# ANNUAL REPORT FOR 2004

**Grimesland Sand Pit Phase II Site**
**Pitt County**
**Project No. 8.T221801**
**TIP No. R-2510 WM**

Office of Natural Environment & Roadside Environmental Unit
North Carolina Department of Transportation
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## SUMMARY

The following report summarizes the monitoring activities that have occurred in the past year for Phase II of the Grimesland Sand Pit Mitigation Site. This site was constructed to serve as a wetland mitigation site for road projects taking place in the Lower Tar River portion of the Tar-Pamlico River Basin in North Carolina. The site will be constructed in three phases. Phase II construction was completed in 2003 and planting occurred in February of 2003.

The site is monitored for hydrology using twenty groundwater-monitoring gauges and one rain gauge. The site is monitored for vegetation using seven vegetation plots, which are representative of the 48.8 acres planted in trees on the Grimesland Sand Pit Site Phase II.

The 2004-year represents the second year of hydrology and vegetation monitoring following construction. The site must demonstrate hydrologic and vegetation success for a minimum of five years or until the project is deemed successful.

Results for both hydrologic and vegetation monitoring indicate that the site is meeting success. The hydrologic data for 2004 demonstrates that the Phase II site met jurisdictional success with all twenty groundwater gauges exceeding the 12.5% minimum success criterion, with fifteen gauges meeting 100% during the growing season. Vegetation monitoring yielded 412 trees per acre, which is above the minimum success criteria for the second year of monitoring.

Per the letter from the Ecosystem Enhancement Program (EEP) to NCDOT dated August 25, 2004, the EEP has accepted the transfer of all off-site mitigation projects. The EEP will be responsible for fulfilling the remaining monitoring requirements and future remediation for this project.

# 1.0 INTRODUCTION

## 1.1 PROJECT DESCRIPTION

The 550-acre Grimesland Sand Pit Mitigation Site (herein after referred to as “the site”) is located in Pitt County near the community of Grimesland. The site is currently owned and mined by NCDOT. The site is bounded on the north and the 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 (Figure 1). The site serves as a regional wetland mitigation site for NCDOT roadway projects that would impact similar sites located in the Lower Tar River Sub-Basin. The site includes the creation of 58 acres of forested riverine wetlands (cypress-gum swamp and coastal plain bottomland hardwoods), the creation of 2 acres of emergent wetlands on submerged benches, the preservation of 348 acres of riverine wetland ecosystem, the preservation of 29.59 acres of riparian buffer and the enhancement of aquatic habitat within 80 acres of flooded abandoned borrow pits.

