was determined to be non-jurisdictional; however, two jurisdictional wetland areas were found at the site. The largest wetland area is an approximately 2.5-acre bottomland hardwood forest wetland in the northeastern corner of the site, adjacent to the intersection of River Bend Road and NC 57 and the NCWRC boat ramp. The second is a floodplain pool wetland located near the central portion of the site along the western property boundary and covers about 0.5 acre.

Figure 3 shows the location of the existing areas determined to be jurisdictional and non-jurisdictional during the delineation, and the results are summarized below.

Existing Communities	Existing Acres (Estimated)	Jurisdictional Acres	Non-Jurisdictional Acres
Piedmont/Mountain Levee Forest	14	0	14
Piedmont/Mountain Bottomland Forest	4.5	2.5	2
Floodplain Pool	0.5	0.5	0
Managed Agricultural Fields	174	0	174
Total Acreage	193	3	190

4.2 Functions and Values

Wetland functions are self-sustaining properties that exist in the natural environment and provide a perceived benefit, or value, to mankind. Wetland functions which provide the highest values include flood water retention, erosion and sediment control, wildlife habitat, water supply and aquifer recharge, pollution control by nutrient reduction and removal, and recreation.

The most important factor in wetland mitigation design is the hydrologic function of the site. When proper hydrologic function occurs, hydric soil development and

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Proposed Components of the Bank

hydrophytic vegetation growth can occur (Mitsch and Gosselink 2000). Hydrologic conditions at the River Bend site will depend on the various inputs of climate and seasonal precipitation, overland flooding from runoff, surface water retention, and depth to groundwater. Removal of topographic constraints to these functions across the site, such as the drainage ditches, will allow reestablishment of the natural hydrology. Hydrologic data provided by Remote Data Systems (RDS[®]) groundwater monitoring gauges was collected for the River Bend site. Thirteen groundwater monitoring gauges were installed across the site in 1999 in order to collect data related to groundwater levels and surface water levels within the drainage ditches. A summary of the data collected for each well is included in Appendix E and the location of each monitoring gauge is shown in Figure 4.

The presence of vegetation provides several important functions across a wetland. These include water storage, sediment retention, nutrient removal, and wildlife habitat. Plants are the primary source of evapotranspiration of water from a wetland and must be considered part of the hydrologic cycle function. The various layers of vegetation, from herbaceous to woody canopy, can provide benefits to multiple communities of wildlife.

Occurrences of plant species on a site that have adapted to wetland conditions often suggest the presence of wetland hydrology. The *National List of Plant Species that Occur in Wetlands, Southeast (Region 2)* (Reed 1988) is generally used to determine whether or not the dominant vegetation at a site is an indicator of wetland hydrology. An area with 50 percent or more of dominant vegetation that is classified as facultative, facultative wetland, or obligate wetland is used as an indicator of wetland hydrology. Facultative (FAC) vegetation has a 34 to 66 percent likelihood of occurring in wetlands as non-wetlands. Facultative wetland (FACW) plants occur 67 to 99 percent of the time in wetlands, but can occasionally be found in non-wetlands. Obligate wetland (OBL) plants occur more than 99 percent of the time under natural conditions in wetlands. Vegetation in these classifications is considered hydrophytic vegetation and used to assist with the delineation of jurisdictional wetlands (Environmental Laboratory 1987). Existing successional vegetation found throughout the River Bend site is comprised of predominantly hydrophytic vegetation that falls within these three categories.

Soil moisture conditions that maintain aquatic conditions, as defined by United States Soil Taxonomy (NRCS 1998), can be correlated to the hydric soil conditions of jurisdictional wetlands. The hydrology criterion required by the USACE wetland delineation manual (Environmental Laboratory 1987) is inundation or saturation to the

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Proposed Components of the Bank

soil surface continuously for at least five percent of the growing season in most years. Soils with aquic conditions are those that have continuous or periodic saturation and where the presence of redoximorphic features indicates the reduction of ferrous iron and manganese in the soil. Five percent of the soils at the River Bend site have been taxonomically described as having an aquic moisture regime (Figure 5) (NRCS 1998). However, 90 percent are classified as moist mineral soils found in humid climates that have enough rainfall to equal evapotranspiration and which are not dry for more than 90 cumulative days within a year. Restoration of the hydrologic function at the mitigation site will also restore or improve these wetland soil conditions and allow further development of an aquic moisture regime in the soils at the site.

4.3 Classes of Wetlands Proposed for Inclusion

Based on the data collected from the reference vegetation locations and *Classification of the Natural Communities of North Carolina* (Schafale and Weakley 1990), it was determined that the variety of communities that likely occurred naturally on and around the River Bend site were influenced by infrequent riverine flooding. The slight variations in topography, as well as hydrology and soil types, will influence the plant species and community types that will occur in a riverine floodplain. Considering these variables, as well as existing conditions at the site, four communities are proposed for the restoration areas of the mitigation site: Piedmont/Mountain Levee Forest, Piedmont/Mountain Bottomland Forest, Dry-Mesic Oak/Hickory Forest, and Floodplain Pool. Areas noted for preservation of the existing communities include Floodplain Pool, Piedmont/Mountain Bottomland Forest, and Piedmont/Mountain Levee Forest. The soil and hydrology characteristics of these communities, as well as the variations in vegetation for existing site conditions, are described below.

Wetland restoration and preservation at the River Bend site can be accomplished simultaneously to expedite both time and manpower considerations. A conceptual wetland mitigation design is provided in Figure 6. As a part of this site work, NCDOT proposes to complete the following mitigation:

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Proposed Communities	Type of Mitigation and Acres		
	Restoration	Preservation	Total
Piedmont/Mountain Levee Forest	0	14	14
Piedmont/Mountain Bottomland Forest	77	4.5	81.5
Floodplain Pool	5	0.5	5.5
Dry-Mesic Oak/Hickory Forest	92	0	92
Total Acres	174	19	193

These 193 acres will provide the mitigation credits proposed for River Bend property. The estimates are conservatively based and do not reflect any changes or modifications which may occur because of site conditions during construction. Mitigation ratios applied to the River Bend site are presented in Section 5.5 of this report.

4.3.1 Piedmont/Mountain Levee Forest

Levee forest communities are typically associated with large streams and rivers that experience periodic flooding. Levees are broad, low embankments built up along the banks of stream and river channels during floods. When a river floods onto the adjacent land, it immediately begins to deposit the coarse materials on the adjacent bank. Over time, this deposition increases the height of the river's banks, often making the banks higher than the surrounding floodplain. The flood events are the dominant force that forms these vegetative communities since sediment deposition, inundation of floodwaters, and water velocities shape the landscape as well as influence the type of vegetation that grows on top of the levee. The periodic input of nutrients from flood-deposited sediments makes levee sites very fertile, and vegetative growth is generally rapid in these communities (Shafale and Weakley 1990). The canopy is normally dominated by sycamore, river birch, and box elder, with a shrub understory that includes pawpaw (*Asimina triloba*), ironwood (*Carpinus caroliniana*), spicebush (*Lindera benzoin*), and buckeye (*Aesculus sylvatica*).

The levee adjacent to the Dan River supports a mixed age group of hardwood trees and shrubs with a sparse understory of woody vines and herbaceous plants. Since a current soil survey is not available for Caswell County, a soil profile delineation was completed to determine the types of soils occurring at the River Bend site. Based on these soil profiles it was determined that the soil unit along this higher elevation is a Buncombe loamy sand. As the levee slopes down toward the floodplain, the soil

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transitions to a Congaree loam. Approximately 14 acres of Piedmont/Mountain Levee Forest are located along the Dan River on the southern edge of the site. Figure 5 shows the location of the soil unit delineated for this area and Figure 6 shows this vegetative community.

4.3.2 Piedmont/Mountain Bottomland Forest

Bottomland forest communities can be found in a wide variety of alluvial landscapes within the Piedmont. Most are on floodplain ridges and terraces, adjacent to streams and rivers yet not within the active levee or floodplain. Since these communities are associated with riverine systems, they are occasionally flooded, which provides a significant part of the nutrients in this community. The velocity of the floodwaters has usually dissipated as it reaches the bottomland forest areas and the flowing water does not create problems for vegetation in the bottomland system. However, long-term flooding can cause mortality for many of the vegetation species found in these communities. There is a broad range of wetness, related to the height of ridges or terraces. Soils are a range of alluvial types associated with deposition and saturation conditions. This type of forest system may be a climax community, with an uneven-aged mix of vegetation that is regenerated whenever gaps occur in the canopy (Shafale and Weakley 1990). The canopy is dominated by species such as swamp chestnut oak (*Quercus michauxii*), sweetgum, swamp black gum (*Nyssa biflora*), red maple (*Acer rubrum*), American elm, and green ash. Understory trees and shrubs include ironwood and possumhaw (*Viburnum nudum*).

The central section of the River Bend site, running in an east/west direction, was most likely a bottomland forest community prior to impacts from clearing for agriculture. The dominant canopy vegetation near the western and central area of the site is now limited to box elder, American elm, and green ash, with a sparse understory of saplings of these species, as well as some sweet gum, Southern sugar maple, and tulip poplar (*Liriodendron tulipifera*). Based on the soil profile delineation, the soil type in this western and central area is a Chewacla loam, with some Congaree loam occurring near the power line access roadway (Figure 5). The bottomland forest community at the northeast corner of the site, which includes the jurisdictional wetland found in this area, is located on a Wehadkee fine sandy loam. Approximately 4.5 acres of bottomland forest are located in the northeast portion of the site (Figure 6).

4.3.3 Floodplain Pool

Floodplain pools are found in shallow depressions on riverine floodplains, such as those formed by abandoned channels. They hold water permanently or semi-permanently, drying up only during periods of drought. Variation occurs due to frequency of drying out. Pools that never dry out can establish permanent aquatic communities, while the ones that dry out at least every few years may not be able to support obligate aquatic species such as fish (Shafale and Weakley 1990). Floodplain pools generally have muddy bottoms, which may provide important breeding habitat for amphibians, especially salamanders, and an easily accessible source of water for wildlife species. Because they hold standing water, trees are usually not found in these wetlands except along the edges. Since they generally occur in floodplains, they may eventually fill with sediments washed in during seasonal floods and succeed to other types of communities. Vegetation is primarily herbaceous and may include regal fern (*Osmunda regalis*), various sedges, smartweed (*Polygonum* sp.), seedbox (*Ludwigia* sp.), and false nettle.

These wetlands tend to be small and as such are not generally mapped or otherwise distinguished in soil surveys. They may occur on the hydric inclusions found in floodplain soils (Shafale and Weakley 1990). The small jurisdictional wetland pool delineated along the western edge of the site, which covers about 0.5 acres, is located at the boundary between the Chewacla and Congaree loam soils. Figure 5 shows the location of these soil units, and Figure 6 shows the proposed location of the floodplain pool wetlands.

4.3.4 Dry-Mesic Oak/Hickory Forest

The dry-mesic oak/hickory forest can be found on mid slopes, low ridges, upland flats, and other dry-mesic upland Piedmont landscapes with acidic soils (Shafale and Weakley 1990). Undisturbed communities are uneven-aged, with mature trees present in a closed canopy. Regeneration occurs when canopy gaps provide opportunities for shade-intolerant seedlings to become established. Fire occurs infrequently and is not an important component of this type of forest system. The dry-mesic oak/hickory forest generally occurs along a topographic moisture gradient that occurs between the drier, more upland communities and the mesic bottomland forest communities. This transitional community type may have been the dominant forest type in pre-Colonial times, but extensive clearing for agricultural lands and timber harvests since then has limited their occurrence to the slopes above alluvial corridors. Areas that have been cleared or heavily logged may be dominated by just a few disturbance species such as

those found at the River Bend site. When undisturbed, canopy vegetation is dominated by a mixture of oak and hickory species, such as white oak (*Q. alba*), southern red oak (*Q. falcata*), black oak (*Q. velutina*), scarlet oak (*Q. coccinea*), northern red oak (*Q. rubra*), black gum, mockernut hickory (*Carya tomentosa*), shagbark hickory (*C. ovata*), and pignut hickory (*C. glabra*). The understory includes red maple, dogwood (*C. florida*), sourwood (*Oxydendrum arboreum*), and American holly (*Ilex opaca*). Figure 5 shows the soil units mapped at the site, and Figure 6 shows the location of the dry-mesic oak/hickory forest community.

The upland slopes that were used for agricultural fields and pastureland at the River Bend site will be restored to a Dry-Mesic Oak/Hickory Forest community (Figure 6). A few mature trees are located near the edge of the road, including short-leaf pine (*Pinus echinata*), sweet gum, and winged elm (*U. alata*). The majority of the slopes are covered with successional herbaceous species, especially Johnsongrass (*Sorghum halapense*) and cocklebur (*Xanthium pensylvanicum*). The soil unit on these slopes is a deep Congaree loam, which has a distinct plow layer and is highly compacted due to past uses (Figure 5).

4.4 Compensation Components

4.4.1 Natural Communities Proposed for Wetland Restoration

Three communities are proposed for the restoration areas at the River Bend mitigation site: Piedmont/Mountain Bottom Land Forest, Floodplain Pools, and Dry-Mesic Oak/Hickory Forest. The existing drainage channels that flow north-to-south and west-to-east to the Dan River will be filled as a part of the restoration plan. Two new channels will be installed on the west side of the existing channels and will be placed at new elevations to provide floodwater drainage from the site to the river. One will be located near the western property boundary and the other near the eastern property boundary. The existing vegetation within the non-jurisdictional areas of the site will be removed, and the slope in the central portion of the site designated for bottomland forest restoration will be graded to direct the flow of potential floodwaters from west to east toward the Dan River. In addition, a shallow berm is proposed for the western property boundary to reduce the risk of hydrologic trespass of surface waters to the adjacent privately-owned agricultural fields. These proposed restoration areas are shown in Figure 6.

4.4.1.1 *Methods for Restoring Piedmont/Mountain Bottomland Forest Wetlands*

Site Preparation

This proposed restoration area is found in the central portion of the site on the topographically lower areas than the adjacent slopes below River Bend Road and the levee by the Dan River. In order to restore the groundwater hydrology influence, the land surface will be graded to eliminate the microtopography and create a more uniform elevation consistent with the lowest elevations near the central east/west ditch. Construction grading equipment will be used to remove enough soil to reduce these microtopographic elevations by as much as 8 to 12 inches. Soil cut from this area will be used to fill the existing ditches. After final grading is complete and before vegetation is installed, the soils will be ripped in order to reduce any compaction. Figure 6 shows the restoration areas located in the central portion of the River Bend site.

Soils

The dominant soils in this proposed restoration area were identified as either a Chewacla loam or a Congaree loam. These soils are both listed on the state hydric soils list as hydric B type soils. Figure 5 shows the soil units mapped at the River Bend site. The Chewacla soil unit is a somewhat poorly drained soil taxonomically identified as a Fluvaquent soil, meaning it is classified as a fluvent soil with aquic conditions. Fluvents are soils that have formed in recent loamy or clayey alluvial deposits. They are usually stratified, and have an organic carbon content that decreases irregularly with depth. Aquic conditions exist when continuous or periodic saturation and reduction occurs. The presence of an aquic condition is indicated by redoximorphic features within the soil profile, such as iron or manganese concretions or oxidized root channels. The Congaree soil unit is a well- to moderately well-drained soil that is taxonomically identified as a Udifluent, which is a udic soil with fluvent conditions. Udic conditions exist when soil moisture dries out for neither 90 cumulative days during the year nor 60 consecutive days during the drier summer months (SSSA 2001). Fluvent conditions are related to the alluvial deposition of loamy or clayey sediments.

Hydrology

The River Bend site is currently ditched so that water is removed from the surrounding soils and drained to the Dan River. Monitoring well data collected from the central

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portion of the site along these ditches indicates that normal annual water table elevations range from 40 inches below the soil surface to inundation conditions. Based on the soil units mapped in this area they are expected to be periodically flooded. However, the extensive draining and past land use practices have reduced the groundwater hydrologic influence to these areas.

Restoration to a Zone IV hydrologic regime, as defined in by the USACE in Table 5 of the Wetland Delineation Manual (Environmental Laboratory 1987) will be provided in the Piedmont/Mountain bottomland forest wetlands. This regime is seasonally inundated or saturated to the surface for 12.5 to 25 percent of the growing season. Filling existing drainage ditches and reducing the existing elevations in the indicated areas will be completed in order to restore the hydrology in these areas. As a result of the cut and fill work, the normal water table level is expected to return to within 12 inches or less of the soil surface for more than 12.5 percent of the growing season.

Vegetation

Vegetation to be planted in the Piedmont/Mountain bottomland forest areas will be based on those available from local nursery stock at the time of planting. Species may include overcup oak (*Q. lyrata*) (OBL), swamp chestnut oak (FACW-), cherry-bark oak (*Q. pagodaefolia*) (FAC+), black walnut (*Juglans nigra*) (FACU), possum-haw (FACW+), highbush blueberry (*Vaccinium corymbosum*) (FACW), and silky dogwood (FACW+). Seeding-in from existing native woody vine, shrub, and tree species from adjacent areas is also expected to occur. Table 3 includes a list of recommended plant species for use in this bottomland forest restoration area. Figure 6 shows the area where this community will be installed.

Plant spacing will be based on total planting area and total number of trees to be planted. Planting density for hardwoods and needle leaved trees will be 680 stems per acre with an estimated 77 acres being planted for this restoration. As site conditions allow, trees will be planted at eight-foot spacing intervals. Consideration for microtopography, soil unit, and spatial diversity for wildlife habitat will be used in determining placement of species to be planted across the site.

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4.4.1.2 Methods for Restoring Floodplain Pool Wetlands

Site Preparation

The proposed floodplain pool restoration areas are located in the central portion of the site on the existing drainage channel that runs in a west to east direction before turning southward toward the Dan River. In order to restore the groundwater hydrology influence, the land surface adjacent to this channel will be graded to reduce the bank heights and to create shallow depressional pools in place of the ditch. Construction grading equipment will be used to remove enough soil to reduce the bank elevations by as much as 1 to 3 feet in those sections that are deeper because they were periodically maintained by the land owner. Soil cut from this area will be used to fill the ditch sections not used to form the shallow pools. After final grading is complete, the adjacent areas will be ripped in order to reduce any soil compaction. Figure 6 shows the floodplain pool restoration areas located in the central portion of the River Bend site.

Soils

The dominant soil in this proposed restoration area was identified as a Chewacla loam. This soil series is listed on the state hydric soils list as a hydric B type soil. Figure 5 shows the soil units mapped at the River Bend site. The Chewacla soil unit is a somewhat poorly drained soil taxonomically identified as a Fluvaquent soil, meaning it is classified as a fluvent soil with aquic conditions. Fluvents are soils that have formed in recent loamy or clayey alluvial deposits. They are usually stratified and have an organic carbon content that decreases irregularly with depth. Aquic conditions exist when continuous or periodic saturation and reduction occurs. The presence of an aquic condition is indicated by redoximorphic features within the soil profile.

Hydrology

The River Bend site is currently ditched so that water is removed from the surrounding soils and drained to the Dan River. Monitoring well data collected from the central portion of the site along the ditches indicates that annual normal water table elevations range from 40 inches below the soil surface to inundation conditions. The ditch that drains from west to east is continuously inundated with water depths ranging from 2 inches to 3 feet, with the shallower depths occurring toward the west end of the site. Based on the Chewacla soil unit mapped for this area, the soil is expected to be

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periodically flooded. However, the extensive draining and past land use practices have restricted the groundwater hydrologic influence to the central ditch area.

The USACE definition for a Zone II hydrologic zone will be used as criteria for restoration of the floodplain pool areas. Table 5 of the Wetland Delineation Manual (Environmental Laboratory 1987) lists parameters for this hydrologic regime as semi-permanently to nearly permanently inundated or saturated to the surface for 75 to 100 percent of the growing season. This restoration will be provided by reducing bank elevations of the current ditch to create shallow depressional pools and by filling the remainder of the ditches to reduce draining to the Dan River. This cut and fill will provide a hydrologic connection between these depressional pools and the existing water table. Periodic flooding of the Dan River and overland flow from surrounding slopes may also provide additional hydrologic inflow of surface water to these depressional wetlands.

Vegetation

Vegetation to be planted in the floodplain pool areas will be based on those available from local nursery stock at the time of planting and may include bur-reed (*Sparganium americanum*) (OBL), woolgrass (*Scirpus cyperinus*) (OBL), buttonbush (OBL), Joe-Pye weed (*Eupatorium fistulosum*) (FAC+), and tag alder (*Alnus serrulata*) (FACW+). Seeding-in from existing native herbaceous species from adjacent areas is also expected to occur. Table 3 includes a list of recommended plant species for use in this floodplain pool restoration area. Figure 6 shows the area where these communities will be installed.

Plant spacing will be based on total planting area and total number of plants to be installed. An estimated 5 acres will be planted for this restoration. As site conditions allow, consideration for microtopography, soil unit, and spatial diversity for wildlife habitat will be used in determining placement of species installed in the floodplain pool communities. Spacing of installed herbaceous plants will depend on species habit for rate of growth and spreading as well as existing conditions at the site. For species that normally become established within one growing season, spacing will be from 1 to 5 feet to allow for spread of rhizomes. Species requiring longer periods for establishment will be planted at 1- to 3-foot intervals. Planting density for woody shrubs will be based on 680 stems per acre; as site conditions allow, shrubs will be planted at 8-foot spacing intervals.

4.4.1.3 *Methods for Restoring Dry-Mesic Oak/Hickory Forest*

Site Preparation

The proposed Dry-Mesic Oak/Hickory Forest restoration area is situated near the outer portions of the site on the topographically higher areas along River Bend Road and on the southern portion of the site north of the levee at the Dan River. Since this restoration is considered an upland community, no additional grading or changes to existing land elevations is anticipated. After final grading is complete for other portions of the site and before vegetation is installed, the soils will be ripped in order to reduce any compaction. Figure 6 shows the restoration areas located along River Bend Road and on the southern portion of the site north of the Dan River levee.

Soils

The dominant soils in this proposed restoration area were identified as Congaree loam and State silt loam. Figure 5 shows the soil units mapped at the River Bend site. The Congaree series is listed on the state hydric soils list as hydric B type soil. This soil unit is a well to moderately well drained soil that is taxonomically identified as a Udifluent, which is a udic soil with fluent conditions. Udic conditions occur when soil moisture dries out for neither 90 cumulative days during the year nor 60 consecutive days during the drier summer months. Fluent conditions are related to the alluvial deposition of loamy or clayey sediments. The State soil unit is a well-drained soil typical of Ultisols that have low or moderate amounts of organic carbon. They have an udic soil moisture regime and are not saturated with water for periods long enough to limit their use for most crops.

Hydrology

Based on the soil units mapped in this restoration area, the soils are not expected to be dry for more than 90 cumulative days within the year or for more than 60 consecutive days during the drier summer months. Restoration to a Zone V hydrologic regime, as defined in by the USACE in Table 5 of the Wetland Delineation Manual (Environmental Laboratory 1987) will be provided in the Dry-Mesic Oak/Hickory forest areas. This regime is irregularly inundated or saturated for 5 to 12.5 percent of the growing season. Filling existing drainage ditches and reducing the existing elevations in the indicated areas will contribute to restoration of the hydrology in these areas. Overland flow from the surrounding higher elevations and periodic flooding of

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the Dan River are also expected to contribute to the hydrology of this restored community.

Vegetation

Vegetation to be planted in the Dry-Mesic Oak/Hickory forest areas will be based on the species available from local nursery stock at the time of planting. The species may include water oak (*Q. nigra*) (FAC), white oak (FACU), pignut hickory (FACU), black cherry (*Prunus serotina*) (FACU), black walnut (FACU), pawpaw (FAC), deerberry (*Vaccinium stamineum*) (FACU), and hazelnut (*Corylus americana*) (FACU).

Seeding-in from existing native woody vine, shrub, and tree species from adjacent areas is also expected to occur. Table 3 includes a list of recommended plant species for use in this forested restoration area. Figure 6 shows the area where this community will be installed.

Plant spacing will be based on total planting area and total number of trees to be planted. Planting density for hardwoods and needle-leaved trees will be 680 stems per acre with an estimated 92 acres being planted for this restoration. As site conditions allow, trees will be planted at eight-foot spacing intervals. Consideration for microtopography, soil unit, and spatial diversity for wildlife habitat will be used in determining placement of species to be planted across the site.

4.4.2 Natural Communities Proposed for Wetland Preservation

Areas noted for preservation of the existing communities are shown on Figure 6. The existing 4.5 acres of Piedmont/Mountain Bottomland Forest identified in the northeast corner of the site, including 2.5 acres of jurisdictional wetland identified as a bottomland forest, is proposed for preservation. The existing 0.5 acres of Floodplain Pool wetland along the western property boundary is also proposed for preservation. In addition, 14 acres of upland preservation is proposed for the Piedmont/Mountain Levee Forest adjacent to the Dan River.

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5. Administration and Operation of the Bank

5.1 Geographic Service Area

The proposed service area for the River Bend Wetland Mitigation Bank is the Western Roanoke River Basin portion of the Roanoke River Basin (Figure 7). The service area is defined by USGS Hydrologic Unit Code 03010104, which is comprised of NCDWQ Sub-basins 03-02-04 and 03-02-05. Use of the River Bend Wetland Mitigation Bank to compensate for impacts outside the specified service area may be considered by the USACE or other environmental permitting agencies on a case-by-case basis.

5.2 Long-Term Management

The NCDOT will maintain ownership of the site until all mitigation activities are completed and determined to be successful. A conservation easement or other restrictive covenant will be established for the property and recorded with the deed when transfer is determined. Final dispensation of the River Bend mitigation bank will go to the NCWRC. Ownership or management of the 193-acre site will be completed once a formal agreement is established between the NCDOT and the NCWRC.

5.3 Financial Assurances

The NCDOT wetland mitigation program is funded by state or federal funds as part of each roadway construction project. Both state and federal legislation authorizes and provides appropriate financial support to the NCDOT. This includes a portion of the taxes collected from the sale of gasoline in North Carolina. The NCDOT does not anticipate any difficulty in meeting its funding obligations, as specified by law, rule, or regulation, for wetland mitigation banks.

5.4 Compensation Ratios

Compensation ratios for debiting will be determined by the USACE during the permit application process.

5.5 Methods for Determining Credits and Debits

Successful implementation of the mitigation plan described in Section 6 of this Site Plan will generate the proposed mitigation credits. The total number of credits available at the River Bend site will be determined by the total acreage of wetland

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preservation put into protection through appropriate real estate instruments and the total acreage of successful wetland restoration and preservation. Mitigation ratios applied to the River Bend site are described in the following chart.

