WETLAND MITIGATION PLAN

GRIMESLAND SITE
PITT COUNTY, NORTH CAROLINA

STATE PROJECT NUMBER:
TIP NUMBER: R-2510 WM

Prepared for:

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
PROJECT DEVELOPMENT AND ENVIRONMENTAL
ANALYSIS BRANCH
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1.0 INTRODUCTION

The North Carolina Department of Transportation (NCDOT) is in the process of identifying and developing mitigation sites, whereon pre-construction mitigation could be provided for regions of the state projected to receive multiple roadway improvement projects within the foreseeable future. The 550-acre Grimesland borrow pit site (hereinafter referred to as "the Grimesland site"), located near the community of Grimesland in Pitt County (Figure 1), is one such mitigation site planned to service the Coastal Plain of the Tar-Pamlico River Basin in North Carolina.

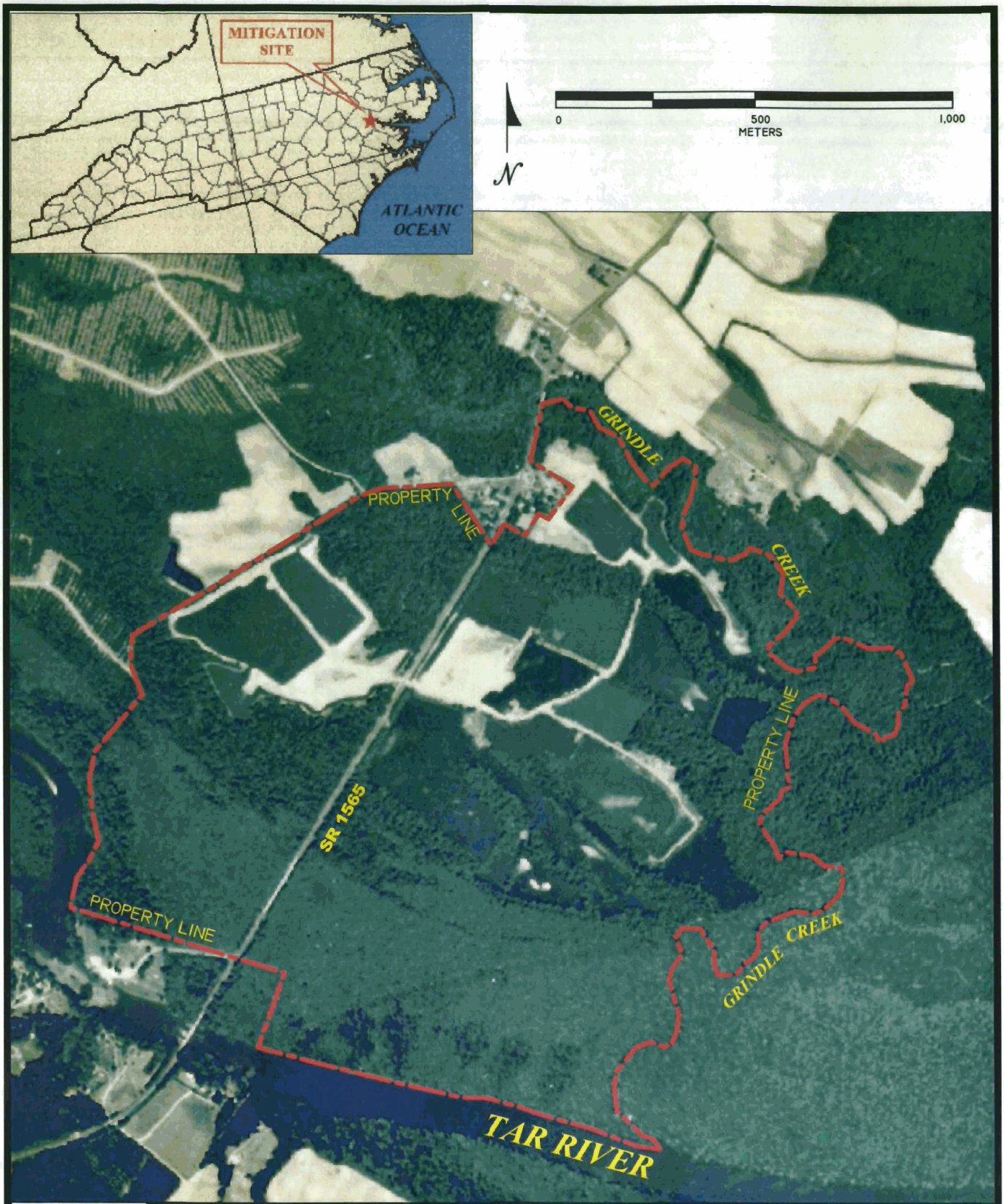
The Grimesland site is presently owned and operated as a sand mining site by NCDOT. The Grimesland site is bisected from north to south by State Route 1565 (SR 1565). For purposes of this Mitigation Plan, the portion of the Grimesland site located west of SR 1565 is referred to as "the western parcel" and the portion located east of SR 1565 is referred to as "the eastern parcel".

Over a span of several years, NCDOT will convert the entire Grimesland site to a regional mitigation site. Mitigation components planned for the Grimesland site consist of the conversion of certain deforested uplands and portions of non-jurisdictional ponds to wetland communities, the provision of habitat enhancement measures within flooded abandoned borrow pits (the non-jurisdictional ponds), and the placement of conservation easements on wetland creation and preservation areas.

Immediate plans to provide mitigation credits consist of:

- creation of approximately 58 acres of forested riverine wetlands (cypress-gum swamp and coastal plain bottomland hardwoods) from presently deforested uplands and portions of non-jurisdictional ponds on the eastern parcel through cut-and-fill methods,
- creation of approximately two acres of emergent wetlands on submerged benches around flooded abandoned borrow pits (ponds) on the eastern parcel through cut-and-fill methods,
- preservation of 348 acres of riverine wetland ecosystem,
- preservation of 29.59 acres of riparian buffer, and
- enhancement of aquatic habitat within approximately 80 acres of flooded abandoned borrow pits (the existing ponds).

Sand mining is presently proposed on approximately eight acres in the eastern parcel (area AM3 of Figure 5) and approximately nine acres in the western parcel (areas AM1 and AM2 of Figure 5). As sand mining operations are phased out, these remaining portions of the site will be assessed to determine whether they can be converted to wetland communities.



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

SITE LOCATION MAP
GRIMESLAND SITE
WETLAND MITIGATION PLAN
PITT COUNTY, NORTH CAROLINA

FIGURE 1
PROJECT: R-2510 WM
DATE: JULY 2000

2.0 EXISTING CONDITIONS

2.1 Physiography, Site History, and Land Use

The Grimesland site is located in the upper central portion of the Coastal Plain Physiographic Province of North Carolina. The Grimesland site is located on the southeastern terminus of an upland peninsula, which is bounded on the north and east by Grindle Creek, on the west by croplands and pine plantation, and on the south by the floodplain of the Tar River and the Tar River itself. Elevations on the site range from less than five feet (msl) along the Tar River to 11.9 feet (msl) along SR 1565.

Portions of the Grimesland site have been mined for sand by the State of North Carolina since 1962. Sand mined on the site has been used for state highway construction and highway maintenance projects, as well as application to iced road surfaces. Prior to 1962, the site consisted of mixed pine/hardwood forest and croplands.

The Grimesland site is bisected from north to south by SR 1565. Present activities on the eastern parcel consist of:

- stockpiling and loading of processed (washed) sand reserves on the approximately eight acres slated for future sand mining operations near the entrance gate from SR 1565, and
- stockpiling of earth materials (derived from shoulder-grading operations within the Washington District) on approximately two acres located in the central portion of the parcel.

Present activities on the western parcel consist of periodic excavation of sand and gravel deposits (via drag-line) and stockpiling and loading of unprocessed (unwashed) sand and gravel reserves.

2.2 Geology

Portions of the Grimesland site containing the borrow pits (generally those areas above five feet elevation (msl)) are underlain by fluvial and estuarine sediments deposited within the ancestral Tar River estuary during one of several cycles of sea rise and fall during the Pleistocene. Preserved as terraces, these Pleistocene deposits are comprised of fining-upward sequences of sediments. On the Grimesland site, the base of this sequence consists of a basal gravel lag deposit, which fines progressively upward to clayey sands. The terrace deposit on the Grimesland site contains large amounts of well-sorted and clean sands that were likely deposited

in a relatively high-energy nearshore environment. This fining-upward sequence is approximately five to eight feet thick in the project vicinity. The elevation of the base of this sequence has been the determining factor on depths of sand mining (and hence the depths of the ponds) on the Grimesland site. The Pleistocene-age terrace deposits on the Grimesland site unconformably overlie Tertiary-age marine silts and clays, which are locally fossiliferous.

Portions of the Grimesland site occupied by the Grindle Creek and Tar River floodplain are underlain by Holocene-age marsh and swamp deposits. These marsh and swamp deposits are primarily comprised of organic sandy silts and sandy, clayey silts. These Holocene deposits thin to a feather-edge in the vicinity of the borrow pits (approximately along the five foot contour) and increase to undetermined thickness towards the Tar River. The Holocene-age marsh and swamp deposits on the Grimesland site unconformably overlie the Pleistocene-age terrace deposits in some areas and the Tertiary-age marine deposits in other areas.

2.3 Water Resources

2.3.1 Water Bodies

Twelve ponds of varying size are currently located on the Grimesland site. As discussed in section 4.4 of this report, a 1.7-acre pond located in the northern portion of the Grimesland site was recently back-filled and planted with hydrophytic vegetation as part of a Phase I mitigation effort on the site. Currently, it is estimated that the remaining ponds on the site occupy 105 acres. Based on review of aerial photography and interviews with NCDOT personnel familiar with the history of the property, all of these ponds were a result of sand mining operations that have been conducted on the property since the early 1960s. Because the ponds were excavated from historic uplands, the Wilmington District Corps of Engineers has determined that they are non-jurisdictional resources with respect to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899.

The regional water table remains within several feet of the ground surface throughout much of the year. Because of this sustained high water table, water levels within the ponds are maintained primarily via groundwater discharge. Water levels are supplemented by precipitation and, less frequently, by major periodic flooding when the Tar River overtops its banks. Maximum water depths within the ponds generally range from four to six feet. None of the ponds have direct outlets to the Grindle Creek/Tar River floodplain.

The two ponds located within the western portion of the property remain active sites of periodic sand mining. The ten ponds located within the eastern portion of the property have been inactive with respect to mining operations for approximately five years.

2.3.2 Waterways

The Grimesland site is bounded on the north and east by Grindle Creek, and on the south by the Tar River. Although the Tar River in the vicinity of the property is nontidal, it is occasionally subject to freshwater tidal influences when coastal storm surge and sustained southeasterly winds push the tidal surge upriver. Grindle Creek is perennial where it adjoins the property. Base flow within Grindle Creek is maintained by the seasonally high water table. An intermittent tributary to Grindle Creek flows from west to east across the northern portion of the property (Figure 2). The Soil Conservation Service soil map (Figure 2) indicates that a second intermittent tributary to Grindle Creek flows from west to east across the southern portion of the site; however no well-defined channel was observed at the time of field investigation. The reason why this second intermittent drainage course is not well-defined appears to be due to the fact that it is a floodplain feature formed by conveyance of over-bank flow from the Tar River during floods rather than fluvial processes associated with runoff.