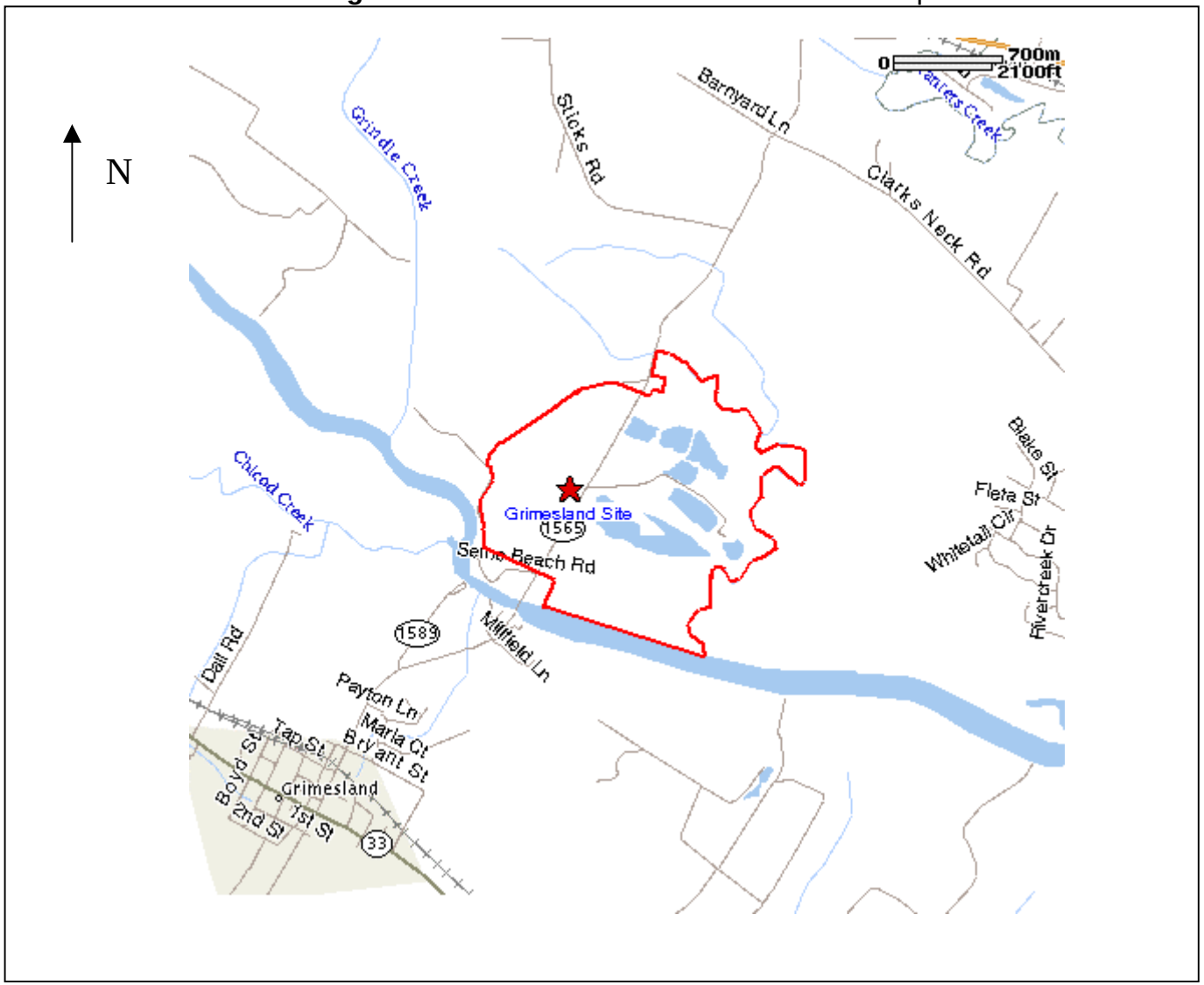
## 1.2 PURPOSE

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five years or until success criteria are satisfied. Success criteria are based on federal guidelines for wetland mitigation. These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report details the results of hydrologic and vegetative monitoring during the 2004-growing season at the Grimesland Sand Pit Site.

## 1.3 PROJECT HISTORY

| | |
|---|---|
| 2003 | Construction-Phase II |
| February 2003 | Phase II Planted |
| March- November 2003 | Hydrologic Monitoring (1 yr.) |
| June 2003 | Vegetation Monitoring (1 yr.) |
| March- November 2004 | Hydrologic Monitoring (1 yr.) |
| June 2004 | Vegetation Monitoring (2 yr.) |

**Figure 1.** Grimesland Phase II Site Location Map



# 2.0 HYDROLOGY

## 2.1 SUCCESS CRITERIA

In accordance with federal guidelines for wetland mitigation, the success criteria for hydrology state that the area must be inundated or saturated (within 12" of the surface) by surface or groundwater for at least a consecutive 12.5% of the growing season. Areas inundated less than 5% of the growing season are always classified as non-wetlands. Areas inundated between 5% - 12.5% of the growing season can be classified as wetlands depending upon other factors, such as the presence of hydrophytic vegetation and hydric soils.

The growing season in Pitt County begins March 15 and ends November 16. These dates correspond to a 50% probability that temperatures will remain above 28$^{o}$ F or higher after March 15 and before November 16.[1] The growing season is 247 days; therefore, the optimum duration for wetland hydrology is 31 days. Also, local climate must represent average conditions for the area.

## 2.2 HYDROLOGIC DESCRIPTION

Twenty groundwater gauges were installed in the Phase II area in April 2003 (Figure 2). The automatic monitoring gauges record daily readings of the groundwater depth. The 2004 data represents the second full growing season during which the water table was monitored in the Phase II area. A rain gauge installed onsite records daily rainfall totals; these rain events are incorporated into the monitoring results to examine how the site's groundwater level responds to rainfall.

