

Charles Creek Park Wetland Restoration Mitigation Plan

Pasquotank County, North Carolina



March 2007

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Cataloging Unit – 03010205 Pasquotank County
SCO – ID# 01-05612-01

Prepared For:



**S&
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1.0 EXECUTIVE SUMMARY

The Charles Creek Park Wetland Restoration project is located in the Pasquotank River Basin, Hydrologic Cataloging Unit 03010205. The site consists of approximately 2.13 acres along the southeast bank of Charles Creek near its confluence with the Pasquotank River. The restoration site is located in Charles Creek Park, owned by the City of Elizabeth City, in downtown Elizabeth City, NC.

The Charles Creek Park Wetland Restoration project restored wetland hydrology and the targeted cypress-gum swamp plant community onsite (Schafale and Weakley, 1990). The restoration of the Charles Creek Park riverine wetland consisted of re-grading previously filled wetlands to lower the site elevation to bring it closer to the water table and thereby restore wetland hydrology. The site was planted with native woody and herbaceous vegetation and seeded with a native herbaceous seed mix.

Site grading was initiated June 19, 2006 and completed on July 11, 2006. Grading lowered the overall elevation of the filled areas of the site and also created micro-topographic site features including sloughs and depressional pool areas (see Sheet 3 – Constructed Site Features and Monitoring Devices). At this time the exotic, invasive *Phragmites* was mechanically cleared and treated with herbicide.

Plant species were selected to restore the cypress-gum swamp community described by Schafale and Weakley (1990), designated as the target community in the Restoration Plan. Plantings were divided into two woody tree and shrub planting units as well as two herbaceous planting zones. Initial planting of native vegetation was completed in mid-July 2006. A variety of containerized trees and shrubs and herbaceous plugs were planted throughout the site. A series of balled and burlapped (B&B) bald cypress were planted around the perimeter and scattered throughout the site. Due to lack of availability, several species listed in the Planting Schedule shown in the Restoration Plan were replaced. The final list of species planted is provided later in this report. The size of the planted tree and shrub material was also reduced in an effort to lower overall construction costs. All installed trees and shrubs (other than B&B specimens) were 1-gallon containers and herbaceous plugs. Trees and shrubs were mulched with hardwood mulch. Graded areas were seeded with a temporary seed mix and covered with straw mulch. The interested reader is referred to the Restoration Plan for the general location of planting zones.

Site construction activities resulted in the restoration of approximately 1.16 acres of restored wetland and the enhancement of 0.60 acres. Site grading and the planting of native vegetation combined with the removal of exotic, invasive vegetation improves habitat and food supply for local wildlife. The restored and enhanced wetland areas will help to improve the water quality of Charles Creek through filtering of pollutants from run-off and decreased use of lawn maintenance chemicals in the park area. The restoration may prove to provide some minor water storage capacity during select rain events which may result in the reduction of localized flooding of the immediately

surrounding residential area. See Section 2.2 for a complete description of the Mitigation Goals and Objectives.

Designed by Soil & Environmental Consultants, PA and constructed by North State Environmental, the project will be monitored for five consecutive years or until the required success criteria have been met as outlined in the approved restoration plan (March 2005). Monitoring devices including groundwater monitoring gauges, a site rain gauge and vegetation monitoring plots were installed following the completion of construction and are shown on the As-built drawings. Year One monitoring activities will be initiated in 2007. See Section 3.0 for a complete description of the Monitoring Plan.

2.0 PROJECT BACKGROUND

2.1 Pre-Existing Site Conditions

This section describes pre-existing site conditions at the Charles Creek Park based on field data recorded by Soil & Environmental Consultants, PA, during the preparation of the approved Restoration Plan (March 2005).

2.1.1 General Site Description

The Charles Creek Park Riverine Wetland Restoration Site is located in downtown Elizabeth City in Pasquotank County, NC. The site is approximately 2.13 acres and is located along the southeastern bank of Charles Creek near its confluence with the Pasquotank River in the Pasquotank River basin (Cataloging Unit 03010205). The restoration site is located within a city park property owned by the City of Elizabeth City, in an urban residential area comprised primarily of single family homes. Charles Creek Park is bordered by a paved basketball court and Southern Avenue to the west, Dawson Street to the south, Hunter Street to the east and Tuscarora Avenue and Charles Creek itself to the north.

