Buck Combined Cycle Station Ash Basin

Topographic Map and Discharge Assessment Plan

NPDES Permit NC0004774

December 30, 2014

Contents

Page

Figures and Tables

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 Buck Combined Cycle Station (BCCS) ash basin operated under National Pollutant Discharge Elimination System (NPDES) Permit NC0004774.

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

Buck Steam Station (BSS) is a former coal-fired electricity generating facility with a capacity of 256 megawatts located near the town of Salisbury in Rowan County, North Carolina. As of April 2013, all of the coal-fired units have been retired. The site is located northwest of Leonard Road, and the surrounding area generally consists of residential properties, undeveloped land, and the Yadkin River (Figure 1). The site now contains the new BCCS Plant, a 620-megawatt natural gas-powered electricity generating station. The entire BSS and BCCS (Buck) site is approximately 640 acres in area.

2.2 Ash Basin Description

The ash basin system at the plant was used to retain and settle ash generated from coal combustion at BSS. The ash basin system consists of three cells, the associated earthen dikes, discharge structures, and two canals. The cells are designated as Cell 1 Additional Primary Pond (Cell 1), Cell 2 Primary Pond (Cell 2), and Cell 3 Secondary Pond (Cell 3). The ash basin is located to the south (Cell 1) and southeast (Cells 2 and 3) of the retired Steam Station Units 1 through 6 and the BCCS Plant. The original ash pond at BSS began operation in 1957 and was formed by constructing a dam across a tributary of the Yadkin River. The footprint of the original ash pond was the approximate current footprint of Cells 2 and 3. As the ash pond capacity diminished over time, the original pond was eventually divided into two ash ponds (Cells 2 and 3) by construction of a separate dike. In 1982, additional storage was created by construction of Cell 1, separate from the other cells, by building a new dike upgradient from Cell 2.

Until Cell 1 was constructed, ash generated from the coal combustion process at BSS was sluiced (via ash discharge lines) to Cell 2. Following construction of Cell 1, sluiced ash was rerouted from Cell 2 to Cell 1. Flow from Cell 1 enters Cell 2 via the Primary Cell Discharge Tower. Flow from Cell 2 enters Cell 3 via the Old Primary Cell Discharge Structure. Flow from Cell 3 discharges to the Yadkin River through the Secondary Cell Discharge Tower.

The approximate pond elevations for the three ash basin cells are: Cell 1 – pond elevation 705 feet; Cell 2 – pond elevation 682 feet; and Cell 3 – pond elevation 674 feet. The elevation of the Yadkin River near the site is approximately 624 feet.

The area contained within the waste boundary for Cell 1 encompasses approximately 90 acres. For purposes of delineating the waste boundary, Cells 2 and 3 are considered a single unit, with the area contained within this portion of the waste boundary encompassing approximately 80.7 acres. Cell 3 was developed by increasing the elevation of the earthen dike along the Yadkin River and constructing an intermediate dike across the ash placed in Cell 2.

The ash basin system is operated as an integral part of the site's wastewater treatment system. During operation of the coal-fired units, the ash basin received variable inflows from the ash removal system and other permitted discharges. Currently, the ash basin receives variable inflows from the station yard drain sump, stormwater flows, BSS wastewater, and BCCS wastewater.

Effluent from the ash basin is discharged through the discharge tower into a concrete-lined channel, to the Yadkin River. The water surface elevation in the ash basin is controlled by the use of stoplogs.

2.3 Site Geologic/Soil Framework

The Buck site and its associated ash basin system are located in the Charlotte terrane of the Piedmont physiographic province (Piedmont). The Piedmont province is bounded to the east and southeast by the Atlantic Coastal Plain and to the west by the escarpment of the Blue Ridge Mountains, covering a distance of 150 to 225 miles (LeGrand, 2004).

The topography of the Piedmont region is characterized by low, rounded hills and long, rolling, northeast-southwest trending ridges (Heath, 1984). Stream valley to ridge relief in most areas ranges from 75 to 200 feet. Along the Coastal Plain boundary, the Piedmont region rises from an elevation of 300 feet above mean sea level to the base of the Blue Ridge Mountains at an elevation of 1,500 feet (LeGrand, 2004).