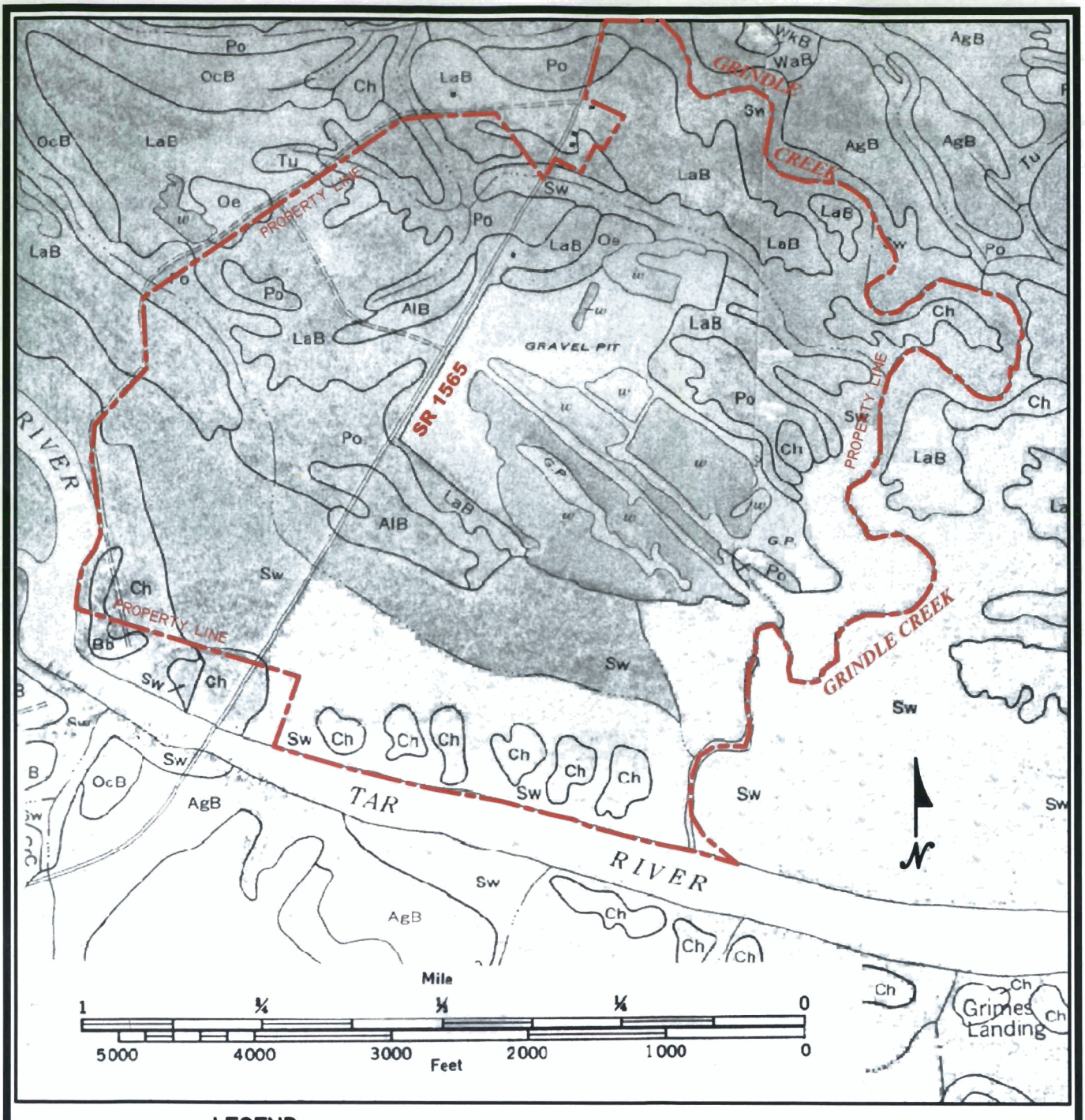
2.3.3 Groundwater

The area within which the Grimesland site is located is characterized by a seasonally high water table. The Soil Survey for Pitt County reports depths to the seasonal high water table ranging from the surface (in areas underlain swamp soils and other hydric soils) to greater than five feet (in areas underlain by Lakeland sands). Groundwater elevations observed in several shallow exploration pits recently excavated on the Grimesland site did not differ significantly from the surface water elevations observed in the nearby ponds at the time of observation (approximately 1.6 to 1.7 feet msl).

2.4 Soils

2.4.1 Non-Hydric Soils

Approximately 40 percent of the Grimesland site is underlain by non-hydric soils. These non-hydric soils are principally located within areas of historic and proposed sand mining operations. Non-hydric soil units mapped within these areas by the U.S. Department of Agriculture consist of Lakeland sand (0-6 percent slopes), Altavista sandy loam (0-4 percent slopes), and Tuckerman



LEGEND

AlB – Altavista
Ch – Chipley
LaB – Lakeland
Oe – Olustee
Po – Portsmouth
Sw – Swamp
Tu – Tuckerman

0 500 1,000
METERS

MAPPED SOIL UNITS
GRIMESLAND SITE
WETLAND MITIGATION PLAN
PITT COUNTY, NORTH CAROLINA

FIGURE 2
PROJECT: R-2510 WM
DATE: JULY 2000

fine sandy loam (Figure 2). The Lakeland sand is the main soil unit containing the sands that have been mined on the site. Outside of areas of historic sand mining, the Chipley sand is a non-hydric soil unit that occurs on upland mounds (levee deposits) principally along the Tar River.

2.4.2 Hydric Soils

Approximately 60 percent of the Grimesland site is underlain by hydric soils. Hydric soils are principally encountered outside of the areas of historic and proposed sand mining operations, i.e., beneath the Tar River floodplain, the Grindle Creek floodplain, and the intermittent stream draining the northern portion of the site. Hydric soil units mapped within these areas by the U.S. Department of Agriculture consist of Olustee loamy sand (sandy subsoil variant), Portsmouth loam, and swamp deposits (Figure 2).

2.5 Natural Vegetation Communities

The Classification of Natural Communities of North Carolina, Third Approximation (Schafale and Weakley, 1990) was used to categorize natural vegetation communities on the site. Under this classification, two broad systems are represented on the site – the Palustrine System and the Terrestrial System. The Palustrine System is comprised of cypress-gum swamps, coastal plain bottomland hardwoods, and coastal plain levee forests. The Terrestrial System is comprised of mesic pine flatwoods.

2.5.1 The Palustrine System

It was found that the several natural communities comprising the palustrine system on the site closely correspond to palustrine wetland units depicted on the National Wetlands Inventory map (Figure 3). At the time of this investigation, approximately 346 acres of forested palustrine wetlands were located on the Grimesland site.

2.5.1.1 Cypress-Gum Swamp (Blackwater Subtype)

Because it exhibits a highly variable flow regime, with floods of short duration and periods of low flow, the Tar River in the vicinity of the Grimesland site is considered to be a blackwater river as defined in the Classification of Natural Communities of North Carolina (Schafale and Weakley, 1990). As described under the Classification of Natural Communities of North Carolina, cypress-gum communities (blackwater subtype) occur within backswamps, sloughs, swales, and featureless floodplains of blackwater rivers.

LEGEND

Cypress–Gum Swamp:
PF01/2F
Coastal Plain Bottomland Hardwoods:
PF01C
PF01/2C
PF04B
PF01A

Coastal Plain Levee Forest:
PF01C
U
Mesic Pine Flatwoods:
U

NATIONAL WETLANDS INVENTORY MAP
GRIMESLAND SITE
WETLAND MITIGATION PLAN
PITT COUNTY, NORTH CAROLINA

FIGURE 3
PROJECT: R-2510 WM
DATE: JULY 2000

On the Grimesland site, a large contiguous cypress-gum community occurs on the floodplain of the Tar River south of the borrow pits and along the floodplain of Grindle Creek east and north of the borrow pits. This community has been mapped under the National Wetlands Inventory System as a semi-permanently flooded, broad-leaved deciduous and needle-leaved deciduous, forested palustrine wetland (PFO1/2F). At the time of this investigation, it is estimated that 202 acres of cypress-gum swamp natural community exist on the Grimesland site (Figure 3).

The canopy of the cypress-gum community is dominated by bald cypress (*Taxodium distichum*) and swamp tupelo (*Nyssa biflora*). Consistent with descriptions offered by Schafale and Weakley, the understory and shrub layer of the cypress-gum community is poorly developed. Where present, the understory is dominated by red maple (*Acer rubrum*), Carolina ash (*Fraxinus caroliniana*), swamp tupelo, and sweetbay (*Magnolia virginiana*). Water elm (*Planera aquatica*), ironwood (*Carpinus caroliniana*), and swamp red bay (*Persea palustris*) also occur in places. Where present, the shrub layer is dominated by sweet-pepperbush (*Clethra alnifolia*), giant cane (*Arundinaria gigantea*), tag alder (*Alnus serrulata*), and fetterbush (*Lyonia lucida*). Palmetto (*Sabal minor*) also occurs in small quantities, primarily near the Tar River. Where present, the herbaceous layer is dominated by lizard's-tail (*Saururus cernuus*), false nettle (*Boehmeria cylindrica*), royal fern (*Osmunda regalis*), and chain fern (*Woodwardia areolata*). Arrow arum (*Peltandra virginica*) occurs in some of the lower swales on the floodplain.

2.5.1.2 Coastal Plain Bottomland Hardwoods (Blackwater Subtype)

As described under the Classification of Natural Communities of North Carolina (Schafale and Weakley, 1990), coastal plain bottomland hardwoods (blackwater subtype) occur on abandoned or relic natural levee deposits, point bar deposits, point bar ridges, and other relatively high parts of the floodplain, away from the channel.

On the Grimesland site, coastal plain bottomland hardwoods (blackwater subtype) occur largely as disjunct communities occupying gently-sloping curvilinear ridges and gentle slopes flanking the uplands (the areas of historic sand mining). On the Grimesland site, the bottomland hardwood communities occurring on the gently-sloping curvilinear ridges within the larger floodplain have been mapped under the National Wetlands Inventory System as seasonally flooded, broad-leaved deciduous and needle-leaved deciduous, forested palustrine wetlands or PFO1/2Cs (Figure 3). The bottomland hardwood communities occurring along the gentle slopes separating the cypress-gum swamp from the uplands have been mapped under the National Wetlands Inventory System as temporarily flooded, broad-leaved deciduous, forested palustrine

wetlands or PFO1As (Figure 3). At the time of this investigation, it is estimated that 121 acres of bottomland hardwood natural community exists on the Grimesland site.

The canopy of the coastal plain bottomland hardwoods is dominated by willow oak (*Quercus phellos*), red maple, and sweetgum (*Liquidambar styraciflua*). Water oak (*Quercus nigra*), laurel oak (*Quercus laurifolia*), and loblolly pine (*Pinus taeda*) also occur in places. The understory is dominated by red maple, sweetbay, and ironwood. River birch (*Betula nigra*), American holly (*Ilex opaca*), beech (*Fagus grandifolia*), and swamp red bay also occur in places. Consistent with descriptions offered by Schafale and Weakley, the shrub layer is well developed. The shrub layer is dominated by sweet-pepperbush, giant cane, mayberry (*Vaccinium elliottii*), tag alder, and titi (*Cyrilla racemosa*). Where present, the herbaceous layer is dominated by chain fern, slender spikegrass (*Chasmanthium laxum*), and cinnamon fern (*Osmunda cinnamomea*). Vines are dense within the bottomland hardwood communities. The vine layer is dominated by common greenbrier (*Smilax rotundifolia*), poison ivy (*Toxicodendron radicans*), Carolina supplejack (*Berchemia scandens*), and muscadine (*Vitis rotundifolia*).

2.5.1.3 Coastal Plain Levee Forest (Blackwater Subtype)

As described under the Classification of Natural Communities of North Carolina (Schafale and Weakley, 1990), coastal plain levee forest communities (blackwater subtype) occur along channels of large blackwater rivers.

On the Grimesland site, coastal plain levee forest communities (blackwater subtype) occur on and around higher grounds in close proximity to the Tar River. The high ground with which they are associated appear to be relict levee deposits and mounds of dredge spoil deposited sometime in the 1940s or 1950s. Because of the sandy and well-drained nature of the soils comprising the levee deposits and spoil piles, the vegetated communities of the coastal plain levee forests on the Grimesland site exhibit a roughly concentric zonation, with facultative-wet species dominating the lower flanks and facultative to facultative-up species dominating the higher portions. On the Grimesland site, coastal plain levee forest communities located on and around higher grounds in close proximity to the Tar River have been mapped under the National Wetlands Inventory System as a seasonally flooded, broad-leaved deciduous, forested palustrine wetland (PFO1C) and upland (Figure 3). It is estimated that 25 acres of coastal plain levee forest natural community exists on the Grimesland site. Of these 25 acres, approximately two acres are comprised of upland forest capping each of the areas of high ground.

The canopy of the coastal plain levee forest communities is dominated by sycamore (*Platanus occidentalis*), red maple, water oak, and laurel oak at lower elevations. At higher elevations, the canopy of the coastal plain levee forest communities is dominated by loblolly pine, laurel oak, and southern red oak (*Quercus falcata*). The understory at higher elevations is dominated by flowering dogwood (*Cornus florida*) and American holly. The understory at lower elevations is dominated by ironwood, American holly, and sweetbay. The shrub layer is denser at lower elevations and is dominated by sweet-pepperbush, giant cane, and mayberry. Where present, the herbaceous layer is dominated by chain fern and slender spikegrass. The vine layer is dominated by common greenbrier, poison ivy, honeysuckle (*Lonicera japonica*), and muscadine.