Type of Mitigation	Ratio	Wetland Type	Acres Available for Credit	Total Credit for Mitigation
Preservation	10:1	Piedmont/Mountain Bottomland Forest	4.5	0.45
Preservation	10:1	Floodplain Pool	0.5	0.05
Preservation	10:1	Piedmont/Mountain Levee Forest	14.0	1.4
Restoration	1:1	Piedmont/Mountain Bottomland Forest	77	77
Restoration	1:1	Floodplain Pool	5	5
Restoration	1:1	Dry-Mesic Oak/Hickory Forest	92.0	92.0
TOTALS			193	175.9

5.6 Accounting Procedures

Compensation ratios for debiting will be determined by the USACE during the permit application process. The Bank Sponsor will submit written notification to the Mitigation Bank Review Team (MBRT) at the time of each transaction affecting the bank. In addition, the bank sponsor will submit an accounting schedule to the regulatory team on an annual basis. The bank sponsor will certify the annual accounting schedule before submitting it to the MBRT.

6. Monitoring and Maintenance of the Bank

6.1 Reference Wetlands

A reference wetland site optimally is a functioning climax wetland community with characteristics that are to be restored at the mitigation site and which is located near the project area. The reference site characteristics should include similar soils, vegetation, and hydrology as the proposed restoration site. Two of the vegetative communities proposed for restoration at the River Bend site are also represented by existing areas of the same communities. These are the bottomland forest and floodplain pool wetland areas. The NWI has mapped the existing bottomland hardwood forest at the River Bend site as Palustrine Forested (PFO1A). This community type is found in the mountains and piedmont where streamflow is moderate and the soil is fairly well drained. Vegetation includes river birch, sweetgum, red maple, tulip poplar, sycamore, American elm, hackberry, bitternut hickory (*C. cordiformis*), swamp chestnut oak, and box elder. This existing onsite palustrine forested area was used as a reference wetland; however, the land has been used for pastureland and the current vegetation is not diverse. Three species (box elder, sycamore, and green ash) currently dominate the area and provide only limited wildlife habitat or food resources.

In order to design the bottomland restoration area for a climax community representing the natural steady state for a palustrine forested wetland community, property exhibiting mature vegetation was located and used as an off-site reference wetland. Two sites mapped as PFO1A communities were found in protected areas of the NCWRC Caswell County Gamelands near Yanceyville. Vegetation and soil surveys were completed at both reference wetlands; however, no groundwater monitoring gauges were installed at these sites. The soil profile delineations for the reference wetlands are included in Appendix F.

The first off-site reference wetland was located along South Country Line Creek, off SR 1750 (George Russell Road) near the intersection with SR 1736 (Burton Chapel Road). This bottomland forest has a wide floodplain and shows no development of a levee adjacent to the creek. The floodplain is bordered by densely wooded moderate slopes. This site exhibited a more spatially diverse community than the onsite reference wetland. While the canopy was dominated by green ash, sycamore, and river birch, the midstory included ironwood, dogwood, spicebush, hackberry, American holly, and black cherry. The adjacent slopes included shagbark hickory, American beech (*Fagus grandifolia*), tulip poplar, sweetgum, and white oak in the canopy. Soil profiles taken on the floodplain, within approximately 50 feet and 100 feet from the

stream banks, had a deep A horizon with a soil color ranging from 10YR 4/4 to 10YR 3/6.

The second off-site reference wetland was also located within the Caswell County Gamelands. This site is adjacent to Country Line Creek at SR 1780 (Gatewood Road), off NC 158 South, east of Yanceyville. The floodplain is narrower than the first reference site, and a distinct levee is present along the creek. The dominant canopy trees included sycamore, river birch, green ash, and red maple, with a midstory dominated by hackberry, spicebush, musclewood, and black gum. The floodplain was bordered by low wooded slopes dominated by loblolly pine (*P. taeda*). Soil profiles taken at the levee and on the floodplain, within about 100 feet from the stream banks, had a shallow A horizon with soil colors ranging from 10YR 3/6 on the levee to 10YR 4/3 on the floodplain.

The existing floodplain depressional wetland at the River Bend site was used as an on-site reference wetland for restoration of the Floodplain Pools. It is mapped by the NWI as Palustrine Emergency Marsh (PEM). These types of freshwater marshes are typically found along power line rights-of-way and in field depressions. The jurisdictional wetland located along the western side of the River Bend site was used as an on-site reference wetland. Herbaceous species such as various types of sedges, needle-rush, and false-nettle were the dominant vegetation. Additional surveys of the hydrophytic vegetation found in these jurisdictional wetlands will be completed after flowering, when seeds have matured in order to determine the type of hydrophytic plants that will likely occur on the floodplain pool restoration areas due to natural seeding. The typical soil profiles delineated as a Chewacla series had a deep A horizon with a typical soil color of 10YR 5/3.

6.2 Performance Standards for Determining Credit Availability and Bank Success

Hydrologic data available from federal and state agencies includes daily precipitation data collected at various sites surrounding the project vicinity. The monitoring location closest to the River Bend site is at the Danville, Virginia, airport that is approximately 10 miles northwest of the site. However, since groundwater data was unavailable, and in order to monitor the existing hydrologic regime of the site, groundwater gauges were installed as previously noted. These gauges will be removed during site preparation and construction, but will be reinstalled at the same locations in order to continue monitoring the hydrologic regime after construction. Data from these monitoring gauges will be recorded on a daily basis and collected monthly in order to establish the changes in groundwater and surface water levels during a yearly cycle. The

groundwater data will be compared with monthly precipitation data in order to estimate the return cycle for water inputs.

Success criteria for mitigation sites are based on federal guidelines as well as comparisons to undisturbed reference sites. These guidelines establish criteria for both hydrologic conditions and vegetation survival. Hydrologic success at the site will be based on the wetland hydrology criteria established by the Corps of Engineers *Wetlands Delineation Manual* (Environmental Laboratory 1987). Annual data collected from the monitoring gauges to be maintained in the restoration areas of the site will be used to determine hydrologic success.

Inundation or saturation to the soil surface for 12.5 percent or more of the growing season during the monitoring period will be deemed a hydrologic success for the site. A growing season is the portion of a year when the soil temperature measured 20 inches below the soil surface is above 41°F (Environmental Laboratory 1987). Inundation or soil saturation to the surface represents the majority of the rooting zone, which occurs within the upper 12-inches of the soil surface.

Growing season data is not currently available for Caswell County. Based on the data from the soil surveys of Rockingham and Person counties, the average growing season for the River Bend site is expected to be 223 days, beginning March 26 and ending November 4. Hydrologic success for 12.5 percent of the growing season requires at least 28 consecutive days of inundation or saturation to the soil surface.

Vegetation survivability at the mitigation site will be measured over a 5-year-monitoring period. Survivability will be based on 320 stems per acre after 3 years and 260 stems per acre after 5 years. A survey of vegetation during the growing season (mid-March to early November) will be conducted annually over the 5-year-monitoring period in order to verify survivability of the installed plantings. This survey will track the total mortality on an annual basis and be used to calculate survivability at the end of 3 and 5 years. Survivability of fewer than 320 stems/acre at the end of 3 years and fewer than 260 stems/acre at the end of 5 years will require the installation of additional plantings as replacement for the mortality.

6.3 Monitoring and Reporting Protocols

Monitoring results will be documented on an annual basis, with the associated reports submitted to the MBRT as evidence that goals are being achieved. Both the mitigation bank sponsor (NCDOT) and the MBRT will determine when the performance

standards have been achieved at the River Bend site. If standards are not met, the bank sponsor will perform appropriate remedial activities to satisfy the regulatory team. Credits will be released in accordance with a schedule approved by the regulatory team.

Monitoring of wetland compensation efforts will be performed for five years or until success criteria are satisfied. This plan will consist of a comparison between hydrology model predictions and regulatory wetland criteria, supplemented by data from both on- and off-site reference wetlands. Wetland monitoring will entail analysis of two primary parameters: hydrology and vegetation. Quantitative sampling of vegetation will be performed after each growing season, preferably before the first frost, in order to determine vegetative success.

6.4 Monitoring of Hydrology

Groundwater monitoring within restoration areas and the on-site reference wetland will be accomplished utilizing Remote Data Systems, Inc. model RDS[®] WL-40 automated groundwater gauges, or acceptable equivalents. These automated groundwater monitoring gauges will continuously record water level data along a 40-inch gradient. Existing automated groundwater monitoring gauges were installed in 1999 in accordance with specifications provided in the USACE's *Installing Monitoring Wells/Piezometers in Wetlands* (WRP August 1993).

6.5 Maintenance, Contingency, and Remedial Action

If the hydrologic and vegetation success criteria, as described in Section 6.2 are not met during the monitoring period, appropriate contingency measures will be identified and implemented. If the hydrologic success criteria are not achieved, contingency measures may include providing additional fill material to ditches to account for soil subsidence and grade adjustments where appropriate. Possible contingency measures for addressing lack of vegetation success include additional plantings of more suitable plant species for current site conditions, control of nuisance species such as common reed, additional fill material added to roadside ditches to account for soil subsidence, minor cut and fill grade adjustments, or an extended monitoring period.

Should these contingency measures not address the success criteria failure, the goals and strategies of the mitigation bank may need to be redefined. If this becomes necessary, NCDOT will consult with the MBRT to determine appropriate revisions to the goals and strategies.

7. Conclusions

This mitigation site plan is the result of an integrated approach that evaluated the feasibility of mitigation, existing site conditions, property owner attitudes, and recommendations. The 193-acre River Bend site currently contains approximately 4.5 acres of bottomland forest, 0.5 acres of floodplain pool wetlands, 14 acres of levee forest, and 174 acres of agricultural fields. Pending acceptance of the proposed mitigation ratios, the site will provide approximately 175.9 acres of total mitigation credits. These ratios are based on existing conditions and proposed restoration at the site.

The proposed plan provides for approximately 77 acres of bottomland forest restoration, 5 acres of floodplain pool wetland restoration, 92 acres of dry-mesic oak/hickory forest restoration, 4.5 acres of bottomland forest preservation, 0.5 acres of floodplain pool wetland preservation, and 14 acres of levee forest preservation. Section 5.5 contains a breakdown of the mitigation types, proposed ratios, wetland types, total acres, and total mitigation credits.

The NCDOT will conduct an inspection of the River Bend site pending review of this report by both federal and state resource agencies. Agency inspection will allow further analysis of the findings presented in this Site Plan. Comments from the resource agencies will be addressed either during the site inspection or in a stand-alone document. Once the plan is approved, NCDOT may proceed with the mitigation design for the property.

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**Mitigation Site Plan
River Bend**

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Mitigation Site Plan River Bend Tables

Table 1. Existing Soils - River Bend Mitigation Site, Caswell County

Symbol	Series	Taxonomy (Subgroup)	Slope (%)	Permeability	Hydric Class.	Drainage Class.*	Available Water Capacity	High Water Table	Shrink-swell Potential
Bu	Buncombe	Typic Udipsamments	0-6	Rapid to Very Rapid	Non-hydric	E	Low	6.0 ft and greater	Low
Cw	Chewacla	Fluvaquentic Dystrudepts	0-2	Moderate	B	SWP	Medium	0.5-2.0 ft	Low
Cn	Congaree	Typic Udifluvents	0-4	Moderate	B	W-MW	Medium	2.5-4.0	Low
Se	State	Typic Hapludults	0-10	Moderate	Non-hydric	W	Medium	3.5-6.0	Low
Wt	Wehadkee	Fluvaquentic Endoaquepts	0-2	Moderate	A	VP	Medium to High	0.0-1.0 ft	Low

* (E=Excessively drained, MW=Moderately well-drained, W=Well drained, and SWP=Somewhat Poorly drained, VP=Very Poorly drained)

Table 2. Protected Species Listed for Caswell County, North Carolina

Common Name	Scientific Name	Federal Status	State Status	Preferred Habitat	Habitat Available in Study Area
<u>Invertebrates</u>					
Atlantic pigtoe	<i>Fusconaia masoni</i>	FSC	T	Inhabits mostly medium to large streams, preferring clean, swift waters with stable gravel, or sand and gravel substrate. Often found at the downstream edge of riffle areas. This species is limited to the headwater areas of drainages in which it is still present.	No
James spiny mussel	<i>Pleurobema collina</i>	E	-	Found in waters with slow to moderate current and relatively hard water on sand and mixed sand and gravel substrates. Currently restricted to a few small headwater tributaries in Virginia and West Virginia.	No
Squawfoot	<i>Strophitus undulatus</i>	-	T	Tar, Neuse, Cape Fear, and Pee Dee systems, perhaps other systems in Piedmont. Prefers silt, sand, gravel, and mixed substrates. Found from headwater streams to large rivers and lakes to a depth of 4 meters.	Yes
Golden banded-skipper	<i>Autochton cellus</i>	-	SR	Moist woods near streams or ponds; host plants -- legumes, mainly hog peanut (<i>Amphicarpa sp.</i>).	No
Mottled duskywing	<i>Erynnis martialis</i>	-	SR	Upland woods and wooded edges; host plant -- New Jersey tea (<i>Ceanothus americanus</i>).	No
Northern oak hairstreak	<i>Fixsenia favonius ontario</i>	-	SR	Oak-dominated woods, usually in dry sites; host plants -- oaks (<i>Quercus sp.</i>).	No
Skillet clubtail	<i>Gomphus ventricosus</i>	-	SR	The larvae inhabit large rivers where they burrow in the soft mud of deep pools.	Yes
<u>Vertebrates</u>					
Riverweed darter	<i>Etheostoma podostemone</i>	-	SC	Runs and riffles of gravel to boulder, cool to warm, typically clear creeks and small rivers. Frequently associated with vascular riverweed, <i>Podostemon sp.</i> Currently found in Upper Roanoke River drainage, including Roanoke system proper and Dan River system, Virginia and North Carolina. Occurs widely in Ridge and Valley, Blue Ridge, and upper Piedmont provinces and disjunctly in middle Piedmont.	Yes
Roanoke hog sucker	<i>Hypentelium roanokense</i>	-	SR	Cool to warm creeks and small rivers; in riffles, runs, and pools of gravel, rubble, and boulder substrates. Also in slower current over partly sandy substrate. Roanoke River drainage basin in Virginia and Dan River drainage basin in North Carolina; extends widely from Ridge and Valley Province into central Piedmont Province.	Yes

Table 2. Protected Species Listed for Caswell County, North Carolina

Common Name	Scientific Name	Federal Status	State Status	Preferred Habitat	Habitat Available in Study Area
Vascular Plants					
Carolina bird-foot (Heller's) trefoil	<i>Lotus helleri</i>	FSC	SR-T	Piedmont open woods over clay soils, roadsides.	Yes
Virginia quillwort	<i>Isoetes virginica</i>	FSC	SR-L	Piedmont upland depression swamp forests, clayey soils.	No
Prairie blue wild indigo	<i>Baptisia minor</i>	-	T	Piedmont glades and open forests on basic soils.	No
Jame's sedge	<i>Carex jamesii</i>	-	SR-P	Piedmont and Coastal Plain rich woods, especially over mafic rocks.	No
Godfrey's thoroughwort	<i>Eupatorium godfreyanum</i>	-	SR-P	Mountain and Piedmont woodlands, especially over mafic rocks.	No
Cliff spurge	<i>Euphorbia commutata</i>	-	SR-P	Mountain and Piedmont thin soil around mafic or calcareous outcrops.	No
Small rabbit tobacco	<i>Gnaphalium helleri</i> var. <i>micradenium</i>	-	SR-T	Piedmont dry woodlands.	No

Notes:

- E - Endangered A taxon "in danger of extinction throughout all or a significant portion of its range."
- T - Threatened A taxon "likely to become endangered within the foreseeable future throughout all or a significant portion of its range."
- FSC - Federal Species of Concern A species that may or may not be listed in the future (formerly C2 candidate species or species under consideration for listing for which there is insufficient information to support listing.)
- SC - Special Concern Any species of wild animal native or once-native to North Carolina which is determined by the N.C. Wildlife Resources Commission to require monitoring but which may be taken under certain regulations.
- SR - Significantly Rare Any species which has not been listed by the N.C. Wildlife Resources Commission as Endangered, Threatened, or Special Concern species, but which exists in the state in small numbers and has been determined by the N.C. Natural Heritage Program to need monitoring.
- C - Candidate Species which are very rare in North Carolina and are substantially reduced in numbers by habitat destruction. They are also rare throughout their ranges and their fate depends on conservation in NC. These species are likely to merit listing as Endangered or Threatened if habitat destruction continues.
- SR-L - Limited to NC The range of the species is limited to North Carolina and adjacent states (endemic or near endemic). These are species have 20-50 populations in North Carolina, but fewer than 50 populations rangewide.
The species is at the periphery of its range in NC. These species are generally more common somewhere else in their ranges, occurring in North Carolina peripherally to their main ranges, mostly in habitats which are unusual in North Carolina.
- SR-P - Periphery of Range A species that is rare throughout its range.
- SR-T - Rare Throughout The species was last observed in the county more than 50 years ago.
- * - Historic Record

Table 3. Summary of Mitigation Acres and Recommended Vegetation - River Bend Wetland Mitigation Site, Caswell County

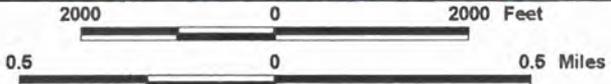
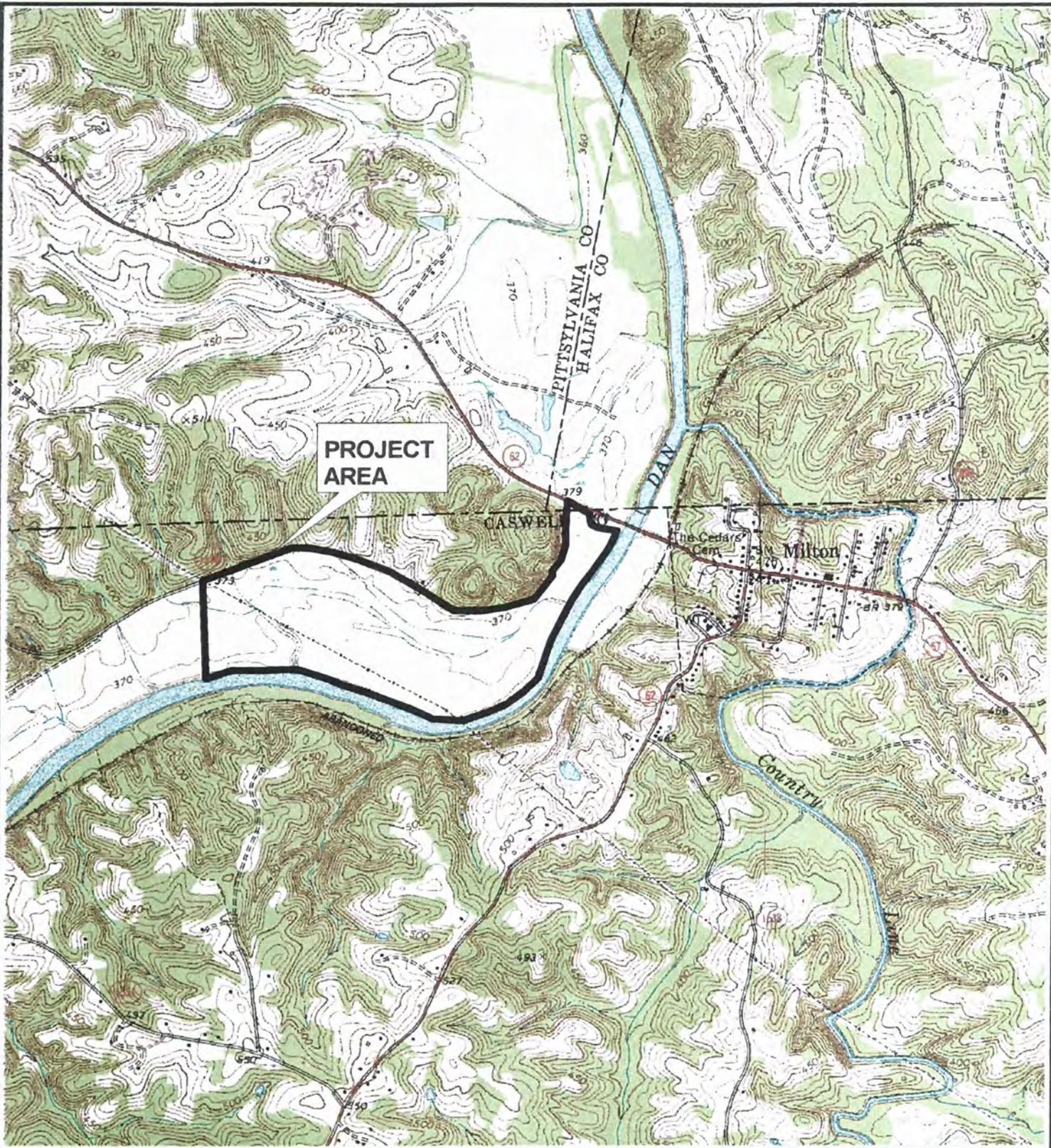
Common Name	Scientific Name	Region 2 Indicator Status
Restoration - Floodplain Pool (Palustrine Freshwater Marsh) (5 acres)		
<u>PERENNIAL HERBACEOUS</u>		
Arrow-arum	<i>Peltandra virginica</i>	OBL
Bur-reed	<i>Sparganium americanum</i>	OBL
Woolgrass	<i>Scirpus cyperinus</i>	OBL
Broad-leaf Arrowhead	<i>Sagittaria latifolia</i>	OBL
Jewelweed	<i>Impatiens capensis</i>	FACW
Joe-Pye Weed	<i>Eupatorium fistulosum</i>	FAC+
Ironweed	<i>Vernonia noveboracensis</i>	FAC+
<u>WOODY SHRUBS</u>		
Buttonbush	<i>Cephalanthus occidentalis</i>	OBL
Possum-haw	<i>Viburnum nudum</i>	FACW+
Silky Dogwood	<i>Cornus amomum</i>	FACW+
Tag Alder	<i>Alnus serrulata</i>	FACW+
Winterberry	<i>Ilex verticillata</i>	FACW
Spicebush	<i>Lindera benzoin</i>	FACW
Elderberry	<i>Sambucus canadensis</i>	FACW-
Restoration - Piedmont/Mountain Bottomland Forest (77 acres)		
<u>WOODY SHRUBS</u>		
Possum-haw	<i>Viburnum nudum</i>	FACW+
Silky Dogwood	<i>Cornus amomum</i>	FACW+
Winterberry	<i>Ilex verticillata</i>	FACW
Highbush Blueberry	<i>Vaccinium corymbosum</i>	FACW
Elderberry	<i>Sambucus canadensis</i>	FACW-
Paw-paw	<i>Asimina triloba</i>	FAC
Red Mulberry	<i>Morus rubra</i>	FAC
<u>TREES</u>		
Overcup Oak	<i>Quercus lyrata</i>	OBL
Black Willow	<i>Salix nigra</i>	OBL
Swamp Chestnut Oak	<i>Q. michauxii</i>	FACW-
Willow Oak	<i>Q. phellos</i>	FACW-
Cherry-bark Oak	<i>Q. pagodafolia</i>	FAC+
Southern Red Cedar	<i>Juniperus silicicola</i>	FAC
Black Walnut	<i>Juglans nigra</i>	FACU

**Table 3. Summary of Mitigation Acres and Recommended Vegetation - River Bend
Wetland Mitigation Site, Caswell County**

Common Name	Scientific Name	Region 2 Indicator Status
Restoration - Dry-Mesic Oak/Hickory Forest (92 acres)		
<u>WOODY SHRUBS</u>		
Sweetleaf	<i>Symplocos tinctoria</i>	FAC
Paw-paw	<i>Asimina triloba</i>	FAC
Red Mulberry	<i>Morus rubra</i>	FAC
Deerberry	<i>Vaccinium stamineum</i>	FACU
Hazelnut	<i>Corylus americana</i>	FACU
<u>TREES</u>		
Water Oak	<i>Quercus nigra</i>	FAC
Bitternut Hickory	<i>Carya cordiformis</i>	FAC
Painted Buckeye	<i>Aesculus sylvatica</i>	FAC
White Oak	<i>Quercus alba</i>	FACU
Northern Red Oak	<i>Quercus rubra</i>	FACU
Pignut Hickory	<i>Carya glabra</i>	FACU
Black Cherry	<i>Prunus serotina</i>	FACU
Black Walnut	<i>Juglans nigra</i>	FACU
Black Oak	<i>Quercus velutina</i>	n/a

Mitigation Site Plan River Bend

Figures



SCALE: 1:24,000

USGS 7.5 Minute Topographic Map: MILTON, NC

Contour Interval: 10 Feet



Prepared For:



PROJECT VICINITY
RIVER BEND WETLAND MITIGATION BANK
 CASWELL COUNTY, NORTH CAROLINA

Figure No.

1

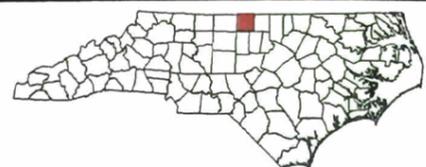
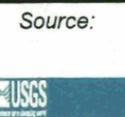


LEGEND

- PROJECT AREA
- DITCHES
- ACCESS ROAD
- CP&L POWERLINE
- SOIL PROFILE LOCATIONS

250 0 250 500 Feet
SCALE: 1:8,000 (1"= 500')

IMAGE: 1994 CCLCR INFRARED- MILTCN, NCVA



SOIL PROFILE DELINEATION
RIVER BEND WETLAND MITIGATION BANK
 CASWELL COUNTY, NORTH CAROLINA

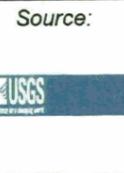
Figure No.
2



LEGEND

- PROJECT AREA
- SOILS**
- AGRICULTURAL FIELDS
- BOAT RAMP LOT
- BOTTOMLAND FOREST
- DELINEATED WETLANDS
- LEVEE FOREST
- DITCHES
- ACCESS ROAD
- CP&L POWERLINE

250 0 250 500 Feet
SCALE: 1:8,000 (1"= 500')
IMAGE: 1994 CCLGR INFRARED- MILTCN, NC/VA



EXISTING CONDITIONS
RIVER BEND WETLAND MITIGATION BANK
 CASWELL COUNTY, NORTH CAROLINA

Figure No.
3



Prepared For:



Source:



MONITORING GAUGE LOCATIONS

RIVER BEND WETLAND MITIGATION BANK

CASWELL COUNTY, NORTH CAROLINA

Figure No.