Charlotte terrane bedrock consists primarily of igneous and metamorphic bedrock. The fractured bedrock is overlain by a mantle of unconsolidated material known as regolith. The regolith includes, where present, the soil zone (a zone of weathered, decomposed bedrock known as saprolite) and, where present, alluvium. Saprolite, the product of chemical and mechanical weathering of the underlying bedrock, is typically composed of clay and coarser granular material up to boulder size and may reflect the texture of the rock from which it was formed. The weathering product of granitic rocks are quartz rich and sandy textured; whereas, rocks poor in quartz and rich in feldspar and other soluble minerals form a more clayey saprolite. The regolith serves as the principal storage reservoir for the underlying bedrock (LeGrand, 2004).

A transition zone may occur at the base of the regolith between the soil-saprolite and the unweathered bedrock. This transition zone of partially weathered rock is a zone of relatively high permeability compared to the overlying soil-saprolite and the underlying bedrock (LeGrand 2004).

Groundwater flow paths in the Piedmont are almost invariably restricted to the zone underlying the topographic slope extending from a topographic divide to an adjacent stream. LeGrand describes this as the local slope aquifer system. Under natural conditions the general direction of groundwater flow can be approximated from the surface topography (LeGrand, 2004).

Groundwater recharge in the Piedmont is derived entirely from infiltration of local precipitation. Groundwater recharge occurs in areas of higher topography (i.e., hilltops) and groundwater discharge occurs in lowland areas bordering surface water bodies, marshes, and floodplains (LeGrand, 2004).

The Buck site ash basin system is generally bounded by an earthen dam and a natural ridge. Leonard Road generally runs from southwest to northeast in the vicinity of the site and is located along the topographic divide. The topography at the site generally slopes downward from that divide toward the Yadkin River. The geology/groundwater conditions at the site are expected to be generally consistent with the characteristics of the conceptual groundwater model developed by LeGrand for the Piedmont region.

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 Buck Station main dam (impounds Cell 2 and 3 of the ash basin) has a blanket toe drain installed for the length of the dam. The new (additional primary) dam (impounds Cell 1 of the ash basin) was constructed with a zoned trench drain, a zoned blanket drain, and a zoned toe drain. 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. HDR 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 Buck 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
- 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 during two non adjacent 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.

  - Yadkin River and Ash Basin Sample Collection Method: Water quality samples and in-situ measurements from the Yadkin River 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

Heath, R.C. 1984. “Ground-water regions of the United States.” U.S. Geological Survey Water-Supply Paper 2242, 78 p.

LeGrand, Harry, Sr. 2004. A Master Conceptual Model for Hydrogeological Site Characterization in the Piedmont and Mountain Region of North Carolina, North Carolina Department of Environment and Natural Resources.

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).

FIGURES AND TABLES

Notes:
1. Sources: US Topo; 2011, USGS National Map Aerial Imagery; 2010 North Carolina Statewide Orthoimagery, NC Geospatial & Technology Management Office

