# GROUNDWATER MONITORING PROGRAM SAMPLING, ANALYSIS, AND REPORTING PLAN

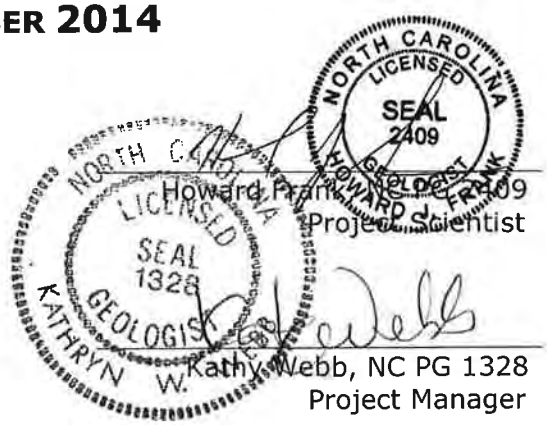
**FOR**

**W.H. WEATHERSPOON POWER PLANT**
**491 POWER PLANT ROAD**
**LUMBERTON, NORTH CAROLINA 28358**
**NPDES PERMIT #NC0005363**

**PREPARED FOR**

**DUKE ENERGY PROGRESS, INC.**
**RALEIGH, NORTH CAROLINA**

**SUBMITTED: OCTOBER 2014**

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# 1.0 INTRODUCTION

This Groundwater Monitoring Program Sampling, Analysis, and Reporting Plan (Plan) is developed to support the Duke Energy Progress, Inc. (Duke Energy) requirement for groundwater monitoring around the W.H. Weatherspoon Power Plant (Weatherspoon Plant) ash basin operated under NPDES Permit NC0005363.

This Plan describes the groundwater monitoring network, methodologies of field sampling, record-keeping protocols, analytical procedures, data quality objectives, data validation, and reporting that will be used for the Weatherspoon Plant ash basin groundwater monitoring program.

# 2.0 SITE DESCRIPTION

## 2.1 Plant and Ash Basin

The Weatherspoon Plant is a former coal-fired electricity-generating facility located in Robeson County, North Carolina, near the city of Lumberton. The location of the plant is shown on **Figure 1**. The Weatherspoon Plant started operations in 1949. Two additional units were added in the 1950s. Four oil and natural gas fueled combustion turbines were added in the 1970s.

As of October 2011, all of the coal-fired units were retired. The four oil and natural gas units continue to operate to meet peak demand. The facility is located southeast of Lumberton on the east side of North Carolina Highway 72. The topography around the property generally slopes downward toward the Lumber River.

The Weatherspoon Plant utilizes a 225-acre cooling pond located adjacent to the Lumber River. The ash basin is located north of the cooling pond, northeast of the plant, as shown on **Figure 2**.

## 2.2 Ash Basin Area Description

The plant, cooling pond, and ash basin are located on the east side of the Lumber River. The ash basin is located north of the cooling pond, northeast of the plant, as shown on **Figure 2**. The ash basin consists of a 65 acre ash basin. The 500 foot compliance boundary circles the ash basin.

The ash basin is impounded by an earthen dike. Ash generated from coal combustion throughout the operational history of the plant was stored on-site in the ash basin. Overflow from the ash basin drains to the northeast corner of the cooling pond. The Weatherspoon Plant NPDES permit (NC005363) authorizes the discharge of recirculated cooling water, ash sluice water, domestic wastewater, chemical metal cleaning water, and low volume wastewater including reject water from a reverse osmosis treatment water treatment unit from the cooling pond via Outfall 001 to the Lumber River under severe weather conditions and pond maintenance.

# 3.0 SITE GEOLOGY AND HYDROGEOLOGY

## 3.1 Geologic/Soil Framework

Geographically, the Weatherspoon Plant lies within the Coastal Plain Physiographic Province (North Carolina Department of Natural Resources and Community Development, 1985).

The North Carolina Coastal Plain is approximately 90 to 150 miles wide from the Atlantic Ocean westward to its boundary with the Piedmont province (Winner, Jr. and Coble, 1989). Two natural subdivisions of the Coastal Plain were described by Stuckey (1965): the Tidewater region and the Inner Coastal Plain. The Weatherspoon Plant is located within the Inner Coastal Plain, which consists of the gently rolling land surface between the Tidewater region and the Fall Line (Winner, Jr. and Coble, 1989). The Weatherspoon Plant is located within a subdivision of the Inner Coastal Plain that is typified by swampy areas in the flat uplands between major river systems. The Weatherspoon Plant is located on the east side of the Lumber River.

The Coastal Plain comprises a wedge shaped sequence of stratified marine and non-marine sedimentary rocks deposited on crystalline basement. The sedimentary sequences range in age from recent to lower Cretaceous (Winner, Jr. and Coble, 1989). In this region, units of confined aquifers divided by confining layers overlay the crystalline bedrock. These confined aquifers consist of laterally continuous silt and clay rich layers. The Lower Cape Fear and Upper Cape Fear aquifers are depicted as the lower-most marine sediment units in the Robeson County area (USGS 1989). The Upper Cape Fear aquifer is overlain by a semi-confining unit that separates the Upper Cape Fear aquifer from the overlying Black Creek aquifer. A semi-confining unit over the Black Creek aquifer separates the Black Creek aquifer from the overlying Peedee aquifer. In this region, the semi-confining unit between the Peedee aquifer and the overlying Yorktown and/or Coastal Plain deposits that comprise the surficial aquifer is discontinuous.

The surficial aquifer is Quaternary in age and primarily composed of sands with inter-bedded silts and clays. The Yorktown Formation is of the Tertiary Era and generally consists of fine-grained sands, shell material, and bluish gray silts and clays. The contact between the Yorktown and the underlying Peedee may represent an erosion unconformity. Cretaceous in age, the Peedee formation generally consists of gray or light brown, silty, fine to very fine grained quartz sand with traces of glauconite, phosphorite, oyster shells, and pyrite. The Black Creek Formation is also considered Cretaceous in age and generally consists of clay, gray to black, lignitic; contains thin beds and laminae of fine-grained micaceous sand and thick lenses of cross-bedded

sand. Glauconitic, fossiliferous clayey sand lenses are also reported to exist in the upper part of the Black Creek Formation.

The surficial aquifer is the saturated zone that underlies the land surface and is generally shallow in the region. It is the first aquifer to receive recharge from precipitation. This recharge water is stored in the surface aquifer as the groundwater migrates toward local discharge points (lakes, rivers, streams, etc.). A portion of the groundwater in the surficial aquifer migrates vertically to recharge deeper, confined- to semi-confined aquifers. On average, only a fraction of the surficial aquifer recharge reaches the deeper aquifers (Giese et al., 1997). This finding is thought to reflect the influence of confining and semi-confining layers and the substantial amount of time it takes for groundwater to reach these deeper units.

Underlying the surficial aquifer, which has an average thickness of 60 feet in the area, is the Peedee confining unit, with an average thickness of 25 feet (Giese et al., 1997). The Peedee aquifer is composed of fine to medium grained sand interbedded with gray to black marine clay and silt (Giese et al., 1997). Shells are common throughout the aquifer. The thickness of the aquifer ranges from 10 feet at its eastern edge to greater than 300 feet thick (Giese et al., 1997).

Based on monitoring well logs (**Appendix A**), the surficial aquifer at the Weatherspoon Plant consists generally of gray, fine and medium grained sand, intermixed with clay and silt across the well screens. The boring logs do not indicate that the Peedee confining unit was encountered during drilling activities; however, the maximum depth of the compliance wells at the Weatherspoon Plant is approximately 20 feet below ground surface.

## 3.2 Hydrogeologic Framework

In the Robeson County part of the North Carolina Coastal Plain, groundwater is obtained from the surficial, Peedee, Yorktown, and Black Creek aquifers. The Coastal Plain groundwater system consists of aquifers comprised of permeable sands, gravels, and limestone separated by confining units of less permeable sediment.

According to Winner, Jr. and Coble (1989), the surficial aquifer consists primarily of fine sands, clays, shells, peat beds, and scattered deposits of coarse-grained material in the form of relic beach ridges and floodplain alluvium. The areal extent of the surficial aquifer in the Coastal Plain is approximately 25,000 square miles with an average thickness of 35 feet. Average recharge to the surficial aquifer is between 12 and 20 inches per year. The average estimated hydraulic conductivity is 29 feet per day (Winner, Jr. and Coble, 1989).

The surface of groundwater at the Weatherspoon Plant is typically located at depths of 4 to 8 feet below ground surface, depending on precipitation and topography. An average transmissivity value of 3,000 square feet per day ($ft^2$ /day) was estimated by Giese et al. (1997) for the surficial sand aquifer in the region. Based on the results of work conducted by others, the actual transmissivity, for the surficial aquifer, calculated from pump tests at the site ranges between approximately 400 and 1,750 $ft^2$/day. Water level maps for the site indicate the general direction of groundwater flow appears to be southeast from the ash basin.

The average precipitation in the Lumberton, NC area is approximately 48 inches per year. Due to the relatively high transmissivity characteristic of the surficial aquifer, recharge rates are expected to be high.

There are two water supply wells owned and operated by Duke Energy (DEP-1 and DEP-2) located approximately 1,000 feet west of the ash basin.

# 4.0 MONITORING PROGRAM

## 4.1 Regulatory Requirements for Groundwater Monitoring

The NPDES program regulates wastewater discharges to surface waters to ensure that surface water quality standards are maintained. The Weatherspoon Plant operates under NPDES Permit NC0005363 (effective January 1, 2010) which authorizes the discharge of recirculated cooling water, ash sluice water, domestic wastewater, chemical metal cleaning water, and low volume wastewater including reject water from a reverse osmosis water treatment unit from the cooling pond via Outfall 001 to the Lumber River under severe weather conditions and pond maintenance. The NPDES permitting program requires that permits be renewed every 5 years.

