

Roxboro Steam Electric Plant Ash Basins

# Topographic Map and Discharge Assessment Plan

NPDES Permit NC0003425

December 30, 2014





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## Section 1 - Introduction

The purpose of this document is to address the requirements of North Carolina General Statute (GS)130A-309.210(a) *topographic map* and (b) *Assessment of Discharges from Coal Combustion Residuals Surface Impoundments to the Surface Waters of the State*, as modified by North Carolina Senate Bill 729, for the Roxboro Steam Electric Plant (Roxboro Plant) ash basins operated under National Pollutant Discharge Elimination System (NPDES) Permit NC0003425.

The following requirements are contained in General Statute (GS) 130A-309.210(a):

- (1) *The owner of a coal combustion residuals surface impoundment shall identify all discharges from the impoundment as provided in this subsection. The requirements for identifying all discharges from an impoundment set out in this subsection are in addition to any other requirements for identifying discharges applicable to the owners of coal combustion residuals surface impoundments.*
  
- (2) *No later than December 31, 2014, the owner of a coal combustion residuals surface impoundment shall submit a topographic map that identifies the location of all (i) outfalls from engineered channels designed or improved for the purpose of collecting water from the toe of the impoundment and (ii) seeps and weeps discharging from the impoundment that are not captured by engineered channels designed or improved for the purpose of collecting water from the toe of the impoundment to the Department. The topographic map shall comply with all of the following:*
  - a. *Be at a scale as required by the Department.*
  - b. *Specify the latitude and longitude of each toe drain outfall, seep, and weep.*
  - c. *Specify whether the discharge from each toe drain outfall, seep, and weep is continuous or intermittent.*
  - d. *Provide an average flow measurement of the discharge from each toe drain outfall, seep, and weep including a description of the method used to measure average flow.*
  - e. *Specify whether the discharge from each toe drain outfall, seep, and weep identified reaches the surface waters of the State. If the discharge from a toe drain outfall, seep, or weep reaches the surface waters of the State, the map shall specify the latitude and longitude of where the discharge reaches the surface waters of the State.*
  - f. *Include any other information related to the topographic map required by the Department.*

The following requirements are contained in General Statute (GS) 130A-309.210(b):

- b) *Assessment of Discharges from Coal Combustion Residuals Surface Impoundments to the Surface Waters of the State. The owner of a coal combustion residuals surface*



*impoundment shall conduct an assessment of discharges from the coal combustion residuals surface impoundment to the surface waters of the State as provided in this subsection. The requirements for assessment of discharges from the coal combustion residuals surface impoundment to the surface waters of the State set out in this subsection are in addition to any other requirements for the assessment of discharges from coal combustion residuals surface impoundments to surface waters of the State applicable to the owners of coal combustion residuals surface impoundments.*

- (1) No later than December 31, 2014, the owner of a coal combustion residuals surface impoundment shall submit a proposed Discharge Assessment Plan to the Department. The Discharge Assessment Plan shall include information sufficient to allow the Department to determine whether any discharge, including a discharge from a toe drain outfall, seep, or weep, has reached the surface waters of the State and has caused a violation of surface water quality standards. The Discharge Assessment Plan shall include, at a minimum, all of the following:
  - a. Upstream and downstream sampling locations within all channels that could potentially carry a discharge.*
  - b. A description of the surface water quality analyses that will be performed.*
  - c. A sampling schedule, including frequency and duration of sampling activities.*
  - d. Reporting requirements.*
  - e. Any other information related to the identification of new discharges required by the Department.**
- (2) The Department shall approve the Discharge Assessment Plan if it determines that the Plan complies with the requirements of this subsection and will be sufficient to protect public health, safety, and welfare; the environment; and natural resources.*
- (3) No later than 30 days from the approval of the Discharge Assessment Plan, the owner shall begin implementation of the Plan in accordance with the Plan's schedule.*

The North Carolina Senate Bill 729 establishes the submittal date of this topographic map and Discharge Assessment Plan no later than December 31, 2014.

The topographic map, developed to satisfy the requirements of GS130A-309.210(a), was utilized as the basis for developing the assessment procedures presented in this plan, required by GS130A-309.210(b).

## Section 2 - Site Background

### 2.1 Plant Description

The Roxboro Steam Electric Plant (Roxboro Plant) is located in north-central North Carolina near Semora, North Carolina. A large part of the Roxboro Plant property encompasses Hyco Lake (Figure 1). The Roxboro Plant is located in Person County along the east bank of Hyco Lake north of Roxboro, North Carolina, and west of Mcghees Mill Road.

The Roxboro Plant began operations in 1966. Additional units were added in 1968, 1973, and 1980. Throughout its operational history, the Roxboro Plant has used coal-fired units to produce steam. Ash generated from coal combustion is stored on site in ash basins.