4



LEGEND

- PROJECT AREA
- SOILS**
- BUNCOMBE
- CHEWACLA
- CONGAREE
- STATE
- WEHADKEE
- JURISDICTIONAL WETLANDS**
- FLOODPLAIN POOL
- BOTTOMLAND FOREST
- ~ DITCHES
- ~ ACCESS ROAD
- ~ CP&L POWERLINE

250 0 250 500 Feet
SCALE: 1:8,000 (1"= 500')

IMAGE: 1994 CCLCR INFRARED- MILTCN, NCVA



DELINEATED SOIL SERIES
RIVER BEND WETLAND MITIGATION BANK
 CASWELL COUNTY, NORTH CAROLINA

Figure No.
5



LEGEND

- PROJECT AREA
- PROPOSED DITCHES
- VEGETATION COMMUNITIES**
- BOTTOMLAND PRESERVATION
- BOTTOMLAND RESTORATION
- DRY MESIC FOREST RESTORATION
- FLOODPLAIN POOL RESTORATION
- LEVEE FOREST PRESERVATION
- JURISDICTIONAL WETLANDS**
- FLOODPLAIN POOL
- BOTTOMLAND FOREST

250 0 250 500 Feet
SCALE: 1:8,000 (1" = 500')

IMAGE: 1994 CCLCR INFRARED- MILTCN, NCVA

Prepared For:



Source:



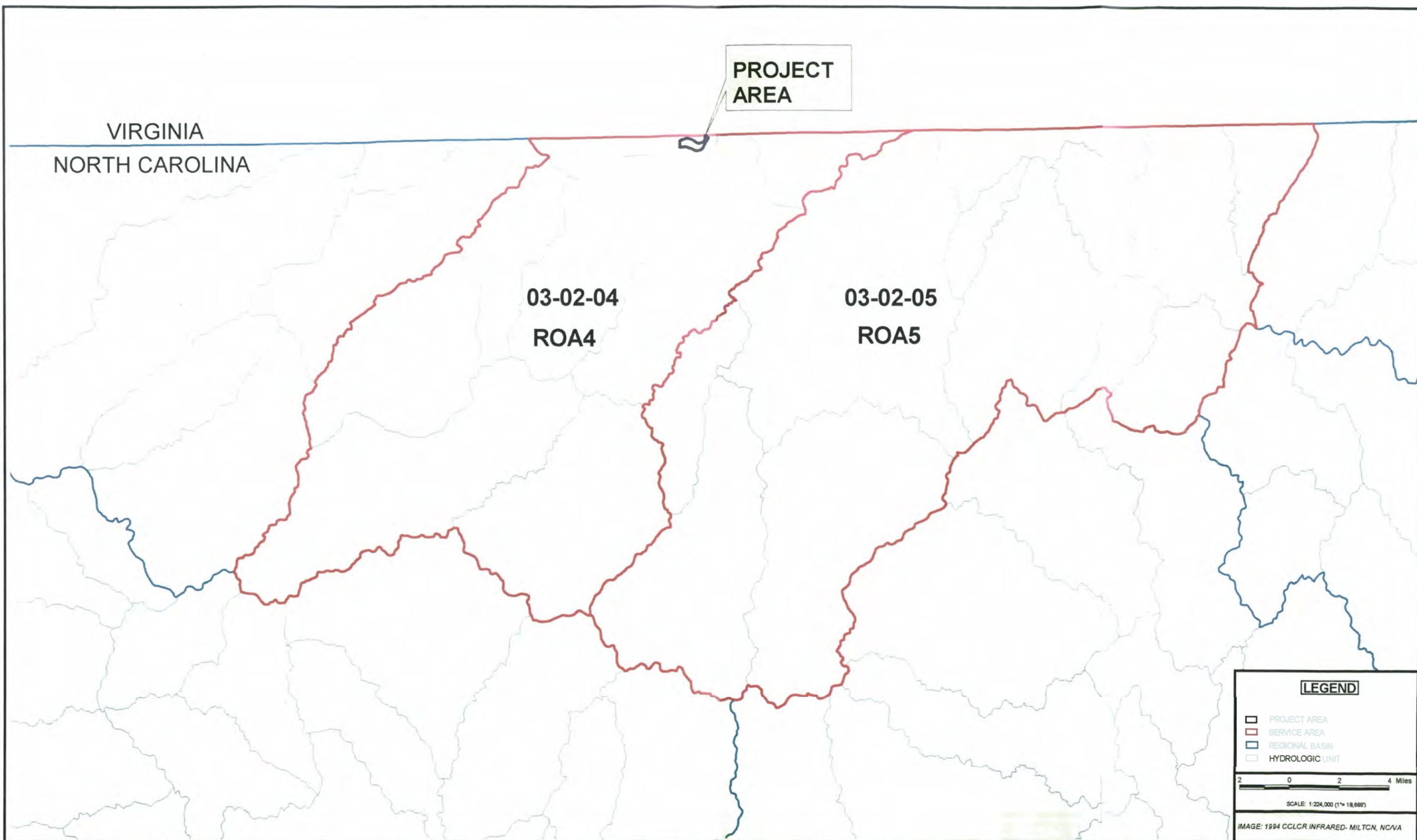
PROPOSED VEGETATION COMMUNITIES

RIVER BEND WETLAND MITIGATION BANK

CASWELL COUNTY, NORTH CAROLINA

Figure No.

6



**PROJECT
AREA**

VIRGINIA
NORTH CAROLINA

**03-02-04
ROA4**

**03-02-05
ROA5**

LEGEND

- PROJECT AREA
- SERVICE AREA
- REGIONAL BASIN
- HYDROLOGIC UNIT

2 0 2 4 Miles

SCALE: 1:224,000 (1" = 18,668')

IMAGE: 1994 CGLCR INFRARED- MILTCN, NCVA



SERVICE AREA
RIVER BEND WETLAND MITIGATION BANK
 CASWELL COUNTY, NORTH CAROLINA

Figure No.
7

Appendix A

Soil Profile Description Forms

Soil Profile Description Form

Project Site		River Bend Mitigation Site			Date	1/29/2002
Investigators		Cindy Carr and Thomas Barrett			County	Caswell
Mapped Series		Chewacla			State	North Carolina
Drainage Class					Plot	A4
Horizon	Depth (in.)	Matrix Color	Mottle Color	Mottle Abundance/Contrast	Texture	Comments
A	0-8	10 YR 5/3	7.5 YR 4/6	c, m, d	L	Elev. 2 or 3' higher than adjacent bog area
Bw1	8-20	10 YR 5/3	5 YR 4/6	c, m, d	CL	small pebbles, organic matter streaks
Bw2	20-30+	7.5 YR 4/2			CL	grit in horizon, possible buried A horizon

Soil Profile Description Form

Project Site		River Bend Mitigation Site			Date	1/29/2002
Investigators		Lane Sauls and Martha Register			County	Caswell
Mapped Series		Congaree			State	North Carolina
Drainage Class					Plot	B2
Horizon	Depth (in.)	Matrix Color	Mottle Color	Mottle Abundance/Contrast	Texture	Comments
A	0-16	10 YR 4/4			SIL	
Bw1	16-24	10 YR 4/2	10 YR 4/4	m, m, d	SIL	
Bw2	24+	10 YR 4/3	10 YR 4/2	f, m, d	SIL	
						small depressional area b/w B1 and B2

Soil Profile Description Form

Project Site	River Bend Mitigation Site			Date	1/29/2002	
Investigators	Lane Sauls and Martha Register			County	Caswell	
Mapped Series	Congaree			State	North Carolina	
Drainage Class				Plot	C5	
Horizon	Depth (in.)	Matrix Color	Mottle Color	Mottle Abundance/Contrast	Texture	Comments
A	0-6	10 YR 3/3			SIL	mica, profile beside big ditch
Bw1	6-22	7.5 YR 4/4			SIL	
Bw2	22+	10 YR 4/3	10 YR 4/2	f, m, f	SIL	stratified, Fe concretions-7.5 YR 6/4 vfine, few

Soil Profile Description Form

Project Site		River Bend Mitigation Site			Date	1/29/2002
Investigators		Cindy Carr and Thomas Barrett			County	Caswell
Mapped Series					State	North Carolina
Drainage Class		Congaree			Plot	D2
Horizon	Depth (in.)	Matrix Color	Mottle Color	Mottle Abundance/Contrast	Texture	Comments
A	0-12	5 YR 4/6			L	
Bw1	12-22	7.5 YR 5/4			SiL	
Bw2	22-31	7.5 YR 5/4			CL	
Bw3	31-35	7.5 YR 4/4			SL	
Bw4	35-42+	7.5 YR 5/3	5 YR 4/6	c, m, d	SiCL	

Soil Profile Description Form

Project Site		River Bend Mitigation Site		Date	1/31/2002	
Investigators		Cindy Carr, Thomas Barrett		County	Caswell	
Mapped Series		Congaree		State	North Carolina	
Drainage Class				Plot	D7 (slight depression)	
Horizon	Depth (in.)	Matrix Color	Mottle Color	Mottle Abundance/Contrast	Texture	Comments
A	0-8	10 YR 4/4	5 YR 4/6 / 7.5 YR 4/6	c, m, d / f, f, d	SiL	Fe concretions and soft masses
Bw1	8-20	7.5 YR 4/6			L	organic streaking
Bw2	20-32+	7.5 YR 4/4			L	mica flakes
						some mottling in surface but lower horizons are not indicative of reduced cond.

Soil Profile Description Form

Project Site		River Bend Mitigation Site			Date	1/31/2002
Investigators		Martha Register, Amin Davis			County	Caswell
Mapped Series		Chewacla			State	North Carolina
Drainage Class					Plot	E7
Horizon	Depth (in.)	Matrix Color	Mottle Color	Mottle Abundance/Contrast	Texture	Comments
A	0-9	7.5 YR 5/4			L	
Bw1	9-20	7.5 YR 4/6	(1) 5 YR 4/6 (2) 2.5 YR 5/3	(1) f, f, d (2) c, m-c, d	CL	some iron concretions
Bw2	20-26	7.5 YR 3/4	10 YR 4/3	c, m, d	SiCL	50/50 matrix to mottle
Bw3	26-32	7.5 YR 3/3	10 YR 3/2	c, m, d	CL	50/50 matrix to mottle
Btg	32-41+	7.5 YR 3/2	7.5 YR 4/4	c, m, d	C	bright films on faces

Soil Profile Description Form

Project Site		River Bend Mitigation Site			Date	1/31/2002
Investigators		Martha Register, Amin Davis			County	Caswell
Mapped Series		Chewacla			State	North Carolina
Drainage Class					Plot	E8
Horizon	Depth (in.)	Matrix Color	Mottle Color	Mottle Abundance/Contrast	Texture	Comments
A1	0-6	2.5 Y 5/2			CL	many fine roots, oxidized root channels
A2	6-12	7.5 YR 3/4	2.5 Y 5/3	c, f, d	CL	50/50 matrix to mottles, iron concretions
Bw1	12-20	7.5 YR 4/4	2.5 Y 5/3	c, m, d	SC	Iron concretions, stratified
Bw2	20-23	7.5 YR 4/4	2.5 Y 5/3	c, m, d	SC/Coarse S	
Bw3	23-30	2.5 Y 5/2	7.5 YR 4/6	c, c, d	SCL	
Bt	30+	7.5 YR 3/4	2.5 Y 5/2	m, m, d	C	

Soil Profile Description Form

Project Site		River Bend Mitigation Site		Date	1/31/2002	
Investigators		Cindy Carr, Thomas Barrett		County	Caswell	
Mapped Series		Congaree		State	North Carolina	
Drainage Class				Plot	F2	
Horizon	Depth (in.)	Matrix Color	Mottle Color	Mottle Abundance/Contrast	Texture	Comments
A	0-15	10 YR 4/6			L	
C	15-24	7.5 YR 5/8			LS	
Ab	24-28	10 YR 4/3			SL	
B	28-32+	10 YR 4/3			L	

Soil Profile Description Form

Project Site	River Bend Mitigation Site			Date	1/31/2002	
Investigators	Cindy Carr, Thomas Barrett			County	Caswell	
Mapped Series	Chewacla			State	North Carolina	
Drainage Class				Plot	F6	
Horizon	Depth (in.)	Matrix Color	Mottle Color	Mottle Abundance/Contrast	Texture	Comments
A	0-8	10 YR 5/3	7.5 YR 4/6	c, m, d	CL	oxidized rhizospheres, water at 5"
Bw1	8-16	10 YR 4/4			SL	
Bw2	16-20	10 YR 5/3	2.5 YR 4/8	f, m, d	CL	small pebbles, soft masses, Fe concretions (2.5 YR 3/2)
Bw3	20-36+	10 YR 5/3	5 YR 4/6 / 5 YR 3/4	m, c, d / c, m, d	SCL	Fe concretions, small pebbles

Soil Profile Description Form

Project Site		River Bend Mitigation Site		Date	1/31/2002	
Investigators		Cindy Carr, Thomas Barrett		County	Caswell	
Mapped Series		Chewacla		State	North Carolina	
Drainage Class				Plot	G4	
Horizon	Depth (in.)	Matrix Color	Mottle Color	Mottle Abundance/Contrast	Texture	Comments
A	0-16	10 YR 4/4	10 YR 5/3 / 10 YR 3/6	f, m, d	SiL	few mica flakes, oxidized rhizopheres
Bw	16-24	10 YR 4/4			SiCL	organic streaking
R						Rock at 24"

Soil Profile Description Form

Project Site	River Bend Mitigation Site			Date	1/31/2002	
Investigators	Cindy Carr, Thomas Barrett			County	Caswell	
Mapped Series	Chenneby			State	North Carolina	
Drainage Class				Plot	H1	
Horizon	Depth (in.)	Matrix Color	Mottle Color	Mottle Abundance/Contrast	Texture	Comments
A	0-12	10 YR 4/4			SCL	organic streaks
B1	12-20	10 YR 5/3	5 YR 4/3	c, m, d	SCL	organic streaks
B2	20-30	10 YR 5/6	10 YR 5/3	c, m, d	CL	saprolite inclusions

Soil Profile Description Form

Project Site	River Bend Mitigation Site			Date	1/31/2002	
Investigators	Cindy Carr, Thomas Barrett			County	Caswell	
Mapped Series	Chewacla			State	North Carolina	
Drainage Class				Plot	I4	
Horizon	Depth (in.)	Matrix Color	Mottle Color	Mottle Abundance/Contrast	Texture	Comments
A	0-12	10 YR 5/3	7.5 YR 4/6	f, f, f	SIL	
Bw1	12-22	7.5 YR 4/6			SCL	indistinguishable fine mottles throughout
Bw2	22-30+	10 YR 5/3	7.5 YR 4/6	c, f, f	SCL	small pebbles, organic streaks, Fe concretions

Soil Profile Description Form

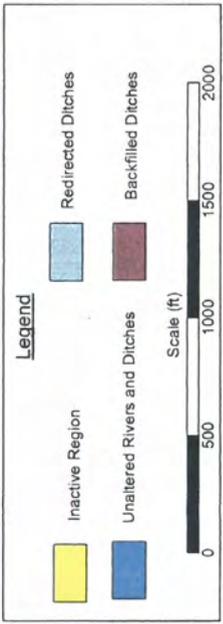
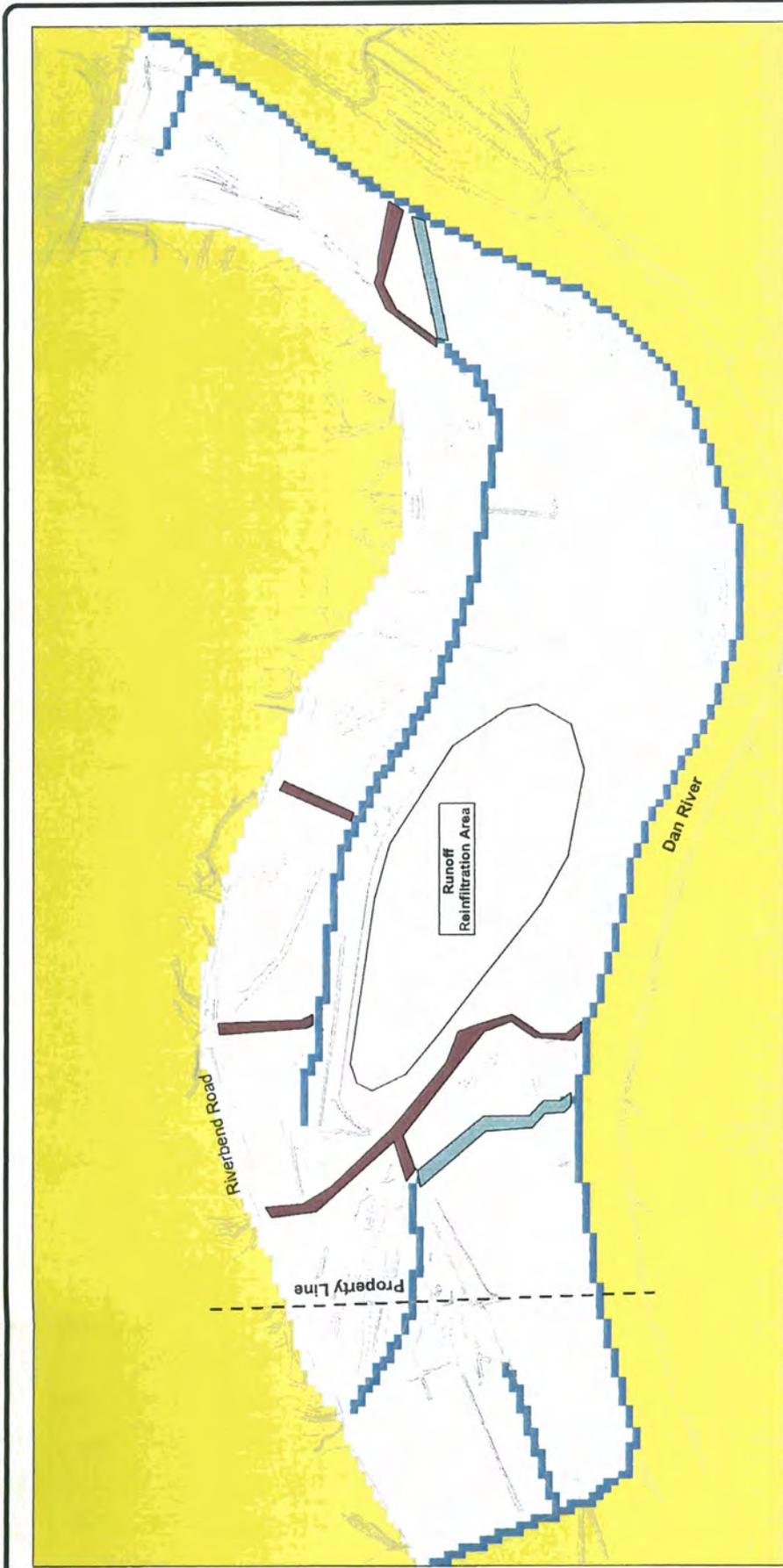
Project Site		River Bend Mitigation Site		Date	1/31/2002	
Investigators		Martha Register, Amin Davis		County	Caswell	
Mapped Series		Congaree		State	North Carolina	
Drainage Class				Plot		
Horizon	Depth (in.)	Matrix Color	Mottle Color	Mottle Abundance/Contrast	Texture	Comments
A1	0-3	7.5 YR 4/3			SiCL	many fine roots
A2	3-12	7.5 YR 4/3			SiL	
C1	12-25	7.5 YR 4/4			vfSCL	
C2	25-30+	10 YR 5/6			vfSL	

Soil Profile Description Form

Project Site		River Bend Mitigation Site			Date	1/31/2002
Investigators		Martha Register, Amin Davis			County	Caswell
Mapped Series		Wehadkee			State	North Carolina
Drainage Class					Plot	K1
Horizon	Depth (in.)	Matrix Color	Mottle Color	Mottle Abundance/Contrast	Texture	Comments
A	0-3	2.5 Y 5/2			SiCL	water stained leaves, oxy root channels
A2	3-11	2.5 Y 5/2	7.5 YR 5/6	m, f, p	SiCL	oxy root channels
Bw1	11-22	7.5 YR 4/4	2.5 Y 5/2	m, m, d	SCL	
Bw2	22-28	7.5 4/3			SCL	
Bt2	28-36	7.5 YR 3/3	2.5 Y 5/1	f, m, d	SC	

Appendix B

Hydrology Model.



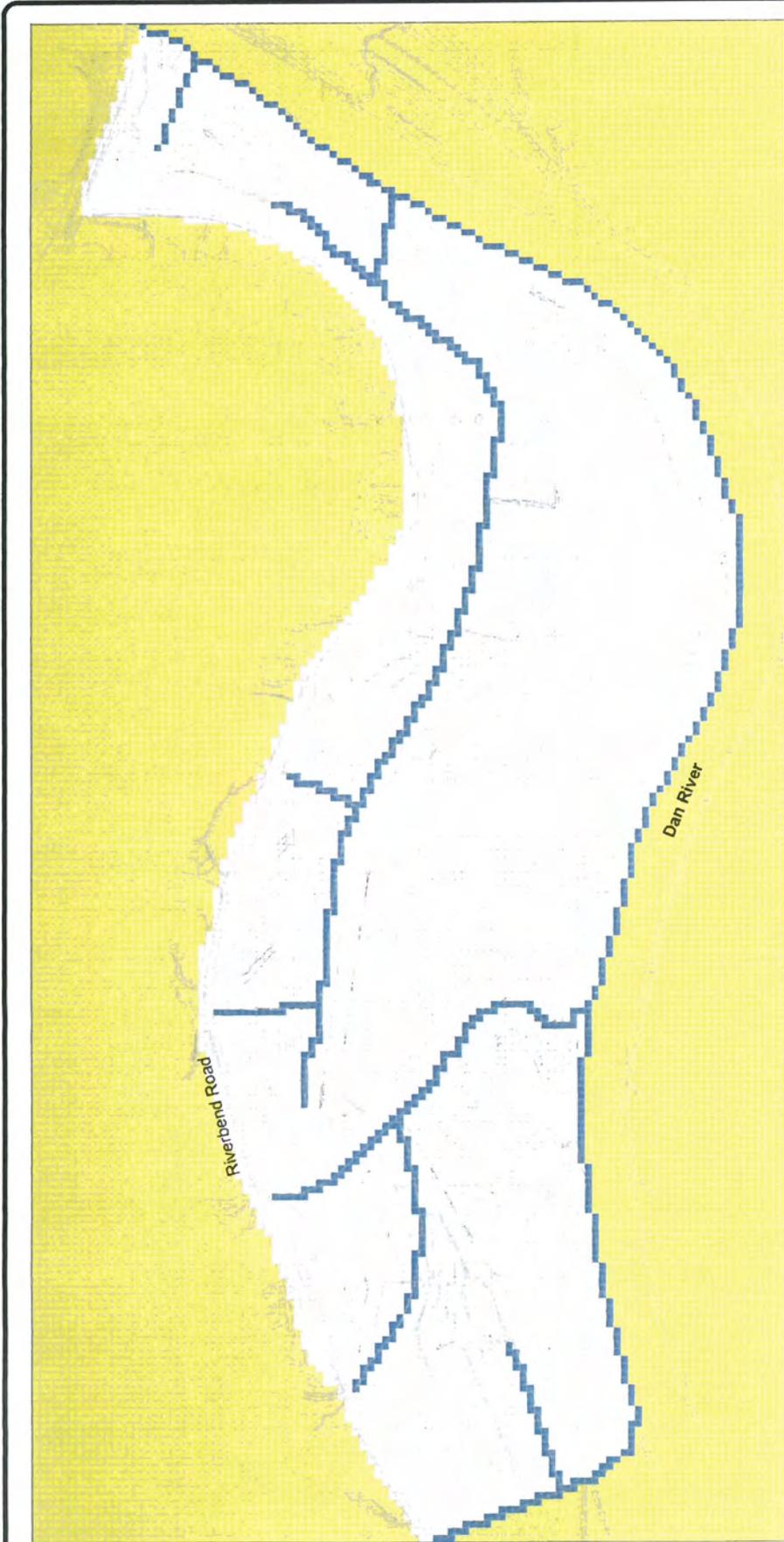
ARCADIS

Site Layout and Proposed
Drainage Alterations

NCDOT
Riverbend, North Carolina

FIGURE
1

DWG DATE: DATE | PRJCT NO. NO | FILE NO. Riverbend | DRAWING: Figure 1 | CHECKED: SBR | APPROVED: MPK | DRAFTED: SBR



Legend

- No-Flow Cell
- Drain Cell

Uniform Grid Spacing:
 20 ft x 20 ft
 213 columns by 104 rows
 22152 nodes

Scale (ft)

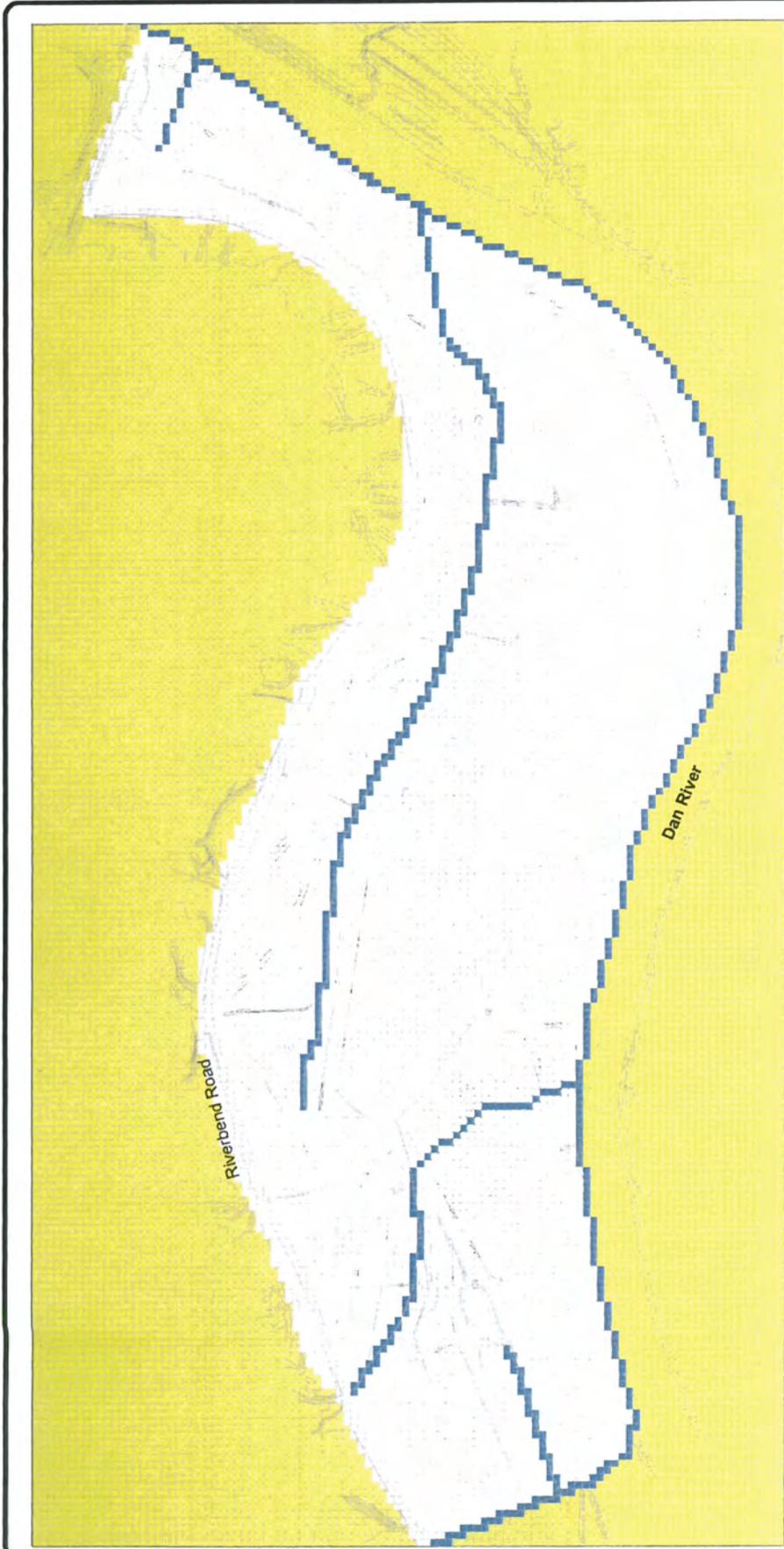


FIGURE
2

Model Boundary Conditions



NCDOT
 Riverbend, North Carolina



Legend

- No-Flow Cell
- Drain Cell

Uniform Grid Spacing:
 20 ft x 20 ft
 213 columns by 104 rows
 22152 nodes

Scale (ft)