The NPDES permit requires groundwater monitoring. Permit Condition Attachment XX, Version 1.0, dated March 17, 2011, lists the groundwater monitoring wells to be sampled, the parameters and constituents to be measured and analyzed, and the requirements for sampling frequency and results reporting. Attachment XX also provides requirements for well location and well construction. A copy of Attachment XX is included as **Appendix B**.

The compliance boundary for groundwater quality associated with the Weatherspoon Plant ash basin is defined in accordance with 15A NCAC 02L .0107(a) as being established at either 500 feet from the waste boundary or at the property boundary, whichever is closer to the source.

In accordance with the March 2011 Groundwater Monitoring Plan, analytical results have been submitted to the Department of Water Resources (DWR) before the last day of the month following the date of sampling. In the future, analytical results will be submitted to the DWR within 60 days of the date of sampling.

## 4.2 Description of Groundwater Monitoring System

The current groundwater monitoring plan for the Weatherspoon Plant includes the sampling of four wells. The four wells comprising the compliance boundary monitoring well network at the Weatherspoon Plant include one (1) background well and three (3) downgradient wells. The locations of the monitoring wells, the waste boundary, and the compliance boundary are shown on **Figure 2**. Well construction data is provided in **Table 1** and **Appendix A**. **Figure 3** is an example of the construction of a typical monitoring well.

Based on water levels measured at the site, the general direction of groundwater flow is to the southeast of the ash basin. The site wells provide monitoring data for the groundwater downgradient of the ash basin to the east, southeast, and south.

Monitoring well BW-1 documents background groundwater quality north of the ash basin. The compliance boundary well for the east side of the ash basin is CW-3. Monitoring well CW-1 is the compliance boundary well for the south side of the ash basin, and monitoring well CW-2 is the downgradient compliance boundary well to the southeast of the ash basin.

## 4.3 Monitoring Frequency

The monitoring wells will be sampled three times per year in March, June, and October.

## 4.4 Sample Parameters and Methods

The monitoring program consists of sampling and analysis for parameters and constituents identified in Attachment XX of the NPDES permit (**Appendix B**).

The parameters and the analytical methods are presented in **Table 2**.

The analytical results for the detection monitoring program will be compared to the 2L Standards or the site-specific background concentrations.

## 4.5 Data Quality Objectives

The overall Quality Assurance (QA) objective is to ensure that reliable data of known and acceptable quality are provided. All measurements will be documented to yield results that are representative of the groundwater quality. Data will be calculated and reported in units as required by the North Carolina Department of Environment and Natural Resources (NCDENR).

The analytical QA objectives for precision, accuracy, and completeness have been established by the laboratory(s) in accordance with the Environmental Protection Agency (EPA) or other accepted agencies for each measurement variable where possible. The objectives are outlined in the Duke Energy Analytical Lab Services Procedures Manual and are available upon request.

Appropriate methods have been selected to meet applicable standards for groundwater quality. Instances may occur, however, in which the condition of the sample will not allow detection of the desired limits for various parameters either because of matrix interference or high analyte concentrations requiring sample dilution. The laboratory(s) will provide sufficient documentation with each data package to notify reviewers about analytical problems with the data, if needed.

# 5.0 SAMPLING PROCEDURES

## 5.1 Sampling Equipment and Cleaning Procedures

Development and sampling equipment shall be selected to ensure that materials are compatible with the sample parameters and comply with state and federal regulatory requirements for sampling.

New disposable sampling equipment (peristaltic pump tubing) is used for each monitoring well sampled. For non-dedicated equipment used, such as water level tapes, the equipment will be cleaned before and after use in each well in accordance with standard EPA-approved cleaning procedures for field equipment. This standard is outlined in the Standard Operating Procedures and Quality Assurance Manual, Engineering Support Branch, EPA Region IV, February 1, 1991 as revised December 20, 2011.

## 5.2 Groundwater Sampling

### 5.2.1 Development of Monitoring Wells

Monitoring wells addressed in this sampling plan have been developed.

If new monitoring wells are installed, they will be developed prior to initial sampling. Development removes silt that has settled into the bottom of the well following installation and removes fine silt and clay particles from the well screen and sand-pack surrounding the screen. Well development is necessary to eliminate potential clogging and enhance well performance. Development involves removing an estimated ten or more well volumes from the well using a submersible pump with up-and-down agitation to loosen particles from the well screen. If the turbidity for a well increases over time, the well may be re-developed to restore conditions.

### 5.2.2 Groundwater Level and Total Depth Measurements

Water level measurements are collected and recorded to determine the groundwater elevation and flow direction. Site monitoring wells have been surveyed to determine the elevation of the top of well casing (TOC). Water level measurements are referenced to the TOC and recorded to the nearest one-hundredth of a foot.

Water level measurements are made with an electronic measuring device consisting of a spool of dual-conductor wire and sensor. When the sensor comes in contact with water, the circuit is closed and a meter light and/or buzzer attached to the spool signal the contact. When the signal is sounded, the water

level is recorded on the Groundwater Monitoring Data Sheet ("Low Flow Sampling Log", **Figure 4**). To minimize sample turbidity, low flow sample methods are used whenever possible. Using low-flow sampling techniques, the volume of the stagnant water in the well is not calculated and the total well depth is not routinely measured to avoid disturbing the bottom sediments. If conditions indicate a possible problem with the integrity of a well, the total well depth may be measured.

### 5.2.3 Well Purging and Sampling

The selection of purging technique is dependent on the hydrogeologic properties of the aquifer and hydraulic characteristics of each well. Hydraulic conductivity, water column, well volume, screen length, and other information are evaluated to select the purging technique to acquire groundwater representative of the aquifer conditions. At the Weatherspoon Plant, a low-flow purging technique has been selected as the most appropriate technique to minimize sample turbidity.

During low-flow purging and sampling, groundwater is pumped into a flow-through chamber at flow rates that minimize or stabilize water level drawdown within the well. At the Weatherspoon Plant, low-flow sampling is conducted using a peristaltic pump with new tubing. The intake for the tubing is lowered to the mid-point of the screened interval. A multi-parameter water quality monitoring instrument is used to measure field indicator parameters within the flow-through chamber during purging. Measurements include pH, specific conductance, and temperature.

Indicator parameters are measured over time (usually at 3-5 minute intervals). When parameters have stabilized within ±0.2 pH units and ±10 percent for temperature and specific conductivity over three consecutive readings, representative groundwater has been achieved for sampling. Turbidity is not a required stabilization parameter, but turbidity levels of 10 NTU or less are targeted.

The Groundwater Monitoring Data Sheet ("Low Flow Sampling Log", **Figure 4**) is used to record purge data and field measurements.

Instrument calibration is performed and documented before the beginning of the sampling event, and the calibration is verified at mid-day and after each sampling event. The pH subsystem is calibrated with three pH standards (pH 4.0, 7.0, and 10.0) bracketing the expected groundwater pH. The pH calibration is then verified using a different pH 7.0 buffer. The specific conductance

subsystem is calibrated using one standard and verified using a different specific conductance buffer. Calibration results are recorded on an Instrument Calibration Log (**Figure 5**).

## 5.3 Sample Collection

Groundwater samples are collected after the indicator parameters have stabilized.

Sampling personnel wear new, clean, disposable, non-powdered nitrile gloves at each location. Samples are collected in the order of the volatilization sensitivity of the parameters:

- Metals, metalloids, and selenium
- Sulfate, nitrate, and chloride
- Total dissolved solids

Groundwater samples are preserved and stored according to parameter-specific methods and delivered to the laboratory under proper Chain-of-Custody (COC) procedures. All pertinent notations, water-level measurements, removed well volumes, and indicator parameters are documented on the Groundwater Monitoring Data Sheet ("Low Flow Sampling Log", **Figure 4**).

## 5.4 Sample Containers, Volume, Preservation, and Holding Time

Sample containers supplied by the laboratory shall be new and pre-cleaned as approved by EPA procedures appropriate for the parameters of interest. **Table 2** summarizes the sample containers, sample volume, preservation procedures, and holding times required for each type of sample and parameter for the monitoring program. Sample containers will be kept closed until used. Sample containers will be provided by Duke Energy or vendor laboratories.

## 5.5 Sample Tracking

The COC procedures allow for tracing the possession and handling of individual samples from the time of field collection through laboratory analysis and report preparation. Samples are logged by the laboratory with a unique tracking number for each sample. An example of the COC Record is provided as **Figure 6**.

## 5.6 Sample Labeling

Sample containers shall be pre-labeled and organized prior to field activities as part of the pre-sampling staging process. As samples are collected, the sampling personnel write the following information directly on the label: sampling date and time, and initials of sample collector. This information is also recorded on the Groundwater Monitoring Data Sheet ("Low Flow Sampling Log", **Figure 4**) and the COC Record (**Figure 6**).

## 5.7 Field Documentation

Field documentation from each sampling event is recorded on the Groundwater Monitoring Data Sheets ("Low Flow Sampling Log", **Figure 4**), the Instrument Calibration Log (**Figure 5**), and the Chain-of-Custody Record (**Figure 6**). Additionally, a Groundwater Sampling Site Checklist (**Figure 7**), or equivalent, is completed indicating information about the monitoring wells such as proper identification (ID) tag and condition of protective casing and pad. Field notations shall be made during the course of the field work to document the following information:

- Identification of well
- Well depth
- Static water level depth and measurement technique
- Well yield – high or low
- Purge volume or pumping rate
- Sample identification numbers
- Well evacuation procedure/equipment
- Sample withdrawal procedure/equipment
- Date and time of collection
- Types of sample containers used
- Identification of replicates or blind samples
- Preservative(s) used
- Parameters requested for analysis
- Field analysis data and methods
- Sample distribution and transporter
- Field observations during sampling event
- Name of sample collector(s)
- Climatic conditions including estimate of air temperature

This information will be entered on the Low Flow Sampling Log (**Figure 4**), the Instrument Calibration Log (**Figure 5**), or the Chain-of-Custody Record and Analysis Request Form (**Figure 6**) which are filled out for each sampling event. These documents will be filed by project and date. Recorded entries will be made on electronic forms or

on paper forms in indelible ink. Errors on paper documents will be corrected by drawing a line through the error, initialing and dating the correction, and starting a new entry on the next line (if necessary).