### 2.2 Ash Basin Description

Ash generated from coal combustion has been stored in on-site ash basins and lined landfill. Ash has been sluiced to the ash basins or conveyed in its dry form to the lined landfill. Two ash basins areas have been used at the Roxboro Plant and are referenced using the date of construction and relative location: the 1966 semi-active East Ash Basin and the 1973 active West Ash Basin. The East Ash Basin is located southeast of the Roxboro Plant, and the West Ash Basin is located south of Roxboro Plant. An unlined landfill was constructed on the East Ash Basin in the late 1980s. A lined landfill was subsequently constructed over the unlined landfill around 2004. The ash basins are impounded by earthen dams.

Currently, the East Ash Basin and lined landfill are covered with vegetation where the landfill is not active (grasses and shrubs). The West Ash Basin has some grass cover and ponded water, mostly along the southern and eastern edges of the basin. Wet ash and run off from the East Ash Basin landfill is directed to the West Ash Basin for settling. The West Ash Basin encompasses approximately 200 acres and discharges by a permitted outfall into Hyco Lake.

### 2.3 Site Geologic/Soil Framework

The Roxboro Plant is situated geographically in the eastern Piedmont Region of north-central North Carolina and is near the contact of two regional geologic zones. The geologic zones include the Inner Piedmont zone, characterized by biotite gneiss and schist, and the Charlotte Belt, distinguished by felsic mica gneiss. Both zones are generally comprised of igneous, metamorphosed igneous, and sedimentary rocks of Paleozoic age. The bedrock is largely fractured, folded, and has been subjected to long periods of physical and chemical weathering. The weathering has produced 10 feet to 30 feet of unconsolidated residuum and saprolitic soil overlying bedrock at the site.

One of the most important interpretations concerning the geologic nature of the region is the discovery and description of the Hyco shear zone, a tectonic boundary comprised of a ductile shear zone that sharply separates contrasting rocks of the Charlotte (Milton) and Carolina Terranes in north-central North Carolina and southern Virginia (Hibbard, et. al., 1998). The Hyco shear zone was mapped as directly underlying Hyco Lake.

Shallow groundwater generally flows from local recharge zones in topographically high areas, such as ridges, toward groundwater discharge zones, such as stream valleys. Ridge and topographic high areas serve as groundwater recharge zones, and groundwater flow patterns in recharge areas tend to develop a somewhat radial pattern from the center of the recharge area outward toward the discharge areas and are expected to mimic surface topography.

## 2.4 Topographic Map and Identification of Discharges

A topographic map is presented in Figure 2 to meet the requirements of GS 130A-309.210(a) in the identification of outfalls from engineered channels, as well as seeps and weeps.

Seepage is the movement of wastewater from the ash basin through the ash basin embankment, the embankment foundation, the embankment abutments, basin rim, through residual material in areas adjacent to the ash basin. A seep is defined in this document as an expression of seepage at the ground surface. A weep is understood to have the same meaning as a seep.

Indicators of seepage include areas where water is observed on the ground surface and/or where vegetation suggests the presence of seepage. Seepage can emerge anywhere on the downstream face, beyond the toe, or on the downstream abutments at elevations below normal pool. Seepage may vary in appearance from a "soft," wet area to a flowing "spring." Seepage may show up first as only an area where the vegetation is lusher and darker green than surrounding vegetation. Cattails, reeds, mosses, and other marsh vegetation often become established in a seepage area. However, in many instances, indicators of seeps do not necessarily indicate the presence of seeps. Areas of apparent iron staining and/or excess iron bacteria may also indicate the presence of a seep.

Locations of seepage at the ground surface adjacent to the ash basin have been identified and are shown in Figure 2. These areas include the earthen embankments which impound the ash basin as well as adjacent areas where water from the ash basin may have infiltrated into the underlying residual materials and expressed as seepage.

### 2.4.1 Engineered Drainage System for Earthen Dam

Earth dams are subject to seepage through the embankment, foundation, and abutments. Seepage control is necessary to prevent excessive uplift pressures, instability of the downstream slope, piping through the embankment and/or foundation, and erosion of material by migration into open joints in the foundation and abutments. The control of seepage is performed by the use of engineered drains such as blanket drains, trench drains, and/or toe drains. In certain cases horizontal pipes may be installed into the embankment to collect and control seepage. It is standard engineering practice to collect the seepage and convey seepage away from the dam.

The Roxboro Plant West Ash Basin was constructed with an internal chimney drain to collect seepage water through the dam. The chimney drain transmits water through a series of chimney drain outlets (7) toward the permitted outfall at Hyco Lake. The engineered drainage system features, or outfalls, associated with the ash basin dam are shown as required by GS 130A-309.210(a)(2)(i) on Figure 2.