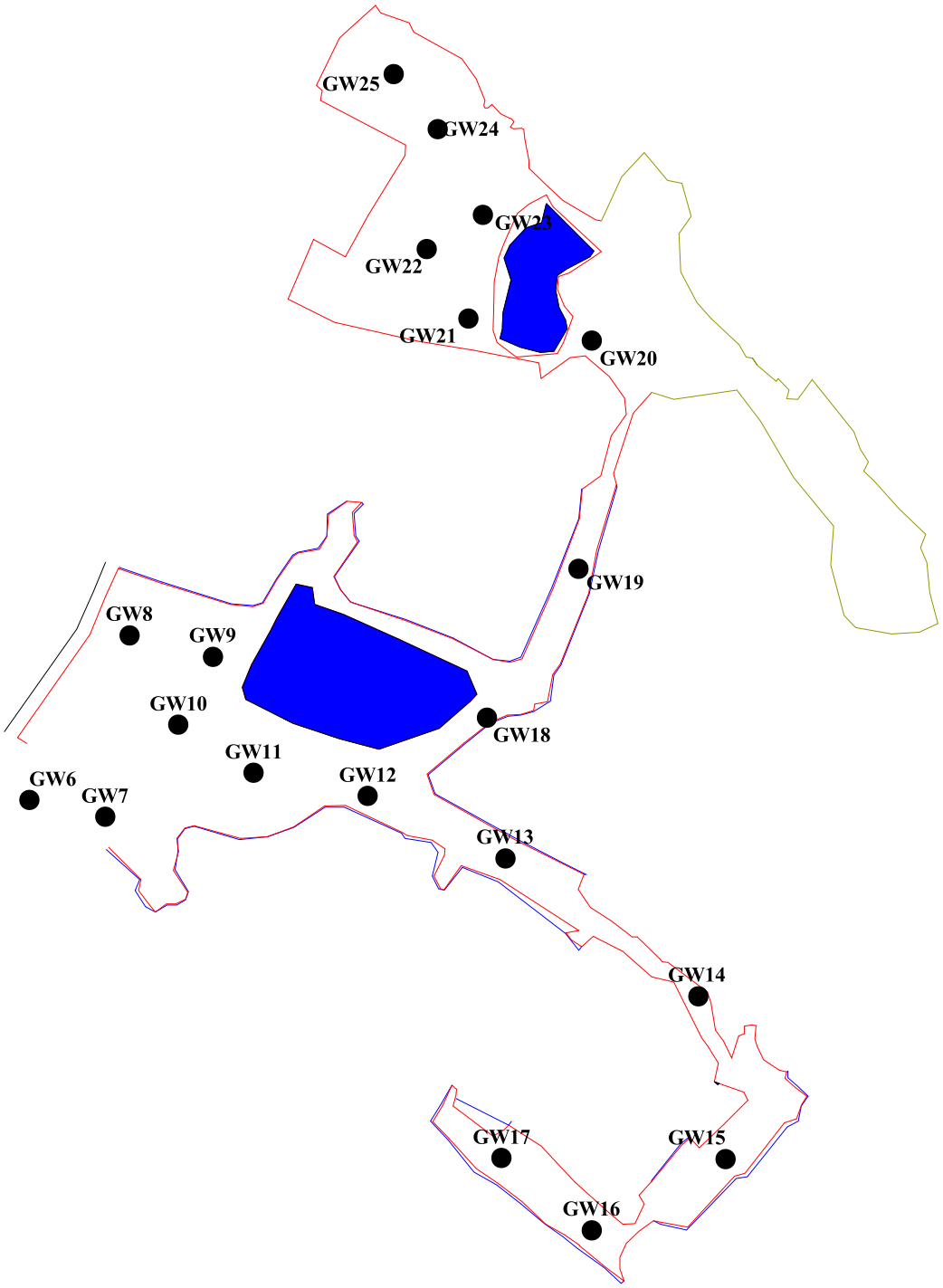
## 2.3 RESULTS OF HYDROLOGIC MONITORING

### *2.3.1 Site Data*

The maximum number of consecutive days that the groundwater was within twelve inches of the surface was determined for each groundwater-monitoring gauge. This number was converted into a percentage of the 247-day growing season (March 15 – November 16).