A majority of the site was filled in order to create the city park and was a maintained turf grass area with some remnant areas of cypress-gum swamp along Charles Creek and the two unnamed tributaries within the project site. The unnamed tributaries enter the site through culverts under surrounding streets. One tributary flows west under Hunter Street and across the north edge of the site until its confluence with Charles Creek. The other tributary flows north into Charles Creek through the center of the property essentially bisecting the restoration site. The natural areas onsite contained many large bald cypress trees.

2.1.2 Site Vegetation

Much of the Charles Creek Park Wetland Restoration site was mowed grass and maintained landscaping with some areas of cypress-gum swamp forest. The existing vegetation was characterized by a canopy layer of many large Bald Cypress (*Taxodium distichum*) located along the Charles Creek water line. A more densely vegetated area just east of the tributary that bisects the site contained a sparse shrub layer of Privet (*Ligustrum* sp.), Black Willow (*Salix nigra*), Swamp Rose (*Rosa palustris*) and Wax Myrtle (*Morella cerifera*) as well as Blackberry (*Rubus* sp.). The canopy layer in this area contained large Bald Cypress as well as a single large Pecan tree (*Carya illinoensis*). Throughout this vegetated area as well as along Charles Creek there is an herbaceous layer made up mostly of Soft Rush (*Juncus effusus*), Pickerelweed (*Pontederia cordata*), Cutgrass (*Leersia oryzoides*) and Giant Cane (*Arundinaria gigantea*).

Two problem areas of invasive, exotic plants existed onsite prior to restoration that may effect establishment of native vegetation. A large stand of Common

Reed (*Phragmites australis*) existed at the northeastern end of the restoration site along the unnamed tributary entering Charles Creek from the east. Additionally, a significant stand of Alligatorweed (*Alternanthera philoxeroides*) filled the herbaceous layer adjacent to Dawson Street just east of the unnamed tributary entering Charles Creek from the south. Privet (*Ligustrum* sp.), while evident, did not appear in sufficient quantity to indicate a problem.

2.2 Restoration Summary

The landscaped park areas adjacent to Charles Creek provided a viable opportunity for restoration of wetland hydrology and plant communities in an urban setting. Through grading of previously filled wetlands and planting of these and other denuded areas, this former cypress-gum swamp forest was returned to its natural state and attained associated ecological benefits while developing an aesthetically pleasing urban riverine wetland.

2.2.1 Mitigation Goals and Objectives

The specific goals and objectives of the Charles Creek Park wetland restoration as described in the Restoration Plan (March 2005) are to:

- 1) Restore and enhance wetland function, vegetative structure, and wildlife habitat to approximately 2 acres of lower coastal plain bald cypress-gum swamp,
- 2) Incorporate the restoration effort into the site's surrounding areas in an aesthetically pleasing manner that does not mark a significant departure from similar nearby cypress-gum swampland,
- 3) Retain valuable natural onsite assets (i.e., large existing bald cypress individuals) and incorporate them into the site restoration, and
- 4) Incorporate the site into the Elizabeth City community in a manner that is conducive to fostering public interest in wetland restoration.

2.3 Restoration Approach

The restoration design for the site was based on qualitative assessment, species lists for vegetative strata and techniques utilizing reference data sets and existing wetland conditions survey data. Reference data utilized in our design included the previously described reference data in the Charles Creek Park Wetland Restoration Plan (March 2005).

The implementation of the Restoration Plan resulted in the restoration of a previously impacted riverine wetland and the enhancement of natural habitat through the removal of fill, the removal of exotic invasive vegetation, and the planting of native vegetation based on reference wetland conditions. This restoration also provided a more appropriate

hydraulic connection of the pre-existing hydrologic regime and the local historic floodplain.

Hand auger borings and visual site assessment indicate that several inches of fill material overlays the residual site soils. This was confirmed based on a review of the Pasquotank County Soil survey, which indicates the presence of primarily Mattapex fine sandy loam in upland areas as well as Bibb and “swamp” mapped soils to lesser degrees. Restoration operations included removal of this fill material to expose residual soils. The resultant presence of groundwater closer to the soil surface in conjunction with the planting of appropriate vegetative species (tree, shrub, and herbaceous) supports the restoration approach.

