Bishop Road Wetland Mitigation Site
Monitoring Year 5 (2013)

Hyde County, NC
State Construction Office Project No. 05-0653802

EEP Project No. 38

Prepared for the
NC Department of Environment and Natural Resources
Ecosystem Enhancement Program

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Final Monitoring Report

December 2013

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This document is based on the NCDENR Ecosystem Enhancement Program's Monitoring Report Submission Template Version 1.2 (dated 11/06/06) in the Project Implementation Manual.

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Executive Summary/ Project Abstract

The Bishop Road Wetland Mitigation Site, hereinafter referred to as the Bishop Road Site or Project Site, is one of a group of sites purchased by the NC Department of Transportation (NCDOT) to meet its on-going mitigation needs throughout North Carolina. In 2006, the Project Site was turned over to the NC Department of Environment and Natural Resources, Ecosystem Enhancement Program (EEP) for project implementation. Construction was completed during the spring of 2009.

Ecological Engineering, LLP (Ecological Engineering) entered into contract with EEP in October 2009. As part of this contract, Ecological Engineering was tasked to provide annual monitoring services including, but not limited to annual vegetation assessments within the existing nine vegetation plots and the downloading of monitoring gauge data at 10 locations. During 2010, Ecological Engineering added three additional vegetation plots to the overall assessment. These plots were subsequently removed by EEP in early 2013. In 2012, two gauges were removed due to ongoing wildlife damage. Two additional gauges were removed in late 2013 due to malfunction. The downloading of gauge data occurred three times during 2013. Additional services, including gauge maintenance and replacement, were also provided, as necessary.

The Bishop Road Site is situated along SR 1156 (Bishop Road), between US 264 and the Pungo River in Hyde County, North Carolina (Figure 1). It is approximately one mile north of Scranton, five miles southeast of Leechville and ten miles east of Belhaven. The Project Site is bordered to the northwest by Tarklin Creek, the south by Scranton Creek and the west by the Pungo River. It is within the Tar-Pamlico River Basin, Hydrologic Unit Code (HUC) 03020104.

Vegetation Assessment

The Monitoring Year (MY) 5 vegetation monitoring effort was performed by determining density and survival of planted species, consistent with prescribed Carolina Vegetation Survey (CVS) protocols. Seven 100-meter^2 wetland and two 100-meter^2 marsh plot locations were assessed. Based on the 2013 assessment, the mean stem count for the seven wetland plots was 400 planted stems per acre and 2,271 total stems per acre. The MY 4 means were approximately 191 planted stems per acre and 2,146 total stems per acre. Six of the seven wetland plots met the 260-planted stem count threshold required for Year 5 results. The remaining two marsh plots were evaluated according to percent herbaceous coverage. One plot was at 98 percent and the other at 50 percent. Supplemental planting was performed in early 2013 to augment existing planted stems.

Wetland Assessment

Wetland assessments associated with the MY 5 monitoring effort were performed by collecting groundwater hydrology via monitoring gauges that record daily groundwater elevations. Based on the results, nine of 10 wells met the criteria established for wetland hydrology. The remaining gauge, a reference gauge, malfunctioned and the data was corrupt.

1.0 Project Background

1.1 Project Objectives

The project goals were to restore Site hydrology, restore natural diverse wetland communities and protect the Site from vehicle access, logging or development (EEP, 2009). These goals were accomplished by the following objectives:

- Removal of earthen roads and fill roadside drainage ditches;
- Removal of bedding rows in selected areas, replanting and establishing natural plant communities, non-riparian hardwood flats, coastal marshes and riverine forested wetlands; and,
- Purchase of the property fee simple, record a conservation easement for protection in perpetuity and installation of vehicle access barriers.

The system of measurement to determine successful implementation includes documentation of hydrology through groundwater monitoring wells, documentation of vegetation development through permanent 100-meter^2 plots and documentation of no vehicle access, logging or development through visual observation (EEP, 2009).

1.2 Project Structure

Mitigation components include coastal marsh restoration and preservation, riverine forested wetland restoration and preservation, non-riparian hardwood flat restoration and preservation and riparian buffer restoration. Figure 2 depicts the locations of each mitigation component. Exhibit Table 1 denotes the final calculated acreages of each component.

According to EEP (2009), the restoration types and amounts were modified during construction due to plant community nomenclature and inaccuracy of the topographic survey. These modifications deviate significantly from names and amounts presented in the 2006 Restoration Plan. Approximately 36.0 acres of non-riparian hardwood flat restoration were removed to reduce construction costs. The tidal freshwater marsh community is now referred to coastal marsh per the request of EEP and the NC Division of Coastal Management. A 2.2-acre section of tidal freshwater marsh/coastal marsh located west of Old Bishop Road was changed to non-riparian hardwood flat due to inaccurate survey elevations. The design was based on topographic survey information provided by a third party. Based on the survey elevations and its proximity to open water, this area was slated for marsh restoration. After the area was cleared during construction, it was obvious that the area was significantly higher than the survey depicted. A small section of non-riparian hardwood flat restoration (0.171 acres) was changed to riparian buffer restoration. This change resulted from the need of riparian buffer credits in the area (EEP, 2009). However, based on low stems counts within this area, buffer assets were determined not viable after this year's monitoring assessment.

Vehicle access barriers comprised of concrete Jersey barriers, an earthen berm and a metal gate were installed at strategic locations within the Project Site.

1.3 Restoration Type and Approach

1.3.1 Coastal Marsh Wetlands

According to EEP (2009), the restoration plan includes 0.343 acres of coastal marsh restoration at two locations. The first and larger area, covering 0.246 acres, is located at the northern end of Bishop Road along the main branch of Tarklin Creek. The area consisted of an earthen road bed approximately 32 feet wide and approximately 2.5 feet higher than the adjacent marsh. Restoration was accomplished by removing the earthen fill to an elevation within ±0.2 feet of the adjacent marsh. The restored area was planted with vegetation representative of the adjacent marsh, including black needle rush (*Juncus roemerianus*), Sawgrass *(Cladium jamaicense),* smooth cordgrass *(Spartina alterniflora)* and pickerelweed *(Pontederia cordata).* Soils in the marsh consist of Longshoal mucky peat, a hydric A soil (EEP, 2009).

The second and smaller area, covering 0.097 acres, is situated near the end of Silverthorne Road. Silverthorne Road crosses a small tidal slough of Scranton Creek at this location. There was no culvert under Silverthorne Road at this location. This disconnected the small slough upstream of Silverthorne Road from tidal flow. Sawgrass *(Cladium jamaicense)* is the dominant vegetation on the downstream (the tidal side) of the road. The upstream side was dominated by bare ground. This significant difference in vegetation is a result of the disconnection from tidal flow. The roadway was removed and graded to an elevation within ±0.2 feet of the adjacent slough elevations and replanted with the same suite of coastal marsh herbaceous vegetation as the above location. Soils in the area consist of Bolling loamy fine sand, a hydric B soil (EEP, 2009).

NC Division of Coastal Management (NCDCM) representative Steve Trowell inspected both coastal marsh restoration areas during construction. Final construction elevations of the coastal marsh areas were provided to NCDCM and concurrence was granted on May 26, 2009.

1.3.2 Non-Riparian Hardwood Flat Wetlands

According to EEP (2009), the non-riparian hardwood flat restoration areas include 56.3 acres of non-jurisdictional areas within the existing planted pine and roadbed areas throughout the Project Site. These areas exhibited hydric soils; however, they did not meet the other two parameters necessary for jurisdictional status. Non-riparian hardwood flat restoration was accomplished by clearing and grubbing non-jurisdictional 10 to 15 year old loblolly pine plantation then replanting the area with the appropriate wetland vegetation. The bedding rows were graded to a more natural contour. Existing roadways were also removed and adjacent ditches were filled with the roadbed material to the elevation of the adjacent non-riparian hardwood flat community. The depth of cut on the roadways averages around 1.5 feet. The depth of the adjacent ditches averaged around 2.5 feet. These areas were also replanted. Soils within the non-riparian hardwood flat restoration areas consist of Acredale silt loam, Argent loam, Chapanoke silt loam and Yeopin silt loam, all of which are hydric. The Site was cleared by first removing the pine trees. Trees were cut at the base, leaving the roots in the ground, and then chipped. The chips were hauled off site. Branches and bark were burned on site. The tree roots were grubbed using a “rake” attached to a track excavator. This also removed the bedding rows. Root material was burned on site (EEP, 2009).

1.3.3 Riverine Forested Wetlands

According to EEP (2009), the restoration plan provided restoration of 1.0 acre of riverine forested wetland. Riverine forested wetlands restoration was accomplished by removing an earthen road bed. The road material was used to fill drainage ditches adjacent to the roadbed. Target restoration elevations were designed to be within ± 0.2 feet of the adjacent target community elevations. An initial survey revealed that the desired elevations had not been met. The contractor was required to re-grade the area to design specifications. A post construction topographic survey verified that final elevations were within the target range. Soils within the adjacent riverine wetlands consist of Belhaven muck, a hydric A soil. Trees removed to accomplish the riverine wetland restoration were a few 10 to 15 year old loblolly pines located along the ditch banks. After clearing, grubbing and grading, the area was replanted with riverine wetland species, including bald cypress (*Taxodium distichum*), water tupelo (*Nyssa aquatica*), tag alder (*Alnus serrulata*) and various oaks (*Quercus* spp.) (EEP, 2009).

1.4 Location and Setting

The Bishop Road Site is situated along SR 1156 (Bishop Road), between US 264 and the Pungo River in Hyde County, North Carolina. It is approximately one mile north of Scranton, five miles southeast of Leechville and ten miles east of Belhaven. The Project Site is bordered to the northwest by Tarklin Creek, the south by Scranton Creek and the west by the Pungo River. The remainder of the Project Site is bordered by roads, managed timber areas, agricultural fields and wooded or undeveloped lands. The Project Site is within the Tar-Pamlico River Basin, Hydrologic Unit Code (HUC) 03020104.

1.5 Project History and Background

Based on information provided by EEP (2009), the Bishop Road Site was purchased in the spring of 2001 from Weyerhauser Corporation. As previously mentioned, NCDOT worked with a consultant to complete the original Wetland Mitigation Plan in 2004, a document that described existing and proposed conditions. In 2006, the Project Site was turned over to EEP for project implementation. During this time period, EEP contracted with the same consultant to update the document into a Restoration Plan. Once the document was approved, final design, quantity estimates, construction bidding and implementation proceeded. Construction was completed during the spring of 2009 (EEP, 2009).

Project history and background information is presented in the following four tables. The Final Wetland Restoration Plan (2006) denotes that the Project Site had been managed for timber since the early 1900's and was initially converted from its original vegetative community to pine plantation by removing the canopy vegetation. This was accomplished by first harvesting merchantable timber and then using techniques such as shearing, piling and burning of slash debris. The Project Site has been clear-cut and planted several times. The timber stands across the site were bedded to keep the roots of the planted pine seedlings above the water table.

Exhibit Table I. Project Restoration Components
Bishop Road Wetland Mitigation Site
SCO Project No. 05-0653802, EEP Project No. 38

Project Segment or Reach ID	Existing Acres	Restoration Level	Approach	Acreage	Stationing	Comments
Non-Riparian Hardwood Flat		R	R	56.3	n/a	Loblolly pine and road beds removed and replanted with suite of native species
Non-Riparian Hardwood Flat	332.5	n/a	P	332.5	n/a	-
Coastal Marsh Restoration - Bishop Road		R	R	0.246	n/a	Road beds removed and replanted with suite of native species
Coastal Marsh Restoration – Silverthorne Road		R	R	0.097	n/a	Road beds removed and replanted with suite of native species
Coastal Marsh Preservation	184.0	n/a	P	184.0	n/a	-
Riverine Forested Restoration		R	R	1.0	n/a	Road beds removed and replanted with suite of native species
Riverine Forested Preservation	61.7	n/a	P	61.7	n/a	-

R = Restoration
P = Preservation
Note that Riparian Buffer assets (0.171 acres) are no longer viable due to low stem counts.