2.5.2 The Terrestrial System

2.5.2.1 Mesic Pine Flatwoods

As described under the Classification of Natural Communities of North Carolina (Schafale and Weakley, 1990), mesic pine flatwoods occur on flat or rolling Coastal Plain sediments that are neither excessively drained nor exhibit a significant seasonal high water table.

On the Grimesland site, mesic pine flatwoods occur as remnant communities interspersed among the active and inactive borrow pits of the uplands (generally above 5 feet msl). On the Grimesland site, mesic pine flatwoods have been mapped under the National Wetlands Inventory System as upland (Figure 3). At the time of this investigation, it is estimated that 67 acres of mesic pine flatwoods and interspersed upland clearings occur on the Grimesland site.

The canopy of the mesic pine flatwoods is dominated by loblolly pine, sweetgum, and southern red oak. Water oak and red maple also occur in places. The understory is dominated by sweetgum and American holly. The shrub layer is mayberry and giant cane. Where present, the herbaceous layer is dominated by bracken (*Pteridium aquilinum*), big bluestem (*Andropogon gerardii*), and goldenrods (*Solidago* spp.). The vine layer is dominated by common greenbrier, poison ivy, and Virginia creeper (*Parthenocissus quinquefolia*).

2.6 Vegetation of the Manmade Ponds (Borrow Pits)

The ponds on the Grimesland site are comprised of intermittently active borrow pits (those on the western portion of the site) or abandoned borrow pits (those on the eastern portion of the site). A manmade aquatic system occurs within the ten abandoned ponds and, to a lesser extent, within the two intermittently dredged ponds. Because the ponds were excavated from historic

uplands, the Wilmington District Corps of Engineers has determined that they are non-jurisdictional resources with respect to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. At the time of this investigation, it is estimated that 105 acres of manmade pond aquatic system exists on the Grimesland site.

The deepest parts of the ponds are open water and support almost no aquatic plants. Because of the steep shorelines, few portions of the ponds support narrow and sparsely vegetated bands of emergent vegetation. Plant species within this band include soft stem rush (*Juncus effusus*), spike rushes (*Eleocharis* spp.), and beak rushes (*Rhyncospora* spp.). Portions of the older ponds on the eastern portion of the Grimesland site support spotty and sparse bands of black willow (*Salix nigra*) and river birch (*Betula nigra*) along the upper banks.

2.7 Wildlife and Wildlife Habitat

2.7.1 Wildlife and Habitat of the Palustrine System (The Riparian Forests)

The cypress-gum swamps and the bottomland hardwoods occupying the Grindle Creek and Tar River floodplains on the Grimesland site provide riparian forest habitat for a wide array of wildlife. The riparian forests on the Grimesland site are comprised of over three hundred acres of contiguous mature forest, which serves as an uninterrupted wildlife corridor along the Tar River. Because of these characteristics the riparian forest communities on the Grimesland site are thought to provide high value wildlife habitat for the region.

Mammalian species directly observed or indicators of mammalian species observed (tracks, burrows, and scat) within the riparian forests of the Grimesland site include white-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), raccoon (*Procyon lotar lotor*), opossum (*Didelphis virginiana virginiana*), gray squirrel (*Sciurus carolinensis*), muskrat (*Ondatra zibetbicus*), beaver (*Castor canadensis*), cotton mouse (*Peromysus gossypinus*), and other small rodents.

Resident bird species observed include Carolina wren (*Thryothorus ludovicianus*), red-bellied woodpecker (*Melanerpes carolinus*), downy woodpecker (*Picoides pubescens*), and belted kingfisher (*Ceryle alcyon*). Passerine bird species observed include wood thrush (*Hylocichla mustelina*), common yellowthroat (*Geothypis trichas*), Acadian flycatcher (*Empidonax virescens*), and summer tanager (*Piranga rubra*). Raptors observed include red-tailed hawk (*Buteo jamaicensis*), barred owl (*Strix varia*), and foraging osprey (*Pandion haliaetus*). Waterfowl observed include wood duck (*Aix sponsa*), Canada goose (*Branta canadensis*), lesser

scaup (*Aytha affinis*), mallard (*Anas platyrhynchos*), American black duck (*Anas rubripes*), and pie-billed grebe (*Podilymbus podiceps*). Wading birds observed include great blue heron (*Ardea herodius*), great egret (*Casmerodius albus*), and green-backed heron (*Butorides striatus*).

Reptiles observed within the riparian forests of the site include brown snake (*Storeria dekeyi*), black rat snake (*Elaphe obsoleta*), six-lined racerunner (*Cnemidophorus sexlineatus*), painted turtle (*Chrysemys picta*), mud turtle (*Kinosternon subrubrum*), and eastern box turtle (*Terrapene carolina*). Although not observed, cottonmouth (*Agkistrodon piscivorus*) is reported to occur in wetter portions of the site.

Amphibians inhabiting the riparian forest of the site include southern leopard frog (*Rana utricularia*), bull frog (*Rana catesbeiana*), pickerel frog (*Rana palustris*), southern green frog (*Rana clamitans melanota*), and southern two-lined salamander (*Eurycea bislineata cirrigera*).

Invertebrate species observed include eastern crayfish (*Cambarus bartonii*), asiatic clam (*Corbicula manilensis*), river mussels (Unionidae), and common tadpole snail (*Physa heterostropha*).

2.7.2 Wildlife and Habitat of the Terrestrial System

Because of the long history of sand mining operations and the remnant nature of vegetation communities, the upland portions of the Grimesland site provide limited value for wildlife habitat. Despite these limitations, the uplands provide foraging grounds for a number of mammal and bird species and serve as part of the larger wildlife corridor extending along the Tar River.

Mammalian species directly observed or indicators of mammalian species observed (tracks, burrows, and scat) on the upland portions of the Grimesland site include white-tailed deer, black bear, raccoon, opossum, gray squirrel, gray fox (*Urocyon cinereoargenteus*), eastern cottontail (*Sylvilagus floridanus*), and small rodents.

Resident bird species observed include killdeer (*Charadrius vociferus*), Carolina wren, northern cardinal (*Cardinalis cardinalis*), eastern bluebird (*Sialia sialis*), American crow (*Corvus brachyrhynchos*), red-bellied woodpecker, and blue jay (*Cyanocitta cristata*). Passerine bird species observed include wood thrush, common yellowthroat, Acadian flycatcher, and summer tanager. Raptors observed include red-tailed hawk and barred owl.

Reptiles observed on the upland portions of the site include eastern garter snake (*Thamnophis sirtalis*), eastern hognose snake (*Heterodon platyrhinos*), black rat snake, northern copperhead (*Agkistrodon contortrix*), six-lined racerunner, and eastern box turtle.

2.7.3 Wildlife and Habitat of the Manmade Ponds (Borrow Pits)

Because of their steep largely unvegetated banks and shallow uniform bottoms, the manmade ponds on the Grimesland site provide somewhat limited aquatic habitat. Muskrat (*Ondatra zibetbicus*) inhabit the banks of a number of the ponds. A large number of raccoon tracks and foraged shellfish indicate heavy foraging by raccoons. Recent beaver sign indicates that younger saplings along the shores of the ponds are regularly foraged by beaver (*Castor canadensis*).

Waterfowl observed utilizing the ponds include Canada goose, mallard, American black duck, and pie-billed grebe. Osprey were observed foraging for fish within several of the ponds located in the northeastern portion of the site.

Reptiles observed within the ponds include slider (*Pseudemys scripta*) and snapping turtle (*Chelydra serpintina*). Amphibians observed within the ponds include lesser siren (*Siren intermedia*), southern leopard frog, and bull frog.

Fish species observed or reported within the ponds include largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), redbreasted sunfish (*Lepomis auritus*), warmouth (*Lepomis gulosus*), flier (*Centrarchus macropterus*), pumpkinseed (*Lepomis gibbosus*), yellow perch (*Perca flavascens*), crappie (*Proxomis* sp.), mosquitofish (*Gambusia affinis*), shiners (*Notropis* spp.), and carp (*Cyprinus carpio*). The ponds on the Grimesland site have no direct connection with Grindle Creek or the Tar River and are not stocked; therefore, it is thought that fisheries within the ponds are introduced and maintained during major flood events when backwater from the adjacent Tar River floodplain inundates the site.

Invertebrate species observed within the ponds include eastern crayfish, asiatic clam, and common tadpole snail.

2.8 Threatened and Endangered Species and Federal Species of Concern

Table 1 presents a list of federally-protected species for Pitt County. No reports of federally-protected species on or in the vicinity of the Grimesland site are contained within the current database maintained by the North Carolina Division of Natural Heritage (as updated through

May of 2000). For each of the species listed, a discussion of field-documented site conditions, findings pertaining to suitable habitat, and findings pertaining to individual organisms or populations are provided following Table 1.

Table 1. Federally-Protected Species for Pitt County

Scientific Name	Common Name	Status
Elliptio steinstansana	Tar spinymussel	Endangered
Haliaeetus leucocephalus	Bald eagle	Threatened
Picoides borealis	Red-cockaded woodpecker	Endangered
Trichechus manatus	West Indian manatee	Endangered

Tar spinymussel (*Elliptio steinstansana*) is found in fast-flowing, well-oxygenated, relatively silt-free streams with uncompacted gravelly and coarse sand substrates. This habitat does not occur within waterways on or adjoining the Grimesland site. No individuals were observed during field investigation. The Grimesland Mitigation Plan will have no adverse effect on the Tar spinymussel or its preferred habitat.

Bald eagle (*Haliaeetus leucocephalus*) nests are found in close proximity to water (i.e., within a half mile). Nests are typically located in the largest living tree in an area. Nest sites typically have a clear flight path to the water and have an open view of the surrounding landscape. Bald eagles forage along coasts, rivers, and large lakes, generally with a mile of their nest. Although no nests have been reported or observed on the Grimesland site, a number of tall living trees within a half-mile of the Tar River offer suitable nesting sites. No such trees will be removed as part of the mitigation plan. A large number of trees comprising suitable nesting sites will be protected in perpetuity as part of the plan to preserve over 300 acres of riverine forest along the Tar River. In addition, trees that will be planted as part of the mitigation plan are anticipated to ultimately provide additional suitable nesting sites. A single bald eagle was observed foraging along the Tar River at the time of site investigation. Proposed enhancement of aquatic habitat within the ponds on the Grimesland site and the resulting benefit to fisheries is anticipated to provide additional foraging areas for bald eagles. The Grimesland Mitigation Plan will have no adverse effect on the bald eagle or its preferred habitat.

The red-cockaded woodpecker (*Picoides borealis*) utilizes old-growth open stands of southern pines for foraging and nesting grounds. The red-cockaded woodpecker shows a particular affinity for stands of longleaf pine (*Pinus palustris*). Inhabited stands typically contain more than 50 percent pine, lack a thick understory, and are contiguous with other suitable stands. The red-cockaded woodpecker nests exclusively in living pine trees that are greater than 60 years in age and are contiguous with pine stands that are at least 30 years in age. This habitat does not occur on the Grimesland site. No individuals or nesting sites were observed during field investigation. The Grimesland Mitigation Plan will have no adverse effect on the red-cockaded woodpecker or its preferred habitat.

The West Indian manatee (*Trichechus manatus*) inhabits warm, shallow waters of canals, sluggish rivers, estuaries, and saltwater embayments. Manatees are also encountered in marine waters as far as 3.7 miles offshore. During winter months, manatees concentrate in areas with warm waters. During other times of years, manatees inhabit the aforementioned waters in areas having sufficient depth (i.e., greater than 1.5 meters), adequate food supply (primarily large amounts of aquatic vegetation), and proximity to a freshwater supply (presumably for drinking). Although the Tar River and lowermost reaches of Grindle Creek appear to have appropriate depths and water qualities to serve as suitable habitat, they support very little to no aquatic vegetation in the project vicinity. No individuals were observed during field investigation. The Grimesland Mitigation Plan will have no adverse effect on the West Indian manatee or its preferred habitat.

Table 2 presents a list of federal species of concern reported for Pitt County. Based on field investigations performed as part of this study and review of scientific literature describing habitat requirements, a determination was made whether suitable habitat for each of the listed species is present on the Grimesland site (see final column of Table 2).