Table 1 shows the hydrologic results for 2004; Figure 3 is a graphical representation of these results. In Figure 3, a blue dot indicates the gauge showed success for more than 12.5% of the growing season; a red dot, between 8 and 12.5%; a green dot, between 5 and 8%, and a black dot, less than 5%.

[1] Soil Conservation Service, Soil Survey of Pitt County, North Carolina, p.71.




**Phase II**

# Figure 2. Gauge Location Map

N

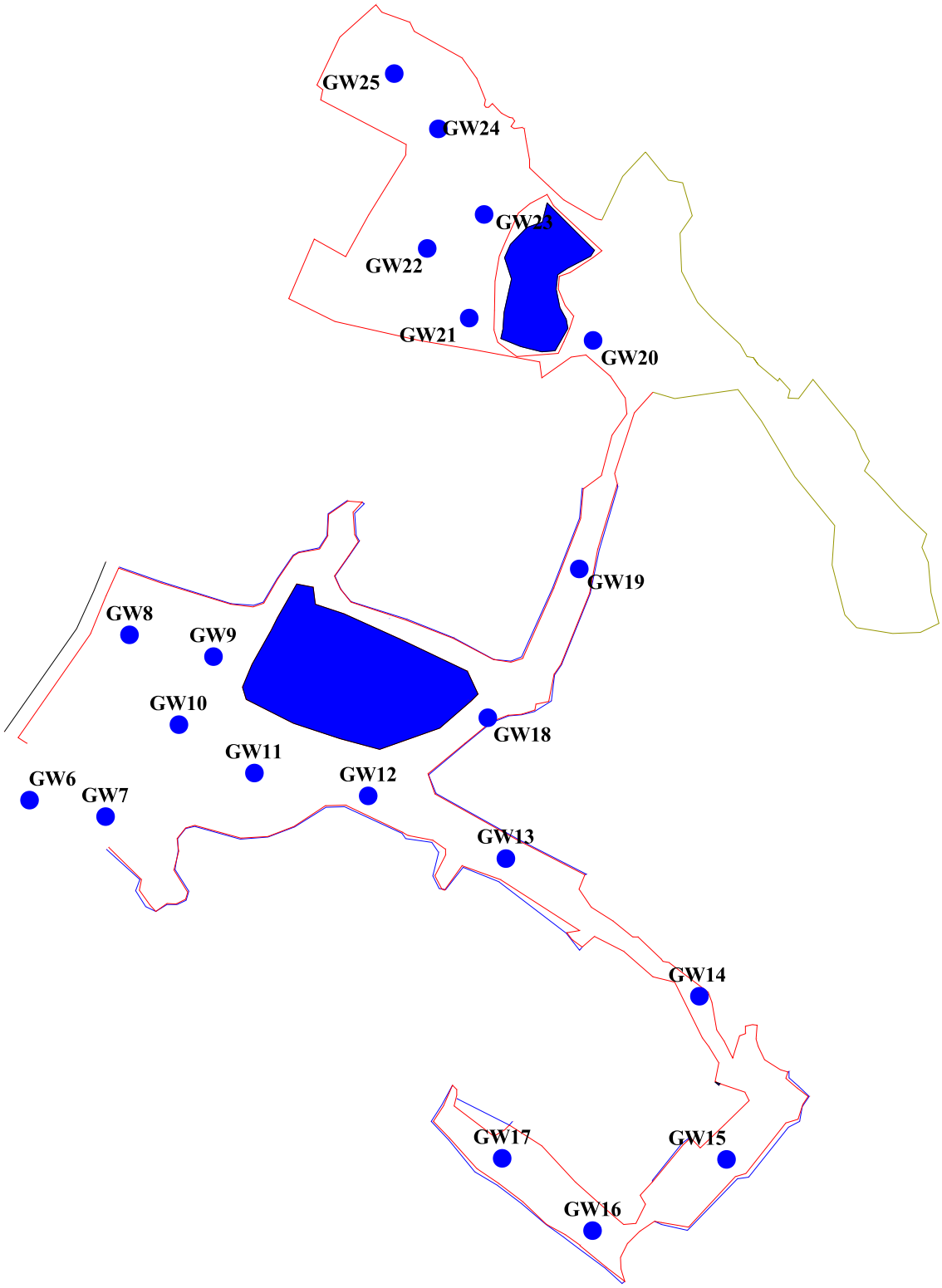
300 0 300 Feet

**Table 1.** 2004 Phase II Hydrologic Monitoring Results

| Monitoring Gauge | < 5% | 5 – 8% | 8 – 12% | > 12.5% | Actual % | Success Dates |
|---|---|---|---|---|---|---|
| GSP-GW6+ | | | | × | 32.4 | March 15-June 2<br>June 5-July 15<br>Aug 13-Sept 24 |
| GSP-GW7+ | | | | × | 100 | April 30-Nov 16 |
| GSP-GW8+ | | | | × | 100 | April 30-Nov 16 |
| GSP-GW9+ | | | | × | 100 | April 30-Nov 16 |
| GSP-GW10+ | | | | × | 100 | April 30-Nov 16 |
| GSP-GW11+ | | | | × | 35.6 | Aug 13-Nov 8 |
| GSP-GW12+ | | | | × | 100 | April 30-Nov 16 |
| GSP-GW13+ | | | | × | 100 | April 30-Nov 16 |
| GSP-GW14+ | | | | × | 100 | April 30-Nov 16 |
| GSP-GW15+ | | | | × | 100 | April 30-Nov 16 |
| GSP-GW16+ | | | | × | 100 | April 30-Nov 16 |
| GSP-GW17+ | | | | × | 98 | April 30-Nov 11 |
| GSP-GW18+ | | | | × | 100 | April 30-Nov 16 |
| GSP-GW19+ | | | | × | 100 | April 30-Nov 16 |
| GSP-GW20+ | | | | × | 100 | April 30-Nov 16 |
| GSP-GW21+ | | | | × | 100 | April 30-Nov 16 |
| GSP-GW22+ | | | | × | 33.6 | April 30-May 20<br>Aug 26-Nov 16 |