A summary of the vegetation planted onsite is presented in the following table:

Common Name	Species	Size	Quantity
Baldcypress	<i>Taxodium distichum</i>	B&B	31
Baldcypress	<i>Taxodium distichum</i>	1-Gallon	124
Possumhaw	<i>Viburnum nudum</i>	1-Gallon	179
Willow Oak	<i>Quercus phellos</i>	1-Gallon	38
Sweetbay	<i>Magnolia virginica</i>	1-Gallon	35
TiTi	<i>Cyrilla racemiflora</i>	1-Gallon	94
Blueberry	<i>Vaccinium sp.</i>	1-Gallon	179
Water Oak	<i>Quercus nigra</i>	1-Gallon	10
Red Bay	<i>Persea palustris</i>	1-Gallon	169
Water Tupelo	<i>Nyssa sylvatica var. biflora</i>	1-Gallon	95
Fetterbush	<i>Leucothoe racemosa</i>	1-Gallon	165
Green Ash	<i>Fraxinus pennsylvanica</i>	1-Gallon	47
Pepperbush	<i>Clethra alnifolia</i>	1-Gallon	161
Buttonbush	<i>Cephalanthus occidentalis</i>	1-Gallon	173
Water Hickory	<i>Carya aquatica</i>	1-Gallon	11
Arrowwood	<i>Viburnum dentatum</i>	1-Gallon	94
Upright Sedge	<i>Carex stricta</i>	Plugs	225
Soft Rush	<i>Juncus effusus</i>	Plugs	225
Pickerel Weed	<i>Pontederia cordata</i>	Plugs	45
Lizard Tail	<i>Saururus cernuus</i>	Plugs	45
Olney's Bullrush	<i>Scirpus americanus</i>	Plugs	335
Woolgrass	<i>Scirpus cyperinus</i>	Plugs	340
Arrowhead	<i>Sagittaria latifolia</i>	Plugs	45
Stiff arrowhead	<i>Sagittaria rigida</i>	Plugs	45

A plan view of the general restoration and As-Built conditions for the site is provided in Plan Sheets 1 through 3 of Appendix B. Site Photographs are presented in Appendix A.

An as-built conditions evaluation of the site has been completed to ensure that site grading work was performed in general accordance with the restoration plan. The limited engineering survey included general site topography and other site features (including sloughs and depressional pools) and the location of the waters edge of Charles Creek and

the two unnamed tributaries within the restoration site. This data was collected using Total Station technology.

Based on a review of site data and our observations during and after construction the site appears to have been constructed in general accordance with the approved Restoration Plan and the associated permits.

2.4 Mitigation Summary Table

The table below gives a wetland summary for the Charles Creek Park Wetland project. Further As-Built data is provided in Appendix B.

Level of Restoration	Acreage	Proposed Credit Ratio	Resultant WMU's
Restoration	1.16		
Enhancement	0.60		
Open Water	0.17	n/a	n/a
Totals	1.93		

3.0 MONITORING PLAN

The project will be monitored for five consecutive years or until the required success criteria have been met as outlined in the approved Restoration Plan (March 2005). Monitoring devices were installed immediately following the completion of construction. As of the date of this report all necessary base-line data has been collected. 2007 will serve as Monitoring Year One.

3.1 Wetland Restoration Monitoring

The following physical, vegetative, and hydrologic monitoring will be performed on the Charles Creek Park restoration during the five year monitoring period:

3.1.1 Physical Monitoring

Physical monitoring will consist of inspection of the entire restoration site in order to visually assess the stability of wetland areas. Should any areas of significant erosion be identified, repair recommendations will be prepared. Representative site photos will be taken and included in the annual monitoring reports.

Site physical stability monitoring will be completed annually for five (5) consecutive years starting in January 2007.

3.1.2 Vegetation Monitoring

Four (4) vegetation monitoring plots were established throughout the restored wetland area. Monitoring plots are 10m x 10m squares with a groundwater monitoring gauge serving as one corner. The plot corners are marked with 1.5-inch diameter PVC pipes. See attached (Sheet 3 – Constructed Site Features and Monitoring Devices) for locations of vegetation plots.

All vegetation monitoring will occur within these observation plots throughout the monitoring period as long as they continue to be representative of the community. Plant species will be identified, live stems counted and photos will be taken of each vegetation monitoring plot.

Herbaceous planting areas will also be monitored. The marsh fringe and slough herbaceous planting zones will be visually evaluated for general success and percent cover. Herbaceous vegetation will be deemed successful if it displays a percent cover of 75 percent or greater at the end of the monitoring period.