#### **2.4.2 Non-Engineered Seep Identification**

Topographic maps of the site were reviewed to identify regions of the site where there was a potential for ash basin related seepage to be present. These regions were determined by comparing ash basin full pond elevations to adjacent topography with ground surface elevations lower than the ash basin full pond elevation. Synterra staff performed site observations within these identified areas as part of NPDES inspections during the reapplication process during August 2014 and documented locations where seepage was apparent at the time of the site visit. These seeps are identified as required by GS 130A-309.210(a)(2)(ii) on Figure 2.

## Section 3 - Discharge Assessment Plan

### 3.1 Purpose of Assessment

The purpose of the assessment is to determine whether existing, known discharges from toe drain outfalls, seeps, and weeps associated with the coal combustion residuals surface impoundment (ash basin) have reached the surface waters of the State and have caused a violation of surface water quality standards as required by North Carolina General Statute 130A-309.210(b).

Figure 2 and Table 1 present the background and downstream sampling locations to be considered as part of this Discharge Assessment Plan (DAP). These locations may be assessed by comparing surface water sampling analytical results of the associated background location with the corresponding downstream location. For discharges located at the toe of a dam, an upstream location within the channel may not have been possible to isolate for comparison given the proximity to the ash basin, which would have the same chemical composition as the discharge itself. As such, the upstream location was established upstream of the ash basin and is considered “background.” For discharges located a distance from the ash basin, an identified upstream, or “background” location for sampling may be compared to the downstream portion of the discharge channel. The background and downstream sampling locations are shown on Figure 2 with “B” and “D” identifiers, respectively, and the corresponding seep locations associated with the sampling locations are indicated on Table 1.

### 3.2 Assessment Procedure

The assessment procedure associated with the Roxboro Plant ash basins is provided within this section. In addition to the specific requirements for the assessment, Section 3.2 also provides the general requirements, the frequency of assessment, documentation requirements, and a description of the surface water quality analyses that will be performed.

#### 3.2.1 General Assessment Requirements

Assessments are to be performed in three phases as follows:

- Observation and sampling (assessment site visit),
- Evaluation, and
- Assessment reporting.

The assessment site visit shall be performed when the background and downstream locations are accessible and not influenced by weather events. Locations on or adjacent to the ash basin embankments should be performed within two months after mowing, if possible. In addition, the assessment site visit should not be performed if the following precipitation amounts have occurred in the respective time period preceding the planned assessment site visit:

- Precipitation of 0.1 inches or greater within 72 hours or
- Precipitation of 0.5 inches or greater within 96 hours.

The assessments shall be performed under the direction of a qualified Professional Engineer or Professional Geologist on a semi-annual basis within two nonadjacent quarters. The date of the



initial assessment site visit shall be selected no later than 30 days from the approval of the Discharge Assessment Plan and should fall within one of the semi-annual timeframes. Additional seep locations that may have been identified and documented in an Identification of New Discharge report(s) shall be reviewed prior to performing an assessment site visit, if available.

### 3.2.2 Observation and Sampling

The initial assessment site visit should be performed to document baseline conditions of the discharge channel, including location, extent (i.e., dimensions of affected area), and flow of each discharge. Discharge channel background and downstream locations should be verified using a Global Positioning System (GPS) device. Photographs should be taken from vantage points that can be replicated during subsequent semi-annual assessments.

Initial and subsequent assessment site visits shall document a minimum of the following to respond to the requirements in 130A-309.210.1(b):

- Record the most recent ash basin water surface elevation and compare to the seep and outfall and associated discharge location surface water elevations.
- For each discharge channel, the observer shall note the following as applicable on the day of the assessment site visit:
  - Is the discharge channel flowing at the time of the assessment site visit?
  - Does the discharge channel visibly flow into a Water of the U.S. at the time of the assessment site visit?
  - How far away is the nearest Water of the U.S.?
  - Document evidence that flow has or could reach a Water of the U.S. (e.g., description of flow, including extent and/or direction) and describe the observed condition. Evidence that flow could or has reached a Water of the U.S. may be indicated by an inspection of the adjacent and downstream topographic drainage features.
  - Observe and document the condition of the discharge channel and outfall of the engineered channel or seep location with photographs. Photographs are to be taken from similar direction and scale as photographs taken during the initial assessment site visit.
- Record flow rate within the discharge channel, if measureable, using the following methods:
  - Timed-volumetric method: Collect a volume of water from the discharge of the PVC pipe directly into an appropriately sized container. Measure volumes (in mL) in the field utilizing a graduated container. Record the amount of time (in seconds) needed to collect the volume of water and calculate the flows (in MGD) for the timed-volume.