| GSP-GW23+ | | | | × | 100 | April 30-Nov 16 |
| GSP-GW24+ | | | | × | 54.7 | April 30-July 27<br>Aug 26-Nov 16 |
| GSP-GW25+ | | | | × | 100 | April 30-Nov 16 |

+ Gauge met the success criterion during an average rainfall month (February, April, May, August, September, October, and November).

Appendix A contains plots of the groundwater depth at each monitoring gauge location during 2004. In addition to documenting the water table level relative to the ground surface, these monitoring gauge graphs are designed to show the reaction of the groundwater level to specific rainfall events. The maximum number of consecutive days that the gauge indicates successful hydrology is noted on each graph. Precipitation events recorded by the onsite rain gauge are also included on each graph. Plots of the data recorded at each of the two surface water gauges are included in Appendix A.




**Phase II**

# Figure 3. 2004 Hydrologic Monitoring Results

Hydrology Results
- < 5%
- 5 - 8%
- 8 - 12%
- >12.5%

Rain Gauge
Surface Gauge

N

300 0 300 Feet

### *2.3.2 Climatic Data*

Figure 4 is a graph of monthly rainfall for the period of November 2003 through November 2004 compared to historical precipitation data (collected between 1973 and 2004) for Washington, North Carolina. The NC State Climate Office provided the rainfall data. The comparison of 2004 rainfall versus historical values gives an indication of how 2004 compares to historical climate conditions.