During monitoring site visits, an evaluation of invasive or undesirable species will be performed. Observations will be focused on areas of previously treated *Phragmites* and infestations of Alligatorweed (*Alternanthera philoxeroides*) along the unnamed tributaries onsite. Recommendations will be made regarding necessary removal or treatments.

3.1.3 Hydrologic Monitoring

Monitoring will be performed to verify re-establishment of wetland hydrologic conditions in the Charles Creek Park restoration site. Groundwater levels are to be measured using Infinities USA, Inc., gauges with data loggers installed onsite.

A total of four (4) groundwater gauges have been installed onsite (CCP1 – CCP4). In addition, an Infinities USA, Inc. rain gauge with data logger was installed onsite to record amount of daily rainfall. See attached (Sheet 3 – Constructed Site Features and Monitoring Devices) for locations of groundwater and rain monitoring gauges. Gauge CCP3 will continue to serve as a reference gauge against which other gauge data will be compared.

3.2 Monitoring Schedule

As previously described, to ensure a stable wetland and vegetative and hydrologic success, monitoring will be conducted annually onsite for a period of five (5) years from the implementation of the restoration plan or until success criteria have been met.

Physical monitoring will occur in the later portion of the monitoring year. This visit will include a walk-through for the general evaluation (by observation) of the site and the collection of photographs at established photo points. Established photo point locations

are shown in Appendix B (Sheet 3). A plant survivability survey will be performed during the growing season on each of the tree and shrub vegetation plots. An evaluation of percent cover will be made in herbaceous planting zones. Hydrologic and rainfall data is recorded daily by the gauges onsite. Site visits will be made periodically to download gauge data and to inspect gauges to ensure proper function.

An Annual Monitoring Report will be prepared at the end of each year of monitoring. This report will be submitted to EEP for review no later than December 31st of the monitoring year. The monitoring report will summarize the general site conditions, the results of vegetative and hydrologic monitoring, and recommendations for necessary maintenance. Upon completion of Year One, monitoring activities will no longer be performed by S&EC, but coordinated by NCEEP.

3.3 Success Criteria

The Charles Creek Park Wetland Restoration will be considered physically successful if there are no significant areas of erosion and the site generally holds stable as compared with the as-built condition of the site.

Vegetation will be considered successful if the total number of planted live woody stems is at least 320 stems per acre through monitoring Year Three (3), 288 stems per acre after Year Four (4), and 260 stems per acre after Year Five (5) as per the approved Restoration Plan (March 2005). Additionally it is desired that no single species comprises more than 60% of the total number of live stems throughout the site. However allowances may be made to this depending on circumstances.

Hydrologic success is determined by groundwater level in relation to ground surface. In order to meet wetland hydrology, groundwater level must be within 12 inches of the ground surface for a period of time equaling approximately 8.5% of the growing season (but allowable between 5% and 12%). According to the Pasquotank County Soil Survey, the average growing season (number of frost-free days) is approximately 208 days long, typically lasting from April 7th to November 1st. Therefore a period of 18 consecutive days of successful hydrologic conditions during this period is desired for the site to be deemed successful. Again depending on specific site conditions including rainfall record and water surface elevations in Charles Creek, exceptions may occur.

4.0 MAINTENANCE AND CONTINGENCY PLANS

Should wetland stability, hydrology, vegetation success criteria not be fulfilled, a contingency plan will be developed by Soil & Environmental Consultants, PA (S&EC). In the case that wetland stability success criteria are not met, remedial actions may include but are not limited to stabilization, seeding and mulching. In the case that vegetation success criteria are not met, problem areas will be replanted and/or reseeded and monitoring operations will be extended accordingly. During Year One contingency plans will be coordinated and directed by S&EC and approved by NCEEP. Following Year One this work will be managed solely by NCEEP.