FIGURE
3

Model Boundary Conditions for the
Proposed Drainage Alteration Plan

NCDOT
Riverbend, North Carolina



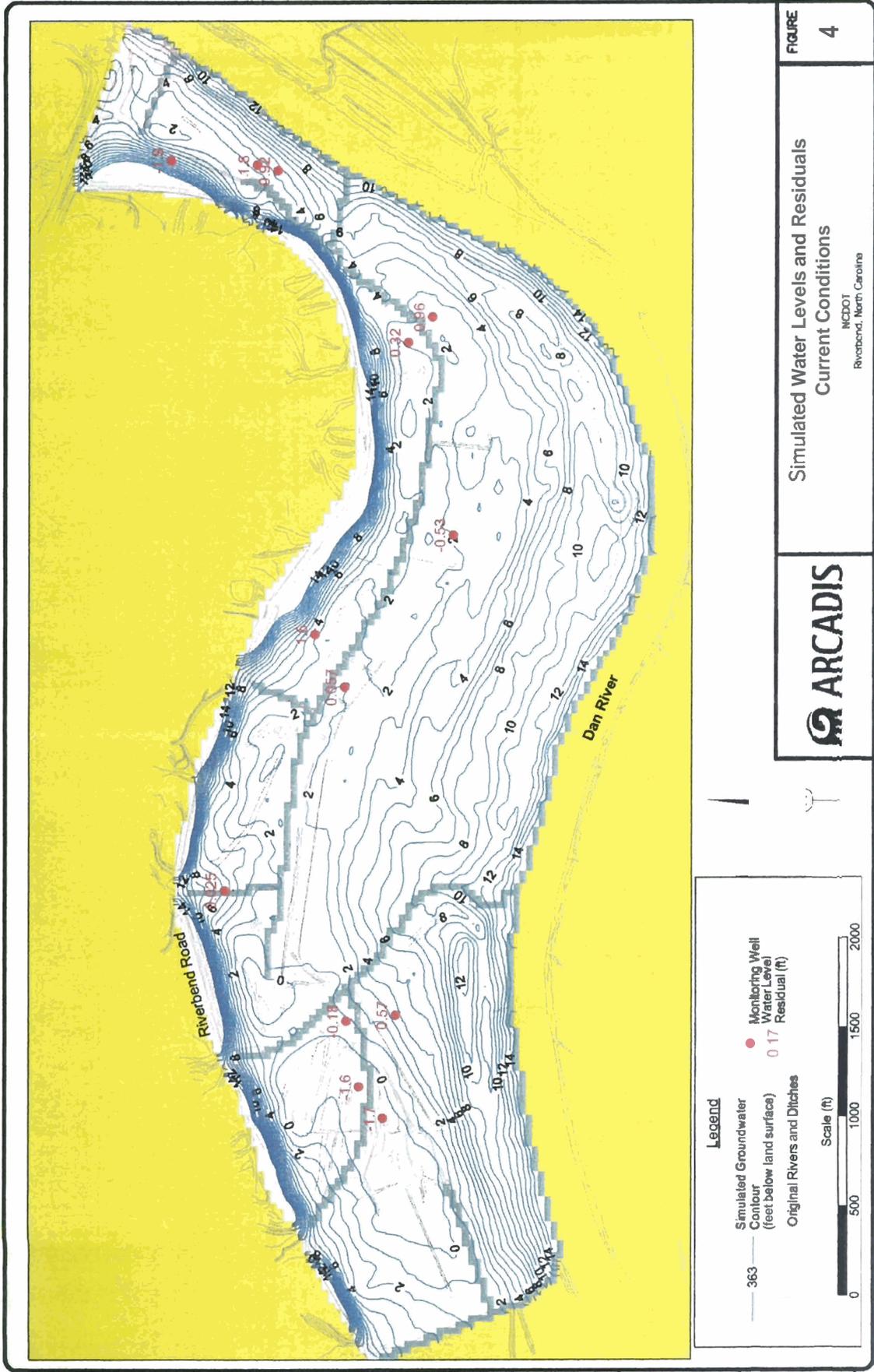
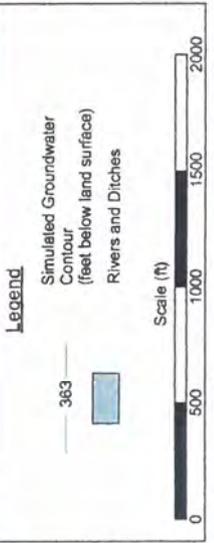
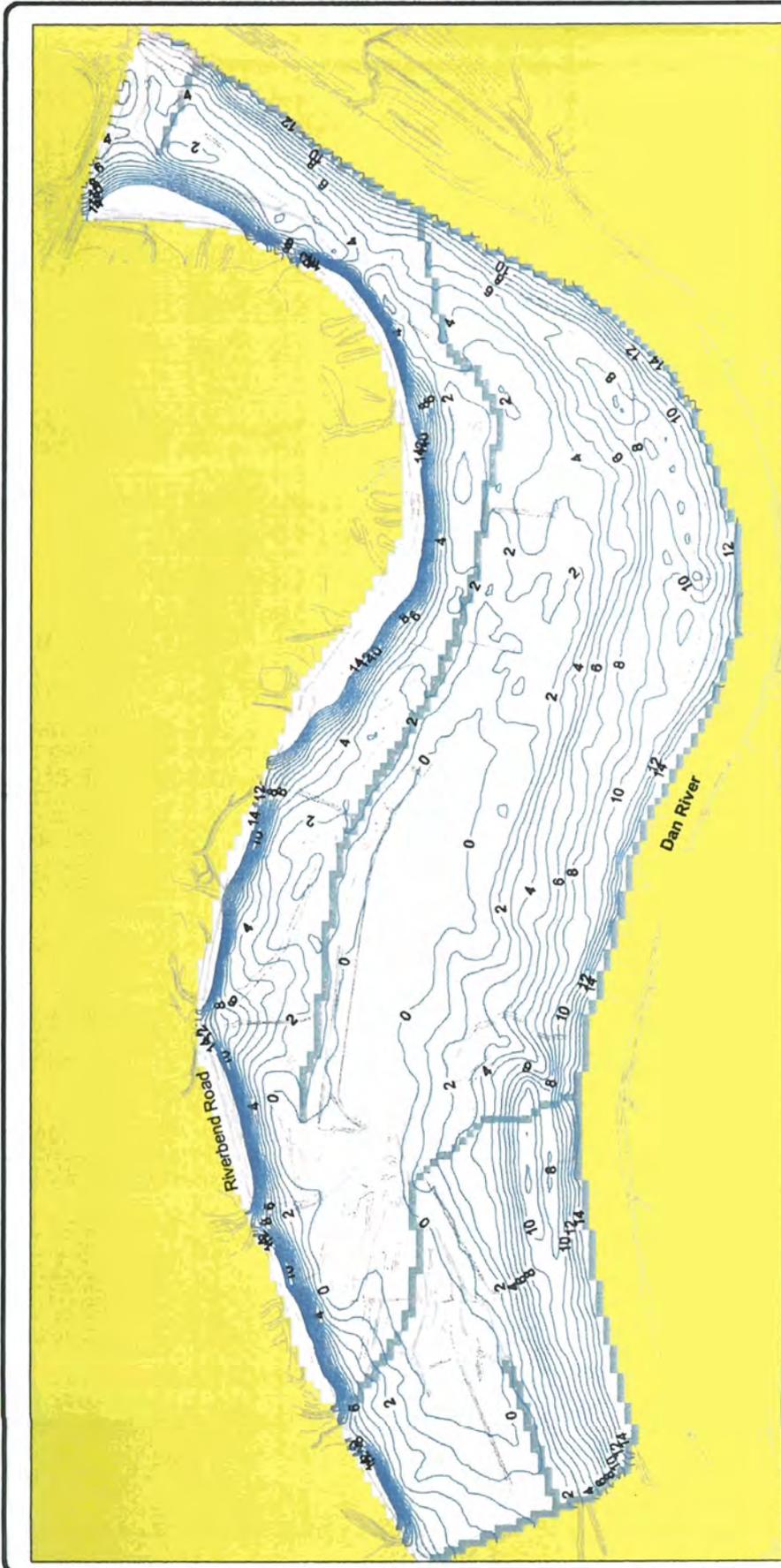


FIGURE 4

**Simulated Water Levels and Residuals
Current Conditions**

NCDOT
Riverbend, North Carolina





Simulated Water Levels With Proposed
Drainage Alteration

NCDOT
Rutherford, North Carolina

FIGURE
5

DATE: DATE: PROJECT NO.: DRAWING FIGURE NO.: CHECKED: APPROVED: DRAFTED:

Appendix C

EDR Report



The EDR-Radius Map with GeoCheck[®]

**River Bend
River Bend
Milton, NC 27305**

Inquiry Number: 0313237.1r

November 18, 1998

The Source For Environmental Risk Management Data

3530 Post Road
Southport, Connecticut 06490

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

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GeoCheck Summary.....	3
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Detail Map.....	6
Map Summary - All Sites.....	7
Map Summary - Sites with higher or the same elevation as the Target Property.....	8
Map Findings.....	9
Orphan Summary.....	12
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Government Records Searched / Data Currency Tracking Addendum.....	A4

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc. (EDR). The report meets the government records search requirements of ASTM Standard Practice for Environmental Site Assessments, E 1527-97. Search distances are per ASTM standard or custom distances requested by the user.

The address of the subject property for which the search was intended is:

RIVER BEND
MILTON, NC 27305

No mapped sites were found in EDR's search of available ("reasonably ascertainable") government records either on the subject property or within the ASTM E 1527-97 search radius around the subject property for the following Databases:

NPL:	National Priority List
Delisted NPL:	NPL Deletions
RCRIS-TSD:	Resource Conservation and Recovery Information System
SHWS:	State Haz. Waste
CERCLIS:	Comprehensive Environmental Response, Compensation, and Liability Information System
CERC-NFRAP:	Comprehensive Environmental Response, Compensation, and Liability Information System
CORRACTS:	Corrective Action Report
SWF/LF:	Solid Waste Facilities
LUST:	Incidents Management Database
RAATS:	RCRA Administrative Action Tracking System
RCRIS-SQG:	Resource Conservation and Recovery Information System
RCRIS-LQG:	Resource Conservation and Recovery Information System
HMIRS:	Hazardous Materials Information Reporting System
PADS:	PCB Activity Database System
ERNS:	Emergency Response Notification System
FINDS:	Facility Index System
TRIS:	Toxic Chemical Release Inventory System
NPL Lien:	NPL Liens
NC HSDS:	Hazardous Substance Disposal Site
IMD:	Incident Management Database
TSCA:	Toxic Substances Control Act
MLTS:	Material Licensing Tracking System
ROD:	ROD
CONSENT:	Superfund (CERCLA) Consent Decrees
Coal Gas:	Former Manufactured gas (Coal Gas) Sites.

Unmapped (orphan) sites are not considered in the foregoing analysis.

Search Results:

Search results for the subject property and the search radius, are listed below:

Subject Property:

The subject property was not listed in any of the databases searched by EDR.

EXECUTIVE SUMMARY

Surrounding Properties:

Elevations have been determined from the USGS 1 degree Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. EDR's definition of a site with an elevation equal to the subject property includes a tolerance of -10 feet. Sites with an elevation equal to or higher than the subject property have been differentiated below from sites with an elevation lower than the subject property (by more than 10 feet). Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in *bold italics* are in multiple databases.

UST: The Underground Storage Tank database contains registered USTs. USTs are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA). The data come from the Department of Environment, Health, & Natural Resources' Petroleum Underground Storage Tank Database.

A review of the UST list, as provided by EDR, and dated 05/01/1998 has revealed that there are 2 UST sites within approximately 2.25 miles of the subject property.

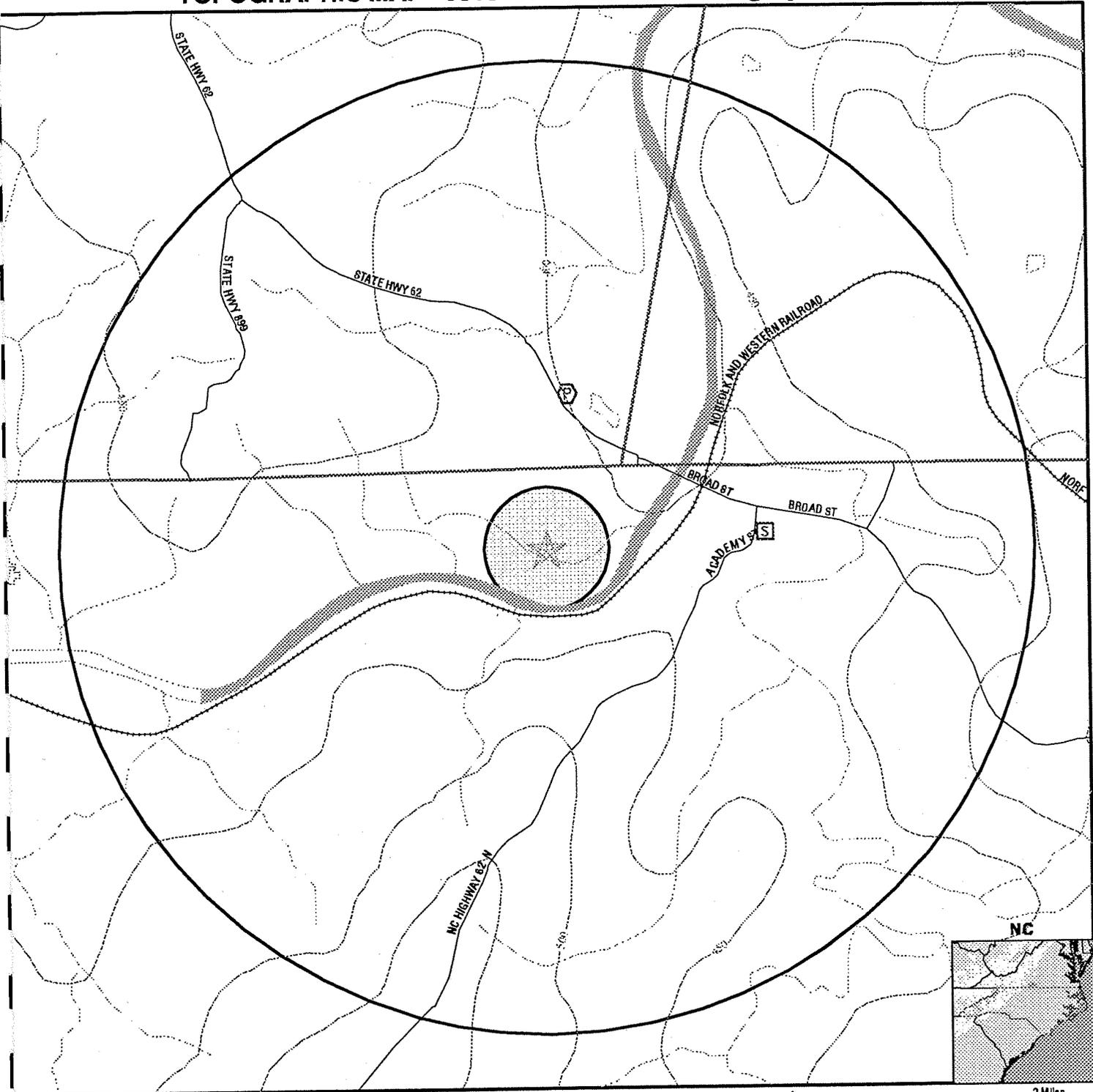
<u>Equal/Higher Elevation</u>	<u>Address</u>	<u>Dist / Dir</u>	<u>Map ID</u>	<u>Page</u>
A MURPHEY ELEM SCHOOL	RR 1 BOX 129	1 - 2 SSE	A1	9
HUDSON'S STORE	9471 N.C. HWY 62 N.	1 - 2 SSE	A2	9

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped:

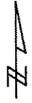
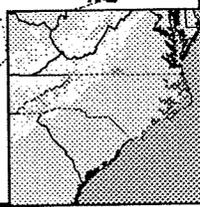
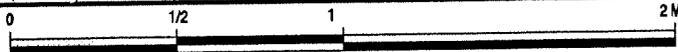
<u>Site Name</u>	<u>Database(s)</u>
BILL MAXEYS GROCERY	UST,LUST
KENTUCK GROCERY	LUST
H&M GROCERY	UST
HARMONY GROCERY	UST
ABERCROMBIE OIL CO INC	UST
BOWES & BOWES	UST
LONGS EXXON SERVICE	UST
TRICKEY STORE	UST
ALTON GROCERY	UST
CHANEYS GROCERY	UST
COUNTRY BOYS MARKET INC	UST
BARKER MILDRED B	UST
SELLERS BROTHERS INC	UST
CARTER WHITTLES QUICK CHECK	UST
NORRIS L HADEN	UST
HOGAN DIST CO INC	UST
MARVIN E COLLIE	UST
BROCKWAY GLASS	UST
T L BARKER & SON	UST
T&T #2	UST
BURGESS TIRE CO	UST
RINGGOLD MARKET	UST
DAN RIVER HIGH SCHOOL	UST
LARAMORE CONST CO INC	UST
BELL ATLANTIC	UST
0-1 BROCKWAY GLASS PLANT #29	UST

TOPOGRAPHIC MAP - 0313237.1r - Arcadis Geraghty & Miller



- Major Roads
- Contour Lines
- Waterways
- Earthquake epicenter, Richter 5 or greater
- Closest Federal Well in quadrant
- Closest State Well in quadrant
- Closest Public Water Supply Well

- Wildlife Areas
- Natural Areas
- Rare & Endangered Species



TARGET PROPERTY:	River Bend	CUSTOMER:	Arcadis Geraghty & Miller
ADDRESS:	River Bend	CONTACT:	Norton Webster
CITY/STATE/ZIP:	Milton NC 27305	INQUIRY #:	0313237.1r
LAT/LONG:	36.5366 / 79.2244	DATE:	November 18, 1998 12:13 pm

GEOCHECK VERSION 2.1 SUMMARY

TARGET PROPERTY COORDINATES

Latitude (North): 36.536598 - 36° 32' 11.8"
 Longitude (West): 79.224403 - 79° 13' 27.9"
 Universal Transverse Mercator: Zone 17
 UTM X (Meters): 6145165.5
 UTM Y (Meters): 63767804.0

USGS TOPOGRAPHIC MAP ASSOCIATED WITH THIS SITE

Target Property: 2436079-E2 MILTON, NC VA

GEOLOGIC AGE IDENTIFICATION†

Geologic Code: mm1
 Era: Paleozoic
 System: Pennsylvanian
 Series: Felsic paragneiss and schist

ROCK STRATIGRAPHIC UNIT†

Category: Metamorphic Rocks

GROUNDWATER FLOW INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, including well data collected on nearby properties, regional groundwater flow information (from deep aquifers), or surface topography.‡

AQUIFLOW™** Search Radius: 2.000 Miles

<u>MAP ID</u>	<u>DISTANCE FROM TP</u>	<u>DIRECTION FROM TP</u>	<u>GENERAL DIRECTION GROUNDWATER FLOW</u>
Not Reported			

General Topographic Gradient at Target Property: General North
 General Hydrogeologic Gradient at Target Property: No hydrogeologic data available.

FEDERAL DATABASE WELL INFORMATION

<u>WELL QUADRANT</u>	<u>DISTANCE FROM TP</u>	<u>LITHOLOGY</u>	<u>DEPTH TO WATER TABLE</u>
NO WELLS FOUND			

STATE DATABASE WELL INFORMATION

<u>WELL QUADRANT</u>	<u>DISTANCE FROM TP</u>
Eastern	1/2 - 1 Mile

NORTH CAROLINA LOCATIONS OF RARE AND ENDANGERED SPECIES DATABASE:

<u>ID</u>	<u>Class</u>
_____	_____

† Source: P.G. Schnuben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - A digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).
 ‡ U.S. EPA Ground Water Handbook, Vol I: Ground Water and Contamination, Office of Research and development EPA/625/6-90/016a, Chapter 4, page 78, September 1990.
 ** EDR AQUIFLOW™ information System of hydrogeologically determined groundwater flow directions at specific locations. See the data pages at the end of this report for a complete description.

GEOCHECK VERSION 2.1 SUMMARY

STATE DATABASE INFORMATION

NORTH CAROLINA LOCATIONS OF RARE AND ENDANGERED SPECIES DATABASE:

ID	Class
8452	Plants
12387	Natural Community Occurrence

NORTH CAROLINA NATURAL AREAS DATABASE:

ID	Name
NO RECORDS FOUND	

NORTH CAROLINA WILDLIFE RESOURCES COMMISSION GAME LANDS DATABASE:

Site Name
NO RECORDS FOUND

PUBLIC WATER SUPPLY SYSTEM INFORMATION

Searched by Nearest PWS.

NOTE: PWS System location is not always the same as well location.

PWS Name: 58 EAST TRUCK STOP
RT 1 BOX 101-C
ROUTE 1
SUTHERLIN, VA 24594

Location Relative to TP: 1/2 - 1 Mile North
PWS currently has or has had major violation(s): Yes

AREA RADON INFORMATION

EPA Radon Zone for CASWELL County: 2

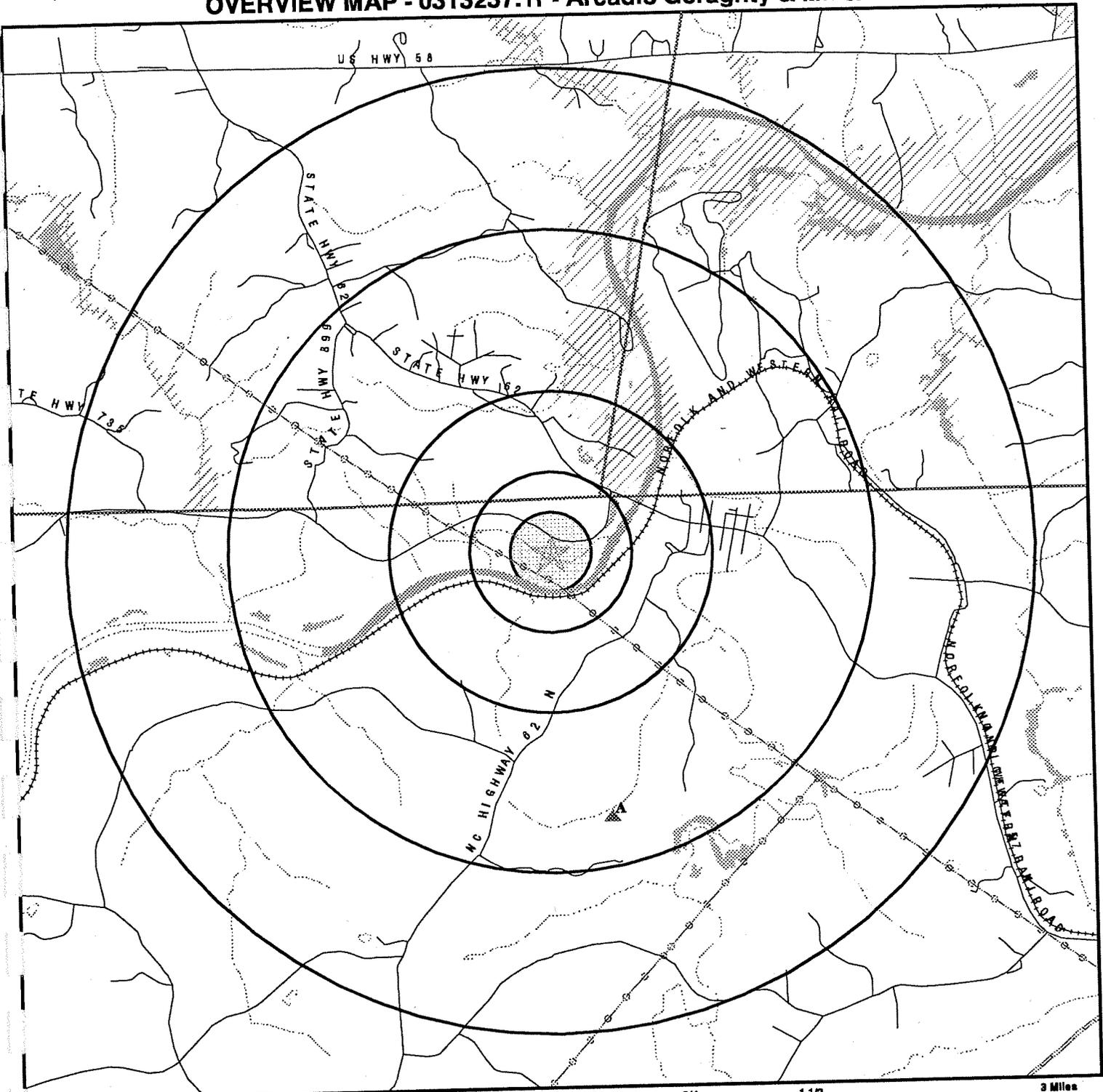
Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

CASWELL COUNTY, NC

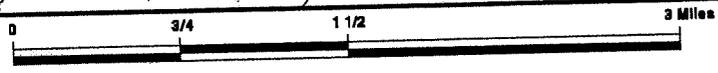
Number of sites tested: 2

Area	Average Activity	% <4 pCi/L	% 4-20 pCi/L	% >20 pCi/L
Living Area - 1st Floor	0.900 pCi/L	100%	0%	0%
Living Area - 2nd Floor	Not Reported	Not Reported	Not Reported	Not Reported
Basement	Not Reported	Not Reported	Not Reported	Not Reported