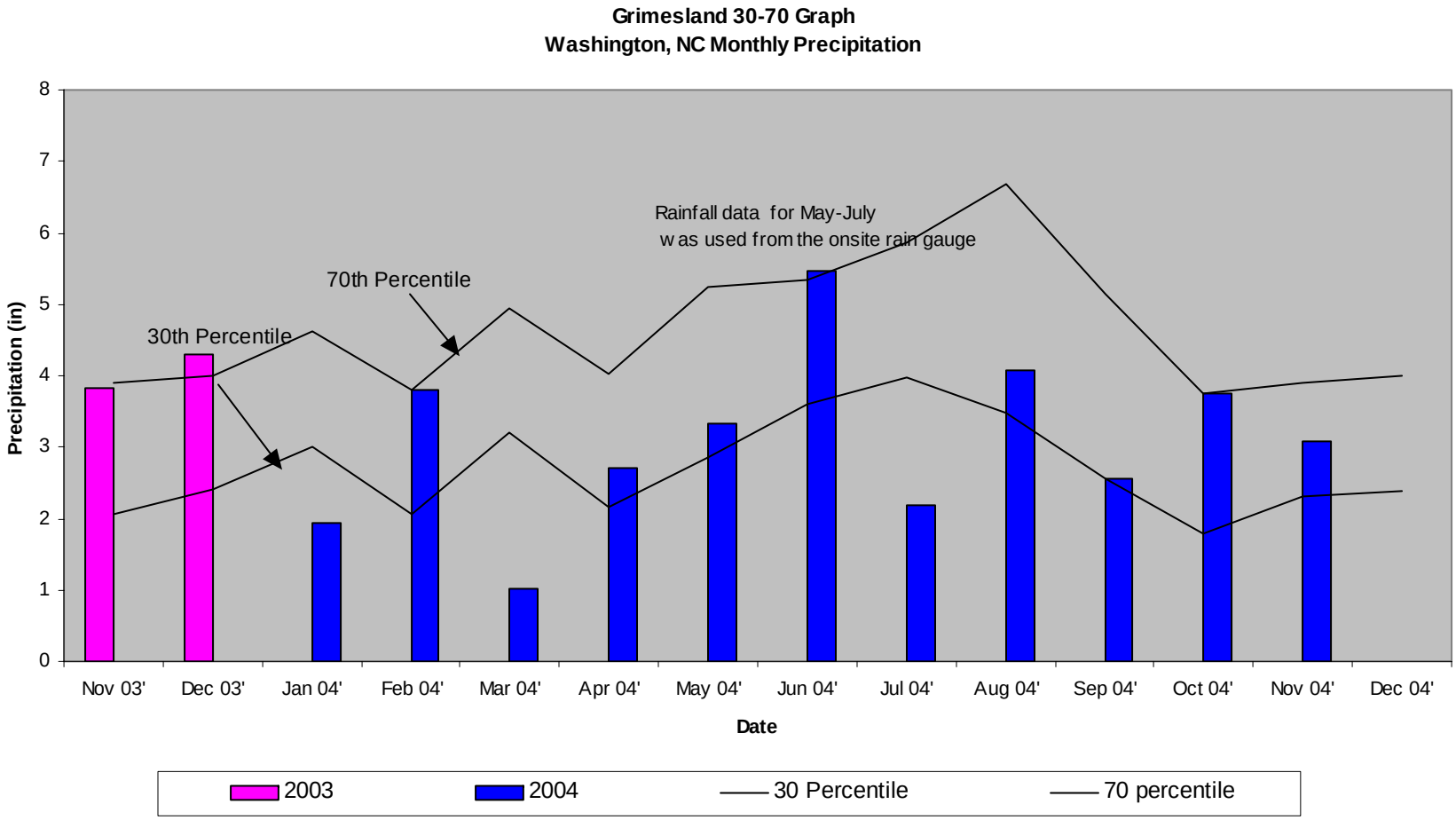
For the 2004 monitoring year, December (03') and June experienced above average rainfall. The months of January, March, and June recorded below average rainfall and November (03'), February, April, May, August, September, October, and November experienced average rainfall. Overall, 2004 experienced an average rainfall year.

## 2.4 CONCLUSIONS

The 2004-year concludes the second complete year of hydrology monitoring at the Grimesland Phase II Site. The 2004 data shows that the Phase II site met jurisdictional success with all twenty groundwater gauges exceeding the 12.5% minimum success criterion (fifteen gauges met for the entire growing season). A comparison of 2004 rainfall versus historical precipitation shows that 2004 experienced average rainfall conditions.