Component Summations

Restoration Level	Stream (lf)	Riparian Wetland (ac)		Non-Riparian Wetland (ac)	Upland (ac)	Coastal Marsh (ac)
		Riverine	Non-Riverine			
Restoration	n/a	1.0	0	56.3	n/a	0.343
Enhancement	n/a	0	0	0	n/a	n/a
Enhancement I	n/a	0	0	0	n/a	n/a
Enhancement II	n/a	0	0	0	n/a	n/a
Creation	n/a	0	0	0	n/a	n/a
Preservation	n/a	61.7	0	332.5	n/a	184.0
High Quality Preservation	n/a	0	0	0	n/a	n/a
High Quality Preservation	n/a	0	0	0	n/a	n/a
Totals	n/a	62.7	0	338.80	n/a	184.343

Source: EEP, 2009

Exhibit Table II. Project Activity and Reporting History Bishop Road Wetland Mitigation Site SCO Project No. 05-0653802, EEP Project No. 38		
Activity or Report	**Data Collection Complete**	**Actual Completion or Delivery**
Restoration Plan	December 2006	August 2006
Construction	n/a	December 2008
Planting Activities	n/a	January 2009
Mitigation Plan / As-Built (Year 0 Monitoring – Baseline)	February 2009	July 2009
Year 1 Monitoring	November 2009	December 2010
Warranty Planting	n/a	March 2010
Year 2 Monitoring	November 2010	December 2010
Year 3 Monitoring	November 2011	December 2011
Year 4 Monitoring	November 2012	December 2012
Year 5 Monitoring	November 2013	December 2013

Exhibit Table III. Project Contact Table Bishop Road Wetland Mitigation Site SCO Project No. 05-0653802, EEP Project No. 38		
Designer ARCADIS G&M of North Carolina, Inc.	801 Corporate Center Drive Suite 300 Raleigh, NC 27607 Robert Lepsic, 919.854.1282	
Construction Contractor Kris-Grey Construction, Inc.	P.O. Box 499 Jamesville, NC 27846 Mitch Dotson, 252.799.6607 (mobile)	
Planting Contractor Habitat Assessment and Restoration Program, Inc.	9305-D Monroe Road Charlotte, NC 28270 Alan Peoples, 704.841.2841	
Seeding Mix Supplier (Permanent)	Ernst Seeds Meadville, PA 16335 800.873.3321	
Seed Mix Suppliers (Temporary)	Indian Creek Farms Midway, AL 888.307.8773 Evergreen Seed, LLC Rice, VA 23966	
Nursery Stock Suppliers	Mellow Marsh Farms Siler City, NC 919.742.1200 SC Super Tree Nursery Blenheim, SC 843.528.3943	Coastal Plain Conservation Nursery Edenton, NC 252.482.5707 Weyerhaeuser NR Company Atlanta, GA 800.221.4898
Monitoring Performer	Ecological Engineering, LLP 1151 SE Cary Parkway, Suite 101 Cary, North Carolina 27518	
Wetland Monitoring POC	Lane Sauls, 919.557.0929	
Vegetation Monitoring POC	Lane Sauls, 919.557.0929	

Source: EEP, 2009

Exhibit Table IV. Project Background Table Bishop Road Wetland Mitigation Site SCO Project No. 05-0653802, EEP Project No. 38	
Project County	Hyde
Drainage Area	n/a
Impervious Cover Estimate	<1%
Stream Order	n/a
Physiographic Region	Outer Coastal Plain
Ecoregion (Griffith and Omernik)	Chesapeake-Pamlico Lowlands and Tidal Marshes
Rosgen Classification of As-built	n/a
Cowardin Classification	n/a
Dominant Soil Types	Acredale, Argent, Hydeland
Reference Site ID	n/a
USGS HUC for Project and Reference	03020104120010
NCDWQ Sub-basin for Project and Reference	03-03-07
Any Portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment.	No
Reason for 303d listing or stressor	n/a
Percent of project easement fenced	0%

Source: EEP, 2009

2.0 Project Condition and Monitoring Results

Precipitation is one of the most critical factors in determining both vegetation and wetland success. During the past several years, Hyde and many other counties across North Carolina have faced below normal precipitation amounts. The Year 2013 results denoted wetter conditions than those experienced during the past several years. According to the NC Drought Management Advisory Council (2013), Hyde County has experienced only 11 weeks of abnormally dry conditions this year. For comparison, last year's results were 15 weeks of abnormally dry and nine weeks of moderate drought and 2011's results were seven weeks of abnormally dry, four weeks of moderate drought, five weeks of severe drought and eight weeks of extreme drought conditions.

2.1 Vegetation Assessment

Vegetation at the Project Site was assessed by general visual assessments and counting stems within the nine pre-determined vegetation plots. These plots are randomly scattered throughout the Project Site and used to determine the approximate stems per acre in and surrounding the plot location. Their locations are depicted on Figure 3. Assessments within each of the plots were completed using methodology prescribed by the CVS and EEP. Level II assessments were completed on seven of the nine plots. The two remaining plots were assessed using Level III assessment protocol, noting primarily cover percentages. Appendix A provides the vegetation related data and information including CVS-EEP output tables and photographic comparisons. Specific information regarding the CVS protocol is presented in Section 3.0.

2.1.1 Vegetation Problem Areas

Based on the annual field assessment, three vegetation problem areas exist at the Project Site. These areas are also depicted on Figure 3 and described in the following paragraphs.

For wetland mitigation success, the USACE et. al. (2003) denotes that planted stem counts should be no less than 260 planted stems after MY 5. Based on the field data collected in September 2013, six of the nine total vegetation plots met the success criteria. Two of these were the marsh plots, which exhibit herbaceous species and we subsequently evaluated for percent cover. The third plot, identified as Vegetation Plot #23 exhibited a planted stem count of approximately 40 stems per acre and a total stem count of 364 stems per acre. This plot is situated along a road bed at the headwaters section of Tarklin Creek. Fluctuations in water elevations, driven primarily by tidal flows, and the intrusion of salt water have been the likely reasons for poor vegetative success at the plot. A brief reconnaissance of the natural community surrounding the plot denotes that the existing swamp forest is being naturally converted to a marsh-type ecosystem.

Overall, stem count averages for seven of the nine total vegetation plots were 400 planted stems per acre and 2,271 total stems per acre. A supplemental planting was conducted in early 2013 to augment existing tree counts. Last year's data exhibited means for planted and total stems at 191 and 2,146 stems per acre as compared with the MY 3 results of 235 and 3,549 stems per acre, respectively.

Vegetation Plots #24 and #25, referred to as the marsh plots, were also investigated for percent cover. Neither exhibited any planted woody stems. Coverage estimates for Year 2013 were approximately 98 percent and 50 percent, respectively, which was better than or equal to last year's data 95 percent and

50 percent. These cover estimates have increased between 15 and 40 percent, respectively, as compared with MY 3 coverage estimates. The absence of planted stems throughout these two areas is likely the result of continuous high water levels during the initial planting and subsequent monitoring years. Exhibit Table V summarizes the vegetation criteria attainment.

Other existing problem areas are associated with exotic invasive vegetation, specifically common reed (*Phragmites australis*). This species is common to Hyde County, especially along roadside and utility rights-of-way, managed impoundments and upper marsh areas. Wind dispersion is the main culprit for the spread of common reed. EEP is currently utilizing a contractor to spray this species during the growing seasons of MY 3, MY 4 and MY 5. Based on the Site visit in November, only two small populations are present. These are situated along old roadbeds which have been previously treated. The current locations of controlled and remaining populations are also depicted on Figure 3.

2.2 Wetland Assessment

Wetland areas at the Project Site were assessed by hydrologic data collected and general visual observations. Hydrologic data was collected using a combination of 24 and 40-inch groundwater monitoring gauges (also referred to as wells or piezometers) that collect daily groundwater elevation levels. These monitoring gauges were placed adjacent to the eight of the existing vegetation plots. Four original reference monitoring gauges were strategically placed within the Project Site to act as control for existing and functional jurisdictional wetlands. Ongoing wildlife damage has resulted in the removal of two of these gauges. The remaining eight monitoring gauges document hydrology throughout the areas receiving mitigation credit. Figure 4 depicts all of the associated gauge locations. For hydrologic success, the restoration plan states that groundwater elevations must be within 12 inches of the ground surface for a consecutive period no less than 5% (approximately 12 days) of the growing season.

All 10 of the monitoring gauges met the hydrologic requirements of saturation within 12 inches of the ground surface for a period no less than 5 percent of the growing season. The growing season at the Project Site is estimated at 230 total days, ranging from March 27 through November 12. Nine gauges exceeded the saturation requirements for more than 12.5 percent of the growing season. The remaining gauge malfunctioned and data was not retrieved. It was a reference gauge.

Exhibit Table V summarizes the wetland criteria attainment. Additional information including charts comparing groundwater elevations with respect to precipitation amounts is provided in Appendix B.

2.2.1 Wetland Problem Areas

No wetland problem areas currently exist at the Project Site.

Exhibit Table V. Wetland Criteria Attainment Bishop Road Wetland Mitigation Site SCO Project No. 05-0653802, EEP Project No. 38					
Well ID	**Well Hydrology Threshold Met? Percentage?**	**Tract Mean**	**Vegetation Plot ID**	**Vegetation Survival Threshold Met?**	**Tract Mean**
MW# 7 (Reference)	Yes 100.0%	29%			
MW# 14 (Reference)	No (Malfunction)	10%			
MW# 17	Yes >12.5%	61%	VP# 17	Yes (364 stems/ac)	61%
MW# 18	Yes >12.5%		VP# 18	Yes (323 stems/ac)	
MW# 19	Yes >12.5%		VP# 19	Yes (485 stems/ac)	
MW# 20	Yes >12.5%		VP# 20	Yes (404 stems/ac)	
MW# 21	Yes >12.5%		VP# 21	Yes (283 stems/ac)	
MW# 22	Yes >12.5%		VP# 22	Yes (404 stems/ac)	
MW# 23	Yes >12.5%	10%	VP# 23	No (40 stems/ac)	10%
MW# 24	Yes >12.5%	29%	VP# 24	Not Applicable (98% cover)	29%
			VP# 25	Not Applicable (50% cover)	

Notes: Growing Season Length = 230 days
12.5% = 29 days
5% = 11 days

3.0 Methodology

This monitoring report follows methodology consistent with EEP's Content, Format and Data Requirements for EEP Monitoring Reports (Version 1.2, dated 11/16/06), available at EEP's website (http://www.nceep.net).

Vegetation assessments were conducted using the CVS-EEP protocol (Version 4.2). As part of this protocol, vegetation is assessed using 100-meter^2 plots, or modules. The scientific method requires that measurements be as unbiased as possible, and that they be repeatable. Plots are designed to achieve both of these objectives; in particular, different people should be able to inventory the same plot and produce similar data (Lee et. al., 2006).

According to Lee et. al. (2006), there are many different goals in recording vegetation, and both time and resources for collecting plot data are extremely variable. To provide appropriate flexibility in project design, the CVS-EEP protocol supports five distinct types of vegetation plot records, which are referred to as levels in recognition of the increasing level of detail and complexity across the sequence. The lower levels require less detail and fewer types of information about both vegetation and environment, and thus are generally sampled with less time and effort (Lee et. al., 2006). Level 1 (Planted Stem Inventory Plots) and Level 2 (Total Woody Stem Inventory Plots) inventories were completed on all nine of the vegetation plots at the Project Site. In addition, Level 3 (Community Occurrence Plots) inventories were conducted on the two marsh vegetation plots.

Level 1 plots are applicable only for restoration areas with planted woody stems. The primary purpose is to determine the pattern of installation of plant material with respect to species, spacing, and density, and to monitor the survival and growth of those installed plants. Level 1 plots are one module in size (Lee et. al., 2006).