APPENDIX A



Photo 1 — West side facing Northeast



Photo 2 — West side facing Southwest



Photo 3 — Center of site facing North from Dawson Street



Photo 4 — East side facing Northwest



Photo 5 — Depressional Pool



Photo 6 — Depressional Pools

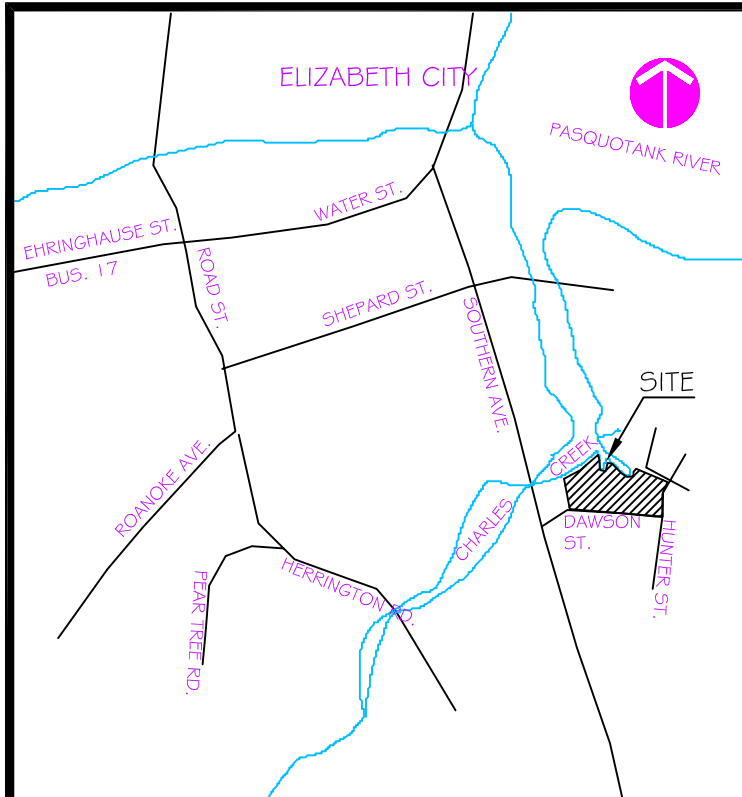


Photo 7 — Depressional Pools & Sloughs



Photo 8 — Center of site facing East

APPENDIX B



VICINITY MAP
NOT TO SCALE

AS-BUILT DRAWINGS FOR CHARLES CREEK PARK WETLAND RESTORATION PROJECT PASQUOTANK COUNTY, NC