## 5.8 Chain-of-Custody Record

The COC Record (**Figure 6**) accompanies the sample(s), traces sample possession from time of collection to delivery to the laboratory(s), and clearly identifies which sample containers have been designated for each requested analysis. The record includes the following types of information:

- Sample identification number
- Signature of collector
- Date and time of collection
- Sample type (e.g., groundwater, immiscible layer)
- Identification of well
- Number of containers
- Parameters requested for analysis
- Preservative(s) used
- Signature of persons involved in the chain of possession
- Inclusive dates of possession

## 5.9 Sample Custody, Shipment, and Laboratory Receipt

For the purpose of these procedures, a sample is considered in custody if it is:

- In actual possession of the responsible person
- In view, after being in physical possession
- Locked or sealed in a manner so that no one can tamper with it after having been in physical custody or in a secured area restricted to authorized personnel.

Samples shall be maintained in the custody of the sampling crew during the sampling event. At the end of each sampling day and prior to the transfer of the samples off site, entries shall be completed on the COC form for all samples. Upon transfer of custody, the COC form is signed by a sampling crew member, including the date and time. If outside vendor laboratories are utilized, samples shall be delivered to these facilities by Duke Energy personnel or courier.

COC forms received by the laboratory(s) shall be signed and dated by the respective supervising scientist(s) or their designee (at the Duke Energy Analytical Lab Services laboratory) or the laboratory sample custodian (at vendor labs) immediately following receipt by the laboratory. The analysts at the laboratory(s) maintain a sample tracking record that will follow each sample through all stages of laboratory processing. The sample tracking records show the date of sample extraction or preparation and analysis. These records are used to determine compliance with holding time limits during lab audits and data validation.

Custody procedures followed by Duke Energy Analytical Lab Services laboratory personnel are described in detail in the Duke Energy Analytical Lab Services Procedures Manual.

# 6.0 ANALYTICAL PROCEDURES

The main analytical laboratory used in this program is the Duke Energy Analytical Lab Services: N.C. Drinking Water (NC37804) and Wastewater (#248) Certifications. The organizational structure and staff qualifications of the laboratory are discussed in its generic Quality Assurance Program (QAP). The QAP and the Analytical Laboratory Procedures Manual are available for review upon request.

Vendor laboratories that meet EPA and North Carolina certification requirements may be used for analyses with approval by Duke Energy.

The analytical procedures used for the samples analyzed for this Groundwater Monitoring Program are listed in **Table 2**. Specific conductance, field pH, and temperature are measured in the field according to the Duke Energy Groundwater Monitoring and Sample Collection Procedure or the instrument manufacturer instructions.

# 7.0 INTERNAL QUALITY CONTROL CHECKS

Internal laboratory quality control (QC) checks used by the laboratories are described in each laboratory's generic QAP and procedures manual. Using the internal laboratory QC checks, the laboratories demonstrate the ability to produce acceptable results using the methods specified.

Internal quality control checks for sampling procedures and laboratory analyses will be conducted with each sampling event. These checks will consist of the preparation and submittal of field blanks, trip (travel) blanks, and/or field replicates for analysis of all parameters at frequencies described in the laboratory(s) procedures manuals.

The field QC blanks and replicates that may be included as internal QC checks are described below. The specific type and number of blanks used may vary depending on the sampling event:

- Field Blanks: A field blank consists of a sample container filled in the field with organic free, deionized, or distilled water prepared and preserved in the same manner as the samples. The field blank is transported to the laboratory with the samples and analyzed along with the field samples for the constituents of interest to check for contamination imparted to the samples by the sample container, preservative, or other exogenous sources. Field blanks are typically utilized for each sampling event. The field blanks are typically analyzed for major anions, cations and metals.
- Trip Blanks: A trip (travel) blank is a sample container filled with organic-free water in the laboratory that travels unopened with the sample bottles. Trip blanks are typically utilized when sampling for volatile organic compounds. The trip blank is returned to the laboratory with the field samples and analyzed along with the field samples for parameters of interest.
- Equipment Blanks: If non-dedicated equipment is used, it is recommended that equipment blanks be collected. The field equipment is cleaned following documented cleaning protocols. An aliquot of the final control rinse water is passed over the cleaned equipment directly into a sample container and submitted for analyses.
- Field Replicates: A field replicate is a duplicate sample prepared at the sampling locations from equal portions of all sample aliquots combined to make the sample. Both the field replicate and the sample are collected at the same time, in the same container type, preserved in the same way, and analyzed by the same laboratory as a measure of sampling and analytical precision.

# 8.0 VALIDATION OF FIELD DATA PACKAGE

The field data package includes all of the field records and measurements developed by the sampling team personnel. The field data package validation will be performed by Duke Energy personnel. The procedure for validation consists of the following:

- A review of field data contained on the Groundwater Monitoring Data Sheets for completeness.
- Verification that equipment blanks, field blanks, and trip blanks were properly prepared, identified, and analyzed.
- A check of the Instrument Calibration Log for equipment calibration and instrument conditions.
- A review of the COC Record for proper completion, signatures of field personnel and the laboratory sample custodian, dates and times, and for verification that the correct analyses were specified.

# 9.0 VALIDATION OF LABORATORY DATA

The laboratory will perform a validation review of the submitted samples and analytical results to ensure that the laboratory QA/QC requirements are acceptable.

# 10.0 REPORT SUBMITTAL

Two copies of the report of the monitoring results for the compliance wells will be submitted to the DWR within 60 days of the date of sampling. The monitoring results will be submitted on NCDENR Form GW-59CCR.

The DWR will be notified in the event that vendor lab analyses have not been completed within this time frame. Groundwater Monitoring Data Sheets, Field Calibration Forms, Chain-of-Custody Records, Laboratory QA data, and Data Validation Checklists shall be kept on file by Duke Energy and are available upon request.

# 11.0 REFERENCES

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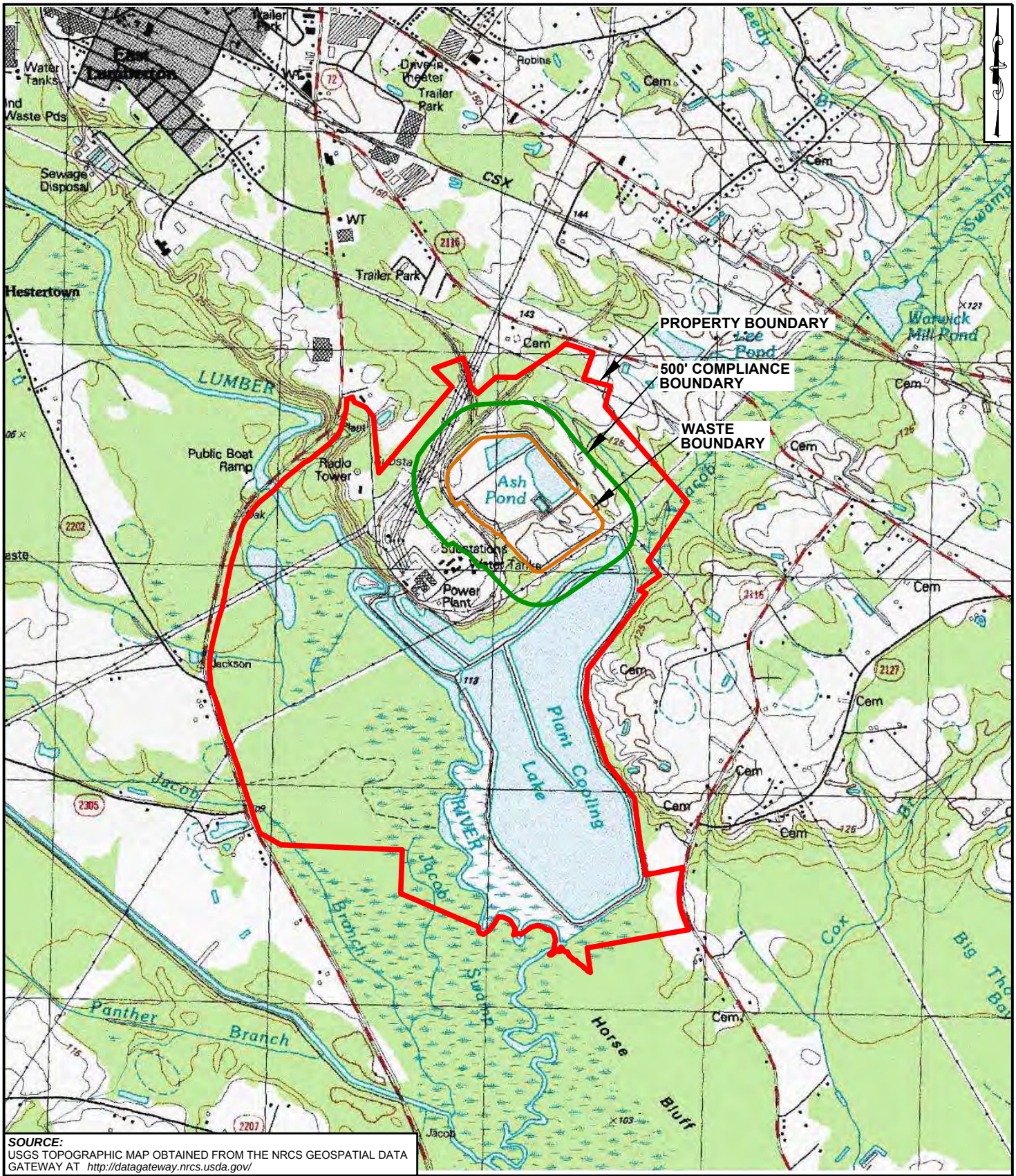
# FIGURES