Level 2 plots also are designed specifically for restoration areas and represent a superset of information collected for Level 1 plots. In these plots planted woody stems are recorded exactly as for Level 1, but in addition all woody stems resulting from natural regeneration are recorded by size class using separate datasheets. These plots allow an accurate and rapid assessment of the overall trajectory of woody-plant restoration and regeneration on a site. Level 2 plots are one module in size (Lee et. al., 2006).

Level 3 plots are used to document the overall abundance and vertical distribution of leaf area cover of the more common species in a plot. Cover is estimated for all plant species exceeding a specified lower level (typically 5% cover); species present but with cover lower than the cut-off may be ignored. The information can also be used to assess vegetation successional status as well as the presence and abundance of undesirable taxa such as invasive exotics. Additional environmental data are collected in Level 3 plots. Optionally, woody stem data required for Level 2 plots (tallies of planted and/or natural woody stems) may be collected for Level 3 plots to allow more accurate assessment of the rate and direction of succession. Level 3 plots are one module in size (Lee et. al., 2006).

Ten Ecotone WM (24 and 40-inch) Water Level Monitors record daily groundwater elevations across the Project Site. These gauges are downloaded electronically in person approximately three times per year.

4.0 References

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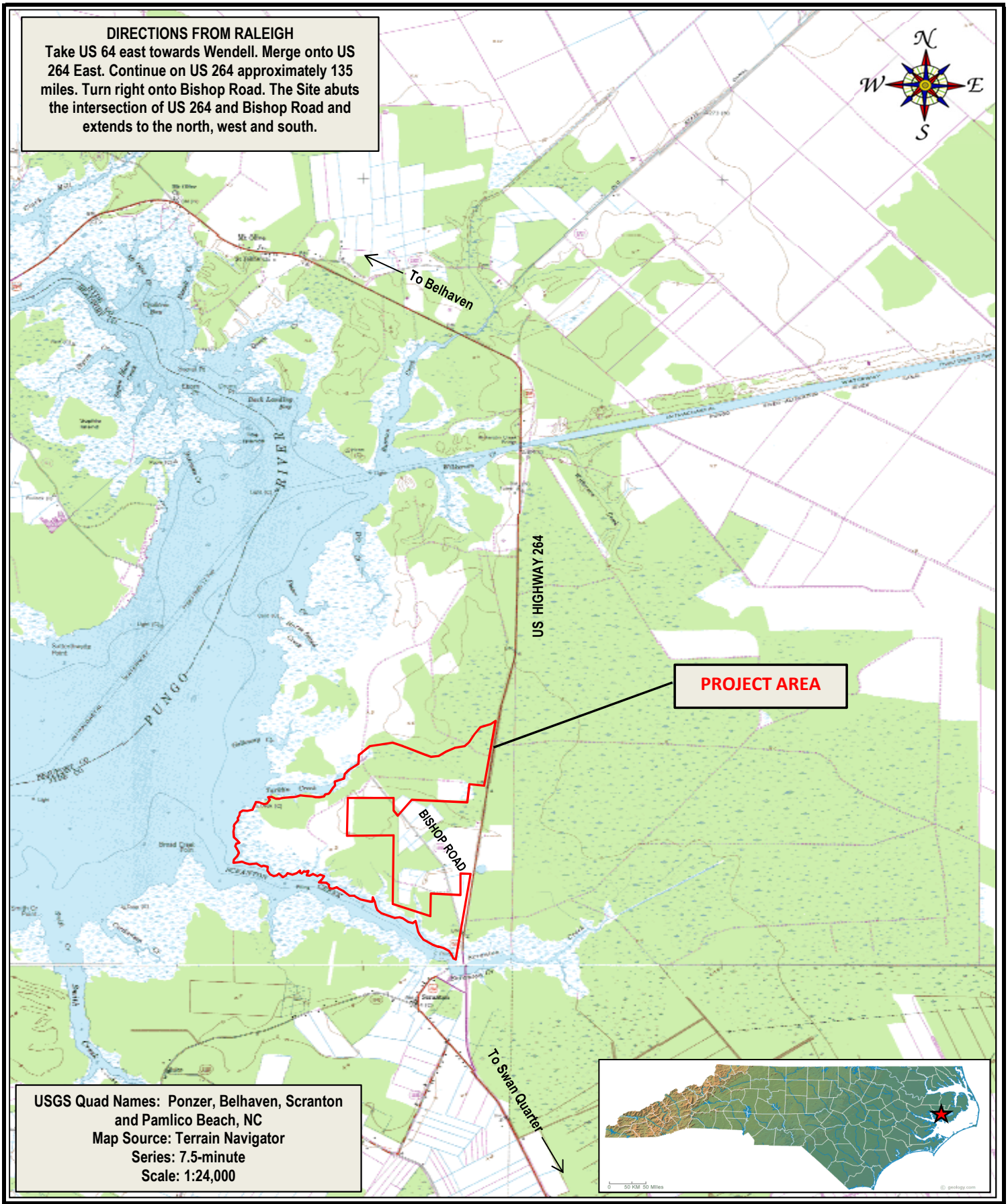


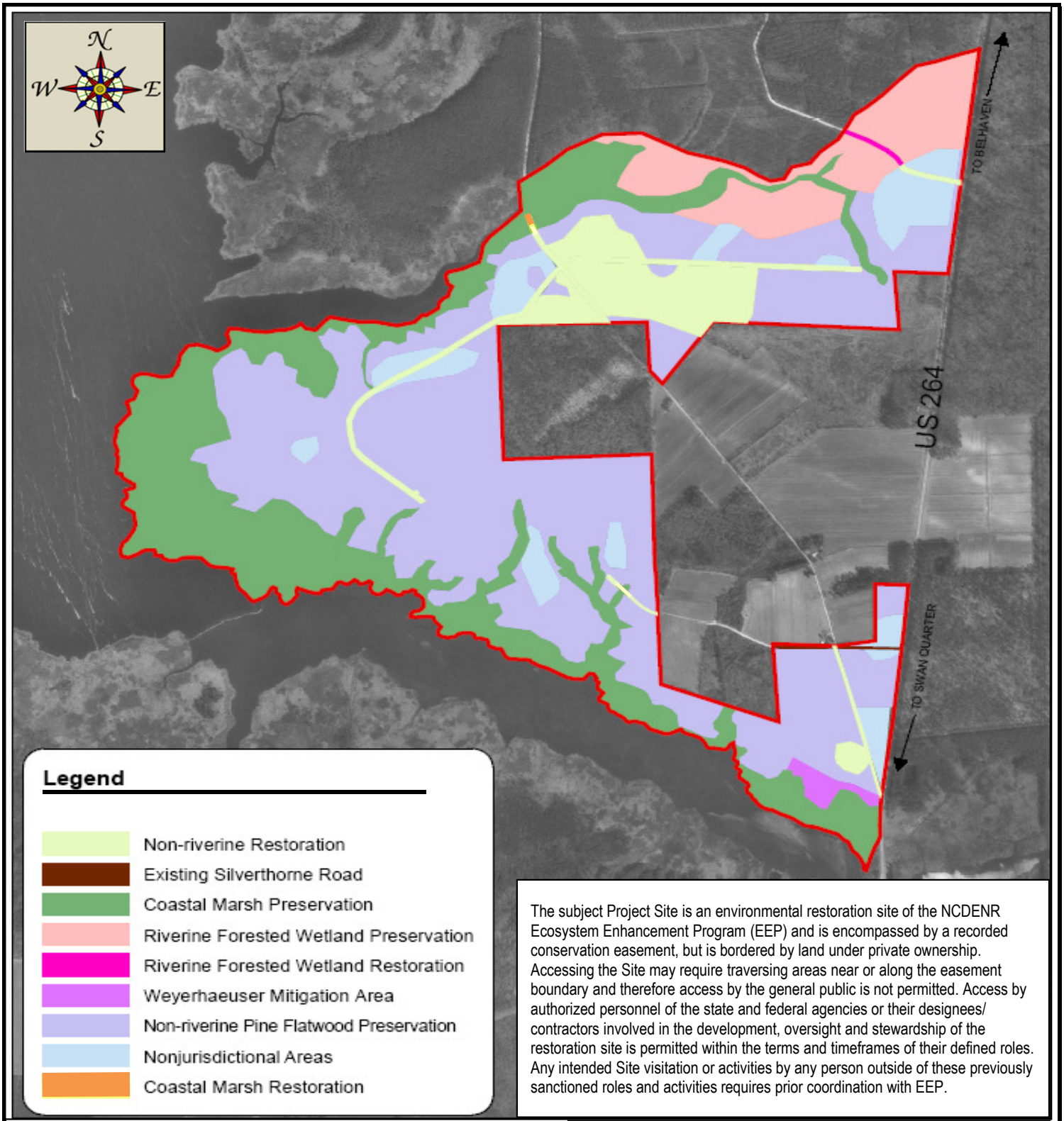
Ecosystem Enhancement Program

PROJECT SITE VICINITY MAP

Bishop Road Wetland Mitigation Site, Hyde County, NC

EEP Project No. 38 November 13, 2013

FIGURE 1

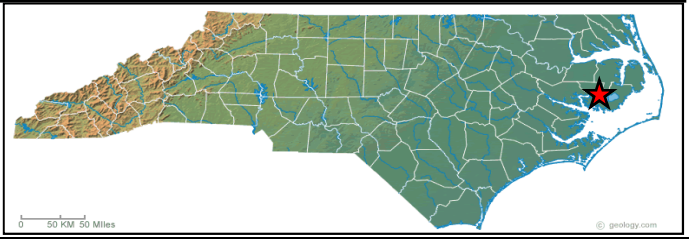


The subject Project Site is an environmental restoration site of the NCDENR Ecosystem Enhancement Program (EEP) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the Site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of the state and federal agencies or their designees/ contractors involved in the development, oversight and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended Site visitation or activities by any person outside of these previously sanctioned roles and activities requires prior coordination with EEP.