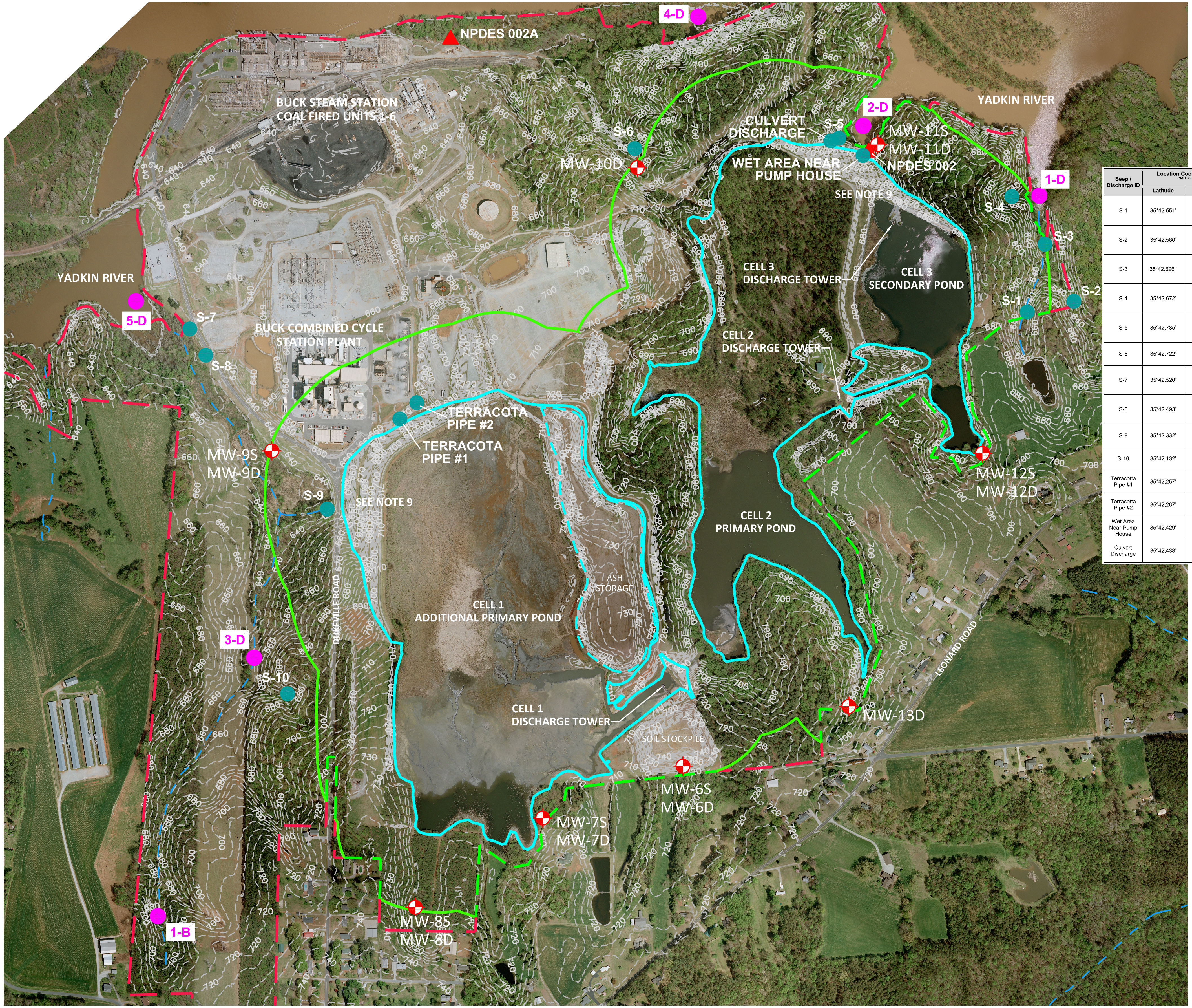
SCALE (FEET)
1,000 0 1,000 2,000

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

SITE LOCATION MAP
BUCK COMBINED CYCLE STATION
DUKE ENERGY CAROLINAS, LLC
ROWAN COUNTY, NORTH CAROLINA

SEPTEMBER 30, 2014

FIGURE
1



N

Seep / Discharge ID	Location Coordinates (NAD 83)		Flow Description	Flow Measurement (MGD) and Method	Background Locations	Discharge Location and Discharge Sampling Location	Discharge Location Coordinates (NAD 83)	
	Latitude	Longitude					Latitude	Longitude
S-1	35°42.551'	80°21.625'	Continuous	0.0023 Timed-Volumetric	1-B	Northeast of active ash basin; tributary to the Yadkin River 1-D	35°42.67'	80°21.611'
S-2	35°42.560'	80°21.566'	Continuous	0.0016 Timed-Volumetric		Northeast of active ash basin; tributary to the Yadkin River 1-D		
S-3	35°42.626"	80°21.607'	Continuous	0.0021 Timed-Volumetric		Northeast of active ash basin; tributary to the Yadkin River 1-D		
S-4	35°42.672'	80°21.650'	Continuous	0.0132 Timed-Volumetric		Northeast of active ash basin; tributary to the Yadkin River 1-D		
S-5	35°42.735'	80°21.874'	Continuous	0.0029 Timed-Volumetric		Northeast of active ash basin; tributary to the Yadkin River 2-D	35°42.742'	80°21.837'
S-6	35°42.722'	80°22.147'	Continuous	0.0225 Timed-Volumetric		North of active ash basin; tributary to the Yadkin River 4-D	35°42.86'	80°22.052'
S-7	35°42.520'	80°22.720'	Continuous	0.0002 Timed-Volumetric		Northwest of active ash basin; tributary to the Yadkin River 5-D	35°42.569'	80°22.794'
S-8	35°42.493'	80°22.697'	Continuous	0.0210 Timed-Volumetric		Northwest of active ash basin; tributary to the Yadkin River 5-D		
S-9	35°42.332'	80°22.539'	Continuous	0.0016 Timed-Volumetric		West of active ash basin; tributary to the Yadkin River 5-D		
S-10	35°42.132'	80°22.581'	Continuous	0.0049 Timed-Volumetric		West of active ash basin; tributary to the Yadkin River 3-D	35°42.155'	80°22.624'
Terracotta Pipe #1	35°42.257'	80°22.266'	Continuous	0.0016		North of Additional Primary Dam 4-D	35°42.86'	80°22.052'
Terracotta Pipe #2	35°42.267'	80°22.253'	No Flow	N/A		North of Additional Primary Dam 4-D		
Wet Area Near Pump House	35°42.429'	80°21.506'	No Flow	N/A		Northeast of Active Ash Basin 2-D	35°42.742'	80°21.837'
Culvert Discharge	35°42.438'	80°21.531'	Flow			Northeast of Active Ash Basin 2-D		