OVERVIEW MAP - 0313237.1r - Arcadis Geraghty & Miller

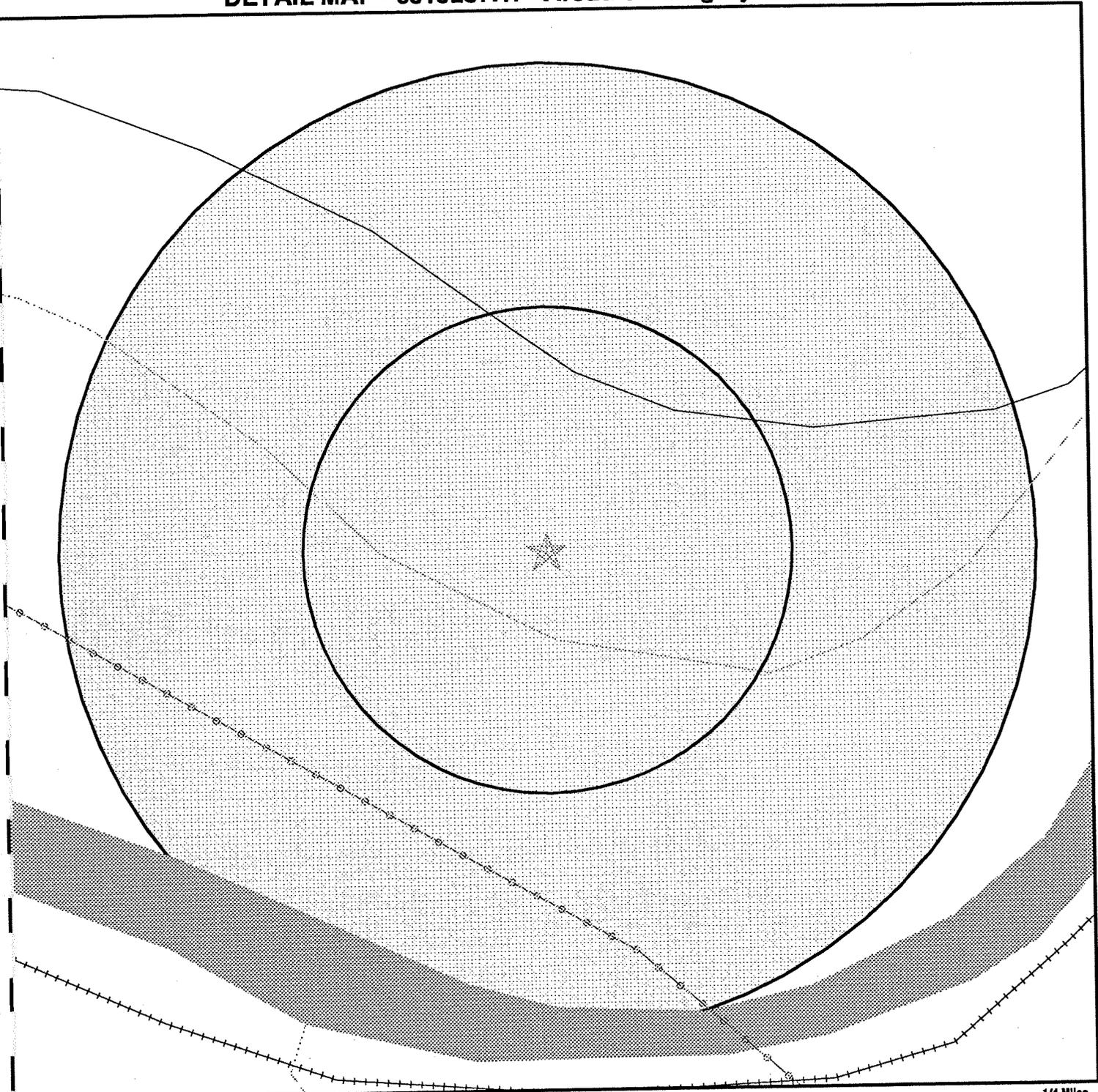


- ✱ Target Property
- ▲ Sites at elevations higher than or equal to the target property
- ◆ Sites at elevations lower than the target property
- ▲ Coal Gasification Sites (if requested)
- ▨ National Priority List Sites
- ▨ Landfill Sites
- ⚡ Power transmission lines
- ⚡ Oil & Gas pipelines
- ▨ 100-year flood zone
- ▨ 500-year flood zone
- ▨ Wetlands per National Wetlands Inventory (1994)
- ▨ Hazardous Substance Disposal Sites

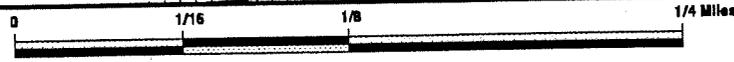


<p>TARGET PROPERTY: River Bend ADDRESS: River Bend CITY/STATE/ZIP: Milton NC 27305 LAT/LONG: 36.5366 / 79.2244</p>	<p>CUSTOMER: Arcadis Geraghty & Miller CONTACT: Norton Webster INQUIRY #: 0313237.1r DATE: November 18, 1998 12:11 pm</p>
---	--

DETAIL MAP - 0313237.1r - Arcadis Geraghty & Miller



- * Target Property
- ▲ Sites at elevations higher than or equal to the target property
- ◆ Sites at elevations lower than the target property
- ▲ Coal Gasification Sites (if requested)
- ▬ Sensitive Receptors
- ▬ National Priority List Sites
- ▬ Landfill Sites
- ▬ Power transmission lines
- ▬ Oil & Gas pipelines
- ▬ Hazardous Substance Disposal Sites



TARGET PROPERTY:	River Bend	CUSTOMER:	Arcadis Geraghty & Miller
ADDRESS:	River Bend	CONTACT:	Norton Webster
CITY/STATE/ZIP:	Milton NC 27305	INQUIRY #:	0313237.1r
LAT/LONG:	36.5366 / 79.2244	DATE:	November 18, 1998 12:12 pm

MAP FINDINGS SUMMARY SHOWING ALL SITES

Database	Target Property	Search Distance (Miles)	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
NPL		3.000	0	0	0	0	0	0
Delisted NPL	TP		NR	NR	NR	NR	NR	0
RCRIS-TSD		2.500	0	0	0	0	0	0
State Haz. Waste		3.000	0	0	0	0	0	0
CERCLIS		2.500	0	0	0	0	0	0
CERC-NFRAP	TP		NR	NR	NR	NR	NR	0
CORRACTS		3.000	0	0	0	0	0	0
State Landfill		2.500	0	0	0	0	0	0
LUST		2.500	0	0	0	0	0	0
UST		2.250	0	0	0	0	2	2
RAATS	TP		NR	NR	NR	NR	NR	0
RCRIS Sm. Quan. Gen.		2.250	0	0	0	0	0	0
RCRIS Lg. Quan. Gen.		2.250	0	0	0	0	0	0
HMIRS	TP		NR	NR	NR	NR	NR	0
PADS	TP		NR	NR	NR	NR	NR	0
ERNS		2.000	0	0	0	0	0	0
FINDS	TP		NR	NR	NR	NR	NR	0
TRIS	TP		NR	NR	NR	NR	NR	0
NPL Liens	TP		NR	NR	NR	NR	NR	0
NC HSDS		2.000	0	0	0	0	0	0
IMD		1.250	0	0	0	0	0	0
TSCA	TP		NR	NR	NR	NR	NR	0
MLTS	TP		NR	NR	NR	NR	NR	0
ROD		3.000	0	0	0	0	0	0
CONSENT		3.000	0	0	0	0	0	0
Coal Gas		2.000	0	0	0	0	0	0

TP = Target Property

NR = Not Requested at this Search Distance

* Sites may be listed in more than one database

MAP FINDINGS SUMMARY SHOWING ONLY SITES HIGHER THAN OR THE SAME ELEVATION AS TP

Database	Target Property	Search Distance (Miles)	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
NPL		3.000	0	0	0	0	0	0
Delisted NPL	TP		NR	NR	NR	NR	NR	0
RCRIS-TSD		2.500	0	0	0	0	0	0
State Haz. Waste		3.000	0	0	0	0	0	0
CERCLIS		2.500	0	0	0	0	0	0
CERC-NFRAP	TP		NR	NR	NR	NR	NR	0
CORRACTS		3.000	0	0	0	0	0	0
State Landfill		2.500	0	0	0	0	0	0
LUST		2.500	0	0	0	0	0	0
UST		2.250	0	0	0	0	2	2
RAATS	TP		NR	NR	NR	NR	NR	0
RCRIS Sm. Quan. Gen.		2.250	0	0	0	0	0	0
RCRIS Lg. Quan. Gen.		2.250	0	0	0	0	0	0
HMIRS	TP		NR	NR	NR	NR	NR	0
PADS	TP		NR	NR	NR	NR	NR	0
ERNS		2.000	0	0	0	0	0	0
FINDS	TP		NR	NR	NR	NR	NR	0
TRIS	TP		NR	NR	NR	NR	NR	0
NPL Liens	TP		NR	NR	NR	NR	NR	0
NC HSDS		2.000	0	0	0	0	0	0
IMD		1.250	0	0	0	0	0	0
TSCA	TP		NR	NR	NR	NR	NR	0
MLTS	TP		NR	NR	NR	NR	NR	0
ROD		3.000	0	0	0	0	0	0
CONSENT		3.000	0	0	0	0	0	0
Coal Gas		2.000	0	0	0	0	0	0

TP = Target Property

NR = Not Requested at this Search Distance

* Sites may be listed in more than one database

MAP FINDINGS

Map ID
Direction
Distance
Elevation

Site

Database(s)

EDR ID Number
EPA ID Number

Coal Gas Site Search: No site was found in a search of Real Property Scan's ENVIROHAZ database.

A1
SSE
> 1
Higher

A MURPHEY ELEM SCHOOL
RR 1 BOX 129
MILTON, NC 27305

UST

U001203465
N/A

UST:

Facility ID:	0-027269	Telephone:	(000) 000-0000
Tank ID:	1	Tank Size:	9999
Interior:	Unknown	Exterior:	Unknown
Material:	Unknown	Piping:	Unknown
Date installed:	01/01/1964	Date removed:	Not reported
Status:	Currently In Use	Product:	Fuel Oil
Tank Leak Det.:	Not reported	Pipe Leak Det.:	Not reported
Tank Corr. Prot.:	Not reported	Pipe Corr. Prot.:	Not reported
Overfill Prot.:	Not reported	Financial Resp.:	Not reported
CAS/CERCLA:	Not reported		
Certification:	Not reported		
Region:	04		
Owner:	GOD'S BLESSING CENTER 8305 HIGHWAY 62 NORTH MILTON, NC 27320		

A2
SSE
> 1
Higher

HUDSON'S STORE
9471 N.C. HWY 62 N.
MILTON, NC 27305

UST

U000829175
N/A

UST:

Facility ID:	0-000279	Telephone:	(910) 234-7546
Tank ID:	001	Tank Size:	1000
Interior:	Unknown	Exterior:	Paint
Material:	Steel	Piping:	Steel
Date installed:	03/10/1970	Date removed:	11/01/1988
Status:	Permanent Closed	Product:	Gasoline, Gasoline Mixture
Tank Leak Det.:	Not reported	Pipe Leak Det.:	Not reported
Tank Corr. Prot.:	Not reported	Pipe Corr. Prot.:	Not reported
Overfill Prot.:	Not reported	Financial Resp.:	Not reported
CAS/CERCLA:	Not reported		
Certification:	Not reported		
Region:	04		
Owner:	STERLING F HUDSON 9559 N.C. HWY 62 N. MILTON, NC 27305		

MAP FINDINGS

Map ID
 Direction
 Distance
 Elevation

Site

Database(s)

EDR ID Number
 EPA ID Number

HUDSON'S STORE (Continued)

U000829175

Facility ID: 0-000279
 Tank ID: 002
 Interior: Unknown
 Material: Steel
 Date installed: 03/10/1970
 Status: Permanent Closed
 Tank Leak Det.: Not reported
 Tank Corr. Prot.: Not reported
 Overfill Prot.: Not reported
 CAS/CERCLA: Not reported
 Certification: Not reported
 Region: 04
 Owner: STERLING F HUDSON
 9559 N.C. HWY 62 N.
 MILTON, NC 27305

Telephone: (910) 234-7546
 Tank Size: 1000
 Exterior: Paint
 Piping: Steel
 Date removed: 11/01/1988
 Product: Gasoline, Gasoline Mixture
 Pipe Leak Det.: Not reported
 Pipe Corr. Prot.: Not reported
 Financial Resp.: Not reported

Facility ID: 0-000279
 Tank ID: 1
 Interior: Unknown
 Material: Steel
 Date installed: 12/22/1988
 Status: Currently In Use
 Tank Leak Det.: Not reported
 Tank Corr. Prot.: Not reported
 Overfill Prot.: Not reported
 CAS/CERCLA: Not reported
 Certification: Not reported
 Region: 04
 Owner: STERLING F HUDSON
 9559 N.C. HWY 62 N.
 MILTON, NC 27305

Telephone: (910) 234-7546
 Tank Size: 2000
 Exterior: Cathodic Protection
 Piping: Steel
 Date removed: Not reported
 Product: Gasoline, Gasoline Mixture
 Pipe Leak Det.: Not reported
 Pipe Corr. Prot.: Not reported
 Financial Resp.: Not reported

Facility ID: 0-000279
 Tank ID: 2
 Interior: Unknown
 Material: Steel
 Date installed: 12/22/1988
 Status: Currently In Use
 Tank Leak Det.: Not reported
 Tank Corr. Prot.: Not reported
 Overfill Prot.: Not reported
 CAS/CERCLA: Not reported
 Certification: Not reported
 Region: 04
 Owner: STERLING F HUDSON
 9559 N.C. HWY 62 N.
 MILTON, NC 27305

Telephone: (910) 234-7546
 Tank Size: 2000
 Exterior: Cathodic Protection
 Piping: Steel
 Date removed: Not reported
 Product: Gasoline, Gasoline Mixture
 Pipe Leak Det.: Not reported
 Pipe Corr. Prot.: Not reported
 Financial Resp.: Not reported

MAP FINDINGS

Map ID
 Direction
 Distance
 Elevation

Site

Database(s)

EDR ID Number
 EPA ID Number

HUDSON'S STORE (Continued)

U000829175

Facility ID:	0-000279	Telephone:	(910) 234-7546
Tank ID:	3	Tank Size:	2000
Interior:	Unknown	Exterior:	Cathodic Protection
Material:	Steel	Piping:	Steel
Date installed:	12/22/1988	Date removed:	Not reported
Status:	Currently In Use	Product:	Gasoline, Gasoline Mixture
Tank Leak Det.:	Not reported	Pipe Leak Det.:	Not reported
Tank Corr. Prot.:	Not reported	Pipe Corr. Prot.:	Not reported
Overfill Prot.:	Not reported	Financial Resp.:	Not reported
CAS/CERCLA:	Not reported		
Certification:	Not reported		
Region:	04		
Owner:	STERLING F HUDSON 9559 N.C. HWY 62 N. MILTON, NC 27305		

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)	Facility ID
ALTON	U002088207	H&M GROCERY	RT 1 BOX 70	24520	UST	4020944
ALTON	U002092320	HARMONY GROCERY	RT 1 BOX 73	24520	UST	4013737
ALTON	U002082140	ABERCROMBIE OIL CO INC	RT. 1, HWY. 58	24520	UST	2011762
ALTON	U003083887	BILL MAXEY'S GROCERY	ROUTE 658	24520	UST, LUST	4-024831
ALTON	U000581014	BOWES & BOWES	HWY 689	24520	UST	4023410
ALTON	U000581017	LONGS EXXON SERVICE	RT 711	24520	UST	4002373
ALTON	U000581021	TRICKEY STORE	RT 711 & 714	24520	UST	4021565
ALTON	U002088661	ALTON GROCERY	RT 711	24520	UST	4007995
KENTUCK	S103222854	KENTUCK GROCERY	RT. 726 / 729	24586	LUST	2011797
RINGGOLD	U000581524	CHANEY'S GROCERY	ROUTE 1	24586	UST	2008244
RINGGOLD	U002087846	COUNTRY BOYS MARKET INC	RT. 1, BOX 1771	24586	UST	2000808
RINGGOLD	U002094455	BARKER MILDRED B	RT. 1, BOX 1547	24586	UST	2004253
RINGGOLD	U002094988	SELLERS BROTHERS INC	RT. 1, BOX 174	24586	UST	2011751
RINGGOLD	U002087133	CARTER WHITTLES QUICK CHECK	ROUTE 2	24586	UST	2012031
RINGGOLD	U003029403	NORRIS L HADEN	RT. 2	24586	UST	2021451
RINGGOLD	U002090606	HOGAN DIST CO INC	RT. 2, BOX 280	24586	UST	2000918
RINGGOLD	U003029346	MARVINE COLLIE	RT. 3	24586	UST	2011794
RINGGOLD	U002082155	BROCKWAY GLASS	RTE. 3, BOX 190	24586	UST	2014991
RINGGOLD	U002094463	T L BARKER & SON	RT. 3, BOX 487	24586	UST	2019285
RINGGOLD	U002082109	T&T #2	HWY. 58 E.	24586	UST	2010969
RINGGOLD	U002092166	BURGESS TIRE CO	RT. 58	24586	UST	2011309
RINGGOLD	U002094508	RINGGOLD MARKET	ROUTE 58 EAST	24586	UST	2011925
RINGGOLD	U002085960	DAN RIVER HIGH SCHOOL	RT 726	24586	UST	2021162
RINGGOLD	U002091723	LARAMORE CONST CO INC	4170 SOUTH BOSTON HIGHWAY	24586	UST	2005549
RINGGOLD	U003085566	BELL ATLANTIC	U.S. RT. 58 E.	24586	UST	2009650
RINGGOLD	U002093115	0-1 BROCKWAY GLASS PLANT #29	STATE RT. 730	24586	UST	

**GEOCHECK VERSION 2.1 ADDENDUM
STATE DATABASE WELL INFORMATION**

Water Well Information:

Well Within 1/2 - 1 Mile of Target Property (Eastern Quadrant)

Site Name:	MILTON, TOWN OF	PWS Type:	Community
Public Water Sys. ID:	0217015	Longitude:	791230.000
Latitude:	363215.000	Source Type:	Ground
Source Name:	WELL #6	Source Availability:	Permanent
Responsible Party Tel.:	(910) 234-8980		
Retail Population:	361		

GEOCHECK VERSION 2.1
STATE DATABASE WELL INFORMATION

North Carolina Locations of Rare and Endangered Species:

Site ID:	8452
Latitude / Longitude:	36.5356 / -79.2639
Classification by Type:	Plants
Degree of Accuracy associated with coordinate:	Minutes

Site ID:	12387
Latitude / Longitude:	36.5361 / -79.2642
Classification by Type:	Natural Community Occurrence
Degree of Accuracy associated with coordinate:	Seconds

GEOCHECK VERSION 2.1
PUBLIC WATER SUPPLY SYSTEM INFORMATION

Searched by Nearest PWS.

PWS SUMMARY:

PWS ID: VA5143978 PWS Status: Active Distance from TP: 1/2 - 1 Mile
Date Initiated: June / 1977 Date Deactivated: Not Reported Dir relative to TP: North
PWS Name: 58 EAST TRUCK STOP
RT 1 BOX 101-C
ROUTE 1
SUTHERLIN, VA 24594

Addressee / Facility: System Owner/Responsible Party
ALMA BOMAN
RT 1 BOX 101 A
SUTHERLIN, VA

Facility Latitude: 36 32 45 Facility Longitude: 079 13 22
City Served: PITTSYLVANIA
Treatment Class: Untreated Population Served: Under 101 Persons

PWS currently has or has had major violation(s): Yes

VIOLATIONS INFORMATION:

Violation ID: 94V0001 Source ID: Not Reported PWS Phone: Not Reported
Vio. beginning Date: 01/01/94 Vio. end Date: 03/31/94 Vio. Period: 3 Months
Num of required Samples: Not Reported Number of Samples Taken: Not Reported
Analysis Result: Not Reported Maximum Contaminant Level: Not Reported
Analysis Method: Not Reported
Violation Type: Monitoring, Routine Major (TCR)
Contaminant: COLIFORM (TCR)
Vio. Awareness Date: Not Reported

ENFORCEMENT INFORMATION:

Violation Type: Monitoring, Routine Major (TCR)
Compliance Period: 01/01/93 - 03/31/93
Contaminant: COLIFORM (TCR)
Enforcement Date: Not Reported Enf. Action: Not Reported
Violation Type: Monitoring, Routine Major (TCR)
Compliance Period: 01/01/94 - 03/31/94
Contaminant: COLIFORM (TCR)
Enforcement Date: Not Reported Enf. Action: Not Reported

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Elapsed ASTM days: Provides confirmation that this EDR report meets or exceeds the 90-day updating requirement of the ASTM standard.

FEDERAL ASTM RECORDS:

CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System

Source: EPA

Telephone: 703-413-0223

CERCLIS contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites which are either proposed to or on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 08/27/98

Date Made Active at EDR: 10/06/98

Database Release Frequency: Quarterly

Date of Data Arrival at EDR: 09/03/98

Elapsed ASTM days: 33

Date of Last EDR Contact: 08/27/98

ERNS: Emergency Response Notification System

Source: EPA/NTIS

Telephone: 202-260-2342

Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 06/30/98

Date Made Active at EDR: 07/20/98

Database Release Frequency: Quarterly

Date of Data Arrival at EDR: 07/14/98

Elapsed ASTM days: 6

Date of Last EDR Contact: 07/10/98

NPL: National Priority List

Source: EPA

Telephone: 703-603-8852

National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC).

Date of Government Version: 03/06/98

Date Made Active at EDR: 07/09/98

Database Release Frequency: Semi-Annually

Date of Data Arrival at EDR: 06/09/98

Elapsed ASTM days: 30

Date of Last EDR Contact: 09/21/98

RCRIS: Resource Conservation and Recovery Information System

Source: EPA/NTIS

Telephone: 800-424-9346

Resource Conservation and Recovery Information System. RCRIS includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA).

Date of Government Version: 07/01/98

Date Made Active at EDR: 10/06/98

Database Release Frequency: Semi-Annually

Date of Data Arrival at EDR: 08/27/98

Elapsed ASTM days: 40

Date of Last EDR Contact: 08/14/98

CORRACTS: Corrective Action Report

Source: EPA

Telephone: 800-424-9346

CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 12/15/97

Date Made Active at EDR: 02/02/98

Database Release Frequency: Semi-Annually

Date of Data Arrival at EDR: 01/05/98

Elapsed ASTM days: 28

Date of Last EDR Contact: 08/14/98

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

FEDERAL NON-ASTM RECORDS:

BRS: Biennial Reporting System

Source: EPA/NTIS

Telephone: 800-424-9346

The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/95

Database Release Frequency: Biennially

Date of Last EDR Contact: 09/22/98

Date of Next Scheduled EDR Contact: 12/21/98

CONSENT: Superfund (CERCLA) Consent Decrees

Source: EPA Regional Offices

Telephone: Varies

Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: Varies

Database Release Frequency: Varies

Date of Last EDR Contact: Varies

Date of Next Scheduled EDR Contact: N/A

FINDS: Facility Index System

Source: EPA/NTIS

Telephone: 703-908-2493

Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 09/30/97

Database Release Frequency: Quarterly

Date of Last EDR Contact: 10/23/98

Date of Next Scheduled EDR Contact: 12/21/98

HMIRS: Hazardous Materials Information Reporting System

Source: U.S. Department of Transportation

Telephone: 202-366-4526

Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 12/31/97

Database Release Frequency: Annually

Date of Last EDR Contact: 07/22/98

Date of Next Scheduled EDR Contact: 10/26/98

MLTS: Material Licensing Tracking System

Source: Nuclear Regulatory Commission

Telephone: 301-415-7169

MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 07/28/98

Database Release Frequency: Quarterly

Date of Last EDR Contact: 07/13/98

Date of Next Scheduled EDR Contact: 10/12/98

NPL LIENS: Federal Superfund Liens

Source: EPA

Telephone: 205-564-4267

Federal Superfund Liens. Under the authority granted the USEPA by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner receives notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/91

Database Release Frequency: No Update Planned

Date of Last EDR Contact: 08/28/98

Date of Next Scheduled EDR Contact: 11/23/98

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

PADS: PCB Activity Database System

Source: EPA

Telephone: 202-260-3936

PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 09/22/97

Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 08/18/98

Date of Next Scheduled EDR Contact: 11/16/98

RAATS: RCRA Administrative Action Tracking System

Source: EPA

Telephone: 202-564-4104

RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/95

Database Release Frequency: No Update Planned

Date of Last EDR Contact: 09/14/98

Date of Next Scheduled EDR Contact: 12/14/98

ROD: Records Of Decision

Source: NTIS

Telephone: 703-416-0223

Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 03/31/95

Database Release Frequency: Annually

Date of Last EDR Contact: 10/09/98

Date of Next Scheduled EDR Contact: 01/18/99

TRIS: Toxic Chemical Release Inventory System

Source: EPA/NTIS

Telephone: 202-260-1531

Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/95

Database Release Frequency: Annually

Date of Last EDR Contact: 09/28/98

Date of Next Scheduled EDR Contact: 12/28/98

TSCA: Toxic Substances Control Act

Source: EPA/NTIS

Telephone: 202-260-1444

Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site. USEPA has no current plan to update and/or re-issue this database.

Date of Government Version: 12/31/94

Database Release Frequency: Annually

Date of Last EDR Contact: 07/22/98

Date of Next Scheduled EDR Contact: 10/26/98

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

STATE OF NORTH CAROLINA ASTM RECORDS:

LUST: Incidents Management Database

Source: Department of Environment, Health and Natural Resources
Telephone: 919-733-1315

Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state.

Date of Government Version: 07/01/98
Date Made Active at EDR: 09/10/98
Database Release Frequency: Quarterly

Date of Data Arrival at EDR: 08/07/98
Elapsed ASTM days: 34
Date of Last EDR Contact: 07/09/98

SHWS: Inactive Hazardous Sites Inventory

Source: Department of Environment, Health and Natural Resources
Telephone: 919-733-2801

State Hazardous Waste Sites. State hazardous waste site records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. Available information varies by state.

Date of Government Version: 03/31/98
Date Made Active at EDR: 10/15/98
Database Release Frequency: Annually

Date of Data Arrival at EDR: 08/10/98
Elapsed ASTM days: 66
Date of Last EDR Contact: 10/19/98

LF: List of Solid Waste Facilities

Source: Department of Environment, Health and Natural Resources
Telephone: 919-733-0692

Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 07/16/98
Date Made Active at EDR: 10/29/98
Database Release Frequency: Semi-Annually

Date of Data Arrival at EDR: 08/11/98
Elapsed ASTM days: 79
Date of Last EDR Contact: 07/28/98

UST: Petroleum Underground Storage Tank Database

Source: Department of Environment, Health and Natural Resources
Telephone: 919-733-1308

Registered Underground Storage Tanks. UST's are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with the state department responsible for administering the UST program. Available information varies by state program.

Date of Government Version: 05/01/98
Date Made Active at EDR: 07/30/98
Database Release Frequency: Quarterly

Date of Data Arrival at EDR: 07/01/98
Elapsed ASTM days: 29
Date of Last EDR Contact: 08/12/98

STATE OF NORTH CAROLINA NON-ASTM RECORDS:

IMD: Incident Management Database

Source: Department of Health and Natural Resources
Telephone: 919-733-1315

Date of Government Version: 07/01/98
Database Release Frequency: N/A

Date of Last EDR Contact: 07/09/98
Date of Next Scheduled EDR Contact: 11/02/98

HSDS: Hazardous Substance Disposal Site

Source: North Carolina Center for Geographic Information and Analysis
Telephone: 919-733-2090

Locations of uncontrolled and unregulated hazardous waste sites. The file includes sites on the National Priority List as well as those on the state priority list.