EEP will begin monitoring the hydrology at the Grimesland Phase II Mitigation Site for the 2005 monitoring year.

**Figure 4.** Grimesland Phase II 30-70 Percentile Graph, Washington, NC



# 3.0 VEGETATION: GRIMESLAND PIT MITIGATION SITE – PHASE II (YEAR 2 MONITORING)

## 3.1 SUCCESS CRITERIA

The success criteria state that there must be a minimum mean density of 320 trees per acre within three years of initial planting and a minimum count of 260 trees per acre must be achieved within five years of initial planting.

## 3.2 DESCRIPTION OF SPECIES

The following species were planted in the Wetland Restoration Area:

Phase II:

*Nyssa sylvatica* var. *biflora*, Swamp Blackgum

*Fraxinus pennsylvanica*, Green Ash

*Quercus phellos*, Willow Oak

*Quercus nigra*, Water Oak

*Taxodium distichum*, Baldcypress

*Quercus lyrata*, Overcup Oak

*Platanus occidentalis*, Sycamore

## 3.3 RESULTS OF VEGETATION MONITORING

**Table 2.** Vegetation Monitoring Statistics

| Plot # | Baldcypress | Green Ash | Swamp Blackgum | Water Oak | Willow Oak | Overcup Oak | Sycamore | Total (Year 2) | Total (at planting) | Density (Trees/Acre |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 7 | 9 | | 7 | 3 | 14 | 1 | 41 | 50 | 558 |
| 2 | 4 | 5 | | 3 | | 3 | | 15 | 31 | 329 |
| 3 | 3 | | 5 | 1 | 1 | 4 | | 14 | 31 | 307 |
| 4 | 11 | | 11 | | | | | 22 | 22 | 680 |
| 5 | 24 | 4 | 2 | | | 3 | | 33 | 45 | 499 |
| 6 | 3 | 10 | | | | | | 13 | 26 | 340 |
| 7 | 1 | 5 | 4 | | | | | 10 | 40 | 170 |
| | **AVERAGE TREE DENSITY** | | | | | | | | | **412** |

**Site Notes:** Other species noted: black willow, *Juncus* sp., woolgrass, cattail, *Cyperus* sp., *Scirpus* sp., smartweed, volunteer sycamore, volunteer swamp blackgum, and various grasses. Standing water 6” – 12” deep in plot 7.

## 3.4 CONCLUSIONS

Phase II consisted of approximately 48.8 acres of tree planting. There were seven vegetation-monitoring plots established throughout the Phase II planting areas. The 2004 vegetation monitoring of the site revealed an average tree density of 412 trees per acre in Phase II. This average is above the minimum success criteria of 320 trees per acre.

The EEP will begin monitoring the vegetation at the Grimesland Phase II Mitigation Site for the 2005 monitoring year.

## 4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

The Grimesland Sand Pit Phase II Mitigation Site was monitored for the second year in 2004. All twenty groundwater-monitoring gauges indicated jurisdictional success of at least 12.5% for the 2004-monitoring year, with fifteen gauges meeting for 100% of the growing season. An analysis of rainfall in nearby Washington, NC shows that the region experienced average rainfall for the year. Therefore, the site the met jurisdictional success criteria under average climatic conditions.

Approximately 48.8 acres of the site were planted; seven vegetation plots within this area are used for vegetation monitoring. The established success criteria state that the minimum survival rate in the first three years following planting is 320 trees per acre. Monitoring results showed an average survival rate of 412 trees per acre in the second year. Therefore, the vegetation exceeds the minimum success criteria.

Per the letter from the Ecosystem Enhancement Program (EEP) to NCDOT dated August 25, 2004, the EEP has accepted the transfer of all off-site mitigation projects. The EEP will be responsible for fulfilling the remaining monitoring requirements and future remediation for this project.