***SOURCE:***
USGS TOPOGRAPHIC MAP OBTAINED FROM THE NRCS GEOSPATIAL DATA GATEWAY AT *http://datagateway.nrcs.usda.gov/*

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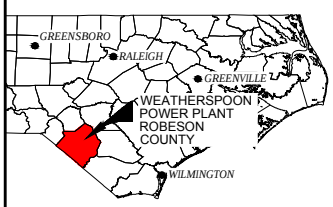


# FIGURE 1
# SITE LOCATION MAP
# WEATHERSPOON POWER PLANT
# 491 POWER PLANT RD
# LUMBERTON, NORTH CAROLINA
# SOUTH EAST LUMBERTON, NC QUADRANGLE

DRAWN BY: S. ARLEDGE
PROJECT MANAGER:KATHY WEBB
LAYOUT:FIG 1 (USGS SITE LOCATION)
DATE: 2014-09-25
CONTOUR INTERVAL: 10 FEET
MAP DATE:1993

GRAPHIC SCALE
1000 0 1000 2000
IN FEET


## LEGEND

- BW-1 BACKGROUND MONITORING WELL (SURVEYED)
- CW-1 COMPLIANCE MONITORING WELL (SURVEYED)
- DUKE ENERGY PROGRESS WEATHERSPOON PLANT
- 500 ft COMPLIANCE BOUNDARY
- WASTE BOUNDARY

***SOURCES:***

1. 2010 HIGH RESOLUTION AERIAL PHOTOGRAPHS AND 1997 WATER LINES OBTAINED FROM NC ONE MAP AT *http://data.nconemap.com/geoportal/catalog/raster/download.page*
2. 2014 AERIAL PHOTOGRAPH WAS OBTAINED FROM WSP FLOWN ON APRIL 17, 2014.
3. DRAWING HAS BEEN SET WITH A PROJECTION OF NORTH CAROLINA STATE PLANE COORDINATE SYSTEM FIPS 3200 (NAD 83).

GRAPHIC SCALE
400 0 400 800
IN FEET

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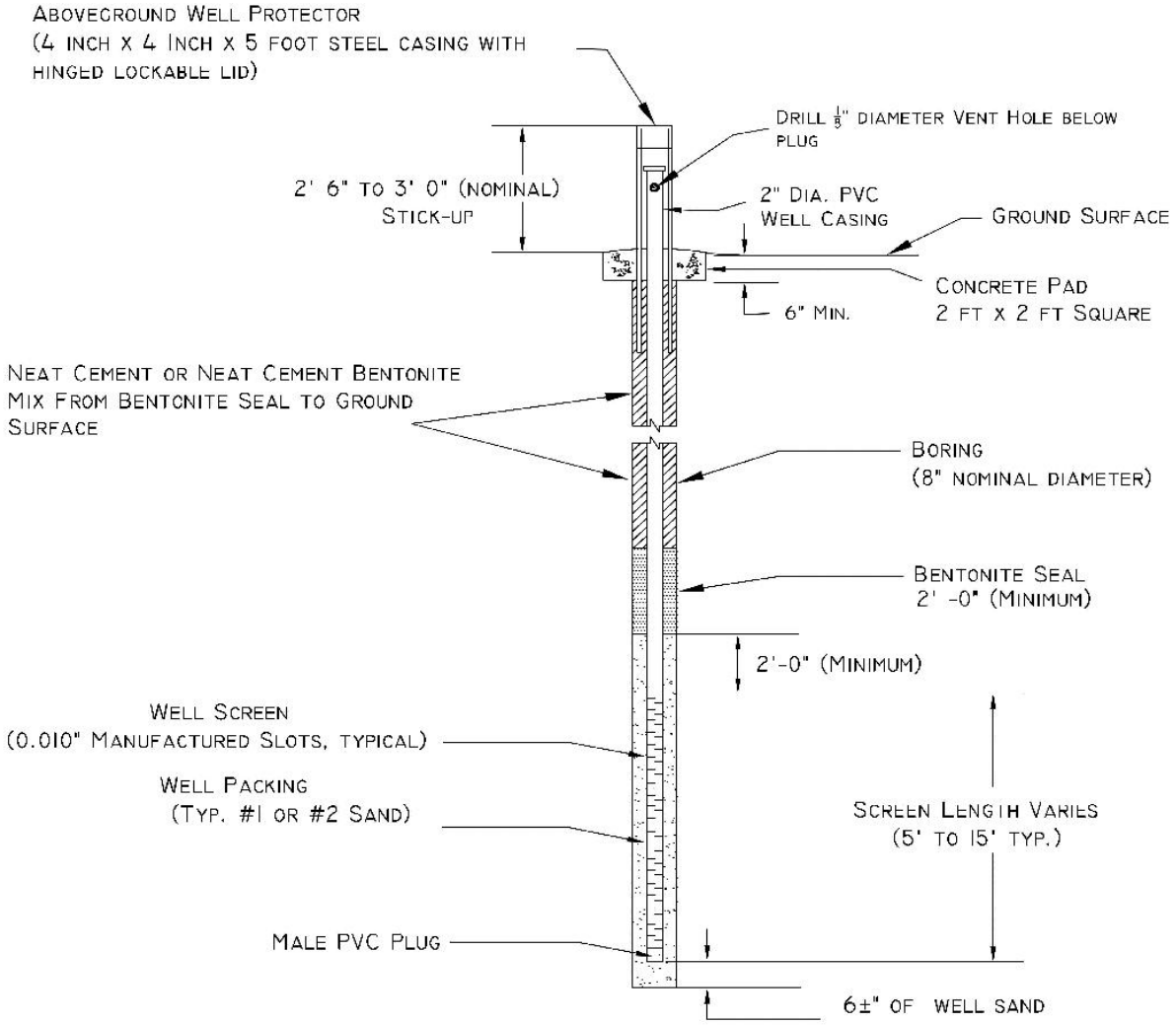
| | | | |
|---|---|---|---|
| DRAWN BY: | S. ARLEDGE | DATE: | 2014-09-25 |
| CHECKED BY: | H. FRANK | DATE: | 2014-09-25 |
| PROJECT MANAGER: | K. WEBB | | |
| LAYOUT NAME: | FIG 2 (SITE LAYOUT) | | |

DUKE ENERGY PROGRESS

**WEATHERSPOON POWER PLANT**
**491 POWER PLANT RD**
**LUMBERTON, NORTH CAROLINA**

# FIGURE 2
# SITE LAYOUT




**Typical Well Construction Details**
**(no scale)**

INFORMATION PROVIDED BY DUKE ENERGY CAROLINAS, LLC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DRAWN BY: H. Frank Date: 8/21/2014
PROJECT MANAGER: Kathy Webb

**FIGURE 3**
**GENERALIZED WELL SCHEMATIC**
**W.H. WEATHERSPOON POWER PLANT**

P:\Duke Energy Progress.1026\ALL NC SITES\NPDES Permit Deliverables\Weatherspoon\GW Monitoring Plan\Tables\

# FIGURE 4

## LOW FLOW SAMPLING LOG

148 River Street, Suite 220
Greenville, South Carolina 29601
(864) 421-9999 • (864) 421-9909 Fax
www.synTerracorp.com

**FIELD PERSONNEL:** _____

**WEATHER:** ☐ SUNNY ☐ OVERCAST ☐ RAIN TEMPERATURE (APPROX):

**NOTES:**

| | | | | | |
|---|---|---|---|---|---|
| **WELL ID:** | | **PUMP/TUBING INTAKE DEPTH:** | (FT) | **START PURGE TIME:** | |
| **MEASURING POINT:** | | **START PURGE DATE:** | | **END PURGE TIME:** | |
| **WELL DIAMETER:** | (IN) | **END PURGE DATE:** | | **FINAL READING TIME:** | |
| **WELL DEPTH:** | (FT) | **TOTAL VOLUME PURGED:** | (GAL) | | |
| **DEPTH TO WATER:** | (FT) | **SAMPLE DATE:** | | **SAMPLE COLLECTION TIME:** | |

**PURGE METHOD:** ☐ Grundfos Pump ☐ 12 Volt Pump ☐ Peristaltic Pump ☐ Dedicated Pump ☐ Teflon Bailer ☐ Polyethylene Bailer

**SAMPLE METHOD:** ☐ Grundfos Pump ☐ 12 Volt Pump ☐ Peristaltic Pump ☐ Dedicated Pump ☐ Teflon Bailer ☐ Polyethylene Bailer

| TIME | WATER LEVEL (FT) | FLOW RATE (mL/min) | TEMPERATURE (° Celsius) | CONDUCTANCE (µS/cm) | DO (mg/L) | pH (su) | ORP* (mV) | TURBIDITY* (NTU) | NOTES |
|---|---|---|---|---|---|---|---|---|---|
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| CONSTITUENTS SAMPLED | NUMBER OF CONTAINERS | | | | | | | | | | PRESERVATION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 40 ml VOA | 125 ml GLASS CLEAR | 250 ml GLASS CLEAR | 500 ml GLASS CLEAR | 1 L GLASS AMBER | 125 ml POLYETHYLENE | 250 mL POLYETHYLENE | 500 mL POLYETHYLENE | | | UNPRESERVED | $H_2SO_4$ | $HNO_3$ | HCL | NaOH | $NA_2S_2O_3$ | METHANOL | OTHER | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

**COMMENTS: FIELD VEHICLE ACCESSIBLE** ☐ **YES** ☐ **NO**

Associated midday/end-of-day pH check within ±0.1 std unts? ☐ YES ☐ NO. If NO, pH data reported on this sheet should be considered as flagged accordingly

* SynTerra is not NC-certified for these parameters. Data collected for information purposes only

| WELL TAG | | | PROTECTIVE CASING | | | LOCK | | | CAP | | | CONCRETE PAD | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ☐ GOOD | ☐ BAD | ☐ NONE | ☐ GOOD | ☐ BAD | ☐ NONE | ☐ GOOD | ☐ BAD | ☐ NONE | ☐ GOOD | ☐ BAD | ☐ NONE | ☐ GOOD | ☐ BAD | ☐ NONE |