Date of Government Version: 06/21/95
Database Release Frequency: Biennially

Date of Last EDR Contact: 09/10/98
Date of Next Scheduled EDR Contact: 12/07/98

Historical and Other Database(s)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

Former Manufactured Gas (Coal Gas) Sites: The existence and location of Coal Gas sites is provided exclusively to EDR by Real Property Scan, Inc. ©Copyright 1993 Real Property Scan, Inc. For a technical description of the types of hazards which may be found at such sites, contact your EDR customer service representative.

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DELISTED NPL: NPL Deletions

Source: EPA

Telephone: 703-603-8769

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 03/06/98

Date Made Active at EDR: 07/09/98

Database Release Frequency: Semi-Annually

Date of Data Arrival at EDR: 06/09/98

Elapsed ASTM days: 30

Date of Last EDR Contact: 09/28/98

NFRAP: No Further Remedial Action Planned

Source: EPA

Telephone: 703-413-0223

As of February 1995, CERCLIS sites designated "No Further Remedial Action Planned" (NFRAP) have been removed from CERCLIS. NFRAP sites may be sites where, following an initial investigation, no contamination was found, contamination was removed quickly without the need for the site to be placed on the NPL, or the contamination was not serious enough to require Federal Superfund action or NPL consideration. EPA has removed approximately 25,000 NFRAP sites to lift the unintended barriers to the redevelopment of these properties and has archived them as historical records so EPA does not needlessly repeat the investigations in the future. This policy change is part of the EPA's Brownfields Redevelopment Program to help cities, states, private investors and affected citizens to promote economic redevelopment of unproductive urban sites.

Date of Government Version: 08/27/98

Date Made Active at EDR: 10/03/98

Database Release Frequency: Quarterly

Date of Data Arrival at EDR: 09/03/98

Elapsed ASTM days: 30

Date of Last EDR Contact: 08/27/98

PWS: Public Water Systems

Source: EPA/Office of Drinking Water

Telephone: 202-260-2805

Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data

Source: EPA/Office of Drinking Water

Telephone: 202-260-2805

Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SWDIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Area Radon Information: The National Radon Database has been developed by the U.S. Environmental Protection Agency (USEPA) and is a compilation of the EPA/State Residential Radon Survey and the National Residential Radon Survey. The study covers the years 1986 - 1992. Where necessary data has been supplemented by information collected at private sources such as universities and research institutions.

EPA Radon Zones: Sections 307 & 309 of IRRA directed EPA to list and identify areas of U.S. with the potential for elevated indoor radon levels.

Oil/Gas Pipelines/Electrical Transmission Lines: This data was obtained by EDR from the USGS in 1994. It is referred to by USGS as GeoData Digital Line Graphs from 1:100,000-Scale Maps. It was extracted from the transportation category including some oil, but primarily gas pipelines and electrical transmission lines.

Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

USGS Water Wells: In November 1971 the United States Geological Survey (USGS) implemented a national water resource information tracking system. This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on more than 900,000 wells, springs, and other sources of groundwater.

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 1996 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in March 1997 from the U.S. Fish and Wildlife Service.

Epicenters: World earthquake epicenters, Richter 5 or greater
Source: Department of Commerce, National Oceanic and Atmospheric Administration

Water Dams: National Inventory of Dams
Source: Federal Emergency Management Agency
Telephone: 202-646-2801
National computer database of more than 74,000 dams maintained by the Federal Emergency Management Agency.

North Carolina Wildlife Resources/Game Lands
Source: Center for Geographic Information and Analysis
Telephone: 919-733-2090
All publicly owned game lands managed by the North Carolina Wildlife Resources Commission and as listed in Hunting and Fishing Maps for North Carolina Game Lands, 1989-90.

North Carolina Rare/Endangered Species and Natural Areas
Source: Natural Heritage Occurrence Sites Center for Geographic Information and Analysis
Telephone: 919-733-2090

North Carolina Public Water Supply Wells
Source: Department of Environmental Health
Telephone: 919-715-3243



"Linking Technology with Tradition"

Sanborn[®] Map Report

Ship to:

Norton Webster
Arcadis Geraghty and Miller
2301 Rexwoods Drive
Raleigh, NC 27607

Order Date: 11/18/98

Completion Date: 11/18/98

Inquiry #: 313237-2

P.O. #:

Site Name: River Bend

Address: River Bend

City/State: Milton, NC 27305

Cross Streets:

1441353MCO

919-782-5511

This document reports that the largest and most complete collection of Sanborn fire insurance maps has been reviewed based on client-supplied information, and fire insurance maps depicting the target property at the specified address were not identified.

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Appendix D

Transaction Screen Questionnaire

Raleigh, North Carolina

TRANSACTION SCREEN QUESTIONNAIRE

Site Name: River Bend
 Site Location: Caswell County, NC
 Project Number: NC602004.0000

Date: Wednesday, May 01, 2002
 Name of Owner: NCDOT
 Name of Occupant (If Applicable): N/A

Question	Owner		Occupants (if applicable)	Observed During Site Visit	
1a. Is the property used for industrial use?	N	Y	N/A	N	Y
1b. Is any adjoining property used for an industrial use?	N	Y	N/A	N	Y
2a. Did you observe evidence or do you have any prior knowledge that the property has been used for an industrial use in the past?	N	Y	N/A	N	Y
2b. Did you observe evidence or do you have any prior knowledge that the adjoining property has been used for an industrial use in the past.	N	Y	N/A	N	Y
3a. Is the property used as a gasoline station, motor repair facility, commercial printing facility, dry cleaners, photo developing laboratory, junkyard or landfill, or as a waste treatment, storage, disposal, processing, or recycling facility (if applicable, identify which)?	N	Y	N/A	N	Y
3b. Is the adjoining property used as a gasoline station, motor repair facility, commercial printing facility, dry cleaners, photo developing laboratory, junkyard or landfill, or as a waste treatment, storage, disposal, processing, or recycling facility (if applicable, identify which)?	N	Y	N/A	N	Y
4a. Did you observe evidence or do you have any prior knowledge that the property has been used as a gasoline station, motor repair facility, commercial printing facility, dry cleaners, photo developing laboratory, junkyard or landfill, or as a waste treatment, storage, disposal, processing, or recycling facility (if applicable, identify which)?	N	Y	N/A	N	Y
4b. Did you observe evidence or do you have any prior knowledge that the adjoining property has been used as a gasoline station, motor repair facility, commercial printing facility, dry cleaners, photo developing laboratory, junkyard or landfill, or as a waste treatment, storage, disposal, processing, or recycling facility (if applicable, identify which)?	N	Y	N/A	N	Y
5a. Are there currently any damaged or discarded automotive or industrial batteries, pesticides, paints, or other chemicals in individual containers of >5 gal (19 L) in volume or 50 gal (190 L) in the aggregate, stored on, or used at the property or facility?	N	Y	N/A	N	Y
5b. Did you observe evidence or do you have any prior knowledge that there have been previously, any damaged or discarded automotive or industrial batteries, pesticides, paints, or other chemicals in individual containers of >5 gal (19 L) in volume or 50 gal (190 L) in the aggregate, stored on, or used at the property or facility?	N	Y	N/A	N	Y

TRANSACTION SCREEN QUESTIONNAIRE

Site Name: River Bend
 Site Location: Caswell County, NC
 Project Number: NC602004.0000

Date: Wednesday, May 01, 2002
 Name of Owner: NCDOT
 Name of Occupant (If Applicable): N/A

Question	Owner		Occupants (if applicable)	Observed During Site Visit	
	N	Y		N	Y
6a. Are there currently any industrial drums (typically 55 gal (208 L)) or sacks of chemicals located on the property or at the facility?	N	Y	N/A	N	Y
6b. Did you observe evidence or do you have any prior knowledge that there have been previously, any industrial drums (typically 55 gal (208 L)) or sacks of chemicals located on the property or at the facility?	N	Y	N/A	N	Y
7a. Did you observe evidence or do you have any prior knowledge that fill dirt has been brought onto the property that originated from a contaminated site?	N	Y	N/A	N	Y
7b. Did you observe evidence or do you have any prior knowledge that fill dirt has been brought onto the property that originated from an unknown origin?	N	Y	N/A	N	Y
8a. Are there currently any pits, ponds, or lagoons located on the property in connection with waste treatment or waste disposal?	N	Y	N/A	N	Y
8b. Did you observe evidence or do you have any prior knowledge that there have been previously, any pits, ponds, or lagoons located on the property in connection with waste treatment or waste disposal?	N	Y	N/A	N	Y
9a. Is there currently any stained soil on the property?	N	Y	N/A	N	Y
9b. Did you observe evidence or do you have any prior knowledge that there have been previously, any stained soil on the property?	N	Y	N/A	N	Y
10a. Are there currently any registered or unregistered storage tanks (above or underground) located on the property?	N	Y	N/A	N	Y
10b. Did you observe evidence or do you have any prior knowledge that there have been previously, any registered or unregistered storage tanks (above or underground) located on the property?	N	Y	N/A	N	Y
11a. Are there currently any vent pipes, fill pipes, or access ways indicating a fill pipe protruding from the ground on the property or adjacent to any structure located on the property?	N	Y	N/A	N	Y
11b. Did you observe evidence or do you have any prior knowledge that there have been previously, any vent pipes, fill pipes, or access ways indicating a fill pipe protruding from the ground on the property or adjacent to any structure located on the property?	N	Y	N/A	N	Y
12a. Are there currently any flooring, drains, or walls located within the facility that are stained by substances other than water or are emitting foul odors?	N	Y	N/A	N	Y
12b. Did you observe evidence or do you have any prior knowledge that there have been previously, any flooring, drains, or walls located within the facility that are stained by substances other than water or are emitting foul odors?	N	Y	N/A	N	Y
13a. If the property is served by a private well or non-public water system, is there evidence or do you have any prior knowledge that contaminants have been identified in the well or system that exceeded guidelines applicable to the water system?	N	Y	N/A	N	Y

TRANSACTION SCREEN QUESTIONNAIRE

Site Name: River Bend
 Site Location: Caswell County, NC
 Project Number: NC602004.0000

Date: Wednesday, May 01, 2002
 Name of Owner: NCDOT
 Name of Occupant (If Applicable): N/A

Question	Owner		Occupants (if applicable)	Observed During Site Visit	
13b. If the property is served by a private well or non-public water system, is there evidence or do you have any prior knowledge that the well has been designated as contaminated by any government environmental/health agency?	N	Y	N/A	N	Y
14. Does the owner or occupant of the property have any knowledge of environmental liens or governmental notification relating to past or recurrent violations of environmental laws with respect to the property or any facility located on the property?	N	Y	N/A	N	Y
15a. Has the owner or occupant of the property been informed of the past existence of hazardous substances or petroleum products with respect to the property or any facility located on the property?	N	Y	N/A	N	Y
15b. Has the owner or occupant of the property been informed of the current existence of hazardous substances or petroleum products with respect to the property or any facility located on the property?	N	Y	N/A	N	Y
15c. Has the owner or occupant of the property been informed of the past existence of environmental violations with respect to the property or any facility located on the property?	N	Y	N/A	N	Y
15d. Has the owner or occupant of the property been informed of the current existence of environmental violations with respect to the property or any facility located on the property?	N	Y	N/A	N	Y
16. Does the owner or occupant of the property have any knowledge of any environmental site assessment of the property or facility that indicated the presence of hazardous substances or petroleum products on, or contamination of, the property or recommended further assessment of the property?	N	Y	N/A	N	Y
17. Does the owner or occupant of the property know of any past, threatened, or pending lawsuits or administrative proceedings concerning a release or threatened release of any hazardous substance or petroleum products involving the property by any owner or occupant of the property?	N	Y	N/A	N	Y
18a. Does the property discharge waste water, on or adjacent to the property, other than storm water, into a stormwater sewer system?	N	Y	N/A	N	Y
18b. Does the adjoining property discharge waste water, on or adjacent to the property, other than storm water, into a stormwater sewer system?	N	Y	N/A	N	Y
19. Did you observe evidence or do you have any prior knowledge that any hazardous substances or petroleum products, unidentified waste materials, tires, automotive or industrial batteries, or any other waste materials have been dumped above grade, buried and/or burned on the property?	N	Y	N/A	N	Y
20. Is there a transformer, capacitor, or any hydraulic equipment for which there are any records indicating the presence of PCBs?	N	Y	N/A	N	Y

TRANSACTION SCREEN QUESTIONNAIRE

Site Name: River Bend
 Site Location: Caswell County, NC
 Project Number: NC602004.0000

Date: Wednesday, May 01, 2002
 Name of Owner: NCDOT
 Name of Occupant (If Applicable): N/A

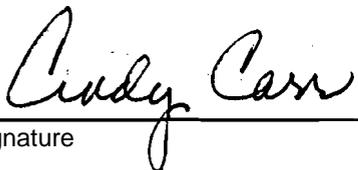
Government **Records/Historical** Sources Inquiry

21. Do any of the following Federal government record systems list the property or any property within the circumference of the area noted below:
- National Priorities List – within 1.0 mile (1.6 Km) N Y
 - CERCLIS List – within 0.5 mile (0.8 Km) N Y
 - RCRA CORRACTS Facilities – within 1.0 mile (1.6 Km) N Y
 - RCRA non-CORRACTS TSD Facilities – within 0.5 mile (0.8 Km) N Y
-
22. Do any of the following state record system list the property or any property within the circumference of the area noted below:
- List maintained by state governmental agency of hazardous waste sites identified for investigation or remediation that is the state agency equivalent to NPL – within approximately 1.0 mile (1.6 Km) N Y
- List maintained by state governmental agency of sites identified for investigation or remediation that is the state agency equivalent to CERCLIS – within 0.5 mile (0.8 Km) N Y
- Leaking Underground Storage Tank (LUST) List – within 0.5 mile (0.8 Km) N Y
- Solid Waste/Landfill Facilities – within 0.5 mile (0.8 Km) N Y
-
23. Based upon a review of fire insurance maps or consultation with the local fire department serving the property, all as specified within the guide, are any buildings or other improvements on the property or on an adjoining property identified as having been used for an industrial use or uses likely to lead to contamination of the property? N

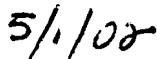
The preparer of this questionnaire must complete and sign the following statements. (For definition of "Preparer" and "User" see 5.3 or 3.3.25)

The questionnaire was completed by:		If the preparer is different than the user, complete the following:	
Name:	Cindy S. Carr	Name of User:	William D. Gilmore, P.E.
Title:	Staff Scientist	User's Address:	Project Development and Environmental Analysis Branch NC Department of Transportation 1548 Mail Service Center Raleigh, NC 27699-1548
Firm Address:	ARCADIS 2301 Rexwoods Drive, Suite 102 Raleigh, NC 27607		
Phone Number:	(919) 782-5511	User's Phone Number:	(919)
Date:	May 1, 2002	Preparer's relationship to site:	Scientist
		Preparer's relationship to user:	Consultant

The preparer presents to the best of the preparer's knowledge the above statements and facts are true and correct and to the best of the preparer's actual knowledge no material facts have been suppressed or misstated.



 Signature



 Date

 Signature

 Date

Appendix E

Groundwater Monitoring Gauges

Groundwater Monitoring Gauge Data
 River Bend Wetland Mitigation Site Plan, Caswell County, North Carolina

	S3169D9 B-203	S31F8C1 B-204	S4CFEE5 B-205	S31F882 B-206	S4CD932 B-207	S31F820 B-208	S4CD964 B-209	S4D03A3 B-210	S31F799 B-211	S4CDA1A B-212	S316995 B-213	S31F751 B-214	REQUIRED DEPTH
01-Jan-02	-39.7	0	-36.9	0	-36	0	-39.1	0	-36.6	0	-31.3	0	-12
02-Jan-02	-39.7	0	-38.9	0	-40.2	0	-39.1	0	-36.6	0	-31.3	0	-12
03-Jan-02	-39.3	0	-38.9	0	-40	0	-38.9	0	-36.4	0	-30.9	0	-12
04-Jan-02	-39.1	0	-36	0	-40.2	0	-38.9	0	-36.6	0	-31.1	0	-12
05-Jan-02	-39.3	0	-38.9	0	-40.2	0	-38.9	0	-36.6	0	-31.1	0	-12
06-Jan-02	-39.3	0	-38.9	0	-40.2	0	-38.9	0	-36.6	0	-31.1	0	-12
07-Jan-02	-35.7	0	-38.7	0	-36.1	0	-38.9	0	-36.6	0	-30.6	0	-12
08-Jan-02	-35.5	0	-38.9	0	-35.9	0	-39.1	0	-36.6	0	-30.9	0	-12
09-Jan-02	-34.2	0	-38.9	0	-35.9	0	-38.9	0	-36.6	0	-30.9	0	-12
10-Jan-02	-32.8	0	-38.9	0	-35.5	0	-38.9	0	-36.6	0	-30.8	0	-12
11-Jan-02	-31.7	0	-38.9	0	-35	0	-39.1	0	-36.6	0	-30.9	0	-12
12-Jan-02	-30.2	0	-38.9	0	-34.4	0	-39.1	0	-36.6	0	-30.8	0	-12
13-Jan-02	-30.9	0	-38.9	0	-34.4	0	-39.1	0	-36.8	0	-30.9	0	-12
14-Jan-02	-30.2	0	-38.9	0	-34.1	0	-39.1	0	-36.8	0	-30.9	0	-12
15-Jan-02	-30.9	0	-38.9	0	-34.1	0	-39.1	0	-36.8	0	-30.9	0	-12
16-Jan-02	-30.2	0	-38.9	0	-33.9	0	-39.1	0	-36.8	0	-30.4	0	-12
17-Jan-02	-30.2	0	-38.9	0	-33.5	0	-38.9	0	-36.8	0	-30.8	0	-12
18-Jan-02	-29.6	0	-38.7	0	-33.5	0	-39.1	0	-36.8	0	-30.8	0	-12
19-Jan-02	-30	0	-38.9	0	-33.1	0	-39.1	0	-36.8	0	-30.6	0	-12
20-Jan-02	2.8	1	-38.9	0	-8	1	-38.9	0	-36.6	0	-30.9	0	-12
21-Jan-02	3.4	2	-38.7	0	-11.4	2	-39.1	0	-36.6	0	-29.9	0	-12
22-Jan-02	3.2	3	-38.9	0	-12.7	0	-38.9	0	-36.6	0	-29.9	0	-12
23-Jan-02	4	4	-38.7	0	-13	0	-38.9	0	-19.5	0	-29.9	0	-12
24-Jan-02	4	5	-38.7	0	-9	2	-38.9	0	-12.3	0	-29.9	0	-12
25-Jan-02	4	6	-38.7	0	-6.2	2	-38.9	0	-16.9	0	-30.8	0	-12
26-Jan-02	4	7	-38.9	0	-6.3	3	-39.1	0	-19.5	0	-30.9	0	-12
27-Jan-02	4	8	-38.9	0	-9.5	4	-39.1	0	-21.1	0	-30.6	0	-12
28-Jan-02	4	9	-38.9	0	-11.2	5	-39.1	0	-22.2	0	-30.8	0	-12
29-Jan-02	4	10	-38.9	0	-12.8	6	-39.1	0	-23.9	0	-30.8	0	-12
30-Jan-02	4	11	-38.9	0	-14	7	-39.1	0	-24.9	0	-30.8	0	-12
31-Jan-02	4	12	-38.9	0	-14.9	8	-39.1	0	-25.2	0	-30.6	0	-12
01-Feb-02	4	13	-38.7	0	-15.4	9	-39.1	0	-26.8	0	-30.8	0	-12
02-Feb-02	3.2	14	-39.1	0	-16.9	0	-39.1	0	-27.3	0	-30.6	0	-12
03-Feb-02	2.1	15	-38.9	0	-17.5	0	-39.1	0	-27.5	0	-30.8	0	-12
04-Feb-02	1.1	16	-38.9	0	-17.9	0	-39.1	0	-29.4	0	-30.8	0	-12
05-Feb-02	-2.1	17	-38.9	0	-19.4	0	-39.1	0	-29.6	0	-30.8	0	-12
06-Feb-02	-4.6	18	-38.9	0	-19.5	0	-39.1	0	-8.7	1	-35.3	0	-12
07-Feb-02	3.4	19	-38.7	0	-3.2	1	-38.9	0	-11.8	2	-31.6	0	-12
08-Feb-02	3.4	20	-38.9	0	-5.2	2	-39.1	0	-14.8	0	-31.4	0	-12
09-Feb-02	4	21	-38.9	0	-9.1	3	-39.1	0	-15.6	0	-30.6	0	-12
10-Feb-02	4	22	-38.9	0	-11	4	-39.1	0	-18	0	-30.4	0	-12
11-Feb-02	4	23	-38.7	0	-11.9	5	-38.9	0	-19.4	0	-30.8	0	-12
12-Feb-02	4	24	-38.9	0	-13.6	6	-39.1	0	-19.4	0	-30.8	0	-12
13-Feb-02	4	25	-38.9	0	-14.5	7	-39.1	0	-19.4	0	-30.8	0	-12
14-Feb-02	4	26	-38.9	0	-15.8	8	-39.1	0	-20.9	0	-30.8	0	-12

15-Feb-02	4	27	-9.2	9	-38.9	0	-9.7	10	-16.2	0	-9.7	9	-39.1	0	-40.9	0	-21.4	0	-32.9	0	-30.8	0	-40.4	0	-12
16-Feb-02	2.8	28	-8.4	10	-38.9	0	-9	11	-16	0	-9.1	10	-38.9	0	-40.9	0	-21.4	0	-32.5	0	-30.8	0	-40.4	0	-12
17-Feb-02	1.9	29	-9.7	11	-38.9	0	-10.1	12	-16.6	0	-10.4	11	-39.1	0	-40.9	0	-22.2	0	-32.9	0	-30.8	0	-40.4	0	-12
18-Feb-02	0	30	-12	12	-38.9	0	-11.2	13	-17.9	0	-11.9	12	-39.1	0	-40.9	0	-23.9	0	-34.2	0	-30.9	0	-40.4	0	-12
19-Feb-02	-3.6	31	-12.7	0	-38.9	0	-11.6	14	-18.2	0	-12.6	0	-39.1	0	-40.9	0	-24.3	0	-34.8	0	-30.8	0	-40.4	0	-12
20-Feb-02	-4.2	32	-11.2	1	-38.9	0	-10.8	15	-17.9	0	-11.9	1	-39.1	0	-41.3	0	-24.3	0	-34.8	0	-30.6	0	-40.4	0	-12
21-Feb-02	-4.9	33	-11.6	2	-38.9	0	-10.3	16	-17.9	0	-11.9	2	-38.9	0	-41.1	0	-24.3	0	-34.8	0	-30.8	0	-40.4	0	-12
22-Feb-02	-7	34	-13.1	0	-38.9	0	-11.4	17	-18.4	0	-13.5	0	-39.1	0	-41.3	0	-25	0	-35.3	0	-30.8	0	-40.4	0	-12
23-Feb-02	-7.6	35	-13.7	0	-38.9	0	-11.6	18	-18.8	0	-14.1	0	-39.1	0	-41.1	0	-25.6	0	-35.9	0	-30.8	0	-40.4	0	-12
24-Feb-02	-9.1	36	-15	0	-38.9	0	-12.1	0	-19.4	0	-15	0	-39.1	0	-41.1	0	-26.4	0	-36.5	0	-30.8	0	-40.4	0	-12
25-Feb-02	-9.9	37	-15.5	0	-38.9	0	-12.3	0	-19.5	0	-15.5	0	-39.1	0	-41.3	0	-26.9	0	-36.8	0	-30.8	0	-40.6	0	-12
26-Feb-02	-8.9	38	-14.4	0	-38.9	0	-11.6	1	-19.2	0	-15	0	-39.1	0	-41.3	0	-26.4	0	-36.5	0	-30.8	0	-40.4	0	-12
27-Feb-02	-10.1	39	-15.3	0	-38.9	0	-11.7	2	-19.2	0	-15.5	0	-39.1	0	-41.1	0	-26.9	0	-37.8	0	-30.9	0	-40.6	0	-12
28-Feb-02	-11.8	40	-15.3	0	-38.9	0	-13.2	0	-20.3	0	-17	0	-39.1	0	-41.1	0	-28.8	0	-38.5	0	-30.9	0	-40.6	0	-12
01-Mar-02	-13.3	0	-17.8	0	-38.9	0	-13.8	0	-20.7	0	-17.7	0	-39.1	0	-41.3	0	-28.7	0	-38.9	0	-30.8	0	-40.4	0	-12
02-Mar-02	-12.5	0	-16.6	0	-38.7	0	1.5	1	-4.3	1	-4.4	1	-38.9	0	-41.1	0	-8.2	1	-30.8	0	-30	0	-40.4	0	-12
03-Mar-02	3.6	2	-4.1	2	-38.9	0	-0.4	2	-6.3	2	-6.8	2	-39.1	0	-41.1	0	-10.6	2	-28.7	0	-38.2	0	-40.4	0	-12
04-Mar-02	4	3	-6.2	3	-38.9	0	-4.6	3	-10.2	3	-9.3	3	-38.9	0	-39.5	0	-15.6	0	-28	0	-38	0	-40.4	0	-12
05-Mar-02	4	4	-6.2	4	-38.9	0	-5.7	4	-11.7	4	-9.5	4	-38.9	0	-39.5	0	-16.5	0	-27.8	0	-38.2	0	-40.6	0	-12
06-Mar-02	4	5	-6.2	5	-38.3	0	-6.2	5	-12.5	0	-9.3	5	-38.9	0	-39.5	0	-17.6	0	-28	0	-38.4	0	-40.6	0	-12
07-Mar-02	4	6	-6.7	6	-38.5	0	-7.3	6	-13.2	0	-9.9	6	-39.1	0	-39.3	0	-18.4	0	-28	0	-38.2	0	-40.4	0	-12
08-Mar-02	4	7	-6.7	7	-38	0	-7.5	7	-13.8	0	-10.2	7	-39.1	0	-37.2	0	-0.9	1	-16.3	0	-36.9	0	-39.1	0	-12
09-Mar-02	4	8	-1.9	8	-14.8	0	1.3	8	0.7	1	-0.2	8	-38.9	0	-34.2	0	-3	2	-16	0	-37.8	0	-39.3	0	-12
10-Mar-02	4	9	-3.2	9	-15.2	0	-0.5	9	-2	2	-0.9	9	-39.1	0	-32.6	0	-5.1	3	-15.4	0	-37.8	0	-39.3	0	-12
11-Mar-02	4	10	-3.6	10	-14.5	0	-2.6	10	-4.7	3	-0.7	10	-39.1	0	-31.1	0	-1.3	4	-12.8	0	-37.5	0	-39.3	0	-12
12-Mar-02	4	11	-1.1	11	-7.9	1	0.9	11	-0.9	4	0.7	11	-38.9	0	-29.8	0	-2.3	5	-13.5	0	-37.6	0	-39.5	0	-12
13-Mar-02	4	12	-2.2	12	-9.8	2	-1.7	12	-3.9	5	0.2	12	-38.9	0	-29.6	0	-4.6	6	-13.7	0	-38	0	-39.5	0	-12
14-Mar-02	4	13	-3	13	-10.7	3	-3.1	13	-5.6	6	-0.4	13	-38.9	0	-29.4	0	-6.8	7	-13.9	0	-38	0	-39.5	0	-12
15-Mar-02	4	14	-3.7	14	-11.8	4	-4.6	14	-6.9	7	-0.9	14	-38.9	0	-30.9	0	-8.3	8	-14.7	0	-37.8	0	-39.5	0	-12
16-Mar-02	4	15	-3.9	15	-13.7	0	-5	15	-8	8	-1.1	15	-38.9	0	-30.9	0	-8.3	8	-14.7	0	-37.8	0	-39.5	0	-12
17-Mar-02	4	16	1.3	16	-0.9	1	2.4	16	2.2	9	2	16	-34.7	0	-0.4	1	1.9	9	-4.5	1	-14.8	0	-38.7	0	-12
18-Mar-02	4	17	0	17	-1.9	2	1.7	17	1.3	10	1.8	17	-17.1	0	0	2	0.2	10	-3.4	2	-18.8	0	-38.7	0	-12
19-Mar-02	4	18	0	18	-2.1	3	1.8	18	0.6	11	2	18	-21.4	0	-0.7	3	0	11	-2.8	3	-22.3	0	-38.9	0	-12
20-Mar-02	4	19	0	19	-2.3	4	0.6	19	0	12	1.6	19	-24.9	0	-2	4	0	12	-2.6	4	-23.7	0	-38.9	0	-12
21-Mar-02	4	20	-1.3	20	-3.2	5	-2	20	-2	13	0.7	20	-28.7	0	-6.5	5	-1.1	13	-3	5	-27.7	0	-38.9	0	-12
22-Mar-02	4	21	-1.9	21	-3.9	6	-4.4	21	-4.5	14	0.5	21	-30.9	0	-9.5	6	-3	14	-3.2	6	-29.3	0	-39.3	0	-12
23-Mar-02	4	22	-2.2	22	-4.1	7	-5.1	22	-5	15	0.4	22	-32.4	0	-11.4	7	-5.3	15	-3.2	7	-30.9	0	-39.5	0	-12
24-Mar-02	4	23	-2.4	23	-4.3	8	-5.9	23	-5.6	16	0.2	23	-33.8	0	-13	0	-7.4	16	-3.2	8	-32.9	0	-39.5	0	-12
25-Mar-02	4	24	-2.6	24	-4.7	9	-6.1	24	-6	17	-0.2	24	-35.4	0	-14.5	0	-8.5	17	-3.4	9	-34.7	0	-39.5	0	-12
26-Mar-02	4	25	-1.1	25	-2.6	10	-2.5	25	-0.2	18	0.9	25	-36.2	0	-8.7	1	-0.6	18	-2.6	10	-33.5	0	-39.5	0	-12
27-Mar-02	4	26	-2.2	26	-3.9	11	-3.7	26	-3.9	19	-0.4	26	-37.4	0	-12.3	0	-2.1	19	-3	11	-33.5	0	-39.5	0	-12
28-Mar-02	4	27	-2.4	27	-4.3	12	-5	27	-5.2	20	-1.1	27	-37.3	0	-14.3	0	-5.1	20	-3	12	-34.6	0	-39.6	0	-12
29-Mar-02	4	28	-2.4	28	-4.5	13	-5.3	28	-5.8	21	-1.5	28	-37.1	0	-15.4	0	-7	21	-3	13	-35.1	0	-39.8	0	-12
30-Mar-02	4	29	-0.6	29	-2.1	14	0.6	29	-0.9	22	1.3	29	-37.8	0	-12.3	0	-0.9	22	-2.4	14	-36.4	0	-39.8	0	-12
31-Mar-02	4	30	-1.3	30	-2.8	15	-1.5	30	-1.7	23	0	30	-37.8	0	-12.3	0	-0.4	23	-2.3	15	-33.1	0	-39.8	0	-12
01-Apr-02	4	31	-2.4	31	-3.8	16	-4.4	31	-4.8	24	-2.4	31	-38.4	0	-15.4	0	-1.9	24	-2.6	16	-34.4	0	-40	0	-12
02-Apr-02	4	32	-2.4	32	-4.1	17	-5.1	32	-5.8	25	-3.1	32	-37.6	0	-16.6	0	-4.6	25	-2.4	17	-34.7	0	-40	0	-12
03-Apr-02	4	33	-3.9	33	-6.4	18	-7	33	-7.6	26	-5.3	33	-38.5	0	-20.3	0	-8.3	26	-2.8	18	-37.5	0	-40	0	-12
04-Apr-02	3	34	-4.5	34	-8.3	19	-7.9	34	-8.4	27	-6.2	34	-38.7	0	-21.4	0	-10.2	27	-3.2	19	-37.5	0	-40.2	0	-12