LEGEND:

- DUKE ENERGY PROPERTY BOUNDARY
- WASTE BOUNDARY
- ASH STORAGE AREA BOUNDARY
- COMPLIANCE BOUNDARY
- COMPLIANCE BOUNDARY COINCIDENT WITH DUKE PROPERTY BOUNDARY
- STREAM
- TOPOGRAPHIC CONTOUR (4-FT INTERVAL)*
- ASH BASIN COMPLIANCE GROUNDWATER MONITORING WELL
- SEEP SAMPLE LOCATION
- NPDES OUTFALL LOCATION
- 1-B BACKGROUND SAMPLING LOCATIONS
- 1-D DISCHARGE SAMPLING LOCATIONS

NOTES:

1. PARCEL DATA FOR THE SITE WAS OBTAINED FROM DUKE ENERGY REAL ESTATE AND IS APPROXIMATE.
2. WASTE BOUNDARY AND ASH STORAGE AREA BOUNDARY ARE APPROXIMATE.
3. AS-BUILT MONITORING WELL LOCATIONS PROVIDED BY DUKE ENERGY AND WSP.
4. TOPOGRAPHY DATA FOR THE SITE WAS OBTAINED FROM WSP DATED NOVEMBER 2013.
5. AERIAL PHOTOGRAPHY WAS OBTAINED FROM WSP DATED APRIL 17, 2014.
6. THE COMPLIANCE BOUNDARY IS ESTABLISHED ACCORDING TO THE DEFINITION FOUND IN 15A NCAC 02L .0107 (a).
7. SEE REPORT "BUCK STEAM STATION ASH BASIN SURFACE WATER AND SEEP MONITORING - OCTOBER 2014, APPENDIX C" FOR DESCRIPTION OF DAM DRAINAGE SYSTEM.

* TOPOGRAPHIC CONTOURS LOCATED WITHIN THE WASTE BOUNDARY AND OTHERS SPECIFIC AREAS SUCH AS DAMS, DIKES, ETC. ARE 2-FT CONTOUR INTERVALS.

SCALE (FEET)

350' 0 350' 700'

1" = 700'

HDR

TOPOGRAPHIC MAP WITH IDENTIFIED SEEPS AND OUTFALLS
DUKE ENERGY CAROLINAS, LLC
BUCK COMBINED CYCLE STATION ASH BASIN
NPDES PERMIT #NC0004774
ROWAN COUNTY, NORTH CAROLINA

DATE
DECEMBER 2014

FIGURE
2

Table 1 – Buck Combined Cycle Ash Basin –Seep and Associated Discharge Locations and Descriptions