- A V-notch weir apparatus will be installed, if necessary, during the initial assessment site visit to impound seepage at locations with a defined channel. Once the impounded seep reaches equilibrium discharge, flows will be measured using the timed-volumetric method described above.
- Area-velocity method: Measure point velocities and water depth at a minimum of 20 stations along a transect setup perpendicular to the direction of flow using a Swoffer® 3000 flow meter mounted to a standard United States Geologic Survey (USGS) top-set wading rod. Utilize the average velocity and cross-sectional area of the wetted channel to calculate flows in MGD.
- Collect water quality samples using the following methods:
  - Collect background and downstream samples during a period with minimal preceding rainfall to minimize potential effects of stormwater runoff. Collect samples from the discharge channel at the flow measurement devices or directly from the discharge into sample bottles while minimizing disturbance and entrainment of soil/sediment. After collection, samples will be preserved and stored according to parameter-specific methods and delivered to the laboratory under proper Chain-of-Custody (COC) procedures.
  - Analytical parameters for analysis include: Fluoride, Arsenic, Cadmium, Copper, Chromium, Nickel, Lead, Selenium, and Mercury. This list includes all parameters previously identified for seep sampling at Duke Energy power plants for which relevant stream water quality standards are in place. (This list is responsive to the statutory requirement for the discharge assessment to allow determination whether discharges from toe drain outfalls, seeps, or weeps have reached surface waters and caused a violation of surface water quality standards.) Analyses shall be conducted by Duke Energy's Huntersville Analytical Laboratory (NC Wastewater Certification #248) and Pace Analytical Laboratories (NC Wastewater Certification # 12). Laboratory analytical methods used for each constituent are provided in Table 2.
  - Seep in-situ measurements: In-situ field parameters (temperature and pH) shall be measured utilizing calibrated field meters either at the discharge of the seep directly, at the discharge of the flow measurement devices, or in the water pool created behind the device, if sufficient water depth did not exist at the device discharge.
  - Hyco Lake and Ash Basin Sample Collection Method: Water quality samples and in-situ measurements from Hyco Lake shall be collected at a location upstream and downstream of the ash basin. Additionally, water samples and in-situ measurements shall be collected from an in-process ash basin location. The grab samples shall be collected from the river and basin's surface (0.3 m) directly into appropriate sample bottles.



### **3.2.3 Evaluation**

Evaluation of the data from the initial assessment site visit will establish baseline conditions and will serve as the basis for comparison for subsequent assessment site visit results. Evaluation of observations and sampling results shall include location, extent (i.e., dimensions of affected area), and flow of each discharge. The analytical results of the upstream and downstream locations shall be compared to the 15A NCAC 2B standards for surface water quality upon receipt to identify potential exceedances.

### **3.2.4 Assessment Reporting**

Each assessment site visit shall be documented by the individual performing the assessment, as described in Section 3.2.2 to meet the requirements in 130A-309.210.1(b). The report should contain site background, observation and sampling methodology, and a summary of the observations and descriptions of the discharge channels observed, changes in observations compared to previous assessment events, estimates of flows quantities, and photographs of discharges and outfalls of engineered channels designed or improved for collecting water from the impoundment. Photographs are to be numbered and captioned. The flow and analytical results shall be recorded and presented in tables similar to the examples provided as Tables 1 and 3. The analytical results shall be compared to the 15A NCAC 2B standards for surface water quality and exceedances highlighted. This information shall be compiled, reviewed, and submitted to NCDENR within 90 days from the Observation and Sampling event.