06-Apr-02	1.9	35	-4.9	35	-10.1	20	-8.4	35	-9.1	28	-7.3	35	-38.7	0	-23.1	0	-11.6	28	-3.4	20	-37.6	0	-40.2	0	-12
07-Apr-02	-1	36	-5.8	36	-13	0	-9.2	36	-10.2	29	-8.6	36	-38.7	0	-25.1	0	-13.3	0	-3.8	21	-37.8	0	-40	0	-12
08-Apr-02	-3.6	37	-14.8	37	-14.8	0	-9.4	37	-10.2	30	-8.9	37	-38.7	0	-25.9	0	-14	0	-3.9	22	-37.8	0	-40	0	-12
09-Apr-02	-4.4	38	-5.6	38	-15.8	0	-9	38	-10	31	-8.9	38	-38.5	0	-26.1	0	-14.6	0	-3.9	23	-37.8	0	-40	0	-12
10-Apr-02	0.4	39	-2.4	39	-11.1	1	-4.2	39	-6.3	32	-6.2	39	-38.5	0	-26.6	0	-10.2	1	-3.4	24	-37.1	0	-40	0	-12
11-Apr-02	-4	40	-5	40	-13.9	0	-6.8	40	-8.6	33	-8.8	40	-38.7	0	-27.2	0	-12.9	0	-4.1	25	-37.8	0	-40.2	0	-12
12-Apr-02	-5.1	41	-5.8	41	-16.5	0	-7.7	41	-9.5	34	-9.5	41	-38.7	0	-27.5	0	-13.9	0	-3.9	26	-37.8	0	-40.2	0	-12
13-Apr-02	-6.3	42	-5.8	42	-16.5	0	-7.7	42	-9.7	35	-9.9	42	-38.7	0	-27.9	0	-13.7	0	-4.1	27	-37.6	0	-40.2	0	-12
14-Apr-02	-6.3	43	-6.5	43	-18	0	-8.3	43	-10.2	36	-10.4	43	-38.7	0	-28.5	0	-14.6	0	-4.3	28	-37.8	0	-40.2	0	-12
15-Apr-02	-5.9	44	-6.7	44	-19.5	0	-8.6	44	-10.4	37	-10.6	44	-38.5	0	-29.2	0	-15.2	0	-4.3	29	-37.3	0	-40.2	0	-12
16-Apr-02	-8.2	45	-8.4	45	-21.4	0	-9.7	45	-11.4	38	-11.5	45	-38.7	0	-30.3	0	-16.7	0	-4.9	30	-37.8	0	-40.2	0	-12
17-Apr-02	-9.3	46	-9.5	46	-22.7	0	-10.3	46	-12.3	0	-12.2	0	-38.7	0	-30.9	0	-18	0	-5.1	31	-37.8	0	-40.2	0	-12
18-Apr-02	-10.2	47	-11	47	-24.1	0	-11	47	-13	0	-13	0	-38.7	0	-31.5	0	-19.2	0	-5.6	32	-37.6	0	-40.2	0	-12
19-Apr-02	-1.7	48	-4.1	48	-16.5	0	-4.8	48	-4.7	1	-7.1	1	-38.7	0	-31.1	0	-4.9	1	-3.4	33	-37.3	0	-40.2	0	-12
20-Apr-02	-2.1	49	-3.9	49	-8.5	1	-4	49	-4.3	2	-6.8	2	-38.7	0	-29.4	0	-1.1	2	-3	34	-36.7	0	-40.2	0	-12
21-Apr-02	-4.7	50	-6.2	50	-11.5	2	-6.2	50	-6.9	3	-8.8	3	-38.7	0	-29.2	0	-4.2	3	-3.2	35	-37.5	0	-40.2	0	-12
22-Apr-02	-6.5	51	-7.9	51	-14.5	0	-7.5	51	-8.4	4	-9.5	4	-38.9	0	-29.8	0	-8.2	4	-3.6	36	-37.6	0	-40.2	0	-12
23-Apr-02	-9.3	52	-10.8	52	-19	0	-9.9	52	-10.4	5	-11.7	5	-38.9	0	-32	0	-12.3	0	-4.3	37	-37.6	0	-40.2	0	-12
24-Apr-02	-10.8	53	-12.9	0	-21.4	0	-11	53	-11.9	6	-13	0	-38.9	0	-32.8	0	-15.2	0	-5.1	38	-37.6	0	-40.2	0	-12
25-Apr-02	-5.7	54	-8.6	1	-21	0	-7.2	54	-9.3	7	-10.2	1	-38.7	0	-32	0	-12.9	0	-4.1	39	-37.5	0	-40	0	-12
26-Apr-02	-10.4	55	-13.1	0	-23.7	0	-10.3	55	-11.9	8	-13.5	0	-38.7	0	-33.7	0	-16.7	0	-5.6	40	-37.6	0	-40.2	0	-12
27-Apr-02	-12.7	0	-15.3	0	-24.8	0	-11.6	56	-13.4	0	-14.4	0	-38.7	0	-34.2	0	-18.8	0	-6.6	41	-37.8	0	-40.2	0	-12
28-Apr-02	-12.7	0	-15.7	0	-24.1	0	-11.6	57	-13.8	0	-14.6	0	-38.7	0	-33.5	0	-19.2	0	-6.8	42	-37.6	0	-40.2	0	-12
29-Apr-02	-11.6	1	-16.1	0	-25	0	-11	58	-12.1	0	-13.9	0	-38.7	0	-34.6	0	-19	0	-5.6	43	-37.5	0	-40.2	0	-12
30-Apr-02	-14.8	0	-18.1	0	-27.2	0	-13	0	-14.9	0	-15.7	0	-38.9	0	-35.7	0	-20.9	0	-7.9	44	-37.6	0	-40.2	0	-12
01-May-02	-15.6	0	-19.1	0	-26.9	0	-13.6	0	-15.4	0	-16.1	0	-38.7	0	-35.7	0	-21.8	0	-8.8	45	-37.6	0	-40.2	0	-12
02-May-02	-14.8	0	-19.3	0	-26.7	0	-13.9	0	-15.6	0	-16.3	0	-38.7	0	-35.7	0	-22.6	0	-9.4	46	-36.9	0	-40	0	-12
03-May-02	4	1	-1.7	1	-9.8	1	2.2	1	1.1	1	-5.5	1	-38.7	0	-27.2	0	-0.4	1	-3.6	47	-33.3	0	-40	0	-12
04-May-02	4	2	-4.3	2	-13.7	0	-2.9	2	-6	2	-10	2	-38.9	0	-27.4	0	-3.4	2	-5.1	48	-37.3	0	-40.2	0	-12
05-May-02	4	3	-5.8	3	-12.2	0	-3.3	3	-6.3	3	-9.3	3	-38.7	0	-27.9	0	-5.1	3	-4.9	49	-37.3	0	-40.2	0	-12
06-May-02	4	4	-6.7	4	-16	0	-6.6	4	-8.9	4	-11	4	-38.7	0	-29	0	-9.5	4	-6	50	-37.3	0	-40.2	0	-12
07-May-02	4	5	-7.5	5	-17.5	0	-7.9	5	-10	5	-11.7	5	-38.7	0	-29.4	0	-12.3	0	-6.8	51	-37.5	0	-40.2	0	-12
08-May-02	4	6	-3.4	6	-18	0	-4.8	6	-8.4	6	-10.2	6	-38.7	0	-29.8	0	-11.6	1	-6.6	52	-36.9	0	-40	0	-12
09-May-02	4	7	3.2	7	0.8	1	2.4	7	2.8	7	2	7	1.1	1	0.6	1	3.6	2	2.8	53	2	1	-38.5	0	-12
10-May-02	4	8	3.2	8	-0.8	2	1.5	8	2.4	8	2	8	-3.1	2	-2.8	2	0.4	3	3	54	2	2	-39.1	0	-12
11-May-02	4	9	3.2	9	-1.5	3	-1.7	9	-1.1	9	1.5	9	-8.5	3	-8.2	3	-1.7	4	3	55	2	3	-39.5	0	-12
12-May-02	4	10	3.2	10	-1.9	4	-4.8	10	-3.7	10	0.5	10	-10.5	4	-10.4	4	-4.2	5	3	56	2	4	-39.5	0	-12
13-May-02	4	11	3.2	11	-2.6	5	-6.6	11	-5	11	-0.7	11	-12.7	0	-12.1	0	-8.7	6	3	57	2	5	-39.5	0	-12
14-May-02	4	12	3.2	12	-0.8	6	1.3	12	2	12	1.1	12	-4.7	1	-3.7	1	0.4	7	3	58	2	6	-38.5	0	-12
15-May-02	4	13	3.2	13	-2.1	7	-4.4	13	-3.2	13	-1.8	13	-11.5	2	-10.6	2	-2.5	8	2.8	59	1.6	7	-38.9	0	-12
16-May-02	4	14	3.2	14	-3	8	-7.5	14	-6.7	14	-3.8	14	-15.6	0	-14.9	0	-8.9	9	2.8	60	0.5	8	-39.3	0	-12
17-May-02	3.8	15	1.7	15	-5.4	9	-9.4	15	-8	15	-5.7	15	-18.2	0	-16.8	0	-13.5	0	3	61	-3.4	9	-39.5	0	-12
18-May-02	3.4	16	3.2	16	-2.8	10	-0.5	16	-6.5	16	0.5	16	-20	0	-18.2	0	-15.6	0	3.2	62	-9	10	-39.6	0	-12
19-May-02	1.3	17	1.7	17	-4.1	11	-7	17	-6.9	17	-6	17	-20.7	0	-19	0	-13.9	0	2.8	63	-12.1	11	-39.5	0	-12
20-May-02	-4.6	18	-0.7	18	-8.5	12	-9.4	18	-9.3	18	-8.4	18	-22.9	0	-22	0	-16.9	0	2.6	64	-16.6	12	-39.6	0	-12
21-May-02	-6.6	19	-1.5	19	-12.6	0	-10.6	19	-10.8	19	-9.9	19	-24.7	0	-24.2	0	-18.8	0	3.6	65	-20.3	13	-39.6	0	-12
22-May-02	-8.7	20	-4.3	20	-16.3	0	-11.6	20	-12.1	0	-11.1	20	-26.4	0	-26.1	0	-20.3	0	3.6	66	-23.7	14	-39.6	0	-12
23-May-02	-9.9	21	-6	21	-18.6	0	-12.7	0	-13.4	0	-12.4	0	-27.6	0	-27.2	0	-21.3	0	3.6	67	-26.6	15	-39.8	0	-12
24-May-02	-11.8	22	-9	22	-20.3	0	-13.9	0	-14.5	0	-13.9	0	-28.5	0	-28.1	0	-22.4	0	3	68	-29.1	16	-39.8	0	-12
25-May-02	-13.9	0	-11	23	-22.5	0	-15.6	0	-16.2	0	-15.2	0	-29.8	0	-29.8	0	-23.5	0	2.3	69	-31.5	17	-39.6	0	-12

26-May-02	-15.8	0	-12.7	0	-24.1	0	-16.9	0	-17.5	0	-16.4	0	-31.1	0	-30.9	0	-24.7	0	1.5	70	-32.9	0	-40	0	-12
27-May-02	-17.5	0	-14.8	0	-25.6	0	-18.2	0	-18.6	0	-17.5	0	-32.4	0	-32.2	0	-26	0	0.9	71	-34.6	0	-40	0	-12
28-May-02	-18.8	0	-16.3	0	-26.7	0	-19.1	0	-19.7	0	-18.4	0	-33.4	0	-33.1	0	-27.3	0	0	72	-36.7	0	-40.2	0	-12
29-May-02	-20.1	0	-17.6	0	-27.6	0	-20.2	0	-20.7	0	-19.4	0	-34.7	0	-34.1	0	-28.5	0	-0.8	73	-37.1	0	-40.2	0	-12
30-May-02	-20.9	0	-18.7	0	-28.2	0	-20.7	0	-21.4	0	-20.1	0	-35.3	0	-34.8	0	-29.4	0	-1.7	74	-37.1	0	-40.2	0	-12
31-May-02	-21.3	0	-19.6	0	-28.6	0	-21.5	0	-21.8	0	-20.6	0	-36	0	-35.5	0	-30.2	0	-2.4	75	-36.9	0	-40.2	0	-12
01-Jun-02	-22.6	0	-20.4	0	-29.9	0	-22.4	0	-22.9	0	-21.5	0	-37.1	0	-36.5	0	-31.7	0	-3.6	76	-37.1	0	-40.4	0	-12
02-Jun-02	-19.4	0	-18.1	0	-29.9	0	-19.8	0	-20.7	0	-20.3	0	-37.6	0	-37.2	0	-32.3	0	-2.8	77	-36.9	0	-40.2	0	-12
03-Jun-02	-21.6	0	-19.6	0	-31.6	0	-21.1	0	-22.1	0	-21.9	0	-37.8	0	-37.8	0	-34	0	-4.7	78	-37.1	0	-40.4	0	-12
04-Jun-02	-23	0	-21.3	0	-32.5	0	-22.9	0	-23.4	0	-22.6	0	-37.8	0	-38	0	-35.1	0	-7	79	-36.9	0	-40.4	0	-12
05-Jun-02	-24.1	0	-22.1	0	-33.1	0	-24.2	0	-24.4	0	-23.4	0	-37.8	0	-38	0	-36.4	0	-9.4	80	-37.1	0	-40.4	0	-12
06-Jun-02	4	1	-23.6	0	-33.8	0	-25.3	0	-25.3	0	-23.9	0	-37.8	0	-	0	-36.8	0	-12.8	0	-36.9	0	-40.6	0	-12
07-Jun-02	4	2	-23.6	0	-35	0	-25.3	0	-26.1	0	-24.5	0	-37.8	0	-	0	-36.6	0	-15	0	-36.7	0	-40.6	0	-12
08-Jun-02	4	3	-25.1	0	-36.1	0	-26.2	0	-26.8	0	-25.2	0	-37.8	0	-	0	-36.8	0	-17.9	0	-37.1	0	-40.6	0	-12
09-Jun-02	-	0	-26	0	-36.6	0	-27	0	-27.5	0	-25.7	0	-38	0	-	0	-37	0	-20.5	0	-37.1	0	-40.2	0	-12
10-Jun-02	-	0	-26.4	0	-37.4	0	-28.1	0	-28.3	0	-26.1	0	-37.8	0	-	0	-37	0	-22.5	0	-37.1	0	-40.2	0	-12
11-Jun-02	-	0	-26.6	0	-38	0	-29.4	0	-29	0	-26.8	0	-37.8	0	-	0	-37	0	-24.8	0	-36.9	0	-40.2	0	-12
12-Jun-02	-	0	-26.6	0	-38	0	-30.5	0	-29.8	0	-27.2	0	-37.8	0	-	0	-37	0	-26.9	0	-36.9	0	-40.2	0	-12
13-Jun-02	-	0	-26	0	-38.1	0	-31.4	0	-30.7	0	-27.8	0	-38	0	-	0	-37	0	-29.1	0	-36.9	0	-40.4	0	-12
14-Jun-02	-	0	-25.4	0	-38.1	0	-31.7	0	-31.1	0	-27.9	0	-37.8	0	-	0	-36.8	0	-29.7	0	-36.5	0	-40.4	0	-12
15-Jun-02	-	0	-25.4	0	-38	0	-32.3	0	-31.5	0	-28.1	0	-37.8	0	-	0	-37	0	-30.6	0	-36.9	0	-40.2	0	-12
16-Jun-02	-	0	-26	0	-38.1	0	-33.4	0	-32	0	-28.5	0	-37.8	0	-	0	-37	0	-32.7	0	-36.9	0	-40.2	0	-12
17-Jun-02	-	0	-25.8	0	-38.1	0	-34.3	0	-32.6	0	-29	0	-37.8	0	-	0	-37	0	-34.4	0	-36.9	0	-40.2	0	-12
18-Jun-02	-	0	-25.6	0	-38.3	0	-35	0	-33.3	0	-29.6	0	-38	0	-	0	-37	0	-36.3	0	-36.9	0	-40.2	0	-12
19-Jun-02	-	0	-25.6	0	-38.5	0	-35.4	0	-33.7	0	-29.9	0	-37.8	0	-	0	-37	0	-38	0	-37.1	0	-40.2	0	-12
20-Jun-02	-	0	-25.1	0	-38.5	0	-35.8	0	-34.2	0	-30.5	0	-37.8	0	-	0	-37.2	0	-38.5	0	-36.9	0	-40.2	0	-12
21-Jun-02	-	0	-25.2	0	-38.7	0	-35.8	0	-34.6	0	-31	0	-38	0	-	0	-37	0	-38.7	0	-37.1	0	-40.2	0	-12
22-Jun-02	-	0	-25.1	0	-38.7	0	-35.8	0	-35	0	-31.2	0	-38	0	-	0	-37.2	0	-39.1	0	-37.1	0	-40.2	0	-12
23-Jun-02	-	0	-24.9	0	-38.9	0	-35.8	0	-35.4	0	-31.4	0	-37.8	0	-	0	-37.2	0	-39.3	0	-37.1	0	-40.4	0	-12
24-Jun-02	-	0	-24.9	0	-38.9	0	-36	0	-35.7	0	-32	0	-37.8	0	-	0	-37.2	0	-39.3	0	-37.1	0	-40.4	0	-12
25-Jun-02	-	0	-22.8	0	-38.9	0	-36	0	-36.1	0	-32.3	0	-37.8	0	-	0	-37.2	0	-39.3	0	-36.9	0	-40.6	0	-12
26-Jun-02	-	0	-23.9	0	-38.9	0	-36.1	0	-36.3	0	-32.7	0	-37.8	0	-	0	-37	0	-36.8	0	-36.9	0	-40.4	0	-12
27-Jun-02	-	0	-23.8	0	-38.3	0	-35.6	0	-33.1	0	-31	0	-37.6	0	-	0	-37	0	-37.6	0	-36.7	0	-40.4	0	-12
28-Jun-02	-	0	-23.8	0	-38.3	0	-35.6	0	-33.5	0	-31.2	0	-37.6	0	-	0	-37	0	-39.1	0	-36.9	0	-40.6	0	-12
29-Jun-02	-	0	-23.9	0	-38.5	0	-35.8	0	-33.7	0	-31.4	0	-37.6	0	-	0	-37	0	-39.1	0	-36.9	0	-40.4	0	-12
30-Jun-02	-	0	-24.1	0	-38.5	0	-35.8	0	-34.1	0	-31.8	0	-37.8	0	-	0	-37	0	-39.5	0	-36.9	0	-40.6	0	-12
01-Jul-02	-	0	-24.1	0	-38.7	0	-35.8	0	-34.4	0	-32.5	0	-37.8	0	-	0	-37	0	-39.5	0	-36.9	0	-40.6	0	-12
02-Jul-02	-	0	-24.3	0	-38.7	0	-35.6	0	-34.8	0	-32.5	0	-37.8	0	-	0	-37	0	-39.5	0	-36.9	0	-40.6	0	-12
03-Jul-02	-	0	-24.3	0	-38.9	0	-35.8	0	-35.2	0	-32.7	0	-37.8	0	-	0	-37.2	0	-39.5	0	-36.9	0	-40.6	0	-12
04-Jul-02	-	0	-24.3	0	-38.7	0	-35.6	0	-35.4	0	-32.7	0	-37.6	0	-	0	-37.2	0	-39.5	0	-36.9	0	-40.4	0	-12
05-Jul-02	-	0	-23.9	0	-38.9	0	-35.8	0	-35.4	0	-33.1	0	-37.6	0	-	0	-37.2	0	-39.5	0	-36.9	0	-40.4	0	-12
06-Jul-02	-	0	-24.3	0	-38.7	0	-35.8	0	-36.3	0	-33.4	0	-37.6	0	-	0	-37.2	0	-39.5	0	-36.9	0	-40.4	0	-12
07-Jul-02	-	0	-24.5	0	-38.7	0	-35.8	0	-36.7	0	-33.8	0	-37.8	0	-	0	-37	0	-39.3	0	-36.9	0	-40.2	0	-12
08-Jul-02	-	0	-23.9	0	-38.9	0	-35.8	0	-36.8	0	-34	0	-37.6	0	-	0	-37.2	0	-39.3	0	-36.9	0	-40	0	-12
09-Jul-02	-	0	-24.1	0	-38.9	0	-35.8	0	-36.8	0	-34	0	-37.6	0	-	0	-37.2	0	-39.5	0	-36.9	0	-40.2	0	-12
10-Jul-02	-38.1	0	-24.3	0	-38.9	0	-35.8	0	-37.4	0	-34.1	0	-37.6	0	-38	0	-37.2	0	-39.5	0	-36.9	0	-40.2	0	-12
11-Jul-02	-38.3	0	-23.2	0	-39.1	0	-35.4	0	-37.2	0	-34	0	-37.8	0	-38	0	-37	0	-39.3	0	-36.9	0	-39.8	0	-12
12-Jul-02	-38.3	0	-24.7	0	-38.9	0	-35.8	0	-37.4	0	-34	0	-37.6	0	-38.2	0	-37.2	0	-39.3	0	-36.9	0	-40.2	0	-12
13-Jul-02	-38.3	0	-24.5	0	-39.1	0	-35.8	0	-37.4	0	-34.1	0	-37.6	0	-38.2	0	-37.2	0	-39.3	0	-36.7	0	-40.2	0	-12
14-Jul-02	-38.1	0	-23.2	0	-38.7	0	-35.6	0	-37.2	0	-33.4	0	-37.6	0	-38	0	-37.2	0	-39.3	0	-36.4	0	-39.8	0	-12