CONTENTS:

1. COVER, CONTENTS, AND VICINITY MAP
2. CONSTRUCTION SITE BOUNDARY
3. CONSTRUCTED SITE FEATURES & MONITORING DEVICES

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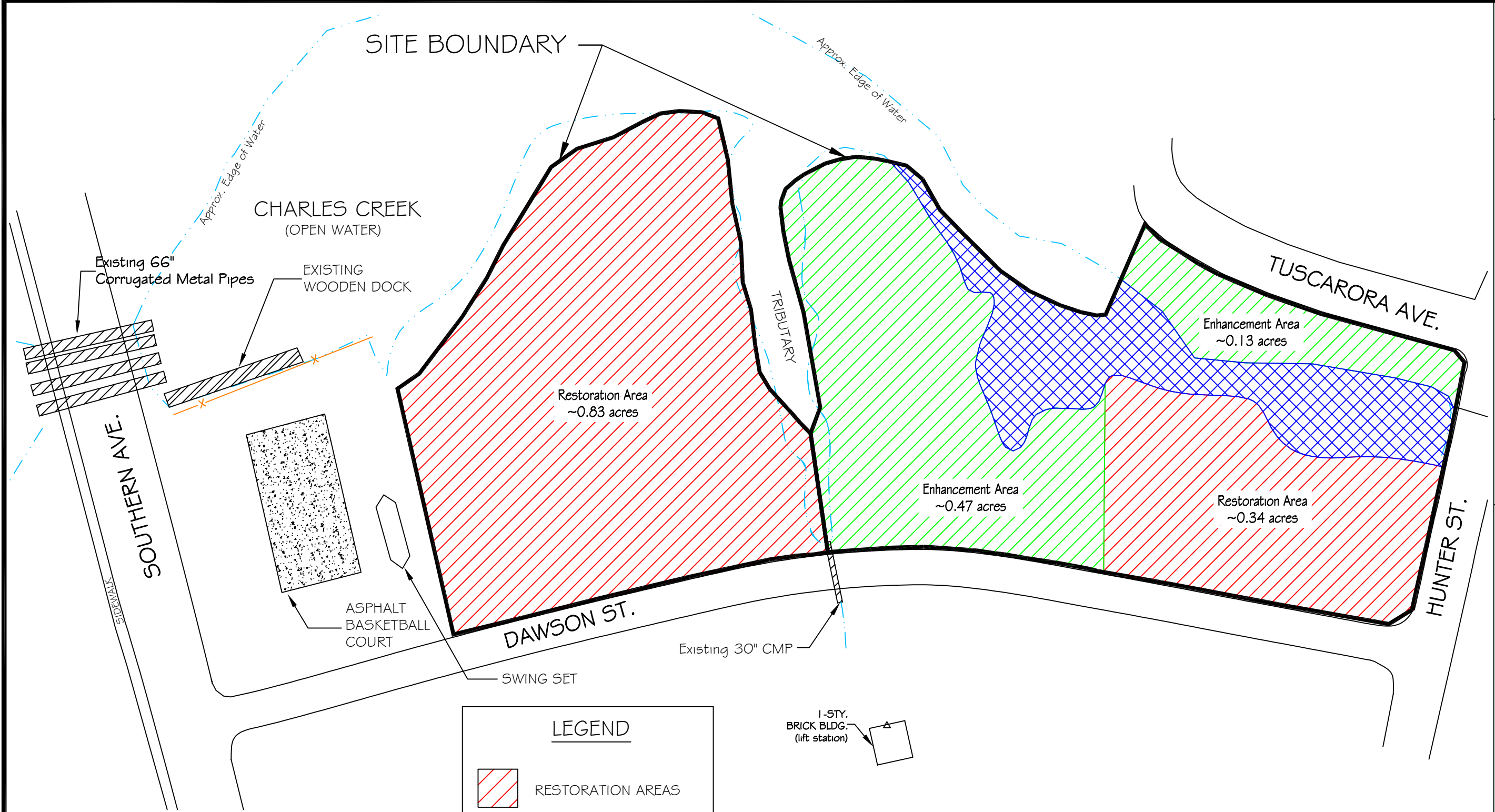
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Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM	
Location: PASQUOTANK CO., NC	
Sheet Title: COVER, CONTENTS, AND VICINITY MAP	
Sheet No.: 1 of 3	