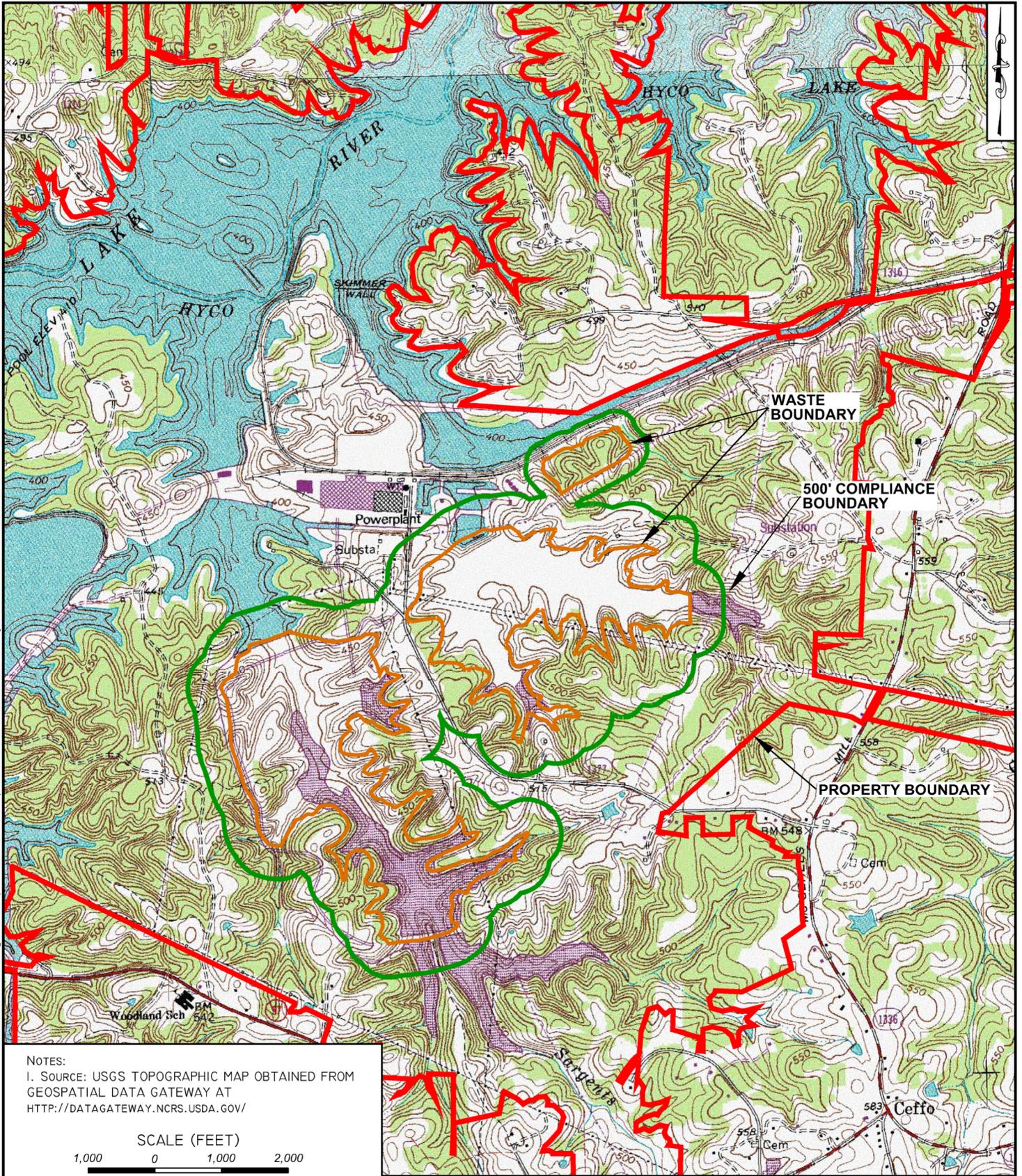
## Section 4 - References

- Hibbard, James P., Glenn S. Shell, Phillip J. Bradley, Scott D. Samson, and Greg L. Wortman, February 1998, The Hyco shear zone in North Carolina and southern Virginia: Implications for the Piedmont Zone-Carolina Zone boundary in the southern Appalachians. *American Journal of Science*, V. 298, p. 85 – 107.
- Hibbard, James P., Edward F. Stoddard, Donald T. Secor, and Allen J. Dennis, 2002, The Carolina Zone: overview of Neoproterozoic to Early Paleozoic peri-Gondwanan terranes along the eastern Flank of the southern Appalachians: *Earth Science Reviews*, v. 57.
- North Carolina Department of Environment and Natural Resources. 2007. *Dam Operation, Maintenance, and Inspection Manual*, North Carolina Department of Environment and Natural Resources, Division of Land Resources, Land Quality Division, 1985 (Revised 2007).
- North Carolina Geological Survey, 1985, *Geologic map of North Carolina*: North Carolina Geological Survey, General Geologic Map , scale 1:500000.

A decorative graphic consisting of several overlapping rectangular blocks. A large teal block is on the left. A grey block is at the top right. A dark grey block is at the bottom right. A tan block is at the bottom left, partially overlapping the teal block.