0 1,000 2,000 4,000 Feet

SCALE: 1:18,000

Image Sources: 1993 USGS DOQQ and EEP



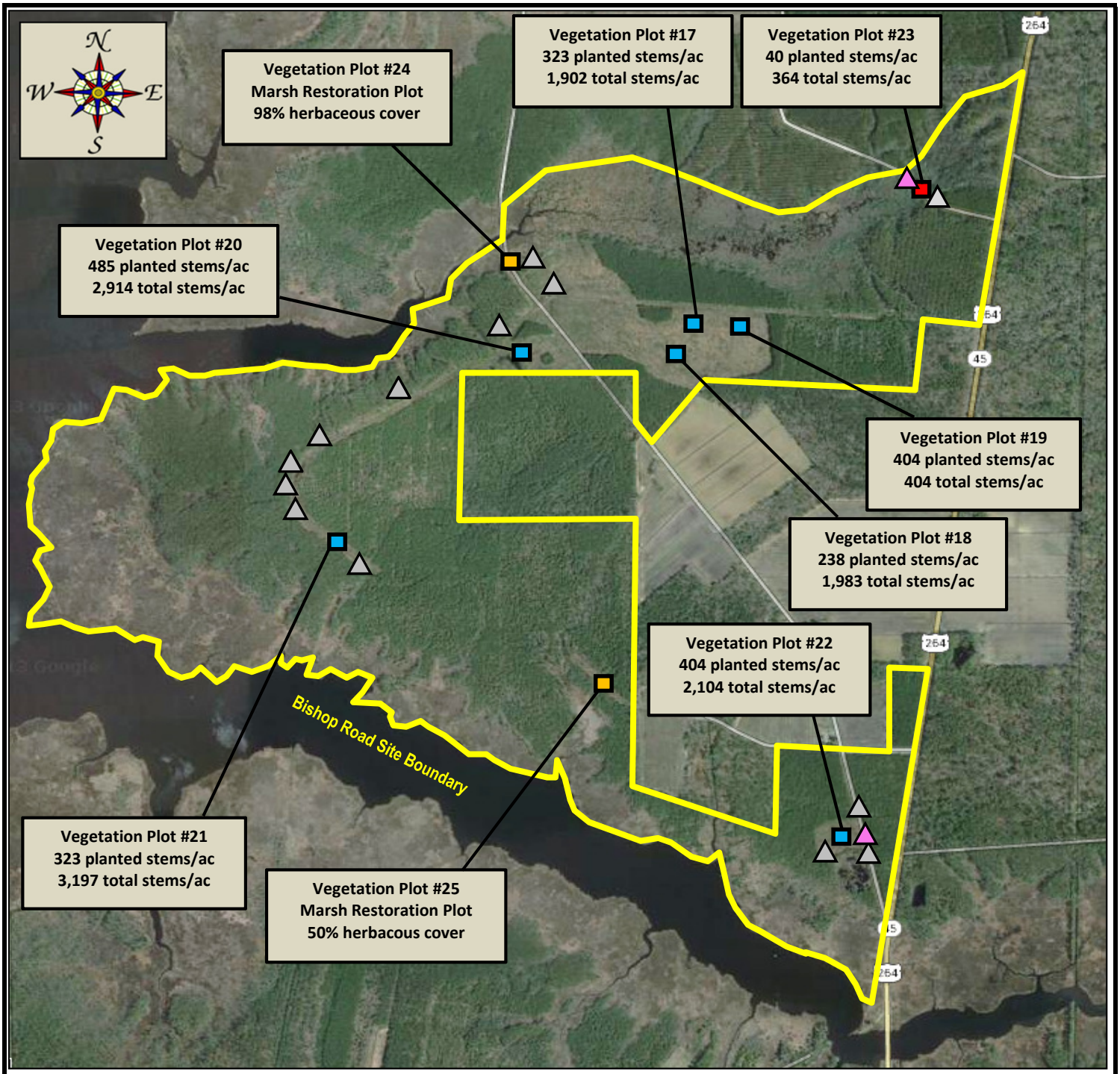
Ecosystem Enhancement Program

Project Attributes

Bishop Road Wetland Mitigation Site, Hyde County, NC

EEP Project No. 38 November 13, 2013

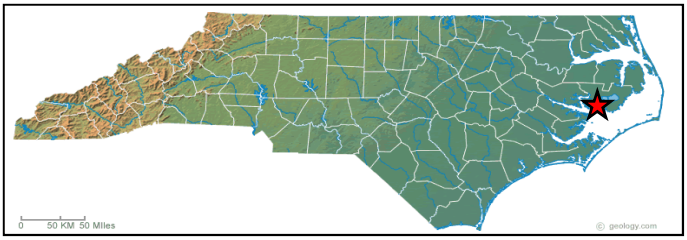
FIGURE 2



LEGEND

- Vegetation plot meets or exceeds mitigation expectations for Year 5 monitoring (≥260 planted stems/acre)
- Vegetation plots does not meed mitigation expectations for Year 5 monitoring (<260 planted stems/acre)
- Common reed (Phragmites australis) observed populations
- Common reed (Phragmites australis) previous treatment areas (2011 and 2012)

Aerial Photography Source: www.googlemaps.com
Not to Scale



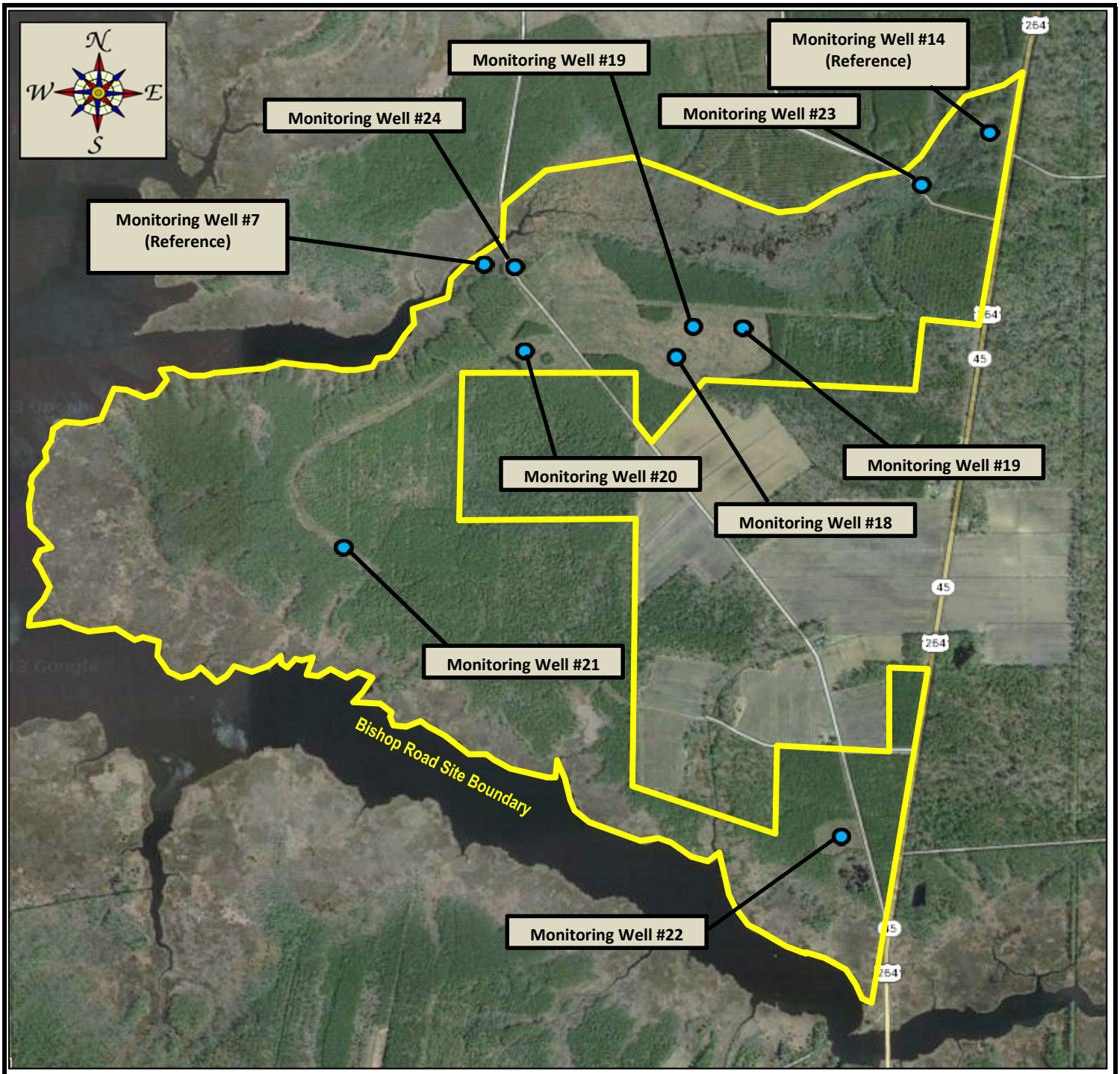
Ecosystem Enhancement Program

Vegetation Problem Areas Plan View

Bishop Road Wetland Mitigation Site, Hyde County, NC

EEP Project No. 38 November 13, 2013

FIGURE 3

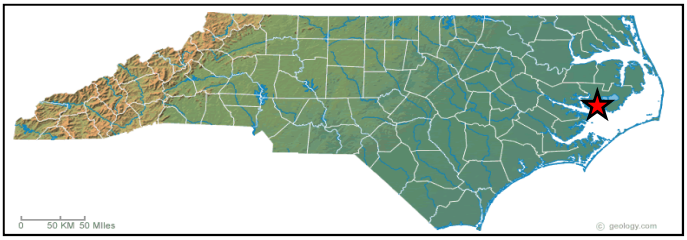


LEGEND

Monitoring well met 2013 hydrology criteria for mitigation

There are no known wetland problem areas at the Bishop Road Wetland Mitigation Site.

Aerial Photography Source: www.googlemaps.com
Not to Scale



Wetland Problem Areas Plan View

Bishop Road Wetland Mitigation Site, Hyde County, NC

EEP Project No. 38 **November 13, 2013**

FIGURE 4

Appendix A

Vegetation Raw Data and Annual Photograph Comparisons

APPENDIX A. Table 1. Vegetation Metadata Bishop Road Wetland Mitigation Site (EEP Project No. 38)	
Report Prepared By	Lane Sauls
Date Prepared	11/12/2013 15:40
database name	cvs-eep-entrytool-v2.3.1.mdb
database location	P:\50000 State\EEP 50512\50512-003 EEP Bishop Road\Bishop Year 5 2013 Monitoring\CVS Data YEAR 5
computer name	LANE
file size	51134464
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	38
project Name	BISHOP ROAD
Description	Bishop Road Wetland Mitigation Site
River Basin	
length(ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	12

APPENDIX A. Table 2. Vigor By Species
Bishop Road Wetland Mitigation Site (EEP Project No. 38)

	Species	CommonName	4	3	2	1	0	Missing	Unknown
	Aronia arbutifolia	Red Chokeberry			1				
	Baccharis halimifolia	eastern baccharis			8				
	Ilex glabra	inkberry			1				
	Nyssa aquatica	water tupelo						1	
	Quercus michauxii	swamp chestnut oak		1	1				
	Quercus pagoda	cherrybark oak		1	1			1	
	Quercus phellos	willow oak		4	11			1	
	Rosa palustris	swamp rose			3				
	Morella cerifera	wax myrtle		12	1			1	
	Ilex opaca	American holly						1	
	Quercus	oak		3	6			1	
	Magnolia virginiana	sweetbay			2			1	
	Nyssa	tupelo						1	
	Salix	willow						1	
TOTALS:	**14**	**14**		**21**	**35**			**9**	

APPENDIX A. Table 3. Vegetation Damage By Species
Bishop Road Wetland Mitigation Site (EEP Project No. 38)

	Species	CommonName	Count of Damage Categories	(no damage)	Diseased	Insects	Unknown	Vine Strangulation
	Aronia arbutifolia	Red Chokeberry	0	1				
	Baccharis halimifolia	eastern baccharis	8				8	
	Ilex glabra	inkberry	1			1		
	Ilex opaca	American holly	0	1				
	Magnolia virginiana	sweetbay	1	2			1	
	Morella cerifera	wax myrtle	1	13	1			
	Nyssa	tupelo	0	1				
	Nyssa aquatica	water tupelo	0	1				
	Quercus	oak	4	6			4	
	Quercus michauxii	swamp chestnut oak	0	2				
	Quercus pagoda	cherrybark oak	1	2				1
	Quercus phellos	willow oak	9	7		1	8	
	Rosa palustris	swamp rose	2	1			2	
	Salix	willow	0	1				
TOTALS:	**14**	**14**	**27**	**38**	**1**	**2**	**23**	**1**

APPENDIX A. Table 4. Vegetation Damage By Plot
Bishop Road Wetland Mitigation Site (EEP Project No. 38)

	Plot	Count of Damage Categories	(no damage)	(no stems on plot)	Diseased	Insects	Unknown	Vine Strangulation
	E38-1-Gauge17-year:5	2	8				2	
	E38-1-Gauge18-year:5	0	8					
	E38-1-Gauge19-year:5	3	9			2		1
	E38-1-Gauge20-year:5	6	6				6	
	E38-1-Gauge21-year:5	5	4		1		4	
	E38-1-Gauge22-year:5	10					10	
	E38-1-Gauge23-year:5	1	3				1	
	E38-1-Gauge24-year:5			1				
	E38-1-Gauge25-year:5			1				
	E38-EEP-NWScranton-year:4			1				
	E38-EEP-SWScranton-year:4			1				
	E38-EEP-TarklinCreek-year:4			1				
TOTALS:	**12**	**27**	**38**	**5**	**1**	**2**	**23**	**1**