# APPENDIX A

# DEPTH TO GROUNDWATER CHARTS

# APPENDIX B

# SITE PHOTOS AND PHOTO AND PLOT LOCATIONS MAP

# Grimesland Pit – Phase II

Photo 1

Photo 2

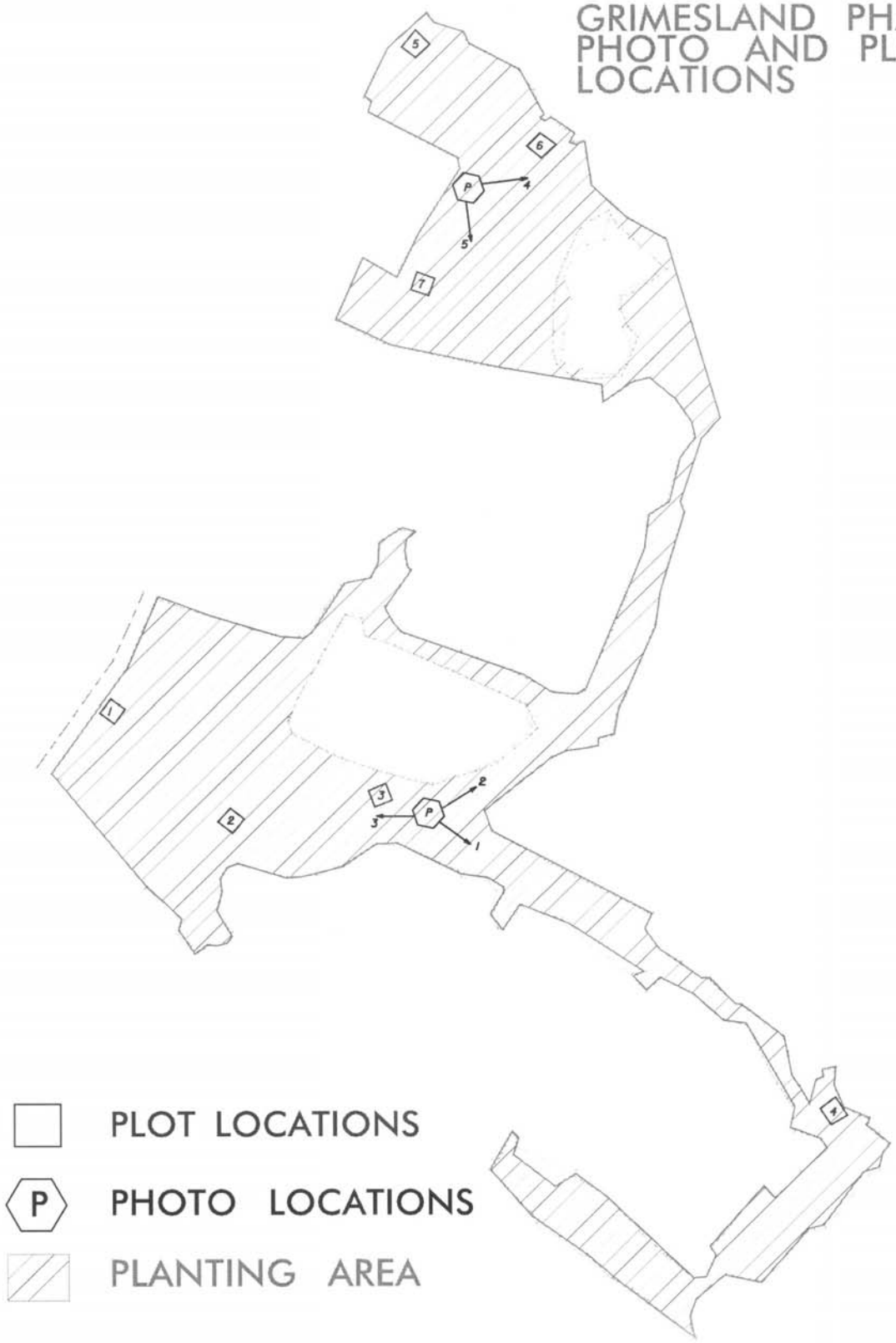
Photo 3

Photo 4

Photo 5

2004

# GRIMESLAND PHASE II PHOTO AND PLOT LOCATIONS




PLOT LOCATIONS

P PHOTO LOCATIONS

PLANTING AREA