15-Jul-02	-38.1	0	-23.4	0	-38.5	0	-35.6	0	-37.2	0	-33.8	0	-37.8	0	-38	0	-37.2	0	-39.3	0	-36.5	0	-39.8	0	-12
16-Jul-02	-38.5	0	-23.9	0	-38.9	0	-35.8	0	-37.4	0	-33.2	0	-37.8	0	-37.4	0	-37.2	0	-39.3	0	-36.9	0	-39.8	0	-12
17-Jul-02	-38.5	0	-24.3	0	-38.9	0	-35.8	0	-37.4	0	-33.8	0	-37.6	0	-37.8	0	-37.4	0	-39.3	0	-36.9	0	-40.2	0	-12
18-Jul-02	-38.5	0	-23.9	0	-38.9	0	-35.8	0	-37.4	0	-34	0	-37.6	0	-38	0	-37.4	0	-39.3	0	-36.9	0	-40.2	0	-12
19-Jul-02	-38.5	0	-23.9	0	-38.9	0	-35.8	0	-37.4	0	-34.1	0	-37.6	0	-38	0	-37.4	0	-39.3	0	-36.9	0	-40.2	0	-12
20-Jul-02	-38.5	0	-23.9	0	-38.9	0	-35.8	0	-37.4	0	-34.1	0	-37.6	0	-38	0	-37.4	0	-39.3	0	-36.9	0	-40.2	0	-12
21-Jul-02	-38.9	0	-23.2	0	-38.5	0	-35.6	0	-37.6	0	-33.6	0	-37.6	0	-37.8	0	-37.2	0	-39.1	0	-36.5	0	-40	0	-12
22-Jul-02	-38.9	0	-22.8	0	-38.7	0	-35.6	0	-37.6	0	-33.8	0	-37.6	0	-37.8	0	-37.2	0	-39.1	0	-36.7	0	-40.2	0	-12
23-Jul-02	-38.9	0	-22.6	0	-38.9	0	-35.4	0	-37.6	0	-33.8	0	-37.8	0	-37.8	0	-37.4	0	-39.1	0	-36.7	0	-40.2	0	-12
24-Jul-02	-38.9	0	-22.6	0	-38.5	0	-35.4	0	-37.6	0	-33.6	0	-37.4	0	-37.8	0	-37.2	0	-39.1	0	-36.4	0	-40.2	0	-12
25-Jul-02	-38.7	0	-21.7	0	-38.5	0	-35.4	0	-37.4	0	-33.2	0	-37.6	0	-37.6	0	-37.2	0	-39.1	0	-36.4	0	-40.2	0	-12
26-Jul-02	-38	0	-21.5	0	-38.7	0	-35.4	0	-37.2	0	-33.6	0	-37.6	0	-37.4	0	-37.2	0	-39.1	0	-36.2	0	-40.2	0	-12
27-Jul-02	-38.7	0	-22.3	0	-38.7	0	-35.6	0	-37.4	0	-33.6	0	-37.6	0	-36.9	0	-37.2	0	-39.1	0	-36.5	0	-40.2	0	-12
28-Jul-02	-38.7	0	-22.4	0	-39.1	0	-35.8	0	-37.4	0	-33.2	0	-37.4	0	-37.6	0	-37.2	0	-39.3	0	-36.7	0	-40.4	0	-12
29-Jul-02	-38.5	0	-22.3	0	-38.7	0	-35.4	0	-37.4	0	-33.2	0	-37.4	0	-37.4	0	-37.2	0	-39.1	0	-36.5	0	-40.2	0	-12
30-Jul-02	-38.5	0	-22.8	0	-39.1	0	-35.6	0	-37.4	0	-33.6	0	-37.6	0	-37.6	0	-37.2	0	-39.3	0	-36.7	0	-40.4	0	-12
31-Jul-02	-38.5	0	-22.8	0	-39.1	0	-35.8	0	-37.4	0	-33.6	0	-37.6	0	-37.8	0	-37.4	0	-39.3	0	-36.7	0	-40.4	0	-12
01-Aug-02	-38.5	0	-22.8	0	-39.1	0	-35.6	0	-37.4	0	-33.8	0	-37.4	0	-37.8	0	-37.4	0	-39.3	0	-36.7	0	-40.4	0	-12
02-Aug-02	-38.7	0	-23	0	-39.1	0	-35.6	0	-37.4	0	-34	0	-37.4	0	-37.8	0	-37.4	0	-39.3	0	-36.7	0	-40.4	0	-12
03-Aug-02	-38.7	0	-23	0	-39.1	0	-35.6	0	-37.4	0	-34	0	-37.4	0	-37.8	0	-37.4	0	-39.3	0	-36.7	0	-40.4	0	-12
04-Aug-02	-38.7	0	-23.2	0	-39.3	0	-35.8	0	-37.4	0	-33.8	0	-37.4	0	-37.8	0	-37.4	0	-39.3	0	-36.7	0	-40.4	0	-12
05-Aug-02	-38.9	0	-23.6	0	-39.3	0	-35.8	0	-37.6	0	-34.1	0	-37.4	0	-37.8	0	-37.4	0	-39.3	0	-36.5	0	-40.4	0	-12
06-Aug-02	-38.9	0	-24.5	0	-39.3	0	-35.8	0	-37.6	0	-34.1	0	-37.4	0	-38	0	-37.4	0	-39.3	0	-36.9	0	-40.2	0	-12
07-Aug-02	-38.9	0	-25.1	0	-39.3	0	-35.8	0	-37.6	0	-34.1	0	-37.6	0	-38	0	-37.4	0	-39.3	0	-36.7	0	-39.6	0	-12
08-Aug-02	-38.9	0	-26.2	0	-39.3	0	-35.8	0	-37.6	0	-34.1	0	-37.6	0	-38	0	-37.4	0	-39.3	0	-36.9	0	-39.6	0	-12
09-Aug-02	-38.9	0	-26.4	0	-39.3	0	-35.8	0	-37.6	0	-34.1	0	-37.4	0	-38.2	0	-37.4	0	-39.5	0	-36.9	0	-39.6	0	-12
10-Aug-02	-38.9	0	-26.6	0	-39.3	0	-35.6	0	-37.6	0	-34.1	0	-37.6	0	-38.2	0	-37.4	0	-39.5	0	-37.1	0	-40	0	-12
11-Aug-02	-38.9	0	-25.2	0	-39.3	0	-35.8	0	-37.6	0	-34.1	0	-37.6	0	-38.2	0	-37.4	0	-39.5	0	-37.1	0	-40	0	-12
12-Aug-02	-38.9	0	-25.1	0	-39.3	0	-35.8	0	-37.6	0	-34.3	0	-37.6	0	-38	0	-37.4	0	-39.5	0	-37.1	0	-40	0	-12
13-Aug-02	-38.9	0	-25.1	0	-39.3	0	-36	0	-37.6	0	-34.5	0	-37.6	0	-38.2	0	-37.6	0	-39.5	0	-37.1	0	-40	0	-12
14-Aug-02	-39.1	0	-24.7	0	-39.5	0	-36	0	-37.6	0	-34.5	0	-37.6	0	-38.2	0	-37.6	0	-39.5	0	-37.1	0	-40	0	-12
15-Aug-02	-39.1	0	-24.9	0	-39.5	0	-35.8	0	-37.6	0	-34.5	0	-37.6	0	-38.2	0	-37.6	0	-39.5	0	-37.5	0	-34.5	0	-12
16-Aug-02	-38.9	0	-23.6	0	-38.9	0	-35.2	0	-37.6	0	-33.8	0	-38.4	0	-38.2	0	-37.6	0	-39.5	0	-37.3	0	-33.8	0	-12
17-Aug-02	-38.7	0	-23.8	0	-38.7	0	-35.2	0	-37.4	0	-34	0	-38.4	0	-38.2	0	-37.6	0	-39.5	0	-37.5	0	-34	0	-12
18-Aug-02	-38.9	0	-24.3	0	-39.1	0	-35.2	0	-37.4	0	-33.8	0	-38.4	0	-38.2	0	-37.6	0	-39.3	0	-37.5	0	-33.8	0	-12
19-Aug-02	-38.9	0	-24.7	0	-39.6	0	-35.2	0	-37.4	0	-34	0	-38.4	0	-38.2	0	-37.6	0	-39.1	0	-37.5	0	-34.5	0	-12
20-Aug-02	-38.9	0	-25.1	0	-39.1	0	-35.2	0	-37.4	0	-34.5	0	-38.4	0	-38.2	0	-37.6	0	-39.3	0	-37.6	0	-34.5	0	-12
21-Aug-02	-38.9	0	-25.1	0	-39.6	0	-35.8	0	-37.4	0	-34.5	0	-38.4	0	-38.3	0	-37.6	0	-39.1	0	-37.5	0	-34.5	0	-12
22-Aug-02	-39.1	0	-25.6	0	-39.6	0	-35.8	0	-37.4	0	-34.5	0	-38.4	0	-38.2	0	-37.8	0	-39.1	0	-37.6	0	-34.5	0	-12
23-Aug-02	-39.1	0	-25.6	0	-39.6	0	-35.8	0	-37.4	0	-34.5	0	-38.4	0	-38.2	0	-37.8	0	-39.1	0	-37.6	0	-34.5	0	-12
24-Aug-02	-39.1	0	-25.6	0	-39.6	0	-35.6	0	-37.4	0	-34.5	0	-38.4	0	-38.3	0	-37.8	0	-39.1	0	-37.6	0	-34.5	0	-12
25-Aug-02	-38.9	0	-25.1	0	-39.1	0	-35.2	0	-37.2	0	-33.8	0	-38.2	0	-38.3	0	-37.6	0	-39.1	0	-37.5	0	-33.8	0	-12
26-Aug-02	-38.9	0	-25.1	0	-39.1	0	-35	0	-37.2	0	-33.8	0	-37.6	0	-38.3	0	-37.6	0	-39.1	0	-37.3	0	-33.8	0	-12
27-Aug-02	-38.7	0	-23.8	0	-39.1	0	-35	0	-37.2	0	-34	0	-37.4	0	-38.3	0	-37.6	0	-39.1	0	-37.5	0	-34	0	-12
28-Aug-02	-38.7	0	-22.4	0	-39.1	0	-35.4	0	-37.2	0	-34	0	-37.4	0	-37.8	0	-37.6	0	-39.3	0	-36.9	0	-34	0	-12
29-Aug-02	-38.5	0	-24.1	0	-39.1	0	-35.6	0	-37.2	0	-34.1	0	-37.4	0	-38	0	-37.6	0	-39.3	0	-36.5	0	-34.1	0	-12
30-Aug-02	-38.3	0	-23.6	0	-39.1	0	-35.4	0	-37.2	0	-33.8	0	-37.4	0	-37.8	0	-37.6	0	-39.3	0	-36.2	0	-33.8	0	-12
31-Aug-02	-38.3	0	-24.5	0	-39.1	0	-35.2	0	-37.2	0	-34	0	-37.4	0	-37.8	0	-37.6	0	-	0	-36.2	0	-34	0	-12
01-Sep-02	-38.3	0	-24.9	0	-38.9	0	-35.2	0	-34.2	0	-33.6	0	-37.6	0	-37.6	0	-37.4	0	-	0	-36	0	-33.6	0	-12
02-Sep-02	-38.1	0	-25.4	0	-39.1	0	-35.2	0	-37.2	0	-34	0	-37.6	0	-37.8	0	-37.4	0	-	0	-36.2	0	-34	0	-12

03-Sep-02	-38.3	0	-25.6	0	-39.1	0	-35.2	0	-37.4	0	-33.8	0	-37.6	0	-37.8	0	-37.6	0	-36.4	0	-33.8	0	-12
04-Sep-02	-38.3	0	-25.6	0	-39.5	0	-35	0	-37.6	0	-33.8	0	-37.8	0	-38	0	-37.8	0	-36.5	0	-33.8	0	-12
05-Sep-02	-38.3	0	-25.6	0	-39.1	0	-35	0	-37.4	0	-33.6	0	-37.8	0	-37.8	0	-37.4	0	-36.7	0	-34	0	-12
06-Sep-02	-38.5	0	-26.2	0	-39.3	0	-35.2	0	-37.6	0	-34	0	-37.8	0	-38	0	-37.6	0	-36.7	0	-33.8	0	-12
07-Sep-02	-38.3	0	-26.2	0	-39.3	0	-35.2	0	-37.6	0	-33.8	0	-38	0	-38	0	-37.4	0	-36.7	0	-33.8	0	-12
08-Sep-02	-38.5	0	-26.4	0	-39.1	0	-35.2	0	-37.6	0	-33.8	0	-38	0	-38.2	0	-37.6	0	-36.7	0	-33.8	0	-12
09-Sep-02	-38.5	0	-26.6	0	-39.3	0	-35.6	0	-37.6	0	-34.1	0	-38	0	-38.3	0	-37.6	0	-36.9	0		1	-12
10-Sep-02	-38.5	0	-26.4	0	-39.3	0	-35.4	0	-37.4	0	-33.8	0	-38	0	-38.3	0	-37.4	0	-36.9	0		2	-12
11-Sep-02	-38.5	0	-26	0	-39.3	0	-35.4	0	-37.4	0	-33.8	0	-38	0	-38.3	0	-37.4	0	-36.9	0		3	-12
12-Sep-02	-38.7	0	-26.7	0	-39.1	0	-35.6	0	-37.6	0	-34	0	-38.2	0	-38.3	0	-37.6	0	-36.9	0		4	-12
13-Sep-02	-38.7	0	-27.9	0	-39.3	0	-35.6	0	-37.4	0	-34	0	-38	0	-38.2	0	-37.4	0	-36.5	0		5	-12
14-Sep-02	-38.7	0	-26.7	0	-39.3	0	-35.6	0	-37.4	0	-33.2	0	-38	0	-38.2	0	-37.4	0	-36.5	0		6	-12
15-Sep-02	-38.7	0	-25.6	0	-38.9	0	-35	0	-37.2	0	-33.2	0	-38	0	-38.2	0	-37.4	0	-36.5	0		7	-12
16-Sep-02	-38.9	0	-23.4	0	-38.9	0	-34.9	0	-37.2	0	-33.2	0	-38	0	-38.2	0	-37.4	0	-36.9	0		8	-12
17-Sep-02	-39.1	0	-24.3	0	-39.1	0	-35.2	0	-37.4	0	-33.8	0	-38	0	-38.2	0	-37.4	0	-36.9	0		9	-12
18-Sep-02	-39.3	0	-24.7	0	-39.1	0	-35	0	-37.4	0	-33.8	0	-38	0	-38.2	0	-37.6	0	-36.7	0		10	-12
19-Sep-02	-38.7	0	-24.9	0	-38.9	0	-35.4	0	-37.4	0	-33.8	0	-38	0	-38.3	0	-37.6	0	-36.9	0		11	-12
20-Sep-02	-39.1	0	-25.4	0	-39.1	0	-35.6	0	-37.4	0	-33.8	0	-38	0	-38.3	0	-37.6	0	-36.9	0		12	-12
21-Sep-02	-39.3	0	-25.1	0	-39.3	0	-35.6	0	-37.4	0	-33.8	0	-38	0	-38.3	0	-37.6	0	-36.9	0		13	-12
22-Sep-02	-39.3	0	-24.9	0	-39.3	0	-35.8	0	-37.4	0	-33.8	0	-38.2	0	-38.3	0	-37.6	0	-36.9	0		14	-12
23-Sep-02	-39.1	0	-25.2	0	-39.3	0	-35.8	0	-37.4	0	-34	0	-38	0	-38.5	0	-37.6	0	-36.9	0		15	-12
24-Sep-02	-39.3	0	-26	0	-39.3	0	-36	0	-37.4	0	-33.8	0	-38.2	0	-38.3	0	-37.4	0	-36.7	0		16	-12
25-Sep-02	-39.1	0	-26.4	0	-39.1	0	-35.8	0	-37.4	0	-34	0	-38	0	-38.3	0	-37.6	0	-36.7	0		17	-12
26-Sep-02	-38.9	0	-24.9	0	-39.1	0	-35.6	0	-37.2	0	-33.2	0	-38	0	-38.2	0	-37.4	0	-36.5	0		18	-12
27-Sep-02	-38.5	0	-25.8	0	-38.7	0	-35.4	0	-37.2	0	-33.1	0	-37.8	0	-38.2	0	-37.4	0	-36.4	0		19	-12
28-Sep-02	-38.5	0	-25.4	0	-38.7	0	-35.4	0	-37.2	0	-33.6	0	-37.8	0	-38	0	-37.4	0	-36.7	0		20	-12
29-Sep-02	-38.7	0	-26.6	0	-38.9	0	-35.6	0	-37.6	0	-34	0	-38	0	-38.2	0	-37.6	0	-36.9	0		21	-12
30-Sep-02	-38.5	0	-26.9	0	-38.9	0	-35.6	0	-37.4	0	-34	0	-38	0	-38.2	0	-37.6	0	-36.9	0		22	-12
01-Oct-02	-38.5	0	-26.4	0	-39.1	0	-35.6	0	-37.4	0	-34	0	-38	0	-38.2	0	-37.6	0	-36.9	0		23	-12
02-Oct-02	-38.5	0	-26.4	0	-39.3	0	-35.6	0	-37.4	0	-33.8	0	-38	0	-38.2	0	-37.6	0	-36.9	0		24	-12
03-Oct-02	-38.7	0	-26.4	0	-39.3	0	-35.6	0	-37.4	0	-33.8	0	-38	0	-38.2	0	-37.6	0	-37.1	0		25	-12
04-Oct-02	-38.7	0	-26.6	0	-39.1	0	-35.8	0	-37.4	0	-33.8	0	-38	0	-38.2	0	-37.6	0	-37.1	0		26	-12
05-Oct-02	-39.1	0	-26.6	0	-39.3	0	-35.8	0	-37.4	0	-33.8	0	-38	0	-38.3	0	-37.6	0	-37.1	0		27	-12
06-Oct-02	-39.1	0	-26.7	0	-39.3	0	-36	0	-37.6	0	-34.1	0	-38	0	-38.3	0	-37.6	0	-36.9	0		28	-12
07-Oct-02	-39.1	0	-26.7	0	-39.1	0	-35.8	0	-37.4	0	-34	0	-38	0	-38.3	0	-37.6	0	-36.9	0		29	-12
08-Oct-02	-38.9	0	-27.3	0	-39.1	0	-36	0	-37.6	0	-34.3	0	-38.2	0	-38.3	0	-37.6	0	-36.9	0		30	-12
09-Oct-02	-38.9	0	-27.5	0	-39.1	0	-35.8	0	-37.6	0	-34	0	-38.2	0	-38.3	0	-37.6	0	-36.9	0		31	-12
10-Oct-02	-38.7	0	-27.7	0	-38.9	0	-35.6	0	-37.4	0	-34	0	-38.2	0	-38.3	0	-37.4	0	-36.9	0		32	-12
11-Oct-02	-37.2	0	-26.4	0	-0.4	1	-35.4	0	-29.8	0	-33.2	0	-37.6	0	-37.4	0	-37	0	-7.6	1		33	-12
12-Oct-02	-38.1	0	-26.6	0	-12.6	0	-35.4	0	-12.7	0	-31	0	-37.6	0	-37.8	0	-25.6	0	-36.7	0		34	-12
13-Oct-02	-38.5	0	-26.6	0	-22.2	0	-33.8	0	-22.5	0	-31.6	0	-37.8	0	-37.8	0	-35.5	0	-36.7	0		35	-12
14-Oct-02	-38.7	0	-26.2	0	-30.3	0	-34.7	0	-26.2	0	-32.1	0	-37.8	0	-37.8	0	-36.6	0	-36.7	0		36	-12
15-Oct-02	-38.9	0	-27.1	0	-35.1	0	-35.4	0	-28.5	0	-31.8	0	-38	0	-38.2	0	-36.8	0	-36.9	0		37	-12
16-Oct-02	-38.1	0	-23.4	0	-5.4	1	-16	0	-5.6	1	-19.4	0	-37.6	0	-35.5	0	-8.2	1	-39.1	0		38	-12
17-Oct-02	4	1	-19.4	0	-3	2	-13.9	0	-11.9	2	-15.2	0	-37.6	0	-38.2	0	-10.4	2	-39.5	0		39	-12
18-Oct-02	3	2	-22.3	0	-6.2	3	-16	0	-17.3	0	-16.3	0	-37.8	0	-38.2	0	-17.1	0	-37.1	0		40	-12
19-Oct-02	-2.5	3	-23.6	0	-10.9	4	-16.9	0	-20.3	0	-16.8	0	-37.8	0	-38.3	0	-21.3	0	-37.1	0		41	-12
20-Oct-02	-7.2	4	-23.6	0	-16.2	0	-17.4	0	-22.5	0	-17.2	0	-37.6	0	-38.2	0	-23.9	0	-36.9	0		42	-12
21-Oct-02	2.5	5	-11	1	-2.8	1	-7.2	1	-11.4	1	-7.1	1	-37.6	0	-38	0	-7.6	1	-39.3	0		43	-12
22-Oct-02	4	6	-7.3	2	-1.9	2	-7.5	2	-8.6	2	-4.6	2	-37.6	0	-38.2	0	-8.3	2	-39.3	0		43	-12

23-Oct-02	4	7	-11.2	3	-4.5	3	-11	3	-11.9	3	-6.9	3	-37.6	0	-38.3	0	-14.2	0	-39.5	0	-37.1	0	44	-12
24-Oct-02		8		4		4		4		4		4		1		1		1		1		1	45	-12
25-Oct-02		9		5		5		5		5		5		2		2		2		2		2	46	-12
26-Oct-02		10		6		6		6		6		6		3		3		3		3		3	47	-12
27-Oct-02		11		7		7		7		7		7		4		4		4		4		4	48	-12
28-Oct-02		12		8		8		8		8		8		5		5		5		5		5	49	-12
29-Oct-02		13		9		9		9		9		9		6		6		6		6		6	50	-12
30-Oct-02		14		10		10		10		10		10		7		7		7		7		7	51	-12
31-Oct-02		15		11		11		11		11		11		8		8		8		8		8	52	-12
01-Nov-02		16		12		12		12		12		12		9		9		9		9		9	53	-12
02-Nov-02		17		13		13		13		13		13		10		10		10		10		10	54	-12
03-Nov-02		18		14		14		14		14		14		11		11		11		11		11	55	-12
04-Nov-02		19		15		15		15		15		15		12		12		12		12		12	56	-12
05-Nov-02		20		16		16		16		16		16		13		13		13		13		13	57	-12
06-Nov-02		21		17		17		17		17		17		14		14		14		14		14	58	-12
07-Nov-02		22		18		18		18		18		18		15		15		15		15		15	59	-12
08-Nov-02		23		19		19		19		19		19		16		16		16		16		16	60	-12
09-Nov-02		24		20		20		20		20		20		17		17		17		17		17	61	-12
10-Nov-02		25		21		21		21		21		21		18		18		18		18		18	62	-12
11-Nov-02		26		22		22		22		22		22		19		19		19		19		19	63	-12
12-Nov-02		27		23		23		23		23		23		20		20		20		20		20	64	-12
Most Consecutive Days		55				23				38				20				28				80		64
% Hydroperiod		17.41%		16.46%		7.28%		18.35%		12.03%		14.24%		6.33%		6.33%		8.86%		25.32%		6.33%		20.25%

Appendix F

Reference Wetland Soils

On-Site Reference Wetlands
 River Bend Wetland Mitigation Site Plan, Caswell County, North Carolina

Horizon (inches)	Texture	Color	Mottles	Mottle Color	Mapped Series
0-12	CL	10 YR 5/3 (Brown)	Oxidized root channels	5 YR 4/6 (Yellowish Red)	Chewacla
12-22	SCL	10 YR 4/3 (Brown)	Many, medium, distinct	5 YR 4/4 (Reddish Brown)	Chewacla
22+	SCL	10 YR 4/3 (Brown)	Common, medium, distinct	5 YR 4/4 (Reddish Brown)	Chewacla
0-8	SiCL	10 YR 4/4 (Dark Yellowish Brown)	Fine roots, Mica flakes		Congaree
8-24	SiL	7.5 YR 4/3 (Brown)	Mica flakes		Congaree
24+	VF SL	10 YR 3/4 (Dark Brown)			Congaree
0-3	SiCL	2.5 Y 5/2 (Grayish Brown)	Fine roots, Oxidized root channels		Wehadkee
3-11	SiCL	2.5 Y 5/2 (Grayish Brown)	Oxidized root channels	7.5 YR 5/6 (Strong Brown)	Wehadkee
11-22	SCL	7.5 YR 4/4 (Brown)	Many, medium, distinct	2.5 Y 5/2 (Grayish Brown)	Wehadkee
22-28	SCL	7.5 YR 4/3 (Brown)			Wehadkee
28-36	SC	7.5 YR 3/3 (Dark Brown)		2.5 Y 5/1 (Gray)	Wehadkee

Reference Wetland 1 (Off-Site)
 North Carolina Wildlife Resource Commission – Caswell Game Lands
 SR 1750 (George Russell Road) near SR 1736 (Burton Chapel Road)

Distance from Creek (feet)	Horizon (inches)	Texture	Color	Mottles	Mottle Color	Mapped Series
Levee	0-30	SL	10 YR 4/3 (Brown)			Buncombe
50	0-11	LS	10 YR 4/4 (Dark Yellowish Brown)			Buncombe/Congaree
50	11-16	SL	10 YR 4/4 (Dark Yellowish Brown)			Buncombe/Congaree
50	16-25	LS	10 YR 4/4 (Dark Yellowish Brown)			Buncombe/Congaree
100	0-13	SiCL	10 YR 3/6 (Dark Yellowish Brown)			Congaree
100	13-23	L	10 YR 4/6 (Dark Yellowish Brown)			Congaree
100	23-30	LS	10 YR 4/6 (Dark Yellowish Brown)			Congaree
150	0-8	L	10 YR 4/4 (Dark Yellowish Brown)			State
150	8-17	CL	7.5 YR 5/6 (Strong Brown)			State
150	17-29	SL	7.5 YR 5/8 (Strong Brown)			State
150	29-36	C	7.5 YR 4/6 (Strong Brown)			State
200	0-14	CL	10 YR 4/3 (Brown)			State
200	14-30	SL	7.5 YR 4/6 (Strong Brown)			State
200	30-40	C	7.5 YR 4/6 (Strong Brown)			State

Reference Wetland 2 (Off-Site)

North Carolina Wildlife Resource Commission – Caswell Game Lands

SR 1780 (Gatewood Road) off NC 86/US 158

Distance from Creek (feet)	Horizon (inches)	Texture	Color	Mottles	Mottle Color	Mapped Series
Levee	0-7	L	10 YR 3/6 (Dark Yellowish Brown)			Congaree
Levee	7-17	SCL	10 YR 4/4 (Dark Yellowish Brown)			Congaree
Levee	17-31	SL	10 YR 4/4 (Dark Yellowish Brown)			Congaree
100	0-5	L	10 YR 4/3 (Brown)			Congaree
100	5-15	CL	10 YR 4/4 (Dark Yellowish Brown)			Congaree
100	15-30	SL	10 YR 4/4 (Dark Yellowish Brown)	Sand inclusions	10 YR 5/4 (Yellowish Brown)	Congaree
100	30-36	SL	10 YR 6/4 (Light Yellowish Brown)	Soft iron masses	5 YR 3/4 (Dark Reddish Brown)	Congaree
130	0-8	CL	10 YR 4/4 (Dark Yellowish Brown)			Chewacla
130	8-17	CL	10 YR 5/4 (Yellowish Brown)	Soft iron masses	5 YR 3/4 (Dark Reddish Brown)	Chewacla
				Organic streaking		Chewacla
130	17-24	LS	10 YR 5/4 (Yellowish Brown)			Chewacla
130	24-32	SCL	10 YR 6/2 (Light Brownish Gray)	Com., med., dist.	7.5 YR 3/4 (Dark Brown)	Chewacla
				Soft iron masses	2.5 YR 3/2 (dusky red)	Chewacla
130	32-36	C	10 YR 5/1 (Gray)	Few, fine, faint	10 YR 3/6 (Dark Yellowish Brown)	Chewacla