Table 2. Federal Species of Concern for Pitt County

Scientific Name	Common Name	NC Status	Habitat Present
Ammodramus henslowii	Henslow's sparrow	SR	No
Heterodon simus	Southern hognose snake	SR/PSC *	Yes
Lythrurus matutinus	Pinewoods shiner	SR	No
Fusconaia masoni	Atlantic pigtoe	T/PE	No
Lampsilis cariosa	Yellow lampmussel	T/PE	No
Procambarus medialis	Tar River crayfish	W3*	Yes
Oxypolis ternata	Savanna cowbane	W1	No
Tofieldia glabra	Carolina asphodel	C	No

Explanation of Status Abbreviations:

"T"-- A Threatened species is one which is likely to become endangered species within the foreseeable future throughout all or a significant portion of its range.

"C"-- A Candidate species is one which is very rare in North Carolina, generally with 1-20 populations in the state, generally substantially reduced in numbers by habitat destruction, direct exploitation or disease. The species is also either rare throughout its range or disjunct in North Carolina from a main range in a different part of the country or the world.

"SR"-- A Significantly Rare species is one which is very rare in North Carolina, generally with 1-20 populations in the state, generally substantially reduced in numbers by habitat destruction, direct exploitation or disease. The species is generally more common elsewhere in its range, occurring peripherally in North Carolina.

"W1"--A Watch Category 1 species is a rare species whose status in North Carolina is relatively well known and which appears to be relatively secure at this time.

"W3"--A Watch Category 3 species is a species which is poorly known in North Carolina, but is not necessarily considered to be declining.

"/P_"--Denotes a species which has been formally proposed for listing as Endangered, Threatened, or Special Concern, but has not yet completed the listing process.

* -- Historic record - the species was last observed in the county more than 50 years ago.

3.0 REFERENCE WETLANDS

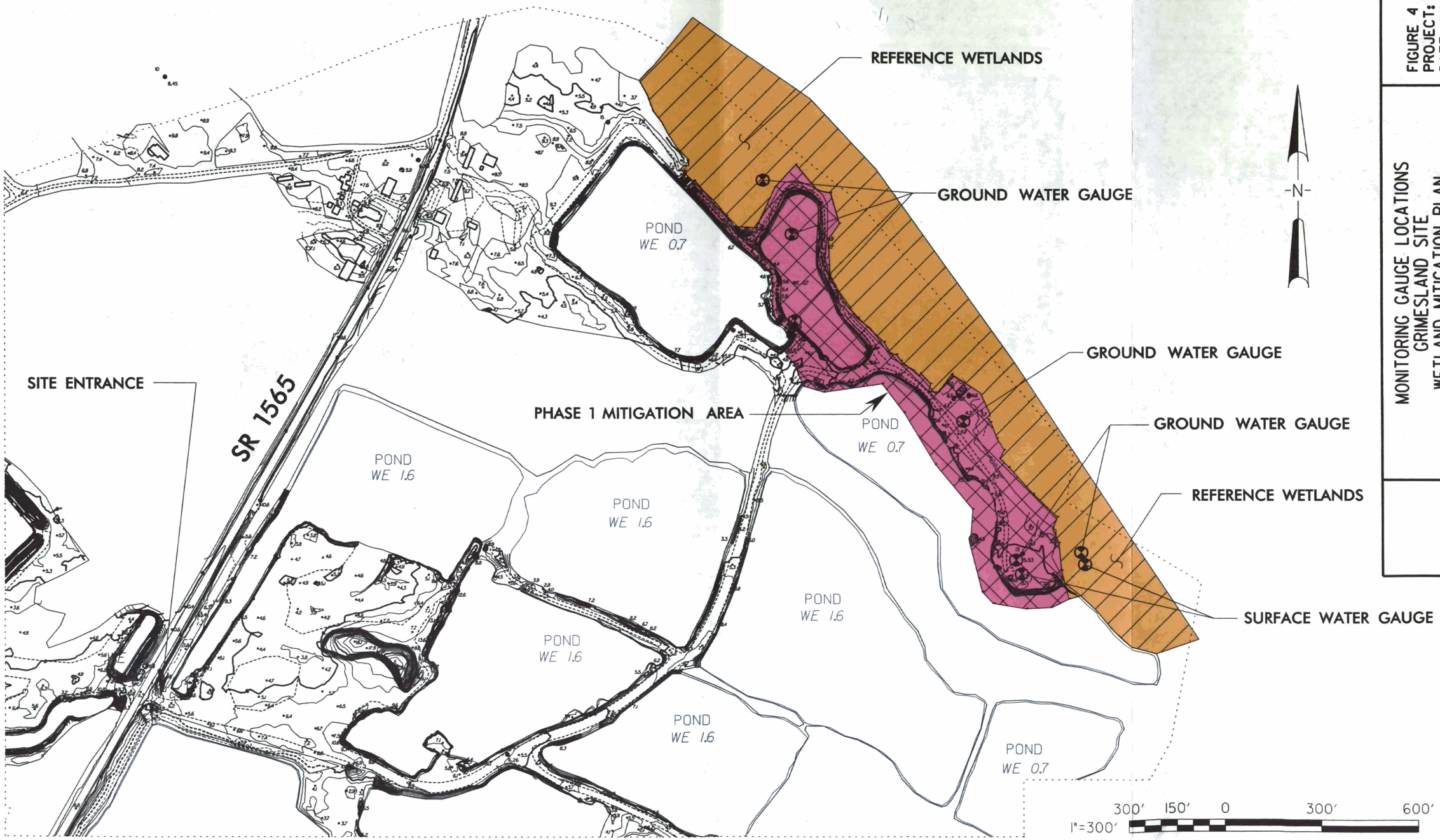
Reference wetlands for the proposed forested wetland creation component of this mitigation plan are located within the northern portion of the site, along Grindle Creek (Figure 4).

One reference wetland is comprised of semi-permanently flooded, broad-leaved deciduous and needle-leaved deciduous, forested palustrine wetland (PFO1/2F), or cypress gum swamp of the Classification of Natural Communities of North Carolina. The other reference wetland is comprised of seasonally flooded, broad-leaved deciduous and needle-leaved deciduous, forested palustrine wetland (PFO1/2C), or coastal plain bottomland hardwoods of the Classification of Natural Communities of North Carolina.

Reference wetlands were selected along Grindle Creek rather than within the larger Tar River floodplain community to the south because hydrologic conditions exhibited in the selected

FIGURE 4
PROJECT: R-2510 WM
DATE: JULY 2000

MONITORING GAUGE LOCATIONS
GRIMESLAND SITE
WETLAND MITIGATION PLAN
PITT COUNTY, NORTH CAROLINA



reference areas will more closely reflect hydrologic conditions targeted for the somewhat linear forested communities proposed.

To date, hydrologic monitoring within reference wetlands consist of visual observations of surface water inundation and groundwater elevation observations made in shallow soil probes. To better monitor hydrologic conditions in the reference wetlands, at least one automated groundwater monitoring gauge will be installed in the cypress-gum swamp reference wetland and at least one automated groundwater monitoring gauge will be installed in the bottomland hardwood reference wetland. As design plans are developed, additional reference wetlands may be designated and monitored for future phases of mitigation (such as those proposed on the western portion of the site).

Permanently flooded, emergent palustrine wetlands of the type to be created on shallow submerged benches around existing ponds do not currently exist in the vicinity of the Grimesland site; therefore, no reference wetland has yet been designated. It is anticipated that a permanently flooded, emergent palustrine wetland recently created as part of the Phase I mitigation effort (see Section 4.4) will become established within several growing seasons and can serve as a reference wetland for other submerged bench wetlands proposed.

4.0 MITIGATION PLAN

4.1 Wetland Creation Component

Fifty-eight (58) acres of cypress gum swamp and two (2) acres of emergent wetlands will be created on the Grimesland site through cut-and-fill methods. Proposed wetland creation areas are shown in Figure 5. Typical cross-sections showing proposed methods of cut-and-fill are shown in Figure 6.

Materials sidecast from previous sand mining operations (primarily topsoil and finer-grained sediments) and in-situ upland materials surrounding the ponds will be excavated to elevations derived from the nearest reference wetland. These materials will be placed around the shorelines of the ponds to create (1) low-lying semi-permanently flooded flats suitable for establishment of cypress-gum dominated communities and (2) shallow permanently flooded subaqueous benches suitable for establishment of emergent wetlands. Observed levels of surface water and groundwater along with Table 5 (Hydrologic Zones - Nontidal Areas) of the 1987 Corps of Engineers Wetlands Delineation Manual was used to set hydrologic regimes targeted for each of the proposed wetland communities.

AREA OF ADDITIONAL MINING
AMI 3.834 AC.
AM2 4.882 AC.
AM3 7.740 AC.

PHASE I MITIGATION AREA
7.770 AC. (INCLUDES THE FOLLOWING):
CACI 4.584 AC
CAFI 1.724 AC.
CAF3 1.462 AC.

PROPOSED WETLAND CREATION AREA (VIA CUT)
CACI 4.584 AC
CAC2 19.771 AC.
CAC3 1.713 AC.
CAC4 0.792 AC.
CAC5 0.621 AC.
CAC6 0.548 AC.
CAC7 4.752 AC.

PROPOSED WETLAND CREATION AREA (VIA FILL)
CAF2 4.000 AC.
CAF5 0.957 AC.

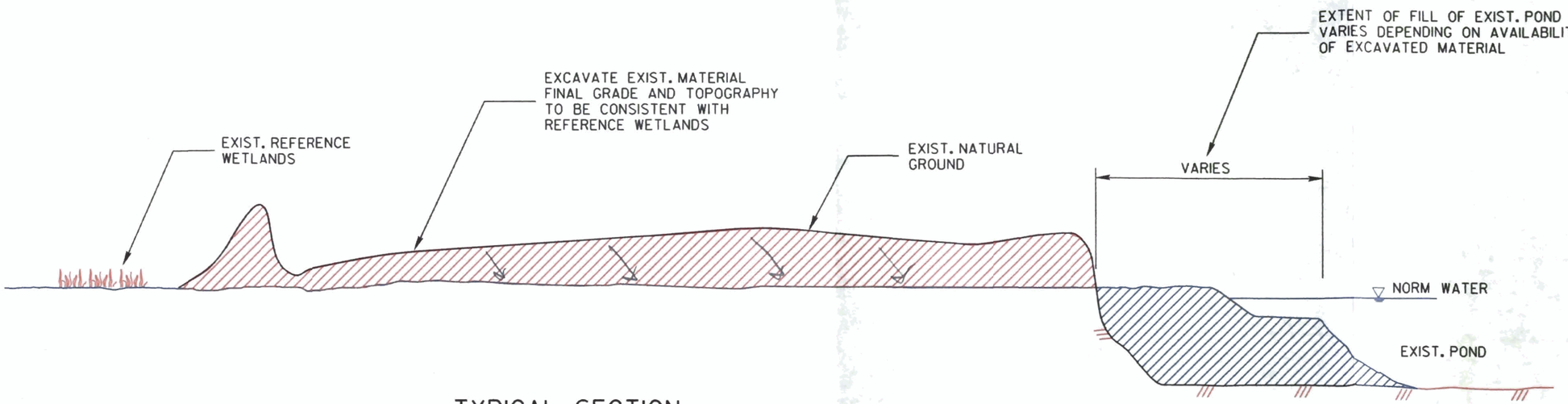
CAF6 0.896 AC.
CAF7 2.226 AC.
CAF8 0.781 AC.
CAF9 9.311 AC.
CAF10 0.474 AC.
CAFN 0.247 AC.
CAF12 0.237 AC.
CAF13 0.1206 AC.

CAF15 2.479 AC.
CAF16 0.704 AC.
CAF17 0.021 AC.