# Instrument Calibration Log

**SynTerra Corporation**
**148 River Street, Suite 220**
**Greenville, South Carolina 29601**

**NC Field Parameter Certification No. 5591**

**Instrument ID: YSI-556-MPS** **Date: _____**
**Analyst: _____** **Location: _____**

## pH Initial Calibration (standard units)
## Reference Method: SW846 9040C

| Cal. Time | Cal. Buffer 4.0 | Cal. Buffer 7.0 | Cal Buffer 10.0 | *Check Buffer 7.0 |
|---|---|---|---|---|
| | | | | |

*pH buffer checks are to be within ± 0.1 pH units of the standards true value

4 Buffer Reference:_____ 10 Buffer Reference:_____

7 Buffer Reference:_____ Check Buffer Reference:_____

## pH Calibration Check (standard units)

| Time | | Check Buffer True Value | *Check Buffer Measured Value |
|---|---|---|---|
| **Mid-Day** | | | |
| **End-of-Day** | | | |
| **Other** | | | |

*pH buffer checks are to be within ± 0.1 pH units of the standards true value

Check Buffer Reference:_____ Action Required: _____

## Specific Conductance (umhos/cm)
## Reference Method: SW846 9050A

| Time | | Calibration Std 1413 | Verification Std 1413 |
|---|---|---|---|
| **Initial Cal** | | | |
| **Mid-Day** | | Not Applicable | |
| **End-of-Day** | | Not Applicable | |

*Verification standard ± 10 percent of the standards true value

Calibration Standard Reference:_____ Verification Standard Reference:_____

Action Required: _____

## Dissolved Oxygen (mg/L)
## Reference Method: SM 4500 O G-2001

| | Time | Temp °C | Barometric Pressure (mm Hg) | Meter DO Reading (mg/L) | Correction Factor | Theoretical DO (mg/L) |
|---|---|---|---|---|---|---|
| **Initial** | | | | | | |
| **Mid-Day** | | | | | | |
| **End-of-Day** | | | | | | |

Theoretical DO = DO from "Dissolved Oxygen Meter Calibration Verification" Table at ambient temp X Correction Factor at Barometric Pressure
Theoretical DO and Meter DO reading within ± 0.5 mg/l, if not calibrate meter.

Action Required: _____

**FIGURE 5 - EXAMPLE FIELD SAMPLING CALIBRATION FORM**

# CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

Duke Energy

For Detailed Instructions, see:
http://dewww/essenv/coc/


**Duke Energy Analytical Lab Services**
**Mail Code MGO3A2 (Building 7405)**
**13339 Hagers Ferry Rd**
**Huntersville, N. C. 28078**
**(704) 875-5245**
**Fax: (704) 875-5038**


**Analytical Laboratory Use Only**

| | | |
|---|---|---|
| LIMS # | | Samples Originating From NC √ SC ___ |
| Logged By | Date & Time | SAMPLE PROGRAM: Groundwater √ NPDES ___ Drinking Water ___ UST ___ RCRA Waste |
| Vendor | Cooler Temp (C) | |
| PO # | [15]Preserv.:1=HCL 2=$H_2SO_4$ 3=$HNO_3$ 4=Ice 5=None | |
| MR # | | |

[19]Page 1 of 1

**DISTRIBUTION**
ORIGINAL to LAB,
COPY to CLIENT

Customer must Complete

| | | |
|---|---|---|
| 1)Project Name | | 2)Phone No: |
| 3)Client | | 4)Fax No: |
| 5)Business Unit: 20036 | 6)Process: | 7)Resp. To: |
| 8)Project ID: | 9)Activity ID: | 10)Mail Code: |

Customer to complete all appropriate NON-SHADED areas.

[16]Analyses Required

| LAB USE ONLY [11]Lab ID | [12]Chem Desktop No. | [13]Sample Description or ID | [14]Collection Information Date | Time | Signature | [17]Comp. | [18]Grab | [20]Total # of Containers |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
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Customer to complete appropriate columns to right

Customer to sign & date below

| | | | |
|---|---|---|---|
| 21)Relinquished By | Date/Time | Accepted By | Date/Time |
| Relinquished By | Date/Time | Accepted By | Date/Time |
| Relinquished By | Date/Time | Accepted By | Date/Time |
| 23)Seal/Locked By | Date/Time | Sealed/Lock Opened By | Date/Time |
| 24)Comments | | | |

Customer, important please indicate desired turnaround

[22]Requested Turnaround

14 Days ___√___
*7 Days _____
* 48 Hr _____
*Other _____
* Add. Cost Will Apply

FIGURE 6

# NORTH CAROLINA GROUNDWATER SAMPLING SITE CHECKLIST
# DUKE ENERGY PROGRESS, INC./W.H. WEATHERSPOON POWER PLANT
# PERMIT #NC0005363

**LOCATION / SITE** _____ **SAMPLE DATE** _____

**SITE CONTACT** _____ **FIELD CREW** _____

**WEATHER** _____

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ACCESS TO WELLS** | | | | | | | | | | | | | | | | | | |
| Access cleared into well | | | | | | | | | | | | | | | | | | |
| Access cleared around well | | | | | | | | | | | | | | | | | | |
| Tall grass or weeds / needs mowing | | | | | | | | | | | | | | | | | | |
| Road washing out / muddy / needs grading | | | | | | | | | | | | | | | | | | |
| Fallen tree blocking access | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| **WELL SECURITY** | | | | | | | | | | | | | | | | | | |
| Well found locked | | | | | | | | | | | | | | | | | | |
| Well found unlocked | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| **WELL LOCK CONDITION** | | | | | | | | | | | | | | | | | | |
| Lock in good condition | | | | | | | | | | | | | | | | | | |
| Lock rusted, difficult to open / needs replacing | | | | | | | | | | | | | | | | | | |
| Replaced damaged lock | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| **WELL CASINGS** | | | | | | | | | | | | | | | | | | |
| Casing in good condition | | | | | | | | | | | | | | | | | | |
| Damaged casing / still functional | | | | | | | | | | | | | | | | | | |
| Damaged casing / repair required | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| **CONCRETE PADS** | | | | | | | | | | | | | | | | | | |
| Pad in good condition | | | | | | | | | | | | | | | | | | |
| Minor cracks | | | | | | | | | | | | | | | | | | |
| Major cracks / broken / repair required | | | | | | | | | | | | | | | | | | |
| Undermined / washing out | | | | | | | | | | | | | | | | | | |
| Fire ants around concrete pad | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| **WELL PROTECTIVE CASINGS** | | | | | | | | | | | | | | | | | | |
| Casing in good condition | | | | | | | | | | | | | | | | | | |
| Damaged casing / still functional | | | | | | | | | | | | | | | | | | |
| Damaged casing / repair required | | | | | | | | | | | | | | | | | | |
| Broken hinge on protective lid | | | | | | | | | | | | | | | | | | |
| Wasp nest inside protective casing | | | | | | | | | | | | | | | | | | |
| Ants inside protective casing | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| **WELL CAPS** | | | | | | | | | | | | | | | | | | |
| Well cap in good condition | | | | | | | | | | | | | | | | | | |
| Damaged / needs replacement | | | | | | | | | | | | | | | | | | |
| Replaced damaged well cap | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| **FLUSH MOUNT WELLS** | | | | | | | | | | | | | | | | | | |
| Vault in good condition | | | | | | | | | | | | | | | | | | |
| Water inside vault | | | | | | | | | | | | | | | | | | |
| Vault bolt holes broken or stripped | | | | | | | | | | | | | | | | | | |
| Bolts stripped | | | | | | | | | | | | | | | | | | |
| Vault lid cracked or broken | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| **WELL ID TAGS** | | | | | | | | | | | | | | | | | | |
| Well tag in good condition | | | | | | | | | | | | | | | | | | |
| Well tag missing | | | | | | | | | | | | | | | | | | |
| Well tag damaged / illegible | | | | | | | | | | | | | | | | | | |
| Lacks required information - Driller Reg # | | | | | | | | | | | | | | | | | | |
| Lacks required information - Completion date | | | | | | | | | | | | | | | | | | |
| Lacks required information - Total well depth | | | | | | | | | | | | | | | | | | |
| Lacks required information - Depth to screen | | | | | | | | | | | | | | | | | | |
| Lacks required information - Non potable tag | | | | | | | | | | | | | | | | | | |

**NOTE:**

**Figure 7. North Carolina Groundwater Sampling Checklist**

# TABLES

# TABLE 1
# MONITORING WELL INFORMATION
# DUKE ENERGY PROGRESS, INC./W.H. WEATHERSPOON POWER PLANT
# LUMBERTON, NORTH CAROLINA

| WELL ID | DATE INSTALLED | NORTHING | EASTING | USE | TYPE OF CASING | WELL DIAMETER (inches) | TOP OF CASING ELEVATION (NGVD 29) | WELL DEPTH TOC | WELL SCREEN INTERVAL * TOC | SCREEN LENGTH (feet) |
|---|---|---|---|---|---|---|---|---|---|---|
| BW-1 | 8/30/2010 | 306927.89 | 2007479.08 | Background | PVC | 2.0 | 142.82 | 23.06 | 8.06 - 23.06 | 15 |
| CW-1 | 8/30/2010 | 304511.22 | 2008942.11 | Compliance | PVC | 2.0 | 116.84 | 17.70 | 7.70 - 17.70 | 10 |
| CW-2 | 8/27/2010 | 305762.29 | 2010618.15 | Comliance | PVC | 2.0 | 113.41 | 17.41 | 7.41 - 17.41 | 10 |
| CW-3 | 8/26/2010 | 306399.73 | 2010288.16 | Compliance | PVC | 2.0 | 119.08 | 17.63 | 7.63 - 17.63 | 10 |

Prepared By: HJF Checked By: KWW

Notes:
TOC - Top of Casing
NGVD 29 - A vertical control datum in the United States by the general adjustment of 1929
* - Well depths and screen intervals are based upon field observations.