**FIGURES  
AND  
TABLES**

C:\pwworking\lpa\d0641035\DUKE ROXBORO-FIG 1 USGS .dwg, FIG 1 (SITE LOCATION), 12/16/2014 5:20:25 PM, clynes



NOTES:  
 1. SOURCE: USGS TOPOGRAPHIC MAP OBTAINED FROM  
 GEOSPATIAL DATA GATEWAY AT  
[HTTP://DATAGATEWAY.NCRS.USDA.GOV/](http://DATAGATEWAY.NCRS.USDA.GOV/)



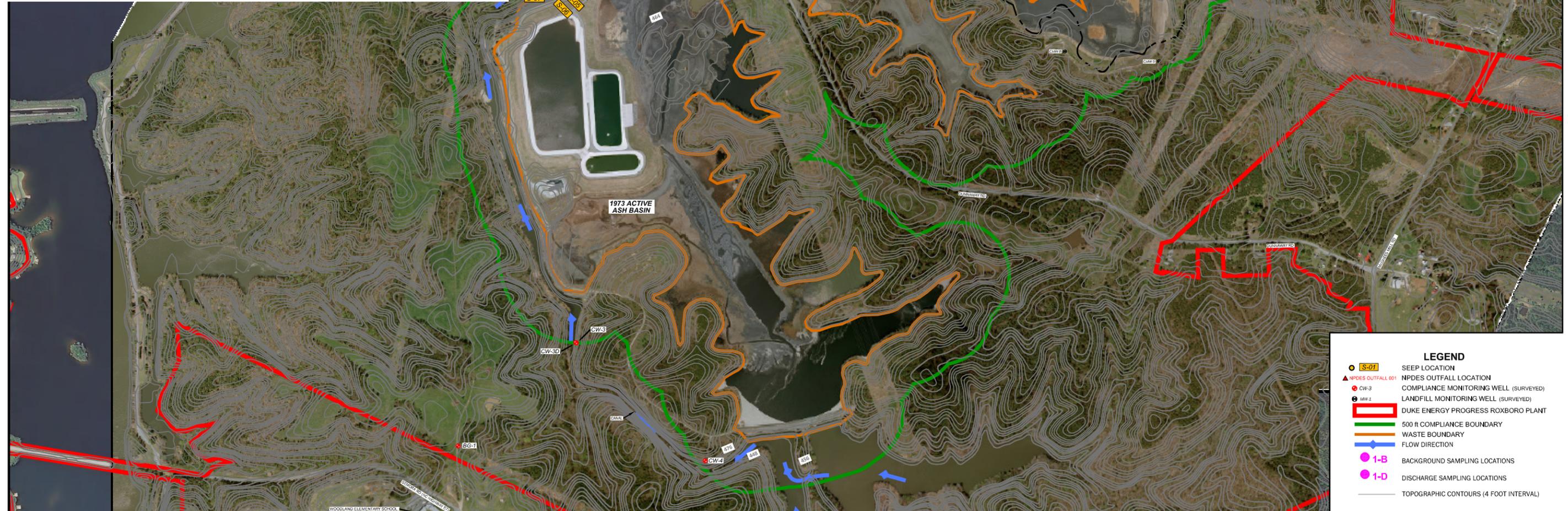
License Number: F-0116  
 440 South Church Street Charlotte, NC 28202

**SITE LOCATION MAP  
 DUKE ENERGY PROGRESS  
 ROXBORO STEAM ELECTRIC PLANT  
 NPDES PERMIT #NC0003425  
 SEMORA, NORTH CAROLINA**

DATE  
 DEC. 16, 2014

FIGURE  
**1**

| Seep / Discharge ID | Location Coordinates (NAD 83) |            | Flow Description | Flow Measurement (MGD) and Method | Background Location | Discharge Location and Discharge Sampling Location |   | Discharge Location Coordinates (NAD 83)   |  |   |           |            |
|---------------------|-------------------------------|------------|------------------|-----------------------------------|---------------------|--|---|---|--|---|-----------|------------|
|                     | Latitude                      | Longitude  |                  |                                   |                     | Latitude   | Longitude                                 |   |  |   |           |            |
| S-01                | 36.477043                     | -79.076467 | Intermittent     | N/A                               | 1-B                 | Discharges into wastewater effluent channel        | Discharges to wastewater effluent channel | Discharges to wastewater effluent channel |  |   |           |            |
| S-02                | 36.477055                     | -79.076727 | Continuous       | 0.00044 timed-volumetric          |                     |  |   |   |  |   |           |            |
| S-03                | 36.476994                     | -79.076978 | Continuous       | 0.0009 timed-volumetric           |                     |  |   |   |  |   |           |            |
| S-04                | 36.476923                     | -79.077204 | Continuous       | 0.00051 timed-volumetric          |                     |  |   |   |  |   |           |            |
| S-05                | 36.476751                     | -79.077412 | Intermittent     | N/A                               |                     |  |   |   |  |   |           |            |
| S-06                | 36.47669                      | -79.077643 | Intermittent     | N/A                               |                     |  |   |   |  |   |           |            |
| S-07                | 36.476736                     | -79.077954 | Continuous       | 0.00063 timed-volumetric          |                     |  |   |   |  |   |           |            |
| S-08                | 36.476719                     | -79.078064 | Continuous       | 0.0011 timed-volumetric           |                     |  |   |   |  |   |           |            |
| S-09                | 36.478230                     | -79.056076 | Continuous       | NF                                |                     |  |   |   |  | East of East Ash Basin berm 1-D             | 36.477928 | -79.055411 |
| S-10                | 36.479169                     | -79.056963 | Intermittent     | N/A                               |                     |  |   |   |  | Northern portion of East Ash Basin berm 1-D |           |            |
| S-11                | 36.478569                     | -79.056737 | Intermittent     | N/A                               |                     |  |   |   |  | Central portion of East Ash Basin berm 1-D  |           |            |
| S-12                | 36.478103                     | -79.056735 | Intermittent     | N/A                               |                     |  |   |   |  | Southern portion of East Ash Basin berm 1-D | 36.484131 | -79.066297 |
| S-13                | 36.486175                     | -79.059612 | Continuous       | 0.01782 timed-volumetric          |                     |  |   |   |  | From S-09 north under railroad tracks 2-D   |           |            |
| S-14                | 36.483738                     | -79.063751 | Continuous       | 0.00808 area-velocity             |                     |  |   |   |  | From pipe beneath Gypsum Pad area 2-D       |           |            |