APPENDIX A. Table 5. Planted Stems By Plot and Species
Bishop Road Wetland Mitigation Site (EEP Project No. 38)

	Comment	Species	SpType	CommonName	Total Planted Stems	# plots	avg# stems	plot E38-1-Gauge17-year:5	plot E38-1-Gauge18-year:5	plot E38-1-Gauge19-year:5	plot E38-1-Gauge20-year:5	plot E38-1-Gauge21-year:5	plot E38-1-Gauge22-year:5	plot E38-1-Gauge23-year:5	plot E38-1-Gauge24-year:5	plot E38-1-Gauge25-year:5	plot E38-EEP-NWScranton-year:4	plot E38-EEP-SWScranton-year:4	plot E38-EEP-TarklinCreek-year:4
		Aronia arbutifolia	Shrub	Red Chokeberry	1	1	1			1										
		Baccharis halimifolia	Shrub Tree	eastern baccharis	8	1	8						8							
		Ilex glabra	Shrub	inkberry	1	1	1			1										
		Magnolia virginiana	Shrub Tree	sweetbay	2	1	2					2								
		Morella cerifera	Shrub Tree	wax myrtle	13	5	2.6	3	4	2	2	2								
		Quercus	Shrub Tree	oak	9	5	1.8	1	2	1	2	3								
		Quercus michauxii	Tree	swamp chestnut oak	2	2	1		1	1										
		Quercus pagoda	Tree	cherrybark oak	2	1	2			2										
		Quercus phellos	Tree	willow oak	15	6	2.5	4		2	5	1	2	1						
		Rosa palustris	Shrub	swamp rose	3	1	3				3									
	n/a: no stems				0	5									0	0	0	0	0	
TOTALS:	**1**	**10**	**10**	**10**	**56**	**11**		**8**	**7**	**10**	**12**	**8**	**10**	**1**	**0**	**0**	**0**	**0**	**0**	

Appendix A Table 6. Vegetative Problem Areas
Bishop Road Wetland Mitigation Site (EEP Project No. 38)

Feature/Issue	Station/Range	Probable Cause	Photo #
Vegetation Plot #23	n/a	Inundation, Salt Water Intrusion	VP -23
Vegetation Plot # 24	n/a	Inundation	VP - 24
Vegetation Plot # 25	n/a	Inundation	VP - 25
Phragmites australis	n/a	Invasive Species	n/a

APPENDIX A. Table 7. Planted and Total Stem Count Summary

EEP Project Code 38. Project Name: BISHOP ROAD

			Current Plot Data (MY5 2013)																											Annual Means														
			E38-1-Gauge17			E38-1-Gauge18			E38-1-Gauge19			E38-1-Gauge20			E38-1-Gauge21			E38-1-Gauge22			E38-1-Gauge23			E38-1-Gauge24			E38-1-Gauge25			MY5 (2013)			MY4 (2012)			MY3 (2011)			MY2 (2010)			MY1 (2010)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubum	red maple	Tree			6			3																							9			13			22								
Aralia spinosa	devil's walkingstick	Shrub						1																							1			1			1								
Aronia arbutifolia	Red Chokeberry	Shrub							1	1	1																			1	1	1	1	1	1	1	1	1	1	1	1	1			
Baccharis halimifolia	eastern baccharis	Shrub			9			15						27			18	8	8	42			8							8	8	119	8	8	264	8	8	464	8	8	167			
Clethra ahifolia	coastal sweetpepperbush	Shrub						1																							1						14								
Ilex glabra	inkberry	Shrub							1	1	1																			1	1	1	1	1	1	1	1	1	1	1	1				
Ilex opaca	American holly	Tree																															1	1	2	1	1	1	2	2	2				
Iva frutescens	Jesuit's bark	Shrub																																	14			14			30				
Liquidambar styraciflua	sweetgum	Tree			6																										6			27			29							
Magnolia virginiana	sweetbay	Tree													2	2	2														2	2	2				1	1	1	1	1	1	2	2	2
Morella cerifera	wax myrtle	shrub	3	3	20	4	4	7	2	2	2	2	2	3	2	2	8			3											13	13	43	13	13	42	14	14	32	8	8	8	1	1	1
Myrica	sweetgale	shrub																																						6	6	6			
Nyssa	tupelo	Tree																															1	1	1	1	1	1						
Nyssa aquatica	water tupelo	Tree																																						1	1	1			
Persea	bay	Tree																																	1									
Pinus taeda	loblolly pine	Tree						4						16			47			3															98			85			4			
Quercus	oak	Tree	1	1	1	2	2	2	1	1	1	2	2	2	3	3	3														9	9	9	9	9	9	11	11	11	22	22	22	6	6	6
Quercus michauxii	swamp chestnut oak	Tree				1	1	1	1	1	1																				2	2	2	2	2	2	2	2	2	1	1	1	3	3	3
Quercus nigra	water oak	Tree						1																									1					2						
Quercus pagoda	cherry bark oak	Tree							2	2	2																				2	2	2	3	3	3	3	3	3	1	1	1			
Quercus phellos	willow oak	Tree	4	4	4				2	2	2	5	5	5	1	1	1	2	2	2	1	1	1								15	15	15	15	15	16	11	11	11	4	4	4			
Rhus copallinum	flameleaf sumac	shrub						10						14						2													26			49			127						
Rosa palustris	swamp rose	Shrub										3	3	3																	3	3	3	3	3	3	3	3	3	5	5	5			
Salix	willow	Shrub or Tree																																	1			1	1	2						
Vaccinium	blueberry	Shrub			1			4						2																			7			6			15						
		Stem count	8	8	47	7	7	49	10	10	10	12	12	72	8	8	79	10	10	52	1	1	9	0	0	0	0	0	0	56	56	318	57	57	554	58	58	843	61	61	254	12	12	12
		size (ares)	1			1			1			1			1			1			1			1			1			9			10.671			10.671			10.671			1.671		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.22			0.26			0.26			0.26			0.04		
		Species count	3	3	7	3	3	11	7	7	7	4	4	8	4	4	6	2	2	5	1	1	2	0	0	0	0	0	0	10	10	18	11	11	20	13	13	23	13	13	15	4	4	4
		Stems per ACRE	323.749	323.749	1902.02	283.28	283.28	1982.96	404.686	404.686	404.686	485.623	485.623	2913.74	323.749	323.749	3197.02	404.686	404.686	2104.37	40.4686	40.4686	364.217	0	0	0	0	0	0	251.804	251.804	1429.89	216.166	216.166	2100.98	219.958	219.958	3196.98	231.336	231.336	963.266	290.618	290.618	290.618

Stem Counts Excluding Vegetation Plots 24 & 25 (marsh plots with no woody stems)				
	Stem Count	56	56	318
	Size (ares)	7		
	Size (ACRES)	0.14		
	Species Count	10	10	10
	Stems per Acre	400	400	2271.43

Color for Density

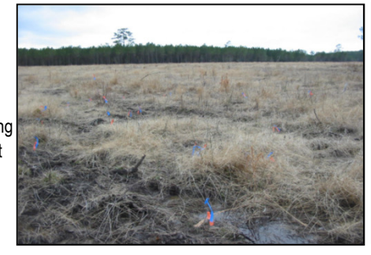
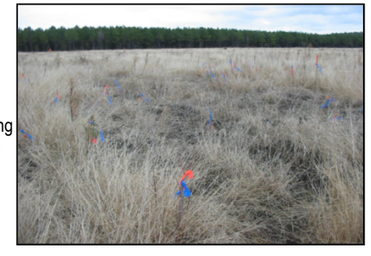
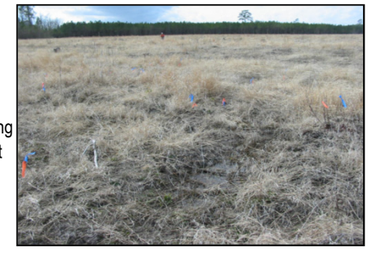
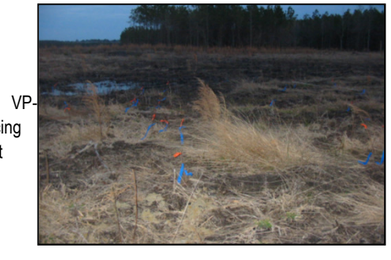
Exceeds requirements by 10%

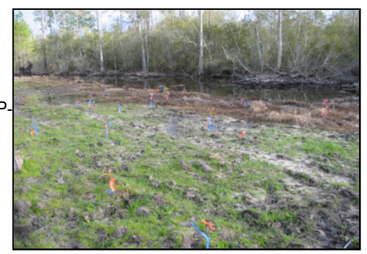
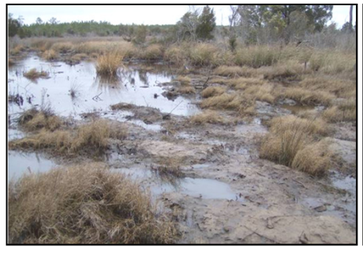
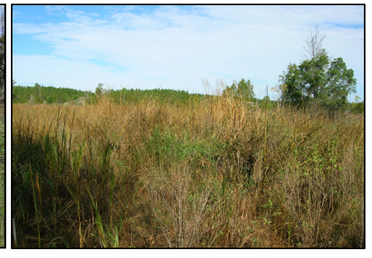
Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%

Bishop Road Wetland Mitigation Site Vegetation Plot Photograph Summary

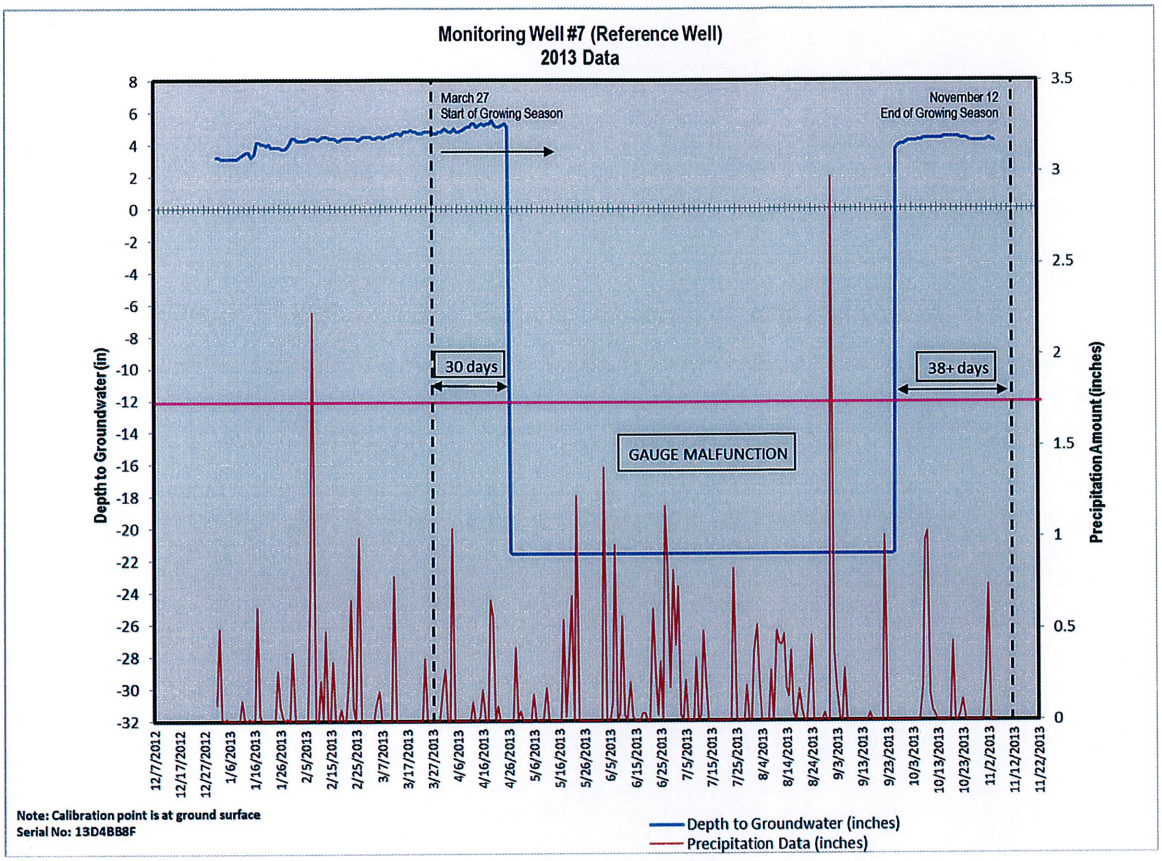
Photograph Information	February 12, 2009 Baseline	January 2010 Monitoring Year 1	July 2010 Monitoring Year 2	July 2011 Monitoring Year 3	July 2012 Monitoring Year 4	September 2013 Monitoring Year 5
Photo # VP-17 Facing Southwest						
Photo # VP-18 Facing Northeast						
Photo # VP-19 Facing Southwest						
Photo # VP-20 Facing East						
Photo # VP-21 Facing West						