**TABLE 2**
**SAMPLE PARAMETERS, ANALYTICAL METHODS, CONTAINERS, PRESERVATIVES, AND HOLIDNG TIMES**
**DUKE ENERGY PROGRESS, INC./W.H. WEATHERSPOON POWER PLANT**
**LUMBERTON, NORTH CAROLINA**

| PARAMETER | UNITS | CONTAINERS | PRESERVATIVES | HOLDING TIMES | ANALYTICAL METHOD |
|---|---|---|---|---|---|
| ***Field Parameters*** | | | | | |
| Field pH | SU | Flow-through Cell | None | Analyze Immediately | YSI 556 Multi-Meter |
| Specific Conductivity | mmhos/cm | Flow-through Cell | None | Analyze Immediately | YSI 556 Multi-Meter |
| Temperature | °C | Flow-through Cell | None | Analyze Immediately | YSI 556 Multi-Meter |
| Water Level | ft | - | - | - | Water Level Meter |
| ***Laboratory Analysis*** | | | | | |
| Antimony | µg/L | 500 ml HDPE | pH < 2 $HN0_3$ | 6 months | TRM / EPA 200.8 |
| Arsenic | µg/L | 500 ml HDPE | pH < 2 $HN0_3$ | 6 months | TRM / EPA 200.8 |
| Barium | mg/L | 500 ml HDPE | pH < 2 $HN0_3$ | 6 months | TRM / EPA 200.7 |
| Boron | mg/L | 500 ml HDPE | pH < 2 $HN0_3$ | 6 months | TRM / EPA 200.7 |
| Cadmium | µg/L | 500 ml HDPE | pH < 2 $HN0_3$ | 6 months | TRM / EPA 200.8 |
| Chloride | mg/L | 125 ml HDPE | Cool 4° C | 28 days | EPA 300.0 |
| Chromium (total) | mg/L | 500 ml HDPE | pH < 2 $HN0_3$ | 6 months | TRM / EPA 200.7 |
| Copper | mg/L | 500 ml HDPE | pH < 2 $HN0_3$ | 6 months | TRM / EPA 200.7 |
| Iron | mg/L | 500 ml HDPE | pH < 2 $HN0_3$ | 6 months | TRM / EPA 200.7 |
| Lead | µg/L | 500 ml HDPE | pH < 2 $HN0_3$ | 6 months | TRM / EPA 200.8 |
| Manganese | mg/L | 500 ml HDPE | pH < 2 $HN0_3$ | 6 months | TRM / EPA 200.7 |
| Mercury | µg/L | 500 ml HDPE | pH < 2 $HN0_3$ | 6 months | EPA 245.1 |
| Nickel | mg/L | 500 ml HDPE | pH < 2 $HN0_3$ | 6 months | TRM / EPA 200.7 |
| Nitrate (as Nitrogen) | mg/L | 125 ml HDPE | Cool 4° C | 48 hour | EPA 300.0 |
| Selenium | µg/L | 500 ml HDPE | pH < 2 $HN0_3$ | 6 months | TRM / EPA 200.8 |
| Sulfate | mg/L | 125 ml HDPE | Cool 4° C | 28 days | EPA 300.0 |
| Total Dissolved Solids | mg/L | 250 ml HDPE | Cool 4° C | 28 days | SM 2540C |
| Thallium | µg/L | 500 ml HDPE | pH < 2 $HN0_3$ | 6 months | TRM / EPA 200.8 |
| Zinc | mg/L | 500 ml HDPE | pH < 2 $HN0_3$ | 6 months | TRM / EPA 200.7 |

Prepared By: HJF Checked By: KWW

Notes:
SU - Standard Units
mS/cm - micro siemen per centimeter
ft - feet
mv - milli volts
mg/L - milligrams per liter
µg/L - micrograms per liter
NTU - Nephelometric Turbidity Units
TRM - Total Recoverable Metals
EPA - Environmental Protection Agency
SM - Standard Method

# APPENDIX A

# BORING LOGS AND MONITORING WELL CONSTRUCTION LOGS

# COMPLETION REPORT OF WELL No. CW-1



PROJECT: **Weatherspoon Steam Electric Plant**
PROJECT NO: **1584-10-022**
PROJECT LOCATION: **491 Power Plant Road, Lumberton, NC**

WATER LEVEL: **110.33 (6.51' bg)**
LATITUDE:
LONGITUDE:
TOP OF CASING ELEVATION: 834.98
DATUM: **MSL**
LOGGED BY: **J. Honeycutt**

DRILLING CONTRACTOR: **S&ME**
DRILLING METHOD: **4 ¼" H.S.A.**
DATE DRILLED: **8/30/10**

| STRATA DESCRIPTION | SYMBOL | DEPTH (ft.) | WELL DETAILS | DEPTH (ft.) | LEGEND | ELEVATION (ft.) |
|---|---|---|---|---|---|---|
| | | | | -4.00 TOC | | |
| | | | | 0.00 | GS | |
| Black Silty Fine to Medium **SAND** with woody organics (dry) | | 0 | | 2.00 | TSC | |
| | | | | 3.00 | CG | |
| Black Silty Fine **SAND** (No organics) | | 5 | | | | |
| | | 10 | | | | |
| Gray Silty Fine to Medium **SAND** | | | | 14.00 | BSC BS | |

## WELL CONSTRUCTION DETAILS

### PROTECTIVE CASING
Diameter:
Type:
Interval:

### RISER CASING
Diameter: **2**
Type: **PVC**
Interval: **+2.5 (-4) Top of casing finished +2.5 above grade**

### GROUT
Type: **Portland**
Interval: **0-2**

### SEAL
Type: **Bentonite**
Interval: **2-3**

### FILTERPACK
Type: **#2 Sand**
Interval: **3-14**

### SCREEN
Diameter: **2**
Type: **PVC**
Interval: **4-14**

### LEGEND
- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

| | |
|---|---|
| TOC | TOP OF CASING |
| GS | GROUND SURFACE |
| BS | BENTONITE SEAL |
| FP | FILTER PACK |
| TSC | TOP OF SCREEN |
| BSC | BOTTOM OF SCREEN |
| TD | TOTAL DEPTH |
| CG | CEMENT GROUT |

MONITORING WELL 1584-10-022 WEATHERSPOON STEAM ELETRIC PLANT GPJ S&ME.GDT 10/8/10

S&ME
ENGINEERING • TESTING
ENVIRONMENTAL SERVICES
3718 OLD BATTLEGROUND ROAD
GREENSBORO, NC

# COMPLETION REPORT OF WELL No. CW-2



PROJECT: **Weatherspoon Steam Electric Plant**
PROJECT NO: **1584-10-022**
PROJECT LOCATION: **491 Power Plant Road, Lumberton, NC**

WATER LEVEL: **105.66 (7.75' bg)**
LATITUDE:
LONGITUDE:
TOP OF CASING ELEVATION: 834.98
DATUM: **MSL**
LOGGED BY: **E. Henriques**

DRILLING CONTRACTOR: **S&ME**
DRILLING METHOD: **4 ¼" H.S.A.**
DATE DRILLED: **8/27/10**

| STRATA DESCRIPTION | SYMBOL | DEPTH (ft.) |
|---|---|---|
| No Recovery | | 0 |
| Red Brown mottled Clayey medium grained sand (Moist) | | 5 |
| Gray Black Silty Fine **SAND** Organic rich (Moist) | | |
| Red Brown mottled Clayey medium grained sand (Moist) | | 10 |
| Gray Clayey medium grained sand (Moist) | | |
| Bright Red Silty Fine **SAND** (Saturated) | | |
| Orange Gray mottled Clayey Fine **SAND** (Saturated) | | |
| Gray Tan Clayey Fine to Medium **SAND** (Saturated) | | |

WELL DETAILS

| DEPTH (ft.) | LEGEND | ELEVATION (ft.) |
|---|---|---|
| 0.00 | GS | |
| 2.00 | | |
| 3.00 | | |
| 4.50 | | |
| 14.50 | | |

## WELL CONSTRUCTION DETAILS

**PROTECTIVE CASING**
Diameter:
Type:
Interval:

**RISER CASING**
Diameter: **2**
Type: **PVC**
Interval: **+2.5-4.5**

**GROUT**
Type: **Portland**
Interval: **0-2**

**SEAL**
Type: **Bentonite**
Interval: **2-3**

**FILTERPACK**
Type: **#2 Sand**
Interval: **3-14.5**

**SCREEN**
Diameter: **2**
Type: **PVC**
Interval: **4.5-14.5**

**LEGEND**

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

| | |
|---|---|
| TOC | TOP OF CASING |
| GS | GROUND SURFACE |
| BS | BENTONITE SEAL |
| FP | FILTER PACK |
| TSC | TOP OF SCREEN |
| BSC | BOTTOM OF SCREEN |
| TD | TOTAL DEPTH |
| CG | CEMENT GROUT |

S&ME
ENGINEERING • TESTING
ENVIRONMENTAL SERVICES
3718 OLD BATTLEGROUND ROAD
GREENSBORO, NC

COMPLETION REPORT OF WELL No. CW-2



MONITORING WELL 1584-10-022 WEATHERSPOON STEAM ELETRIC PLANT.GPJ S&ME.GDT 10/8/10

# COMPLETION REPORT OF WELL No. CW-3

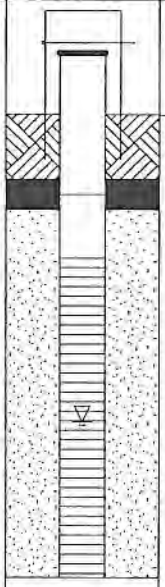


PROJECT: **Weatherspoon Steam Electric Plant**
PROJECT NO: **1584-10-022**
PROJECT LOCATION: **491 Power Plant Road, Lumberton, NC**

WATER LEVEL: **109.46 (9.62' bg)**
LATITUDE:
LONGITUDE:
TOP OF CASING ELEVATION: 834.98
DATUM: **MSL**
LOGGED BY: **E. Henriques**