Seep / Discharge ID	Location Coordinates (NAD 83)		Flow Description	Flow Measurement (MGD) and Method	Background Locations	Discharge Location and Discharge Sampling Location	Discharge Location Coordinates (NAD 83)	
	Latitude	Longitude					Latitude	Longitude
S-1	35°42.551’	80°21.625’	Continuous	0.0023 Timed-Volumetric	1-B	Northeast of active ash basin; tributary to the Yadkin River 1-D	35°42.67’	80°21.611’
S-2	35°42.560’	80°21.566’	Continuous	0.0016 Timed-Volumetric		Northeast of active ash basin; tributary to the Yadkin River 1-D		
S-3	35°42.626’’	80°21.607’	Continuous	0.0021 Timed-Volumetric		Northeast of active ash basin; tributary to the Yadkin River 1-D		
S-4	35°42.672’	80°21.650’	Continuous	0.0132 Timed-Volumetric		Northeast of active ash basin; tributary to the Yadkin River 1-D		
S-5	35°42.735’	80°21.874’	Continuous	0.0029 Timed-Volumetric		Northeast of active ash basin; tributary to the Yadkin River 2-D	35°42.742’	80°21.837’
S-6	35°42.722’	80°22.147’	Continuous	0.0225 Timed-Volumetric		North of active ash basin; tributary to the Yadkin River 4-D	35°42.86’	80°22.052’
S-7	35°42.520’	80°22.720’	Continuous	0.0002 Timed-Volumetric		Northwest of active ash basin; tributary to the Yadkin River 5-D	35°42.569’	80°22.794’
S-8	35°42.493’	80°22.697’	Continuous	0.0210 Timed-Volumetric		Northwest of active ash basin; tributary to the Yadkin River 5-D		
S-9	35°42.332’	80°22.539’	Continuous	0.0016 Timed-Volumetric		West of active ash basin; tributary to the Yadkin River 5-D		
S-10	35°42.132’	80°22.581’	Continuous	0.0049 Timed-Volumetric		West of active ash basin; tributary to the Yadkin River 3-D	35°42.155’	80°22.624’
Terracotta Pipe #1	35°42.257’	80°22.266’	Continuous	0.0016		North of Additional Primary Dam 4-D	35°42.86’	80°22.052’
Terracotta Pipe #2	35°42.267’	80°22.253’	No Flow	N/A		North of Additional Primary Dam 4-D		
Wet Area Near Pump House	35°42.429’	80°21.506’	No Flow	N/A		Northeast of Active Ash Basin 2-D	35°42.742’	80°21.837’
Culvert Discharge	35°42.438’	80°21.531’	Flow			Northeast of Active Ash Basin 2-D		

Notes:

1. Flow description for each seep sample location is based on observation during site visits performed by HDR August 19, 2014
2. Flow measurements and analytical samples were collected on September 10, 2014, and November 21, 2014
3. Location coordinates (degrees) for seep sampling locations are approximate and are in NAD 83 datum

Table 2 – Laboratory Analytical Methods

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

Table 3 – Buck Combined Cycle Station – Example of Surface Water/Seep Monitoring Flow and Analysis Results Table

Parameter	Units	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	Terracota Pipe #1
Fl – Fluoride	**mg/l**	0.12	0.12	0.12	<0.1	0.11	<0.5	0.16	0.12	0.21	<0.1	<0.1
Hg - Mercury (71900)	**µg/l**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
As - Arsenic (01002)	**µg/l**	1.08	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cd - Cadmium (01027)	**µg/l**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cr - Chromium (01034)	**µg/l**	3.32	4.48	4.02	9.00	<1	1.32	2.06	<1	4.28	3.27	<1
Cu - Copper (01042)	**µg/l**	6.52	7.35	6.81	13.6	<1	<1	4.84	<1	5.62	<1	<1
Pb - Lead (01051)	**µg/l**	4.17	3.21	3.44	7.55	<1	<1	3.22	<1	2.05	<1	<1
Ni - Nickel (01067)	**µg/l**	2.35	3.87	2.83	5.23	<1	<1	<1	2.35	9.53	1.51	2.33
Se - Selenium (01147)	**µg/l**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
pH	**s.u.**	6.65	6.30	6.57	6.89	6.80	6.12	7.37	6.86	7.09	7.20	6.25
Temperature	**°C**	20.6	20.3	19.6	16.7	19.4	15.8	21.8	24.4	19.6	16.6	17.2
Flow	**MGD**	0.0023	0.0016	0.0021	0.0132	0.0029	0.0225	0.0002	0.0210	0.0016	0.0049	0.0016

Notes:

1. Flow measurements and analytical samples were collected on September 10, 2014, and November 20, 2014