500' 250' 0 500' 1000'
1"=500'

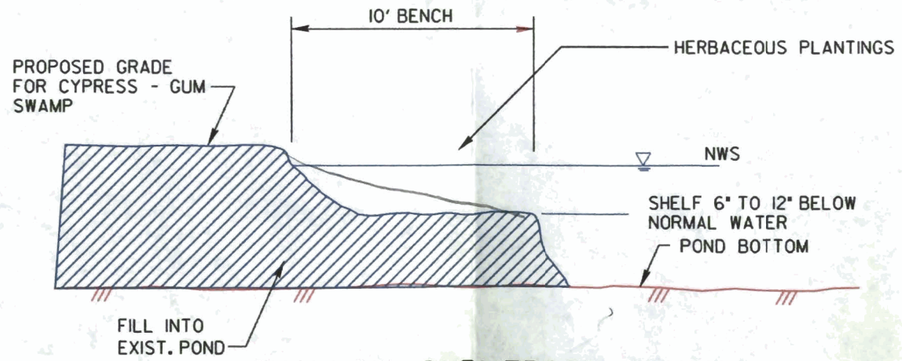
FIGURE 5
PROJECT: R-2510 WM
DATE: JULY 2000

WETLANDS COMPENSATION (CREATION) PLAN
GRIMESLAND SITE
WETLAND MITIGATION PLAN
PITT COUNTY, NORTH CAROLINA



TYPICAL SECTION

NOT TO SCALE



SHALLOW SUBMERGED BENCH

NOT TO SCALE

FIGURE 6
PROJECT: R-2510 WM
DATE: JULY 2000

WETLANDS CREATION TYPICAL SECTION
GRIMESLAND SITE
WETLAND MITIGATION PLAN
PITT COUNTY, NORTH CAROLINA

4.1.1 Cypress-Gum Swamps

4.1.1.1 Hydrology

A seasonally saturated to semipermanently saturated hydrologic regime will be the primary hydrologic regime provided for the proposed cypress-gum swamps. Randomized micro-topography will be provided to create slightly higher areas having a seasonally saturated hydrologic regime. In accordance with Table 5 of the Corps Wetlands Delineation Manual, field criteria to be used to determine the presence of this seasonally saturated to semipermanently saturated hydrologic regime will be saturated conditions within a major portion of the root zone (i.e., within 12 inches of the surface) for between 12.5 and 75 percent of the growing season in most years.

The dominant component of the water budget for these areas will be groundwater provided by excavating to intercept the seasonal high water table. Based on observations of surface water elevations in adjacent ponds and observations of groundwater elevations in shallow soil probes, this critical ground elevation has been determined to lie around 1.7 feet (msl). The remainder of the water budget will be derived from precipitation and effective utilization of stormwater runoff. Backwater flooding from the Tar River floodplain will be more prevalent within proposed mitigation areas due to the lowering of ground elevations over 25 acres of the site (i.e., the conversion of uplands to low-lying flats).

4.1.1.2 Soils

No new soils will be introduced to the Grimesland site for mitigation. All new substrate will result from cut-and-fill. In-situ subsoils and materials sidecast during sand mining operations will be utilized as planting substrate within proposed mitigation areas. Because of the low organic content of subsoils that will comprise the substrate of excavated areas, fertilization will be important to plant establishment. Although the use of sidecast materials for substrate of areas of proposed fill will provide a certain level of organic content, fertilization will also be critical in these areas. Prior to planting, soils will be tested and, if necessary, amended with lime to achieve a pH between 5.5 and 7. Fertilization will be provided, as necessary. Over time, introduction of detritus through backwater flooding from the Tar River floodplain and the breakdown of above-ground biomass within planted communities can be expected to provide, initially, an histic epipedon and, eventually, more-organic soils.

4.1.1.3 Vegetation

Proposed cypress-gum swamps will be planted with a mix of trees in the form of bare root stock, containerized stock, or seedlings (tublings or plugs). Planting of species using dormant plant stock will be performed between December 1 and March 15 when plant stock is dormant.

Trees will be planted within proposed cypress-gum swamps to provide a minimum stem count of 680 stems per acre. This translates to plantings roughly on 8-foot centers. Tree species to be planted will derived from the following list (as available):

- *Betula nigra* (river birch)
- *Carpinus caroliniana* (ironwood)
- *Fraxinus caroliniana* (Carolina ash)
- *Fraxinus pennsylvanica* (green ash)
- *Magnolia virginiana* (sweetbay)
- *Nyssa biflora* (swamp tupelo)
- *Nyssa aquatica* (water tupelo)
- *Pinus taeda* (loblolly pine)
- *Platanus occidentalis* (sycamore)
- *Quercus nigra* (water oak)
- *Quercus phellos* (willow oak)
- *Taxodium distichum* (bald cypress)

4.1.2 Emergent Wetlands on Shallow Submerged Benches

4.1.2.1 Hydrology

A semipermanently inundated hydrologic regime will be provided for the proposed emergent wetlands planted on shallow submerged benches created around ponds. In accordance with Table 5 of the Corps Wetlands Delineation Manual, inundation no greater than 6.6 feet will be provided during at least 75 percent of the growing season in most years. This hydrologic regime will be provided by cutting (see Section C of Figure 6) or filling (see Section D of Figure 6) along the edges of proposed pond shorelines to provide nearly level benches having an average water depth of eight inches (or 1.0 feet msl). The dominant component of the water budget for these areas will be surface water inundation (maintained by groundwater discharge, precipitation, and stormwater runoff on the site). As previously discussed, backwater flooding from the Tar River floodplain will be more prevalent within proposed mitigation areas due to the lowering of elevations over 25 acres of the site (i.e., the conversion of uplands to low-lying flats).

4.1.2.2 Soils

No new soils will be introduced to the Grimesland site for submerged bench creation. All new substrate will result from cut-and-fill. In-situ subsoils and materials sidecast during sand mining operations will be utilized as planting substrate within proposed mitigation areas. Because of the

low organic content of subsoils that will comprise the substrate of excavated areas, fertilization will be important to plant establishment. Although the use of sidecast materials for substrate of areas of proposed fill will provide a certain level of organic content, fertilization will also be critical in these areas. Over time, introduction of detritus through backwater flooding from the Tar River floodplain and the breakdown of above-ground biomass within planted communities can be expected to provide, initially, an histic epipedon and, eventually, more-organic soils.

4.1.2.3 Vegetation

Proposed submerged benches will be planted with a mix of herbs. Herbaceous species will be planted in the form of plugs, containerized stock, or dormant stock. Plantings will be provided on three-foot centers. Emergent herbaceous species will be selected from the following list (as available):

- *Carex* spp. (segdes, as available)
- *Dulichium arundinaceum* (three-way sedge)
- *Hibiscus moscheutos* (marsh hibiscus)
- *Juncus effusus* (soft stem rush)
- *Leersia oryzoides* (rice cutgrass)
- *Peltandra virginica* (arrow arum)
- *Pontederia cordata* (Pickerelweed)
- *Polygonum* spp. (smartweeds, as available)
- *Sagittaria graminae* (grass-like duck potato)
- *Scirpus cyperinus* (wool grass)
- *Sparganium americanum* (lesser bur-reed)

4.2 Habitat Enhancement Component

The ponds on the Grimesland site were excavated during sand mining operations over the last 40 years. Because of dredging methods used and the relatively uniform thickness of the sand resources mined, the ponds range in depth from four to six feet and exhibit relatively flat bottoms. The shorelines of the ponds are steep and support very little emergent vegetation. The ponds are not interconnected and have no direct connection with Grindle Creek or its tributaries.

Field surveys conducted as part of this investigation indicate that, although the ponds support warmwater fisheries typical of other waterways and watercourses in the region, the richness and diversity of aquatic flora and fauna within the ponds is low. A discussion of species observed is provided in section 2.7.3 of this report.

The limited richness and diversity of the aquatic communities within the ponds is attributed to seasonal heat stress and uniformity of habitat. A combination of pond geometry (relatively shallow depths with uniform bottom contours, relatively straight and featureless shorelines, and

the lack of unrestricted hydraulic connections between ponds) along with the lack of shade-providing plants around the shorelines are major factors contributing to seasonal heat stress. Pond geometry limits limnetic stratification, seasonal water column turnover, and circulation patterns - contributing to periods of sustained heat stress. Proposed interconnection of ponds can be expected to enhance hydrologic circulation and provide limited relief from heat stress.

Lack of habitat diversity within the ponds is likely contributing as well to the limited richness and diversity observed. Provision of shallow vegetated benches and shade-providing plants around the shoreline can be expected to provide refuge for fish during times of high water temperature. Fish habitat will be further enhanced by the placement of additional fish cover where possible. This fish cover will be comprised of felled trees and/or root wads.

To provide some relief from seasonal heat stress and to provide more-diverse habitat, the following mitigation components are proposed within existing ponds on the site:

- Planting of Shade-Providing Trees Along Selected Shorelines
- Planting of Submerged Aquatic Vegetation
- Provision of Hydraulic Connections Between Ponds
- Provision of Additional Fish Cover

Through the aforementioned means, aquatic habitat enhancement will be provided within approximately 80 acres of ponds remaining after implementation of the wetland creation components discussed in section 4.1 of this report. The ponds are presently not subject to regulation under Section 404 of the Clean Water Act. Through recordation of real estate documents, a legal means to protect the ponds in perpetuity will be provided.

4.3 Preservation Component

This mitigation component entails the development, execution, and recording of appropriate real estate documents that will ensure the preservation of existing wetlands and riparian habitat on the Grimesland site in perpetuity. Stewardship options are discussed in section 7.0 of this report.

Through such means, 210 acres of cypress-gum swamp, 113 acres of coastal plain bottomland hardwoods, and 25 acres of coastal plain levee forest will be preserved. In addition to these resources, 4.92 acres of riparian buffer along one bank of the Tar River, 15.03 acres of riparian buffer along one bank of Grindle Creek, and 9.64 acres of riparian buffer along both banks of the intermittent stream traversing the northern portion of the site will be preserved. Overall areas of proposed preservation are shown in Figure 7.

Development, execution, and recording of preservation documents for wetlands and riparian habitat presently existing on the Grimesland site will be accomplished as soon as practicable following agency approval of the mitigation plan. Preservation of compensatory (created) wetlands and the ponds will be implemented in stages as each phased mitigation area is completed and established.

4.4 Phase I Mitigation Area – Current Status

Using general construction methods set forth in section 4.1 of this report, grading plans were developed for 7.77 acres of wetlands mitigation shown as "Phase I Mitigation Area" on Figure 5. Construction of the Phase I Mitigation Area was performed in accordance with Grading Plans, NCDOT Project Reference No. R-2510WM, dated 28 May 1999. Construction of the Phase I Mitigation Area began on 16 August 1999 and was completed on 19 January 2000.

The area, exclusive of the shallow subaqueous benches, was planted with tree seedlings during the first week of February 2000. Tree seedlings were planted on six-foot to ten-foot centers using random spacing. Using an average of eight feet centers, this equates to approximately 680 plants per acre. Tree species planted consist of:

- swamp black gum or swamp tupelo (*Nyssa sylvatica* var. *biflora*)
- green ash (*Fraxinus pennsylvanica*)
- post oak (*Quercus stellata*)
- water tupelo (*Nyssa aquatica*)
- willow oak (*Quercus phellos*)
- water oak (*Quercus nigra*)
- bald cypress (*Taxodium distichum*)
- hornbeam or ironwood (*Carpinus caroliniana*).

No herbaceous species were planted to determine whether enough latent seed and root stock is available in the project vicinity to allow for effective passive revegetation. Inspections as recently as October of 2000 confirm that the Phase I Mitigation Area has, through passive revegetation, become established to at least 50 percent coverage with the following herbaceous plant species:

- panic grasses (*Panicum* spp.)
- rice cutgrass (*Leersia oryzoides*)

- barnyard grass (*Echinochloa crus-gali*)
- soft rush (*Juncus effusus*)
- needle-pod rush (*Juncus scirpoides*)
- wool grass (*Scirpus cyperinus*)
- spike rush (*Eleocharis* sp.)
- soft stem bulrush (*Scirpus validus*)
- crimson-eyed hibiscus (*Hibiscus moscheutos*)
- stinkweed (*Pluchea foetida*)
- climbing hempweed (*Mikania scandens*)
- water horehound (*Lycopus virginicus*)
- smartweeds (*Polygonum* spp.)
- false nettle (*Boehmeria cylindrical*).

As of October of 2000, no vegetation had become established on the shallow subaqueous benches created around the ponds. This indicates that planting may be required on the benches.

5.0 MONITORING PLAN

Monitoring of wetland compensation (creation) efforts will be performed for three years or until success criteria are satisfied. Monitoring is proposed for two wetland components, hydrology and vegetation. Soils within proposed compensation areas will be observed to determine, qualitatively, their development of hydric soil indicators.