DRILLING CONTRACTOR: **S&ME**
DRILLING METHOD: **4 ¼" H.S.A.**
DATE DRILLED: **8/26/10**

| STRATA DESCRIPTION | SYMBOL | DEPTH (ft.) |
|---|---|---|
| Loose Gray Black Sandy **SILT** with Roots (Dry) | | 0 |
| Loose Tan Silty Fine **SAND** (Moist) | | |
| Loose Dark Brown Silty Fine **SAND** (Moist) | | 5 |
| Gray Silty Fine **SAND** Transitions to a clayey fine grained sand (Saturated) | | |
| Gray Silty Fine **SAND** (Saturated) | | 10 |
| Gray Clayey **SILT** (Saturated) | | |
| Gray Silty Fine to Medium **SAND** with isolated clay varves | | |



| DEPTH (ft.) | LEGEND | ELEVATION (ft.) |
|---|---|---|
| 0.00 | GS | |
| 2.00 | | |
| 3.00 | | |
| 4.50 | | |
| 14.50 | | |

## WELL CONSTRUCTION DETAILS

**PROTECTIVE CASING**
Diameter:
Type:
Interval:

**RISER CASING**
Diameter: **2**
Type: **PVC**
Interval: **+2.5 - 4.5**

**GROUT**
Type: **Portland**
Interval: **0-2**

**SEAL**
Type: **Bentonite**
Interval: **2-3**

**FILTERPACK**
Type: **#2 Sand**
Interval: **3-14.5**

**SCREEN**
Diameter: **2**
Type: **PVC**
Interval: **4.5-14.5**

**LEGEND**

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

| | |
|---|---|
| TOC | TOP OF CASING |
| GS | GROUND SURFACE |
| BS | BENTONITE SEAL |
| FP | FILTER PACK |
| TSC | TOP OF SCREEN |
| BSC | BOTTOM OF SCREEN |
| TD | TOTAL DEPTH |
| CG | CEMENT GROUT |

S&ME
ENGINEERING • TESTING
ENVIRONMENTAL SERVICES
3718 OLD BATTLEGROUND ROAD
GREENSBORO, NC

**COMPLETION REPORT OF WELL No. CW-3**

# COMPLETION REPORT OF WELL No. BW-1



PROJECT: **Weatherspoon Steam Electric Plant**
PROJECT NO: **1584-10-022**
PROJECT LOCATION: **491 Power Plant Road, Lumberton, NC**

WATER LEVEL: **132.73 (10.09' bg)**
LATITUDE:
LONGITUDE:
TOP OF CASING ELEVATION: 834.98
DATUM: **MSL**
LOGGED BY: **J. Honeycutt**

DRILLING CONTRACTOR: **S&ME**
DRILLING METHOD: **4 ¼" H.S.A.**
DATE DRILLED: **8/30/10**

| STRATA DESCRIPTION | SYMBOL | DEPTH (ft.) |
|---|---|---|
| Loose Brown Silty Fine to Medium **SAND** with wood organics (Dry) | | 0 |
| Firm Dark Gray Clayey Fine to Medium **SAND** (Moist) | | 5 |
| Loose Black Silty Fine to Medium **SAND** with Organics (Saturated) | | 10 |
| Loose Tan Gray Fine to Medium **SAND** Mottled (Saturated) | | 15 |
| | | 20 |

WELL DETAILS

| DEPTH (ft.) | LEGEND | ELEVATION (ft.) |
|---|---|---|
| 0.00 | GS | |
| 2.00 | | |
| 3.00 | | |
| 5.00 | | |
| 20.00 | | |

## WELL CONSTRUCTION DETAILS

**PROTECTIVE CASING**
Diameter:
Type:
Interval:

**RISER CASING**
Diameter: **2**
Type: **PVC**
Interval: **+2.5 - 5**

**GROUT**
Type: **Portland**
Interval: **0-2**

**SEAL**
Type: **Bentonite**
Interval: **2-3**

**FILTERPACK**
Type: **#2 Sand**
Interval: **3-20**

**SCREEN**
Diameter: **2**
Type: **PVC**
Interval: **5-20**

**LEGEND**

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL
- STATIC WATER LEVEL

| | |
|---|---|
| TOC | TOP OF CASING |
| GS | GROUND SURFACE |
| BS | BENTONITE SEAL |
| FP | FILTER PACK |
| TSC | TOP OF SCREEN |
| BSC | BOTTOM OF SCREEN |
| TD | TOTAL DEPTH |
| CG | CEMENT GROUT |

MONITORING WELL 1584-10-022 WEATHERSPOON STEAM ELETRIC PLANT.GPJ S&ME.GDT 10/8/10

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3718 OLD BATTLEGROUND ROAD
GREENSBORO, NC

**COMPLETION REPORT OF WELL No. BW-1**

# APPENDIX B

# W.H. WEATHERSPOON POWER PLANT

# PERMIT CONDITION ATTACHMENT XX, VERSION 1.0

# MARCH 17, 2011

NCDENR
North Carolina Department of Environment and Natural Resources
Division of Water Quality
Coleen H. Sullins
Director

Beverly Eaves Perdue
Governor

Dee Freeman
Secretary

June 15, 2011

Mr. Rick Grant, Plant Manager
Progress Energy Carolinas, Inc.
Weatherspoon Steam Plant
491 Power Plant Road
Lumberton, NC 28358

Subject: Permit Modification
NPDES Permit NC0005363
Weatherspoon Steam Plant
Robeson County

Dear Mr. Grant:

Thank you for your letter of March 7, 2011 requesting modifications to the stormwater provisions contained in the subject permit. Our Stormwater Permitting Unit discussed the site circumstances with Robin Bryson, as per your direction in that letter. Robin has via email and verbal discussion revised Progress' request, and we are in accord with her revised modification request.

Effective immediately, you may consider all of Section B (Stormwater Permit Requirements) of the subject permit as rescinded. These stormwater requirements were initially established to cover coal ash hauling activity along an access road; however, this activity ceased in November 2010 and there are no current plans to conduct coal ash hauling or other qualifying activities along the access road. For administrative efficiency, DWQ will postpone revising and re-issuing the remaining text of the permit until the next scheduled permit renewal in 2014.

Please contact Ken Pickle in DWQ's Stormwater Permitting Unit with any questions on this stormwater modification.

Sincerely,

Tom Belnick
Supervisor, Complex Permitting Unit

Cc
Robin Bryson, Progress
Ken Pickle, SPU

1617 Mail Service Center, Raleigh, North Carolina 27699-1617
Location: 512 N. Salisbury St. Raleigh, North Carolina 27604
Phone: 919-807-6300 \ FAX: 919-807-6492 \ Customer Service: 1-877-623-6748
Internet: www.ncwaterquality.org
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NCDENR
North Carolina Department of Environment and Natural Resources
Division of Water Quality
Coleen H. Sullins
Director

Beverly Eaves Perdue
Governor

Dee Freeman
Secretary

March 17, 2011

RECEIVED MAR 24 2011

Mr. John Toepfer
Senior Environmental Technical Specialist
Progress Energy Service Company, LLC
410 South Wilmington Street
PEB 4
Raleigh, North Carolina 27601

Subject: Progress Energy's North Carolina Ash Pond Facilities
Final Groundwater Monitoring Plans and Maps

Dear Mr. Toepfer:

Attached are the final Groundwater Monitoring Plans and maps for the Asheville, Cape Fear, Lee, Mayo, Roxboro, Sutton, and Weatherspoon facilities. These plans and maps will be incorporated in each facility's NPDES permits. Please note some minor additions and corrections to the individual Groundwater Monitoring Plans.

If you have any questions, please feel free to contact Eric Smith at (919) 715-6196 or me at (919) 715-6699.

Sincerely,

Debra J. Watts

Debra J. Watts
Supervisor – Groundwater Protection Unit

Attachments

cc: APS Central Office Files w/ attachments
SWP – NPDES (Sergei Chernikov) w/ attachments
Regional Offices – APS

AQUIFER PROTECTION SECTION
1636 Mail Service Center, Raleigh, North Carolina 27699-1636
Location: 2728 Capital Boulevard, Raleigh, North Carolina 27604
Phone: 919-733-3221 \ FAX 1: 919-715-0588; FAX 2: 919-715-6048 \ Customer Service 1-877-623-6748
Internet: www.ncwaterquality.org
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A. (6) GROUNDWATER MONITORING WELL CONSTRUCTION AND SAMPLING

1. The permittee shall conduct groundwater monitoring as may be required to determine the compliance of this NPDES permitted facility with the current groundwater Standards found under 15A NCAC 2L .0200

2. WELL CONSTRUCTION. Within 120 days of permit issuance, monitoring wells, as proposed on Attachment XX, shall be installed to monitor groundwater quality.

   a. Monitoring wells shall be constructed in accordance with 15A NCAC 02C .0108 (Standards of Construction for Wells Other than Water Supply) and any other jurisdictional laws and regulations pertaining to well construction. The general locations for all monitoring wells are indicated on Attachment XX.

   b. Within 30 days of completion of well construction, a completed Well Construction Record (Form GW-1) must be submitted for each monitoring well to Division of Water Quality, Aquifer Protection Section, 1636 Mail Service Center, Raleigh, NC 27699-1636.

   c. The Fayetteville Regional Office, telephone number (910) 433-3300 shall approve the location of new monitoring wells prior to installation. The regional office shall be notified at least 48 hours prior to the construction of any monitoring well and such notification to the Aquifer Protection Section's regional supervisor shall be made from 8:00 a.m. until 5:00 p.m. on Monday through Friday, excluding State Holidays.

   d. Within 60 days of completion of the monitoring wells, the Permittee shall submit two original copies of a site map with a scale no greater than 1-inch equals 500 feet. At a minimum, the map shall include the following information:

      i. The location and identity of each monitoring well.
      ii. The location of major components of the waste disposal system.
      iii. The location of property boundaries within 500 feet of the disposal areas.
      iv. The latitude and longitude of the established horizontal control monument.
      v. The elevation of the top of the well casing (i.e., measuring point) relative to a common datum.
      vi. The depth of water below the measuring point at the time the measuring point is established.
      vii. The location of compliance and review boundaries.
      viii. The date the map is prepared and/or revised.
      ix. Topographic contours in no more than ten (10) foot intervals

   e. The above information should be overlaid on the most recent aerial photograph taken of the site. Control monuments shall be installed in such a manner and made of such materials that the monument will not be destroyed due to activities taking place on the property. The map and any supporting documentation shall be sent to the Division of Water Quality, Aquifer Protection Section, 1636 Mail Service Center, Raleigh, NC 27699-1636.

   f. The well(s) must be constructed by a North Carolina Certified Well Contractor, the property owner, or the property lessee according to General Statutes 87-98.4. If the construction is not performed by a certified well contractor, the property owner or lessee, provided they are a natural person, must physically perform the actual well construction activities.

g. The monitoring wells shall be regularly maintained. Such maintenance shall include ensuring that the well caps are rust-free and locked at all times, the outer casing is upright and undamaged, and the well does not serve as a conduit for contamination.