Photograph Information	February 12, 2009 Baseline	January 2010 Monitoring Year 1	July 2010 Monitoring Year 2	July 2011 Monitoring Year 3	July 2012 Monitoring Year 4	September 2013 Monitoring Year 5
Photo # VP-22 Facing West						
Photo # VP-23 Facing North						
Photo # VP-24 Facing North						
Photo # VP-25 Facing North						
Photo # Scranton NW Facing Northwest						

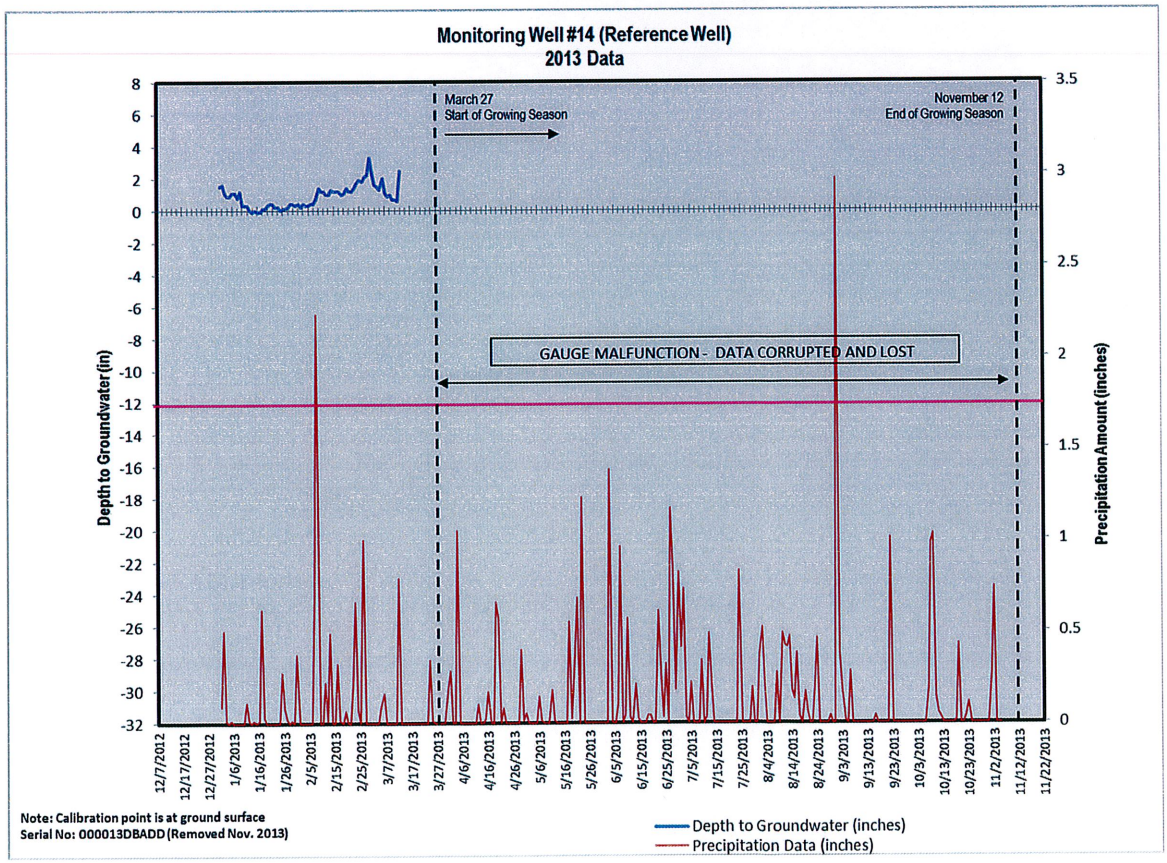
Photograph Information	February 12, 2009 Baseline	January 2010 Monitoring Year 1	July 2010 Monitoring Year 2	July 2011 Monitoring Year 3	July 2012 Monitoring Year 4	September 2013 Monitoring Year 5
Photo # Scranton SE Facing Northwest						
Photo # Tarklin Creek S Facing South						