5.1 Hydrology

Automated groundwater monitoring gauges utilized to monitor hydrology on the Grimesland site will be designed and placed in accordance with specifications in the Corps of Engineers' *Installing Monitoring Wells/Piezometers in Wetlands* (WRP Technical Note HY-IA-3.1, August, 1993). Groundwater monitoring gauges installed will include Remote Data Systems, Inc. model RDS WL-40® automated groundwater monitoring gauges, or acceptable equivalents. These automated groundwater monitoring gauges will continuously record water level data along an 40-inch gradient.

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

WETLAND PRESERVATION AREAS
GRIMESLAND SITE
WETLAND MITIGATION PLAN
PITT COUNTY, NORTH CAROLINA

FIGURE 7
PROJECT: R-2510 WM
DATE: JULY 2000

To monitor groundwater levels, RDS WL-40® (40-inch) automated groundwater monitoring gauges will be installed within compensatory mitigation areas (proposed cypress-gum swamps) and reference wetlands. To monitor surface water elevations during times of flooding, several RDS WL-40® groundwater monitoring gauges will be mounted above-grade on wooden poles. The poles will be appropriately anchored to ensure their stability during periods of site inundation when significant flow velocities may occur. The bottom of each unit will be set at ground level. In this configuration, the RDS WL-40® groundwater monitoring gauges will be capable of recording water levels 40 inches above the ground surface. The purpose of these above-grade units is to provide evidence of riverine-influenced hydrology within reference wetlands and areas of wetland creation.

To monitor surface water levels within the ponds, RDS WL-40® automated groundwater monitoring gauges will be installed on anchored wooden poles along the shallow submerged benches (the proposed emergent wetlands). The bottom of each unit will be set at the surface of the bench substrate. In this configuration, the RDS WL-40® groundwater monitoring gauges will be capable of recording water levels 40 inches above the substrate of the benches.

Automated groundwater monitoring gauges have been installed within reference wetlands (Figure 4). Locations of automated groundwater monitoring gauges installed in the Phase I mitigation area are also shown in Figure 4. Proposed locations of additional automated groundwater monitoring gauges will be identified for future phases of mitigation when these phases near final design. Additional automated groundwater monitoring gauges will be installed within each phased mitigation area immediately following completion of grading.

5.1.1 Monitoring

Following installation, the continuous-logging automated groundwater monitoring gauges will be adjusted to record water levels at 6-hour intervals. The continuous monitoring groundwater monitoring gauges will be in operation throughout the year, and data will be downloaded at intervals sufficiently spaced to provide effective monitoring and assessment of success criteria for hydrology.

5.1.2 Success Criteria

For compensatory areas proposed to support forested wetlands (cypress gum swamps and coastal plain bottomland hardwoods), hydrological success criteria will be defined as saturated soil

conditions within a major portion of the root zone (i.e., within 12 inches of the surface) for 12.5 to 75 percent of the growing season in most years. For compensatory areas proposed to support emergent wetlands (the shallow aquatic benches), hydrological success criteria will be defined as inundation less than 6.6 feet for at least 75 percent of the growing season in most years. Areas supporting the aforementioned wetland hydrology regimes are required to support a prevalence of hydrophytic vegetation and hydric soils. If wetland hydrology is determined to be marginal after three years of monitoring, consultation with the Wilmington District Corps of Engineers will be initiated to assess jurisdictional issues in transitional areas.

The primary goal of the mitigation plan is to optimize the amount of riverine wetlands to be created. Adjoining riverine wetlands along Grindle Creek and the Tar River floodplain have been selected to serve as reference wetlands. Two groundwater monitoring wells have been installed in adjoining reference riverine wetlands and additional monitoring wells will be installed as phases of mitigation progress. Groundwater data collected from the monitoring wells installed within the reference wetlands will be compared to groundwater data collected from monitoring wells installed within compensatory wetlands to assess the degree to which the aforementioned goal has been met.

5.2 Vegetation

Monitoring methods for vegetation within compensatory areas have been developed in accordance with Corps of Engineers *Branch Guidance for Wetlands Compensation Permit Conditions and Performance Criteria* (1995). A general discussion of the compensatory wetland monitoring plan is provided in the following sections.

5.2.1 Monitoring

After planting has been completed, an initial evaluation will be performed to verify planting methods and to determine initial species composition and density. Supplemental planting and additional site modification will be implemented, if necessary. Permanent photography stations will be established at selected vantage points to provide a visual record of vegetation development over time.

During the first year after planting, the Grimesland site will receive cursory visual evaluation on a periodic basis to ascertain the degree of overtopping of planted trees by nuisance species, such as common reed (*Phragmites australis*) or multiflora rose (*Rosa multiflora*). Remedial action will be undertaken as needed to control nuisance species. Subsequently, quantitative sampling of

vegetation will be performed after each growing season and preferably after the first frost until vegetation success criteria is achieved.

During quantitative vegetation sampling in the early fall of the first year 0.05-acre plots will be established with the 58 acres of compensatory wetlands comprised of cypress-gum swamp and bottomland hardwoods. Monitoring plots will be established and permanently located, providing a representative sample of the site. Vegetation monitoring plots will be correlated with hydrological monitoring sites in most cases to allow for point-source data of hydrologic and vegetation parameters.

5.2.2 Success Criteria

Success criteria have been established to verify that wetland creation areas support vegetation necessary for a jurisdictional determination. Additional success criteria are dependent upon the density and growth of characteristic forest species. For the forested wetlands, a minimum count of 320 trees per acre must be achieved within three years of initial planting and a minimum count of 260 trees per acre must be achieved within five years of initial planting. Supplemental plantings will be undertaken as needed to achieve the vegetation success criteria.

5.3 Report Submittals

As-built plans will be submitted within 90 days following completion of each phase of the wetlands mitigation plan. The as-built plans will show final site grading along with a description of post-planting site conditions. A discussion of the planting program, including species planted, species densities, and number of stems planted will be included. The report will also provide a description of groundwater monitoring gauge locations, proposed photographic monitoring stations and proposed vegetation sampling plots.

Subsequently, monitoring reports will be submitted yearly to appropriate permitting agencies following each assessment. Submitted reports will include (1) sample plot data, (2) water level data from automated groundwater monitoring gauges, and (3) a discussion of substantiated problems and proposed recommendations for problem resolution. The duration of wetland hydrology during the growing season will also be calculated at each monitoring gauge location and extrapolated to each restored or enhanced community. Density, survival and percent composition of targeted tree species will be reported.

5.4 Contingency

In the event that vegetation or hydrology success criteria are not fulfilled, appropriate contingency measures will be identified and implemented. Should the specified vegetation success criteria not be satisfied, possible contingency measures will include additional plantings, specification of more-suitable plant species, control of unsuitable plant species (such as common reed) which may be out-competing targeted species, minor grade adjustments, and extended monitoring periods.

In the event that the specified wetland hydrology success criteria are not achieved during the monitoring period, the only practicable contingency measure would entail minor grade adjustments. Should grade adjustment not be feasible, redefinition of mitigation goals and strategies will be required. Redefinition of mitigation goals and strategies would be carried out in close consultation with the Corps of Engineers and other involved agencies.

6.0 MITIGATION VALUE

The types of natural communities available for various types of mitigation measures on the Grimesland site are shown in Table 3.

The primary value of the mitigation is the preservation of 408 acres of existing and proposed riparian ecosystem. The riparian ecosystem to be protected in perpetuity not only provides valuable habitat to a diverse assemblage of flora and fauna, but also serves as a contiguous wildlife corridor along the Tar River.

At present, the 105 acres of ponds (abandoned and intermittently dredged borrow pits) on the site are non-jurisdictional with respect to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. Proposed enhancement of aquatic habitat within approximately 80 acres of ponds remaining after wetlands creation will enhance the value of these relatively low value manmade water bodies; thereby contributing to the overall functions and values of the ecosystem within which they are located.

TABLE 3

AVAILABLE MITIGATION AREAS
GRIMESLAND SITE
PITT COUNTY, NORTH CAROLINA

PRESERVATION OF WETLANDS:	
• Cypress-Gum Swamp	202 acres
• Bottomland Hardwood	121 acres
• Coastal Plain Levee Forests	25 acres
Subtotal	348 acres
WETLAND CREATION:	
• Cypress-Gum Swamp	58 acres
• Emergent Wetlands on Shallow Submerged Benches	2 acres
Subtotal	60 acres
TOTAL WETLAND ACREAGE	408 acres
PRESERVATION OF RIPARIAN BUFFER:	
• Riparian Buffer Along the Tar River	4.92 acres
• Riprian Along Grindle Creek	15.03 acres
• Riparian Buffer Along Intermittent Stream	9.64 acres
TOTAL RIPARIAN BUFFER CONSERVATION	29.59 acres
ENHANCEMENT OF AQUATIC HABITAT WITHIN PONDS:	
• Planting of Shade-Providing Trees Along Selected Shorelines	
• Planting of Submerged Aquatic Vegetation	
• Provision of Hydraulic Connections Between Ponds	80 acres
• Randomization of Bottom Contours	
• Provision of Additional Fish Cover	

6.1 Preconstruction and Post-Construction Wetland Functions and Values

The Grimesland site will serve as a regional wetlands mitigation site for NCDOT roadway projects. As of April 2000, no construction projects have been identified for which credits would be sought.

The goal of the mitigation plan is to expand, enhance, and preserve over 400 acres of the Tar River riparian ecosystem. As contiguous components of the larger ecosystem, areas of proposed wetland creation and aquatic habitat enhancement should be viewed from the perspective of their cumulative contribution to overall value of the riparian ecosystem rather than their individual values.

To serve as a baseline against which proposed mitigation goals can be gauged, values of existing natural communities on the Grimesland site were estimated using North Carolina Department of Environment and Natural Resourses' *Guidance for Rating the Values of Wetlands in North Carolina* (1995). Wetland Rating Worksheets for communities assessed are provided in Appendix A.

6.1.1 Cypress-Gum Swamps

Using methods set forth in *Guidance for Rating the Values of Wetlands in North Carolina*, the cypress-gum swamps on the Grimesland site were determined to exhibit high values for water storage, pollutant removal, wildlife habitat, aquatic life value, and recreation/education. The cypress-gum swamps exhibit intermediate values for bank/shoreline stabilization only because the Grimesland site is not located within one-half mile of an urbanized portion of the watershed. Compared to other natural communities on the Grimesland site, the cypress-gum swamps rated the highest overall value (Appendix A). Preservation of 202 acres of this high value cypress-gum swamp is proposed.

Under the wetland creation component of the mitigation plan, it is proposed to create 58 acres of wetlands dominated by cypress-gum swamp communities. Because grading plans will call for microtopographic relief, a lesser component of bottomland hardwood communities will also become established. Most of the newly created communities will be located adjacent to ponds. Lowering of elevations around the ponds will allow the ponds to serve as floodplain pools and will provide an unrestricted hydraulic connection to the Tar River and Grindle Creek during times of significant flooding; however, the cypress-gum swamps created adjacent to ponds can

be expected to exhibit slightly lower values than the reference wetland or those wetlands being created within 300 feet of Grindle Creek and its perennial tributary (i.e., a numerical value of 82 compared to 91).

6.1.2 Bottomland Hardwoods Within 300 Feet of a Waterway

Using methods set forth in *Guidance for Rating the Values of Wetlands in North Carolina*, the coastal plain bottomland hardwood forests located within 300 feet of a waterway (the Tar River, Grindle Creek, or tributaries to Grindle Creek) were determined to exhibit moderately high values for water storage, pollutant removal, wildlife habitat, aquatic life value, and recreation/education. As with the cypress-gum swamps, these bottomland hardwood communities exhibited intermediate values for bank/shoreline stabilization only because the Grimesland site is not located within one-half mile of an urbanized portion of the watershed. Compared to other natural communities on the Grimesland site, the coastal plain bottomland hardwood forests located within 300 feet of a waterway rated the second highest overall value (Appendix A). Of the total 121 acres of bottomland hardwoods to be preserved, 58 acres are comprised of these high value bottomland hardwood communities.

6.1.3 Coastal Plain Levee Forests

Using methods set forth in *Guidance for Rating the Values of Wetlands in North Carolina*, the coastal plain levee forests located along the Tar River were determined to exhibit high values for pollutant removal, wildlife habitat, and recreation/education. Due primarily to their lack of microtopographic relief and lack of seasonal pockets of inundation, the levee forest communities exhibit relatively low values with respect to water storage and aquatic life value. As with other communities on the Grimesland site, these levee forests exhibit intermediate values for bank/shoreline stabilization only because the site is not located within one-half mile of an urbanized portion of the watershed. Compared to other natural communities on the Grimesland site, the coastal plain levee forests rated the third highest overall value (Appendix A). Preservation of 25 acres of coastal plain levee forests is proposed.