**LEGEND**

- S-01 SEEP LOCATION
- ▲ NPDES OUTFALL 001 NPDES OUTFALL LOCATION
- CW-3 COMPLIANCE MONITORING WELL (SURVEYED)
- MW-2 LANDFILL MONITORING WELL (SURVEYED)
- DUKE ENERGY PROGRESS ROXBORO PLANT
- 500 ft COMPLIANCE BOUNDARY
- WASTE BOUNDARY
- FLOW DIRECTION
- 1-B BACKGROUND SAMPLING LOCATIONS
- 1-D DISCHARGE SAMPLING LOCATIONS
- TOPOGRAPHIC CONTOURS (4 FOOT INTERVAL)

- SOURCES:**
- 2012 AERIAL PHOTOGRAPH OF PERSON COUNTY, NORTH CAROLINA WAS OBTAINED FROM USGS EARTH EXPLORER WEBSITE AT <http://earthexplorer.usgs.gov/>
  - WELL SURVEY INFORMATION, PROPERTY LINE, LANDFILL LIMITS AND BOUNDARIES ARE FROM ARCGIS FILES PROVIDED BY S&ME AND PROGRESS ENERGY.
  - 2014 AERIAL PHOTOGRAPH WAS OBTAINED FROM WSP FLOWN ON APRIL 17, 2014.
  - DRAWING HAS BEEN SET WITH A PROJECTION OF NORTH CAROLINA STATE PLANE COORDINATE SYSTEM FIPS 3200 (NAD 83).



TOPOGRAPHIC MAP WITH IDENTIFIED SEEPS AND OUTFALLS  
 DUKE ENERGY CAROLINAS, LLC  
 ROXBORO STEAM ELECTRIC PLANT  
 NPDES PERMIT #NC0003425  
 SEMORA, NORTH CAROLINA

DATE  
 DECEMBER 2014

FIGURE  
 2

**Table 1 – Roxboro Steam Station Ash Basin – Seep and Associated Discharge Locations and Descriptions**

| Seep / Discharge ID | Location Coordinates (NAD 83) |            | Flow Description | Flow Measurement (MGD) and Method | Background Location | Discharge Location and Discharge Sampling Location | Discharge Location Coordinates            |   |
|---------------------|-------------------------------|------------|------------------|-----------------------------------|---------------------|--|---|---|
|                     | Latitude                      | Longitude  |                  |                                   |                     |  | Latitude                                  | Longitude                                 |
| S-01                | 36.477043                     | -79.076467 | Intermittent     | N/A                               | 1-B                 | Discharges into wastewater effluent channel        | Discharges to wastewater effluent channel | Discharges to wastewater effluent channel |
| S-02                | 36.477055                     | -79.076727 | Continuous       | 0.00044<br>timed-volumetric       |                     |  |   |   |
| S-03                | 36.476994                     | -79.076978 | Continuous       | 0.0009<br>timed-volumetric        |                     |  |   |   |
| S-04                | 36.476923                     | -79.077204 | Continuous       | 0.00051<br>timed-volumetric       |                     |  |   |   |
| S-05                | 36.476751                     | -79.077412 | Intermittent     | N/A                               |                     |  |   |   |
| S-06                | 36.47669                      | -79.077643 | Intermittent     | N/A                               |                     |  |   |   |
| S-07                | 36.476736                     | -79.077954 | Continuous       | 0.00063<br>timed-volumetric       |                     |  |   |   |
| S-08                | 36.476719                     | -79.078064 | Continuous       | 0.0011<br>timed-volumetric        |                     | East of East Ash Basin berm<br>1-D                 | 36.477928                                 | -79.055411                                |
| S-09                | 36.478230                     | -79.056076 | Continuous       | NF                                |                     |  |   |   |
| S-10                | 36.479169                     | -79.056963 | Intermittent     | N/A                               |                     |  |   |   |
| S-11                | 36.478569                     | -79.056737 | Intermittent     | N/A                               |                     |  |   |   |
| S-12                | 36.478103                     | -79.056735 | Intermittent     | N/A                               |                     |  |   |   |
| S-13                | 36.486175                     | -79.059612 | Continuous       | 0.01782<br>timed-volumetric       |                     |  |   |   |
| S-14                | 36.483738                     | -79.063751 | Continuous       | 0.00808<br>area-velocity          |                     | From pipe beneath Gypsum Pad area<br>2-D           |   |   |