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REV.	DESCRIPTION	DATE	APPROVED
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




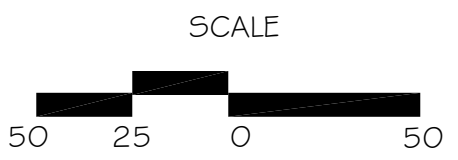
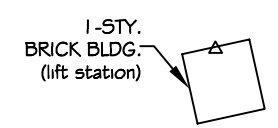
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- NOTES:
- 1) THIS MAP IS NOT A CERTIFIED SURVEY & HAS NOT BEEN REVIEWED BY A LOCAL GOVERNMENT AGENCY FOR COMPLIANCE WITH ANY APPLICABLE LAND DEVELOPMENT REGULATIONS. THIS IS NOT A BOUNDARY SURVEY.
 - 2) ALL PARCEL BOUNDARIES ARE APPROXIMATE AND SHOWN TO TYPIFY SITE AND SURROUNDING PROPERTIES.

LEGEND

	RESTORATION AREAS
	ENHANCEMENT AREAS
	OPEN WATER



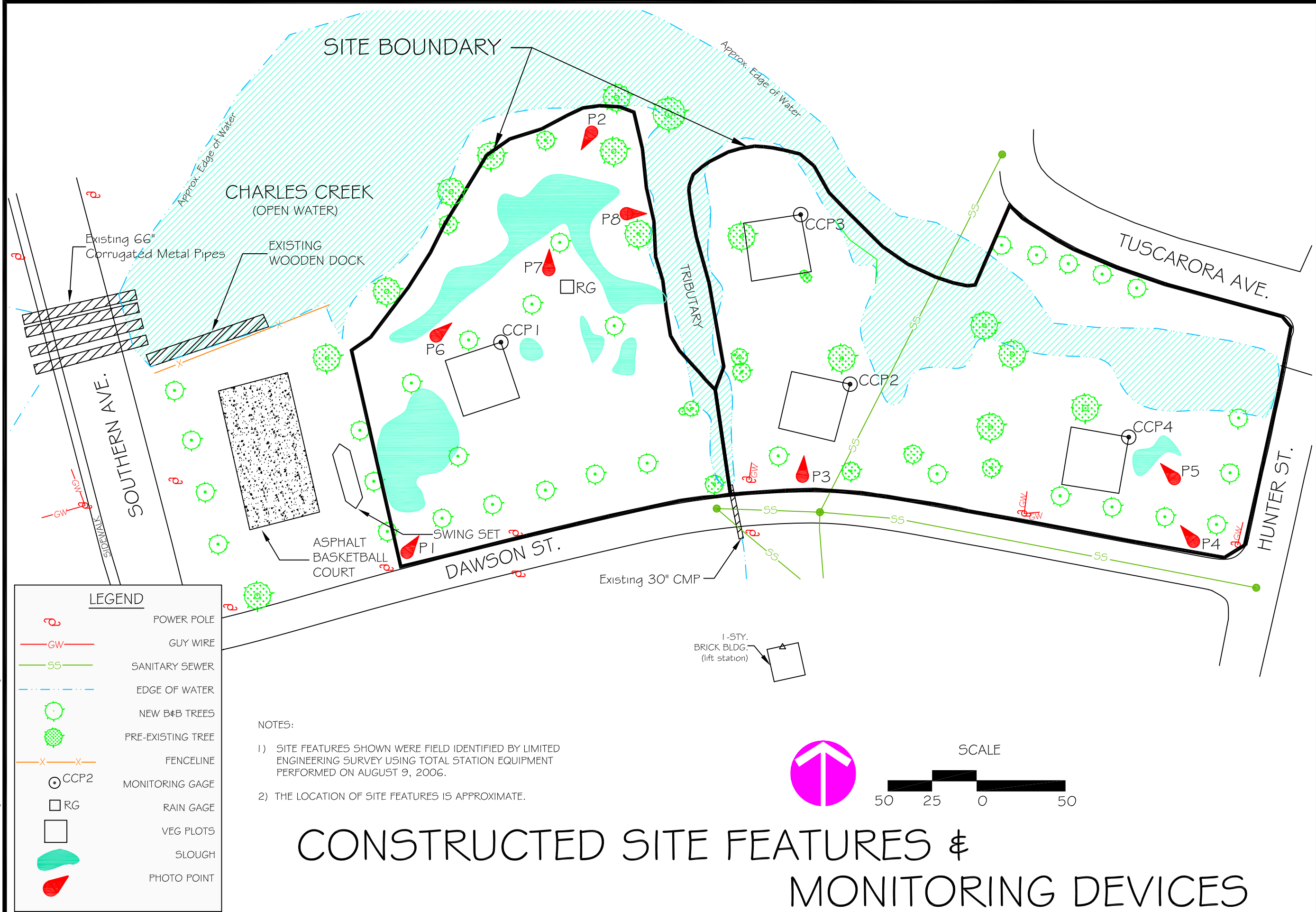
CONSTRUCTION SITE BOUNDARY

Project: CHARLES CREEK PARK WETLAND RESTORATION Location: PASQUOTANK CO., NC Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM	Project No.: 7281.D2 Designer: JMO, PKS Scale: 1" = 50' Sheet No.: 2 of 3
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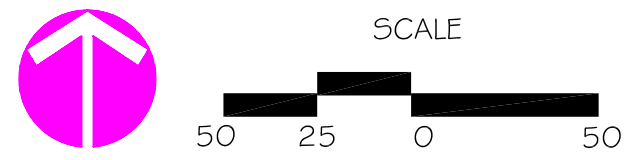
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LEGEND	
	POWER POLE
	GUY WIRE
	SANITARY SEWER
	EDGE OF WATER
	NEW B&B TREES
	PRE-EXISTING TREE
	FENCELINE
	MONITORING GAGE
	RAIN GAGE
	VEG PLOTS
	SLOUGH
	PHOTO POINT

- NOTES:
- 1) SITE FEATURES SHOWN WERE FIELD IDENTIFIED BY LIMITED ENGINEERING SURVEY USING TOTAL STATION EQUIPMENT PERFORMED ON AUGUST 9, 2006.
 - 2) THE LOCATION OF SITE FEATURES IS APPROXIMATE.



CONSTRUCTED SITE FEATURES & MONITORING DEVICES

Project No.: 7281.D2	Drawn: NMM
Designed: JMO, PKS	Scale: 1" = 50'
Sheet No.: 3 of 3	

Project: CHARLES CREEK PARK WETLAND RESTORATION

Location: PASQUOTANK CO., NC

Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

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