Appendix B

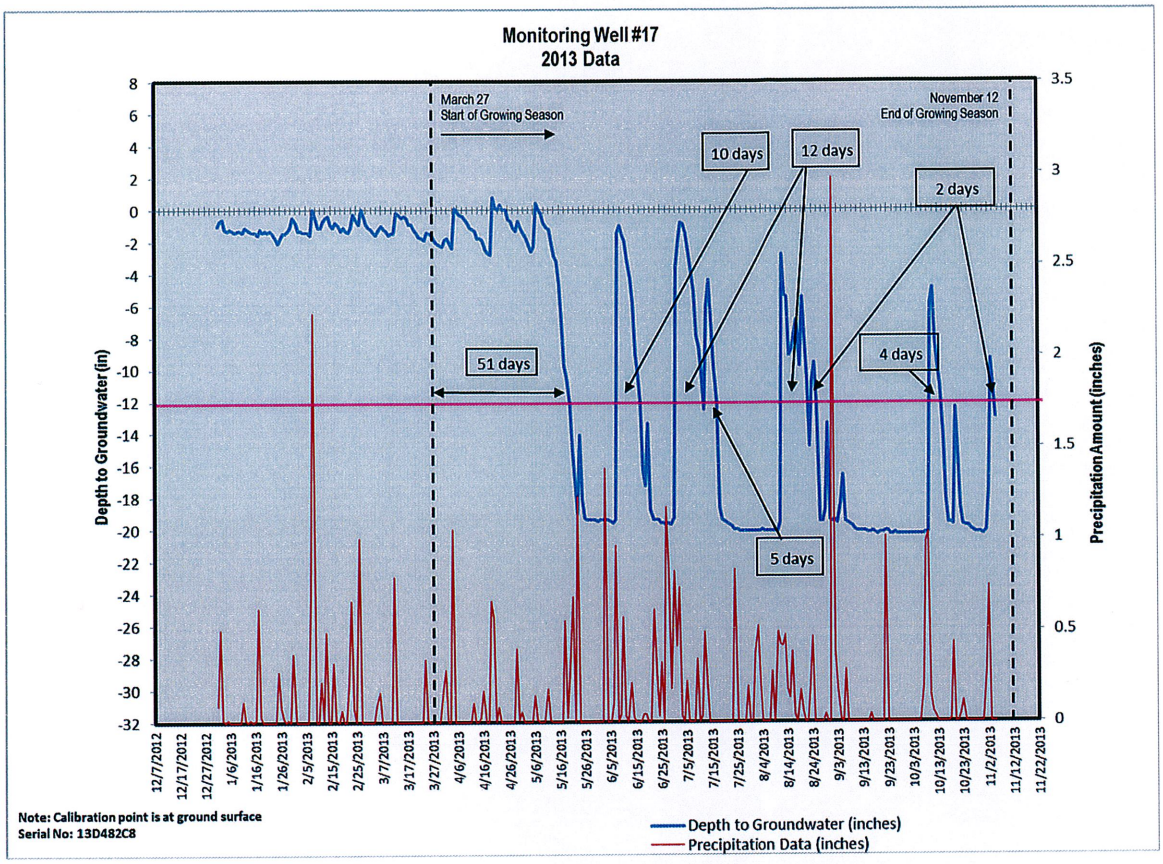
Wetland Raw Data

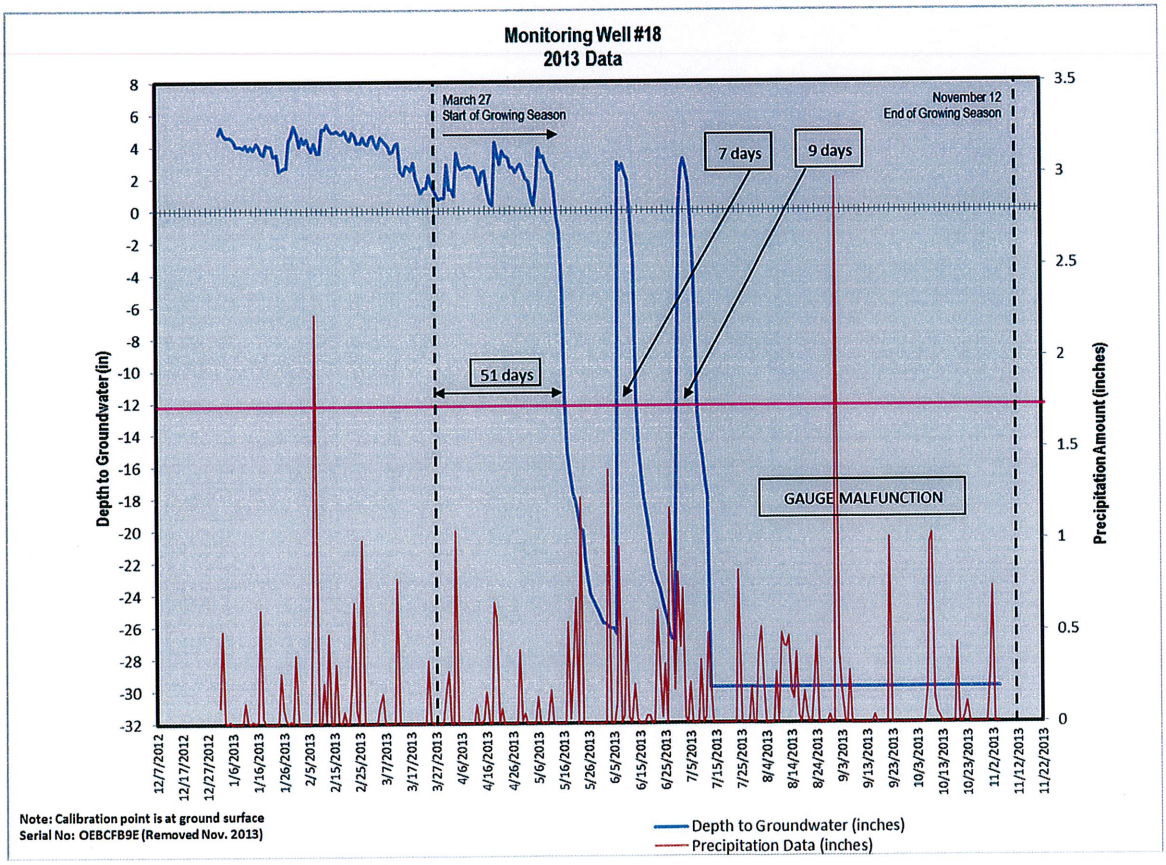


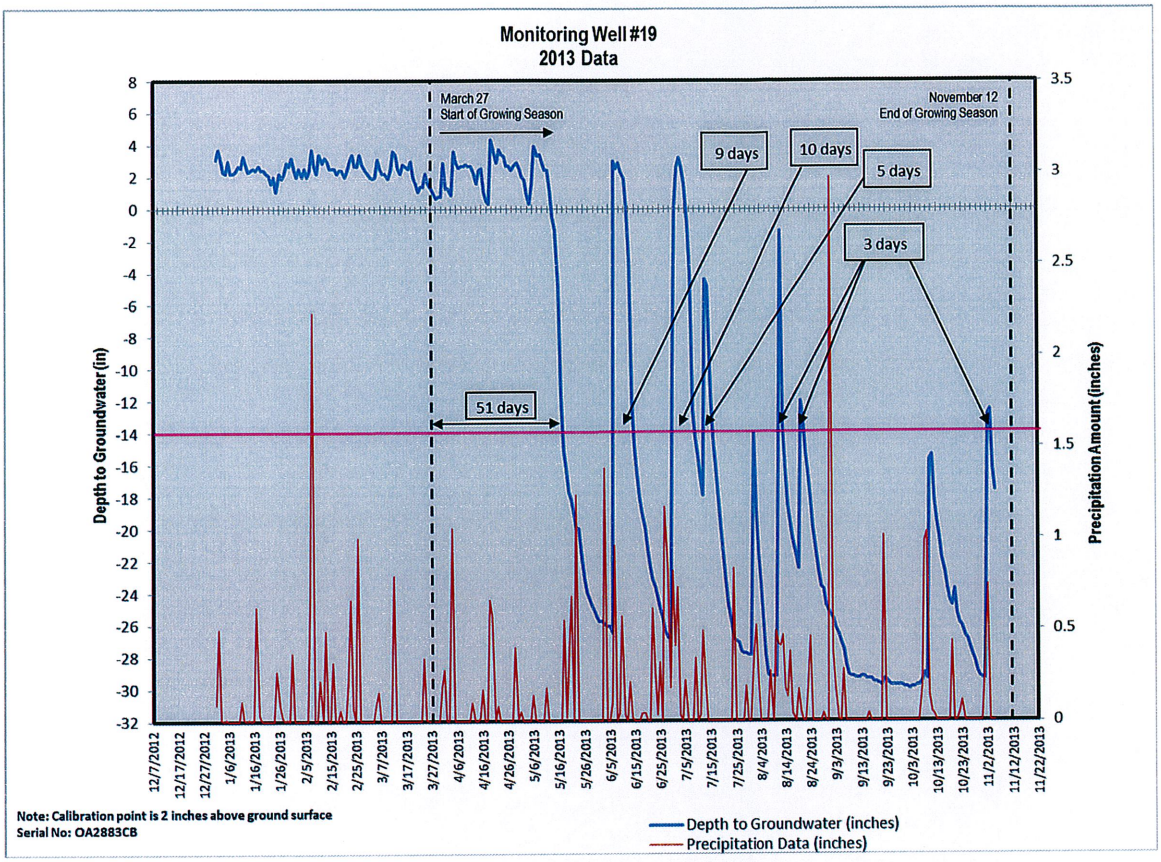
Note: Calibration point is at ground surface
Serial No: 13D4BB8F



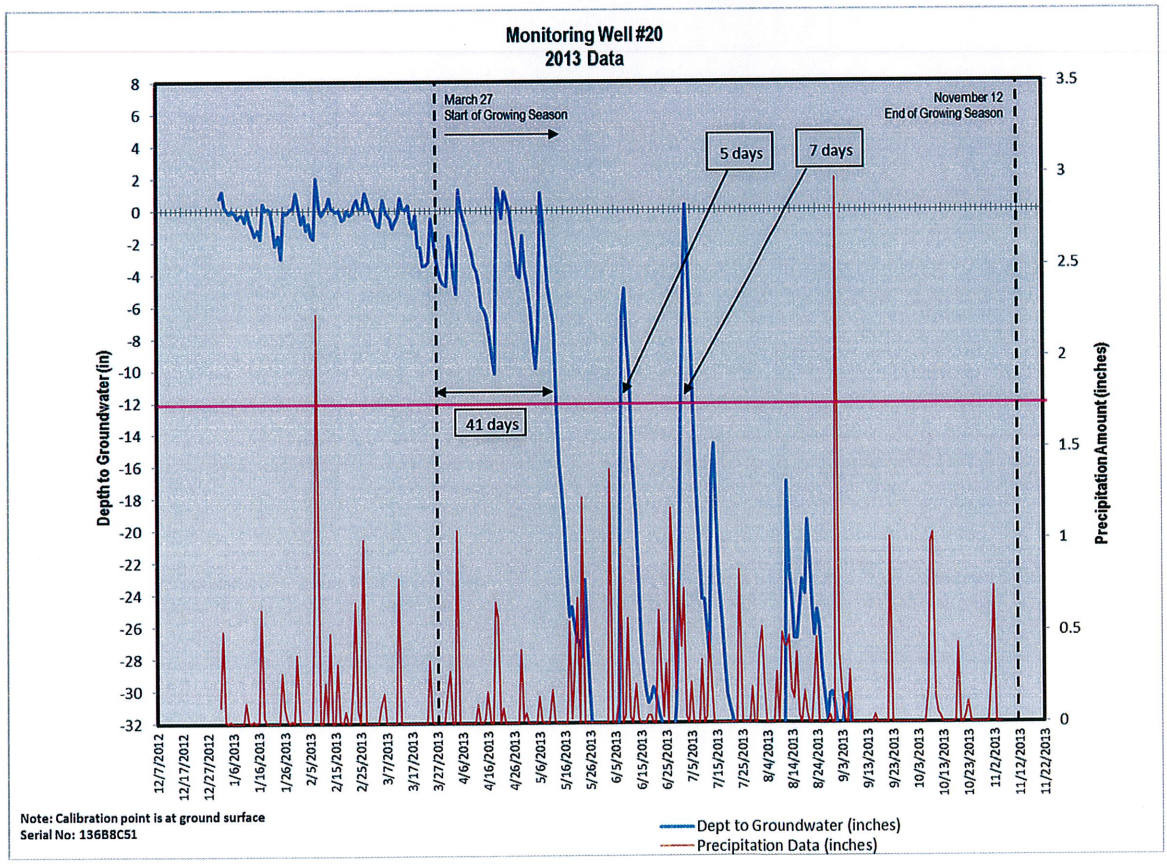
Note: Calibration point is at ground surface
Serial No: 000013DBADD (Removed Nov. 2013)


Monitoring Well #17
2013 Data
March 27
Start of Growing Season
November 12
End of Growing Season
10 days
12 days
2 days
4 days
51 days
5 days
Depth to Groundwater (in)
Precipitation Amount (inches)
Depth to Groundwater (inches)
Precipitation Data (inches)
Note: Calibration point is at ground surface
Serial No: 13D482C8

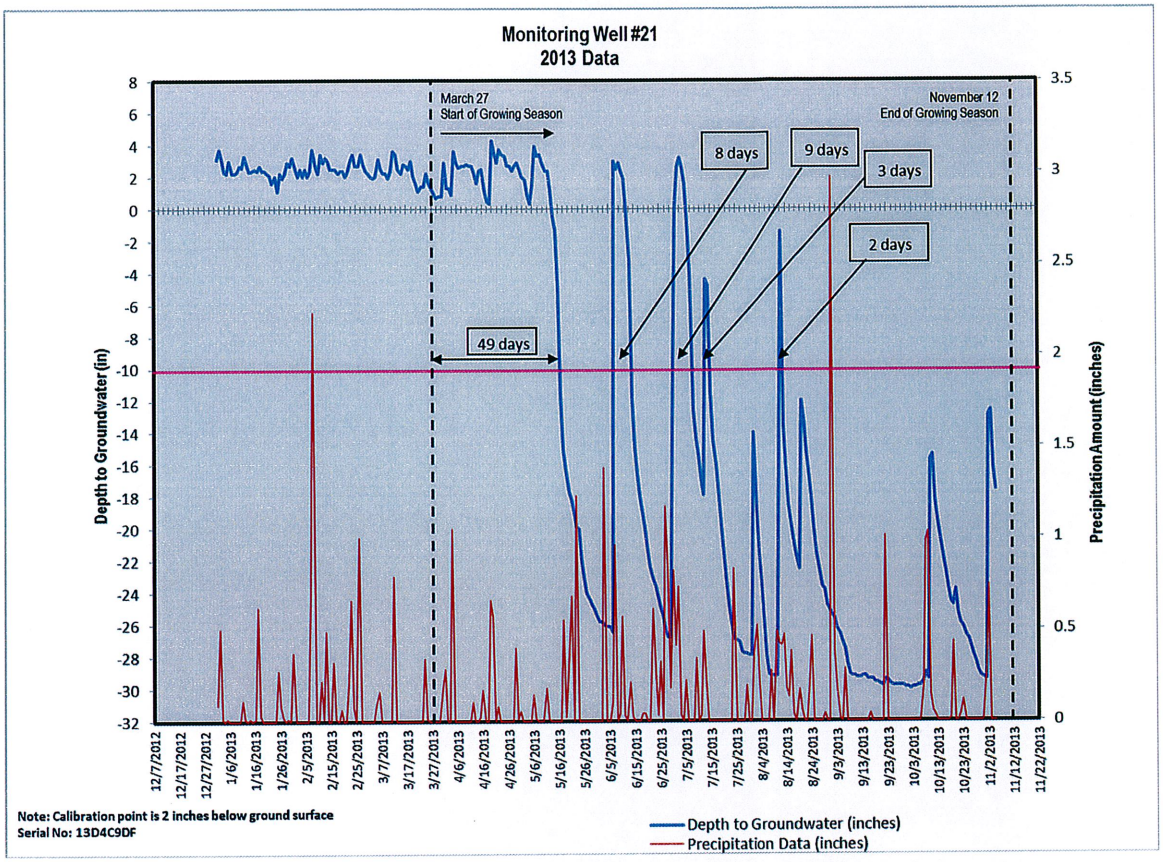

Monitoring Well #18
2013 Data
March 27
Start of Growing Season
November 12
End of Growing Season
7 days
9 days
51 days
GAUGE MALFUNCTION
Depth to Groundwater (in)
Precipitation Amount (inches)
Depth to Groundwater (inches)
Precipitation Data (inches)
Note: Calibration point is at ground surface
Serial No: OEBCFB9E (Removed Nov. 2013)



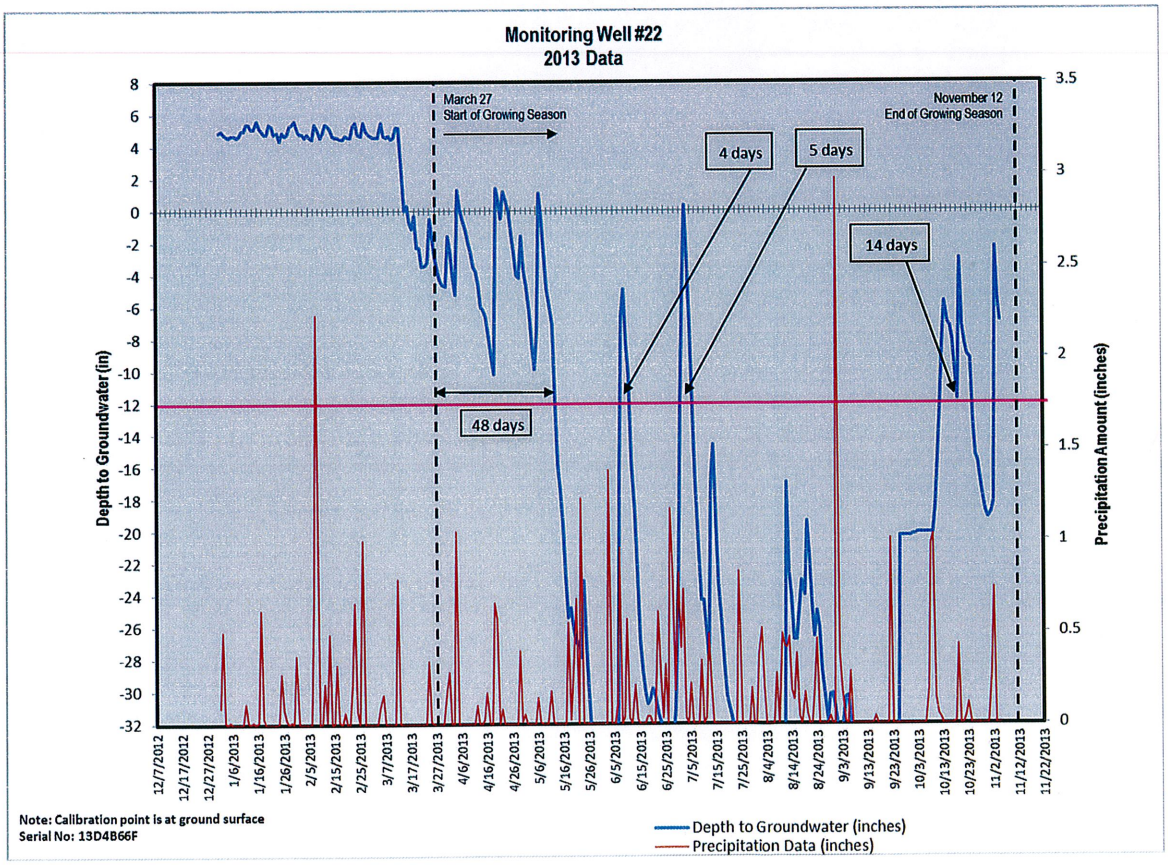
Note: Calibration point is 2 inches above ground surface
Serial No: OA2883CB