**Notes:**

- Flow description for each seep sample location is based on observation during site visits performed by Synterra in June and July 2014.

**Table 2 – Laboratory Analytical Methods**

| <b>Parameter</b>     | <b>Method</b> | <b>Reporting Limit</b> | <b>Units</b> | <b>Laboratory</b> |
|----------------------|---------------|------------------------|--------------|-------------------|
| <b>Fluoride (F)</b>  | EPA 300.0     | 1                      | mg/l         | Duke Energy       |
| <b>Mercury (Hg)</b>  | EPA 245.1     | 0.05                   | µg/l         | Duke Energy       |
| <b>Arsenic (As)</b>  | EPA 200.8     | 1                      | µg/l         | Duke Energy       |
| <b>Cadmium (Cd)</b>  | EPA 200.8     | 1                      | µg/l         | Duke Energy       |
| <b>Chromium (Cr)</b> | EPA 200.8     | 1                      | µg/l         | Duke Energy       |
| <b>Copper (Cu)</b>   | EPA 200.8     | 1                      | µg/l         | Duke Energy       |
| <b>Lead (Pb)</b>     | EPA 200.8     | 1                      | µg/l         | Duke Energy       |
| <b>Nickel (Ni)</b>   | EPA 200.8     | 1                      | µg/l         | Duke Energy       |
| <b>Selenium (Se)</b> | EPA 200.8     | 1                      | µg/l         | Duke Energy       |

**Table 3 – Roxboro Steam Electric Plant Ash Basins – Example of Surface Water/Seep Monitoring Flow and Analysis Results Table**

| Parameter             | Units | S-02    | S-03    | S-04    | S-07    | S-08    | S-09 | S-13    | S-13 Duplicate | S-14    |
|-----------------------|-------|---------|---------|---------|---------|---------|------|---------|----------------|---------|
| Fluoride              | mg/l  | 0.45    | 0.74    | 0.64    | < 1     | 0.76    | 0.18 | < 0.5   | 0.5            | 1.0     |
| Hg - Mercury (71900)  | µg/l  | < 1     | < 1     | < 1     | < 1     | < 1     | < 1  | < 1     | < 1            | < 1     |
| As - Arsenic (01002)  | µg/l  | < 1     | 1.47    | 1.88    | < 1     | 2.86    | 15.7 | 1.73    | 1.65           | 25.4    |
| Cd - Cadmium (01027)  | µg/l  | < 1     | < 1     | < 1     | < 1     | < 1     | < 1  | < 1     | < 1            | < 1     |
| Cr - Chromium (01034) | µg/l  | < 1     | < 1     | < 1     | < 1     | < 1     | < 1  | < 1     | < 1            | 2.57    |
| Cu - Copper (01042)   | µg/l  | < 1     | < 1     | < 1     | < 1     | < 1     | < 1  | 1.34    | 1.11           | 4.42    |
| Pb - Lead (01051)     | µg/l  | < 1     | < 1     | < 1     | < 1     | < 1     | < 1  | < 1     | < 1            | 2.09    |
| Ni - Nickel (01067)   | µg/l  | 1.39    | 1.88    | 1.64    | 3.21    | 4.98    | < 1  | < 1     | < 1            | 3.64    |
| Se - Selenium (01147) | µg/l  | < 1     | < 1     | < 1     | < 1     | < 1     | 1.86 | < 1     | < 1            | 62.9    |
| pH                    | s.u.  | 6.8     | 7.6     | 7.7     | 7.6     | 6.7     | 6.8  | 7.0     | 7.0            | 7.1     |
| Temperature           | °C    | 29      | 29      | 29      | 28      | 21      | 26   | 18      | 18             | 23      |
| Flow                  | MGD   | 0.00044 | 0.00094 | 0.00051 | 0.00063 | 0.00107 | NF   | 0.01782 | 0.01782        | 0.00808 |

Notes:

1. Flow measurements and analytical samples were collected on June and July, 2014.