3. GROUNDWATER SAMPLING AND COMPLIANCE. Monitoring wells shall be sampled after construction and thereafter at the frequencies and for the parameters as specified in Attachment XX. All maps, well construction forms, well abandonment forms and monitoring data shall refer to the permit number and the well nomenclature as provided on Attachment XX.

a. Per 15A NCAC 02H .0800, a Division certified laboratory shall conduct all laboratory analyses for the required effluent, groundwater or surface water parameters.

b. The measurement of water levels shall be made prior to purging the wells. The depth to water in each well shall be measured from the surveyed point on the top of the casing. The measurement of pH shall be made after purging and prior to sampling for the remaining parameters.

c. The measuring points (top of well casing) of all monitoring wells shall be surveyed to provide the relative elevation of the measuring point for each monitoring well. The measuring points (top of casing) of all monitoring wells shall be surveyed relative to a common datum.

d. For monitoring wells that are not located at the Compliance Boundary, the Compliance Monitoring Form (GW-59CCR) is not required. However, predictive calculations or modeling shall be submitted to the Regional Office annually (i.e. 12 months after permit issuance) demonstrating groundwater quality standards at the Compliance Boundary.

e. Two copies of the monitoring well sampling shall be submitted on a Compliance Monitoring Form (GW-59CCR), and received no later than the last working day of the month following the sampling month. Copies of the laboratory analyses shall be kept on site, and made available upon request. The Compliance Monitoring Form (GW-59CCR) shall include this permit number and the appropriate well identification number. All information shall be submitted to the following address:

Division of Water Quality
Information Processing Unit
1617 Mail Service Center
Raleigh, North Carolina 27699-1617

f. For groundwater samples that exceed the ground water quality standards in 15A NCAC 02L .0202, the Regional Office shall be contacted within 30 days after submission of the groundwater monitoring report; an evaluation may be required to determine the impact of the waste disposal activities. Failure to do so may subject the permittee to a Notice of Violation, fines, and/or penalties.

4. COMPLIANCE BOUNDARY. The compliance boundary for the disposal system shall be specified in accordance with 15A NCAC 02L .0107(a). This disposal system was individually permitted prior to December 30, 1983; therefore, the compliance boundary is established at either 500 feet from the effluent disposal area, or at the property boundary, whichever is closest to the effluent disposal area. An exceedance of groundwater standards at or beyond the compliance boundary is subject to remediation action according to 15A NCAC 02L .0106(c) as well as enforcement actions in accordance with North Carolina General Statute 143-215.6A through 143-215.6C.

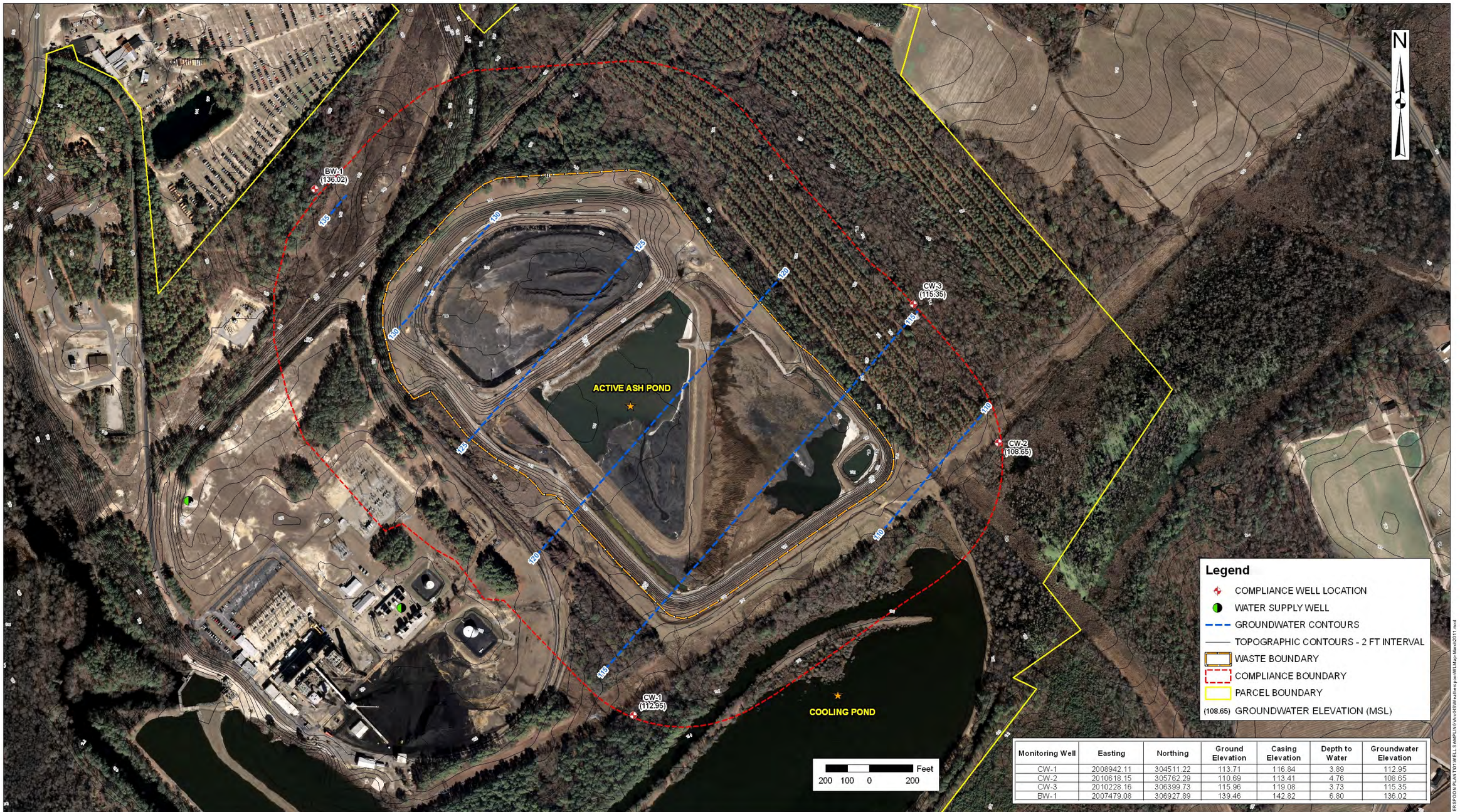
# ATTACHMENT XX – GROUNDWATER MONITORING PLAN

**Permit Number: NC0005363** **Version 1.0**

| WELL NOMENCLATURE | PARAMETER DESCRIPTION | | | | FREQUENCY |
|---|---|---|---|---|---|
| Monitoring Wells: BW-1, CW-1, CW-2, CW-3 | Antimony | Chromium | Nickel | Thallium | March, June, and October |
| | Arsenic | Copper | Nitrate | Water Level | |
| | Barium | Iron | pH | Zinc | |
| | Boron | Lead | Selenium | | |
| | Cadmium | Manganese | Sulfate | | |
| | Chloride | Mercury | TDS | | |

Note 1: For locations of monitoring wells, see attached map.

Note 2: Monitoring revisions may be considered, as applicable, if there are no significant detections prior to permit renewal.




| Monitoring Well | Easting | Northing | Ground Elevation | Casing Elevation | Depth to Water | Groundwater Elevation |
|---|---|---|---|---|---|---|
| CW-1 | 2008942.11 | 304511.22 | 113.71 | 116.84 | 3.89 | 112.95 |
| CW-2 | 2010618.15 | 305762.29 | 110.69 | 113.41 | 4.76 | 108.65 |
| CW-3 | 2010228.16 | 306399.73 | 115.96 | 119.08 | 3.73 | 115.35 |
| BW-1 | 2007479.08 | 306927.89 | 139.46 | 142.82 | 6.80 | 136.02 |

Notes:
1. TOPO Source - NCDOT LIDAR, Dated 2007
2. Image Source - NC ONEMAP, Robeson CO., DATED 2008
3. Parcel Source - Robeson County GIS, Dated February 2010.
4. Compliance well locations and elevations from the site survey prepared by Bateman Civil Survey CO., PC.
5. Objects are shown in general arrangement for illustration purposes. The locations of objects shown are not necessarily accurate and have not been surveyed.
6. Depth to water measured by SynTerra on March 1, 2011.
7. Base information provided by S&ME.


synTerra
148 River Street, Suite 220
Greenville, SC 29601
864-421-9999
www.synterracorp.com


DRAWN BY: B. Russo DATE: 03/31/2011
CHECKED BY: K. Webb DATE: 03/31/2011
PROJECT MANAGER: K. Webb

PROGRESS ENERGY CAROLINAS
WEATHERSPOON STEAM ELECTRIC PLANT
LUMBERTON, NORTH CAROLINA

# WATER LEVEL MAP
# MARCH 2011

FIGURE 1
1026.09.01
DRAWING
FIG 1

3/31/2011 P:\Progress Energy\1026\09\WEATHERSPOON PLANT\GIS\WELL SAMPLING\March\SWeatherspoonWLMap-March2011.mxd