6.1.4 Bottomland Hardwoods Over 300 Feet from a Waterway

Using methods set forth in *Guidance for Rating the Values of Wetlands in North Carolina*, the coastal plain bottomland hardwood forests located over 300 feet from a waterway were determined to exhibit high values for wildlife habitat. Due primarily to their distance from waterways, these communities exhibit intermediate values for pollutant removal and

recreation/education. As with other communities on the Grimesland site, these bottomland hardwood communities exhibit intermediate values for bank/shoreline stabilization only because the site is not located within one-half mile of an urbanized portion of the watershed. Due primarily to their lack of microtopographic relief and lack of seasonal pockets of inundation, these bottomland hardwood forest communities exhibit relatively low values with respect to water storage and aquatic life value. Compared to other natural communities on the Grimesland site, the bottomland hardwood forests located over 300 feet from a waterway rated the lowest overall value (Appendix A); however, with a numerical rating of 52, their value is considered important from a regional perspective. Of the total 121 acres of bottomland hardwoods to be preserved, 63 acres are comprised of these medium value bottomland hardwood communities.

6.1.5 Palustrine Emergent Wetlands Along Shorelines of Ponds

Using methods set forth in *Guidance for Rating the Values of Wetlands in North Carolina*, the palustrine emergent wetland communities that currently exist around the shorelines of the ponds were determined to exhibit low to moderately low values for all values assessed. These comparatively low values are due primarily to the fact that their hydrology is dominated by groundwater flow and rainfall rather than surface flow, their hydraulic isolation from nearby wetlands where surface flows exist, their limited extent (i.e., narrow and non-contiguous fringe communities), their limited vegetation cover, and their limited amount of food-bearing plants.

Under the mitigation plan, new emergent wetlands will be created on shallow aquatic benches around the shorelines of the ponds. The values of the created emergent wetlands will be noticeably higher than the values of the existing emergent communities (a numerical rating of 36 for the existing wetlands compared to a numerical rating of 52 for the proposed wetlands). The relatively greater rating of the new wetlands is attributed to the provision of less-restrictive hydraulic connections with adjoining created wetlands to be dominated by surface flows, the relatively greater size of the created emergent wetlands, a greater coverage by vegetation including vegetation having greater food value, their contribution to providing a wildlife corridor across the property, and the reduction in human disturbances anticipated under new stewardship and management practices.

6.1.6 Aquatic Habitat Within Ponds

Using methods set forth in *Guidance for Rating the Values of Wetlands in North Carolina*, the aquatic habitat that currently exists within the ponds were determined to exhibit low to moderately low values for values assessed with the exception of aquatic life value (for which

they rated moderate to moderately high in value). These low to moderate values are due primarily to the fact that their hydrology is dominated by groundwater flow and rainfall rather than surface flow, their hydraulic isolation from nearby wetlands where surface flows exist, the limited size of the majority of the ponds (less than ten acres), the lack of submerged aquatic and emergent vegetation, their limited amount of food-bearing plants, and their lack of cover-providing fish habitat.

Under the mitigation plan, measures will be taken to enhance the aquatic habitat within the ponds. The values of enhanced aquatic habitat will be noticeably higher than the values of existing aquatic habitat (a numerical rating of 38 for the existing habitat compared to a numerical rating of 47 for enhanced habitat). The relatively greater rating of the enhanced aquatic habitat is attributed to the provision of less-restrictive hydraulic connections with adjoining created wetlands to be dominated by surface flows, proposed interconnection of some of the ponds resulting in relatively greater habitat sizes, a greater coverage by vegetation including vegetation having greater food value, provision of cover-providing fish habitat, and the reduction in human disturbances anticipated under new stewardship and management practices.

6.2 Mitigation Credit Ratios

The Grimesland site will be designated as a regional wetlands mitigation site. At present, the mitigation being provided on the Grimesland site is "up-front", that is, no construction projects are currently identified for which credits would be sought. Actual compensatory mitigation credit generated by the Grimesland site mitigation plan will be determined by the type and value of wetlands impacted by a particular construction project.

In determining specific mitigation credits, the following formula will be utilized:

- 1 acre of credit = 1 acre of creation + 5 acres of preservation + 1 acre of aquatic habitat enhancement.

Based on the above formula, net mitigation credits to be obtained on the Grimesland site will consist of 60 acres of cypress-gum swamp. In addition, a credit for preservation of 29.59 acres of riparian buffer will be applied toward the Grimesland site.

7.0 DISPENSATION OF THE PROPERTY

No plan for dispensation of the Grimesland site has yet been finalized. Parties, which could provide responsible stewardship of the site, include non-profit conservation organizations (such as the Nature Conservancy), local governments (Pitt County), land trusts, or continued North Carolina ownership with state agency management. Covenants and/or deed restrictions will be implemented to ensure responsible management and protection of the site in perpetuity.

NCDOT will maintain ownership of the wetland compensation portions of the site (Figure 5) until all mitigation activities are completed and until each phased mitigation area is determined to be successful. Dispensation of these areas can be performed in stages as each successive area is determined to be successful or dispensation can be accomplished for the entire 60-acre compensatory area once all areas have been deemed successful. Once a formal agreement has been entered into between NCDOT and an appropriate party, ownership or management of the 348 acres of riparian forests can be transferred at any time.

8.0 REFERENCES

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APPENDIX A

WETLAND RATING WORKSHEETS

WETLAND RATING WORKSHEET Fourth Version

EXISTING CYPRESS-GUM SWAMP

Project Name GRIMESLAND MITIGATION PLAN Nearest Road SR 1565
County PITT Wetland Area 202 acres Wetland Width > 300 feet
Name of evaluator MLM - HSMM INC. Date 9/24/00

Wetland Location

___ on pond or lake
X on perennial stream
___ on intermittent stream
___ within interstream divide
___ other _____

Soil series SWAMP

X predominantly organic - humus, muck, or peat
___ predominantly mineral - non-sandy
___ predominantly sandy

Hydraulic factors

___ steep topography
___ ditched or channelized
X total wetland width ≥100 feet

Adjacent land use
(within 1/2 mile upstream, upslope, or radius)

X forested/natural vegetation 60 %
X agriculture, urban/suburban 40 %
___ impervious surface ___ %

Dominant vegetation

(1) Taxodium distichum
(2) Nyssa biflora
(3) Saururus cernuus

Flooding and wetness

X semipermanently to permanently flooded or inundated
___ seasonally flooded or inundated
___ intermittanly flooded or temporary surface water
___ no evidence of flooding or surface water

Wetland type (select one)*

___ Bottomland hardwood forest
___ Headwater forest
X Swamp forest
___ Wet flat
___ Pocosin
___ Bog forest
___ Pine savanna
___ Freshwater marsh
___ Bog/fen
___ Ephemeral wetland
___ Carolina Bay
___ Other _____

*the rating system cannot be applied to salt or brackish marshes or stream channels

			weight			
R	Water storage	5	x 4.00 =	20	Wetland Rating	
A	Bank/Shoreline stabilization	3	x 4.00 =	12		
T	Pollutant removal	5	* x 5.00 =	25		
I	Wildlife habitat	5	x 2.00 =	10		
N	Aquatic life value	5	x 4.00 =	20		
G	Recreation/Education	4	x 1.00 =	4		91

*Add 1 point if in sensitive watershed and >10% nonpoint disturbance within 1/2 mile upstream, upslope, or radius

WETLAND RATING WORKSHEET Fourth Version

PROPOSED CYPRESS-GUM SWAMP

Project Name GRIMESLAND MITIGATION PLAN Nearest Road SR 1565
County PITT Wetland Area 58 acres Wetland Width > 300 feet
Name of evaluator MLM - HSMM, INC. Date 4/24/00

Wetland Location

___ on pond or lake
X on perennial stream
___ on intermittent stream
___ within interstream divide
___ other _____

Soil series Lakeland sands

___ predominantly organic - humus, muck, or peat
___ predominantly mineral - non-sandy
X predominantly sandy

Hydraulic factors

___ steep topography
___ ditched or channelized
X total wetland width ≥100 feet

Adjacent land use
(within 1/2 mile upstream, upslope, or radius)

X forested/natural vegetation 60 %
X agriculture, urban/suburban 40 %
___ impervious surface ___ %

Dominant vegetation

(1) Taxodium distichum
(2) Nyssa biflora
(3) Quercus phellos

Flooding and wetness

X semipermanently to permanently flooded or inundated
___ seasonally flooded or inundated
___ intermittanly flooded or temporary surface water
___ no evidence of flooding or surface water

Wetland type (select one)*

___ Bottomland hardwood forest
___ Headwater forest
X Swamp forest
___ Wet flat
___ Pocosin
___ Bog forest
___ Pine savanna
___ Freshwater marsh
___ Bog/fen
___ Ephemeral wetland
___ Carolina Bay
___ Other _____

*the rating system cannot be applied to salt or brackish marshes or stream channels

		weight			
R	Water storage	4	x 4.00 =	16	Wetland Rating
A	Bank/Shoreline stabilization	3	x 4.00 =	12	
T	Pollutant removal	4	* x 5.00 =	20	
I	Wildlife habitat	5	x 2.00 =	10	
N	Aquatic life value	5	x 4.00 =	20	82
G	Recreation/Education	4	x 1.00 =	4	

*Add 1 point if in sensitive watershed and >10% nonpoint disturbance within 1/2 mile upstream, upslope, or radius

WETLAND RATING WORKSHEET Fourth Version

BOTTOMLAND HARDWOODS ≤ 300' FROM SURFACE WATER

Project Name GRIMESLAND MITIGATION PLAN Nearest Road SR 1565
County PITT Wetland Area >10 acres Wetland Width >300 feet
Name of evaluator MLM - HSMM INC. Date 4/24/00

Wetland Location

___ on pond or lake
X on perennial stream
___ on intermittent stream
___ within interstream divide
___ other _____

Soil series Swamp deposits, Portsmouth loam

X predominantly organic - humus, muck, or peat
X predominantly mineral - non-sandy
___ predominantly sandy

Hydraulic factors

___ steep topography
___ ditched or channelized
X total wetland width ≥100 feet

Adjacent land use
(within 1/2 mile upstream, upslope, or radius)

X forested/natural vegetation 60 %
X agriculture, urban/suburban 40 %
___ impervious surface ___ %

Dominant vegetation

(1) Quercus phellos
(2) Acer rubrum
(3) Arundinaria gigantea

Flooding and wetness

___ semipermanently to permanently flooded or inundated
X seasonally flooded or inundated
___ intermittanly flooded or temporary surface water
___ no evidence of flooding or surface water

Wetland type (select one)*

X Bottomland hardwood forest
___ Headwater forest
___ Swamp forest
___ Wet flat
___ Pocosin
___ Bog forest
___ Pine savanna
___ Freshwater marsh
___ Bog/fen
___ Ephemeral wetland
___ Carolina Bay
___ Other _____

*the rating system cannot be applied to salt or brackish marshes or stream channels

		weight		
R	Water storage	4	x 4.00 =	16
A	Bank/Shoreline stabilization	3	x 4.00 =	12
T	Pollutant removal	4	* x 5.00 =	20
I	Wildlife habitat	4	x 2.00 =	8
N	Aquatic life value	4	x 4.00 =	16
G	Recreation/Education	4	x 1.00 =	4

Wetland Rating: 76

*Add 1 point if in sensitive watershed and >10% nonpoint disturbance within 1/2 mile upstream, upslope, or radius

WETLAND RATING WORKSHEET Fourth Version

BOTTOMLAND HARDWOODS ≥ 300' FROM SURFACE WATER

Project Name GRIMESLAND MITIGATION PLAN Nearest Road SR 1565
County PITT Wetland Area >10 acres Wetland Width >300 feet
Name of evaluator MLM - HSMM INC. Date 4/24/00

Wetland Location

___ on pond or lake
___ on perennial stream
X on intermittent stream
___ within interstream divide
___ other _____

Soil series Portsmouth loam.