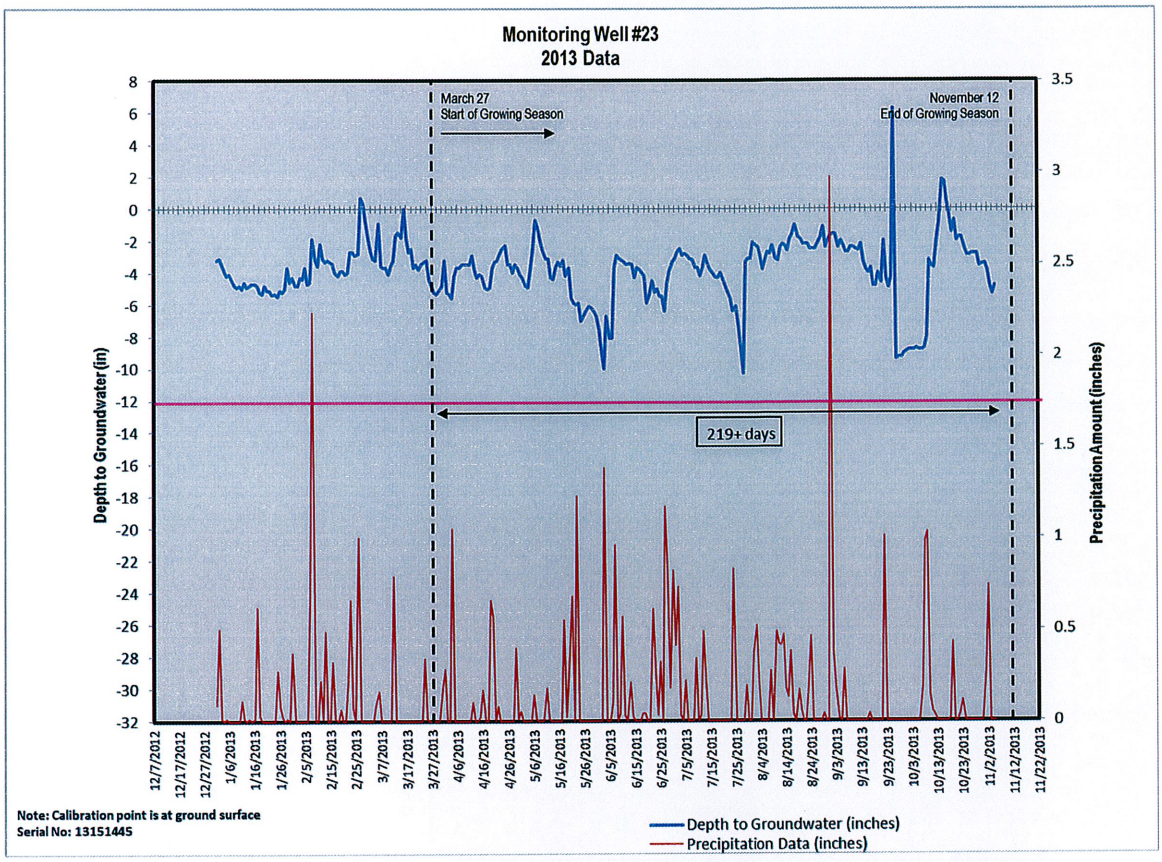
Note: Calibration point is at ground surface
Serial No: 136B8C51



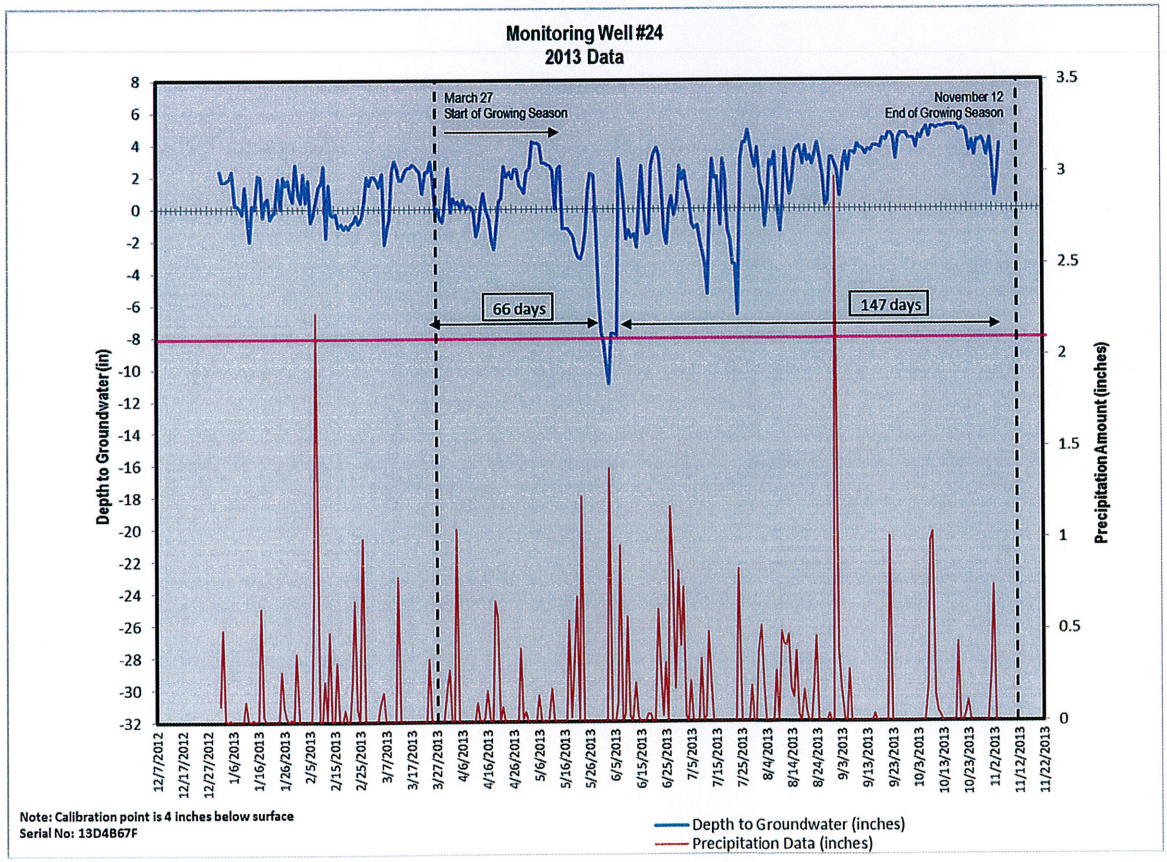
Note: Calibration point is 2 inches below ground surface
Serial No: 13D4C9DF



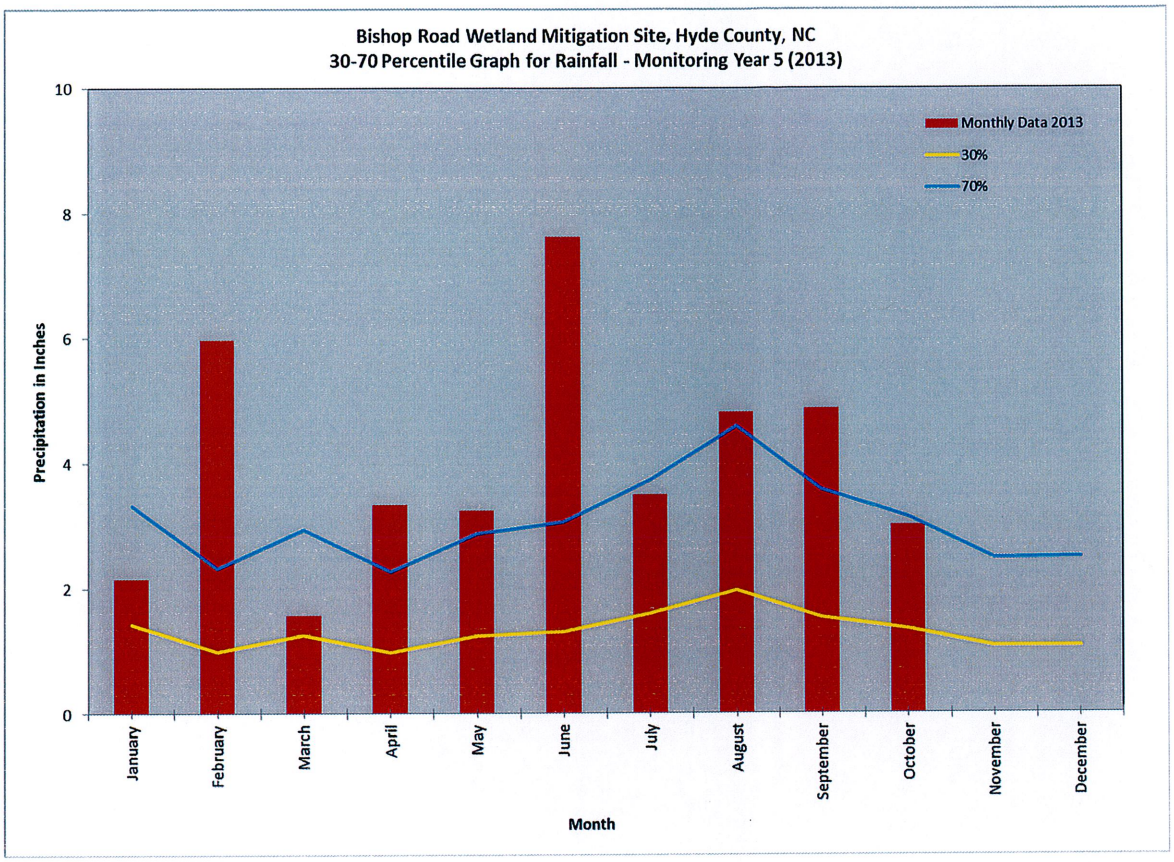
Note: Calibration point is at ground surface
Serial No: 13D4B66F



Note: Calibration point is at ground surface
Serial No: 13151445



Note: Calibration point is 4 inches below surface
Serial No: 13D4B67F


Bishop Road Wetland Mitigation Site, Hyde County, NC
30-70 Percentile Graph for Rainfall - Monitoring Year 5 (2013)
Monthly Data 2013
30%
70%
Precipitation in Inches
0
2
4
6
8
10
January
February
March
April
May
June
July
August
September
October
November
December
Month