___ predominantly organic - humus, muck, or peat
X predominantly mineral - non-sandy
___ predominantly sandy

Hydraulic factors

___ steep topography
___ ditched or channelized
X total wetland width ≥100 feet

Adjacent land use
(within 1/2 mile upstream, upslope, or radius)

X forested/natural vegetation 60 %
X agriculture, urban/suburban 40 %
___ impervious surface ___ %

Dominant vegetation

(1) Quercus phellos
(2) Acer rubrum
(3) Arundinaria gigantea

Flooding and wetness

___ semipermanently to permanently flooded or inundated
X seasonally flooded or inundated
___ intermittanly flooded or temporary surface water
___ no evidence of flooding or surface water

Wetland type (select one)*

X Bottomland hardwood forest
___ Headwater forest
___ Swamp forest
___ Wet flat
___ Pocosin
___ Bog forest
___ Pine savanna
___ Freshwater marsh
___ Bog/fen
___ Ephemeral wetland
___ Carolina Bay
___ Other _____

*the rating system cannot be applied to salt or brackish marshes or stream channels

		weight		
R	Water storage	3	x 4.00 =	12
A	Bank/Shoreline stabilization	2	x 4.00 =	8
T	Pollutant removal	3 *	x 5.00 =	15
I	Wildlife habitat	5	x 2.00 =	10
N	Aquatic life value	1	x 4.00 =	4
G	Recreation/Education	3	x 1.00 =	3

Wetland Rating: 52

*Add 1 point if in sensitive watershed and >10% nonpoint disturbance within 1/2 mile upstream, upslope, or radius

WETLAND RATING WORKSHEET Fourth Version

LEVEE FOREST

Project Name GRIMESLAND MITIGATION PLAN Nearest Road SR 1565
County PITT Wetland Area 5 acres Wetland Width > 300 feet
Name of evaluator MLM - HSMM INC. Date 4/24/00

Wetland Location

___ on pond or lake
_X_ on perennial stream
___ on intermittent stream
___ within interstream divide
___ other _____

Soil series Chipley sand

___ predominantly organic - humus, muck, or peat
___ predominantly mineral - non-sandy
_X_ predominantly sandy

Hydraulic factors

_X_ steep topography
___ ditched or channelized
_X_ total wetland width ≥100 feet

Adjacent land use
(within 1/2 mile upstream, upslope, or radius)

_X_ forested/natural vegetation 80 %
_X_ agriculture, urban/suburban 20 %
___ impervious surface ____ %

Dominant vegetation

(1) Platanus occidentalis
(2) Quercus phellos
(3) Acer rubrum

Flooding and wetness

___ semipermanently to permanently flooded or inundated
___ seasonally flooded or inundated
_X_ intermittanly flooded or temporary surface water
___ no evidence of flooding or surface water

Wetland type (select one)*

___ Bottomland hardwood forest
___ Headwater forest
___ Swamp forest
___ Wet flat
___ Pocosin
___ Bog forest
___ Pine savanna
___ Freshwater marsh
___ Bog/fen
___ Ephemeral wetland
___ Carolina Bay
_X_ Other LEVEE FOREST

*the rating system cannot be applied to salt or brackish marshes or stream channels

		weight		
R	Water storage	2	x 4.00 =	8
A	Bank/Shoreline stabilization	3	x 4.00 =	12
T	Pollutant removal	5 *	x 5.00 =	25
I	Wildlife habitat	5	x 2.00 =	10
N	Aquatic life value	2	x 4.00 =	8
G	Recreation/Education	5	x 1.00 =	5

Wetland Rating: 68

*Add 1 point if in sensitive watershed and >10% nonpoint disturbance within 1/2 mile upstream, upslope, or radius

WETLAND RATING WORKSHEET Fourth Version

EXISTING EMERGENT WETLANDS

Project Name GRIMESLAND MITIGATION PLAN Nearest Road SR 1565
County PITT Wetland Area <1 acres Wetland Width 1-2 feet
Name of evaluator MLM-HSMM, INC. Date 7/17/00

Wetland Location

- X on pond or lake
- ___ on perennial stream
- ___ on intermittent stream
- ___ within interstream divide
- ___ other ___

Soil series LAKELAND

- ___ predominantly organic - humus, muck, or peat
- ___ predominantly mineral - non-sandy
- X predominantly sandy

Hydraulic factors

- X steep topography
- ___ ditched or channelized
- ___ total wetland width ≥100 feet

Adjacent land use
(within 1/2 mile upstream, upslope, or radius)

- X forested/natural vegetation 60 %
- X agriculture, urban/suburban 40 %
- ___ impervious surface ___ %

Dominant vegetation

(1) Juncus effusus
(2) Eleocharis spp.
(3) Rhyncospora spp.

Flooding and wetness

- X semipermanently to permanently flooded or inundated
- ___ seasonally flooded or inundated
- ___ intermittanly flooded or temporary surface water
- ___ no evidence of flooding or surface water

Wetland type (select one)*

- ___ Bottomland hardwood forest
- ___ Headwater forest
- ___ Swamp forest
- ___ Wet flat
- ___ Pocosin
- ___ Bog forest
- ___ Pine savanna
- X Freshwater marsh
- ___ Bog/fen
- ___ Ephemeral wetland
- ___ Carolina Bay
- ___ Other ___

*the rating system cannot be applied to salt or brackish marshes or stream channels

			weight		
R	Water storage	0.5	x 4.00 =	2	Wetland Rating
A	Bank/Shoreline stabilization	0.5	x 4.00 =	2	36
T	Pollutant removal	2 *	x 5.00 =	10	
I	Wildlife habitat	1	x 2.00 =	2	
N	Aquatic life value	4	x 4.00 =	16	
G	Recreation/Education	4	x 1.00 =	4	

*Add 1 point if in sensitive watershed and >10% nonpoint disturbance within 1/2 mile upstream, upslope, or radius

WETLAND RATING WORKSHEET Fourth Version

PROPOSED EMERGENT WETLANDS

Project Name GRIMESLAND MITIGATION PLAN Nearest Road SR 1565
County PITT Wetland Area 2 acres Wetland Width 10-15 feet
Name of evaluator HLM - HSMM, INC. Date 7/17/00

Wetland Location

X on pond or lake
___ on perennial stream
___ on intermittent stream
___ within interstream divide
___ other _____

Soil series LAKELAND

___ predominantly organic - humus, muck, or peat
X predominantly mineral - non-sandy
___ predominantly sandy

Hydraulic factors

___ steep topography
___ ditched or channelized
X total wetland width ≥10 feet

Adjacent land use
(within 1/2 mile upstream, upslope, or radius)

X forested/natural vegetation 65 %
X agriculture, urban/suburban 35 %
___ impervious surface ___ %

Dominant vegetation

(1) Polygonum spp.
(2) Scirpus cyperinus
(3) Sparganium americanum

Flooding and wetness

X semipermanently to permanently flooded or inundated
___ seasonally flooded or inundated
___ intermittanly flooded or temporary surface water
___ no evidence of flooding or surface water

Wetland type (select one)*

___ Bottomland hardwood forest
___ Headwater forest
___ Swamp forest
___ Wet flat
___ Pocosin
___ Bog forest
___ Pine savanna
X Freshwater marsh
___ Bog/fen
___ Ephemeral wetland
___ Carolina Bay
___ Other _____

*the rating system cannot be applied to salt or brackish marshes or stream channels

			weight		
R	Water storage	1	x 4.00 =	4	Wetland Rating
A	Bank/Shoreline stabilization	1	x 4.00 =	4	
T	Pollutant removal	3	* x 5.00 =	15	
I	Wildlife habitat	2	x 2.00 =	4	
N	Aquatic life value	5	x 4.00 =	20	
G	Recreation/Education	5	x 1.00 =	5	52

*Add 1 point if in sensitive watershed and >10% nonpoint disturbance within 1/2 mile upstream, upslope, or radius

WETLAND RATING WORKSHEET Fourth Version

EXISTING AQUATIC HABITAT

Project Name GRIMESLAND MITIGATION PLAN Nearest Road SR 1565
County PITT Wetland Area >7 acres Wetland Width N/A feet
Name of evaluator MLM - HSMM, INC. Date 7/17/00

Wetland Location

X on pond or lake
___ on perennial stream
___ on intermittent stream
___ within interstream divide
___ other _____

Soil series N/A

X predominantly organic - humus, muck, or peat
___ predominantly mineral - non-sandy
___ predominantly sandy

Hydraulic factors

___ steep topography
___ ditched or channelized
X total wetland width ≥100 feet

Adjacent land use
(within 1/2 mile upstream, upslope, or radius)

X forested/natural vegetation 60 %
X agriculture, urban/suburban 40 %
___ impervious surface ___ %

Dominant vegetation

(1) NONE
(2) _____
(3) _____

Flooding and wetness

X semipermanently to permanently flooded or inundated
___ seasonally flooded or inundated
___ intermittanly flooded or temporary surface water
___ no evidence of flooding or surface water

Wetland type (select one)*

___ Bottomland hardwood forest
___ Headwater forest
___ Swamp forest
___ Wet flat
___ Pocosin
___ Bog forest
___ Pine savanna
X Freshwater marsh
___ Bog/fen
___ Ephemeral wetland
___ Carolina Bay
X Other Pond

*the rating system cannot be applied to salt or brackish marshes or stream channels

			weight		
R	Water storage	1	x 4.00 =	4	Wetland Rating
A	Bank/Shoreline stabilization	0.5	x 4.00 =	2	38
T	Pollutant removal	2 *	x 5.00 =	10	
I	Wildlife habitat	1	x 2.00 =	2	
N	Aquatic life value	4	x 4.00 =	16	
G	Recreation/Education	4	x 1.00 =	4	

*Add 1 point if in sensitive watershed and >10% nonpoint disturbance within 1/2 mile upstream, upslope, or radius

WETLAND RATING WORKSHEET Fourth Version

PROPOSED (ENHANCED) AQUATIC HABITAT

Project Name GRIMESLAND MITIGATION PLAN Nearest Road SR 1565
County PITT Wetland Area >7 acres Wetland Width >100 feet
Name of evaluator MLM - HSMM, INC. Date 7/17/00

Wetland Location

X on pond or lake
___ on perennial stream
___ on intermittent stream
___ within interstream divide
___ other _____

Soil series N/A

X predominantly organic - humus, muck, or peat
___ predominantly mineral - non-sandy
___ predominantly sandy

Hydraulic factors

___ steep topography
___ ditched or channelized
X total wetland width ≥100 feet

Adjacent land use
(within 1/2 mile upstream, upslope, or radius)

X forested/natural vegetation 65 %
X agriculture, urban/suburban 35 %
___ impervious surface ___ %

Dominant vegetation

(1) Potamogetan nodosus
(2) Vallesneria americana
(3) Nymphea odorata

Flooding and wetness

X semipermanently to permanently flooded or inundated
___ seasonally flooded or inundated
___ intermittanly flooded or temporary surface water
___ no evidence of flooding or surface water

Wetland type (select one)*

___ Bottomland hardwood forest
___ Headwater forest
___ Swamp forest
___ Wet flat
___ Pocosin
___ Bog forest
___ Pine savanna
X Freshwater marsh
___ Bog/fen
___ Ephemeral wetland
___ Carolina Bay
X Other Pond

*the rating system cannot be applied to salt or brackish marshes or stream channels

			weight		
R	Water storage	1	x 4.00 =	4	Wetland Rating
A	Bank/Shoreline stabilization	1	x 4.00 =	4	
T	Pollutant removal	2	* x 5.00 =	10	
I	Wildlife habitat	2	x 2.00 =	4	
N	Aquatic life value	5	x 4.00 =	20	
G	Recreation/Education	5	x 1.00 =	5	47

*Add 1 point if in sensitive watershed and >10% nonpoint disturbance within 1/2 mile upstream, upslope, or radius

APPENDIX B

SIGNATURE PAGE

SIGNATURE PAGE

Wetland Mitigation Plan
Grimesland Site

Pitt County, North Carolina
T.I.P. No. R-2510WM

As an effort to improve internal NCDOT documentation, we are requesting your signature on the final version of this mitigation plan dated November 14, 2000.

By way of your signature, you are accepting this restoration plan, credit ratios, success criteria, and monitoring plan as documented in the Wetland Mitigation Plan, Grimesland Site.

_____ _____
Mr. Mike Bell — Date
United States Army Corps of Engineers

_____ _____
Mr. John Hennessy — Date
NC Division of Water Quality

_____ _____
Mr. Tom McCartney — Date
US Fish and Wildlife Service

_____ _____
Mr. David Cox — Date
NC Wildlife Resource Commission