Harry K. Sideris
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April 28, 2016

Jeffrey O. Poupart
Water Quality Permitting Section Chief
Division of Water Resources
Department of Environmental Quality
State of North Carolina
1617 Mail Service Center
Raleigh, NC 27699-1617

Subject: March 2, 2016 Insufficiency of Discharge Assessment Plans – Duke Energy Carolinas, LLC and Duke Energy Progress, LLC

Dear Mr. Poupart:

This responds to your letter of March 2, 2016 to Duke Energy Carolinas, LLC and Duke Energy Progress, LLC on March 2, 2016 regarding Duke Energy's proposed Discharge Assessment Plans.

With regard to your letter describing changes in *Section 3.2.2 Observation and Sampling:*

- *The discussion must include a statement noting that jurisdictional determinations regarding the extent of waters of the United States and their relationship with identified seeps at the subject facilities will be obtained from the United States Army Corps of Engineers (USA COE).*

Duke Energy does not yet have jurisdictional determinations from the US Army Corps of Engineers for the relevant areas at all of the twelve sites mentioned in your letter. We submitted applications for jurisdictional determinations in September, October, and November 2015 and have since worked with the Corps of Engineers to schedule site visits and provide draft plats for approval. Nonetheless, the timing of the approved jurisdictional determinations is up to the Corps and outside of Duke's control. To date, out of these twelve sites, only Buck has an approved jurisdictional determination, but we do not yet have the signed plats.

We will submit the maps you have requested for each site on a rolling basis, within a reasonable period after the jurisdictional determinations are complete. In order to address the changes described in your March 2, 2016 letter, we have added the following text at the start of Section 3.2.2.

> *Jurisdictional determinations regarding the extent of waters of the United States and their relationship with identified seeps at the subject facilities will be obtained from the United States Army Corps of Engineers (USA COE). Until jurisdictional determinations are finalized by USA COE, preliminary information will be used to evaluate the seeps as described in the section below.*

The second change in Section 3.2.2 described in your letter is as follows.

- *The schedule for water quality sampling of the seeps and related jurisdictional waters must be more frequent than the semi-annual basis stated in the proposed DAPs. DWR recommends a monthly monitoring schedule, consistent with the conditions described in the DAPs' general assessment requirements, for all identified seeps that will continue for twelve (12) months. After that time, monitoring may be reduced to a semi-annual basis until such monitoring becomes a requirement of the NPDES permit.*

We do not believe sampling monthly as part of a revised Discharge Assessment Plan is warranted. For the larger receiving waters, data is available from sampling associated with NPDES permits that demonstrates the lack of impact on the larger surface waters of the state. In addition, we are conducting weekly observations of all AOWs on a dam or dike slope, sampling any new seeps, and providing the analytical results to DEQ. We recommend the sampling frequency under the DAPs remain at twice/year with the weekly inspections of dam slopes for any new seeps with data provided to DEQ. We recommend that we collectively focus our resources on the completion of all of the NPDES Wastewater Permits for the Duke Energy sites and implement appropriate sampling frequency for each of the permitted seeps in that document .

However, in order to address the changes described in your March 2, 2016 letter, we have added the following text in Section 3.2.2.

> *In addition to sampling conducted with the semi-annual assessments, additional seep sampling will be conducted at locations and at a frequency as determined through discussions with NC DEQ personnel.*

We would like to work with DEQ to achieve alignment of the various (present and future) documents involving required seep activities including:

- Discharge Assessment Plans
- Discharge Identification Plans
- NPDES Wastewater Permits
- EPA requirements
- Any future legal agreements with either DEQ or EPA

Duke Energy is committed to providing the Department with additional information to facilitate the issuance of new NPDES Wastewater permits. The issues are complex and require special consideration, as illustrated by the time elapsed since the permit applications were submitted. We look forward to working with you further to resolve the issues identified here on a mutually acceptable schedule.

Sincerely,

Harry Sideris

Harry Sideris
Senior Vice President
Environmental, Health and Safety

Dan River Combined Cycle Station Ash Basin

Topographic Map and Discharge Assessment Plan

NPDES Permit NC0003468

April 29, 2016

DUKE ENERGY®

HDR

Contents

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 Dan River Combined Cycle Station (DRCCS) ash basin operated under National Pollutant Discharge Elimination System (NPDES) Permit NC0003468.

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

Dan River Steam Station (DRSS) was a coal-fired generating facility located near the town of Eden in Rockingham County, North Carolina. The three-unit station began commercial operation in 1949. All three coal-fired units, along with three oil-fired combustion turbine units, were retired in 2012 and are currently being decommissioned. Simultaneously, the DRCCS, a 620-megawatt natural gas facility, began commercial operations on site on December 10, 2012. The Dan River site is located on the north bank of the Dan River, and the surrounding area generally consists of undeveloped and agricultural land, the Dan River, and a small number of residential properties (Figure 1).

2.2 Ash Basin Description

The ash basin system is located adjacent to the Dan River and consists of a Primary Cell, a Secondary Cell, and associated embankments and outlet works, as shown on Figure 2. The ash basin is impounded by earthen dikes and an earthen/ash divider dike separates the Primary Cell from the Secondary Cell. The Primary Cell lies at an elevation of approximately 535 feet and has a surface area of approximately 21.8 acres. The Secondary Cell lies at an elevation of approximately 527 feet and has a surface area of approximately 12.2 acres.

The original ash basin was constructed in 1956 with an approximate crest elevation of 525 feet. In 1968 and 1969, the ash storage basin was expanded to cover the area occupied today. At that time, the dikes were raised to an approximate elevation of 530 feet. In 1976 and 1977, the intermediate dike was constructed to stage sluicing by subdividing the basin into a Primary Cell and Secondary Cell. The intermediate dike and new Primary Cell dikes were vertically expanded through inward dike construction, where the outward dike slope was maintained and extended upward to the dike crest. Through inward dike construction, portions of the main dike were constructed over ash. The intermediate dike was also constructed over ash.

In 1980, newer dikes, referenced as the dredge dikes, were constructed north of the Primary and Secondary Ponds, creating a dredge pond and two dry storage areas. Ash was dredged to the southernmost portion of the northern ash fill and free liquids were allowed to gravity drain to the topographically lower dredge pond located between the dry storage areas. Once dewatered, ash was hauled and placed dry in the two dry storage areas known as Ash Fill 1 and Ash Fill 2. The placement of ash in the ash storage areas occurred during multiple projects.

The ash basin was 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, station yard drain sump, stormwater flows, and other permitted discharges. The coal ash was sluiced to the southwest corner of the Primary Cell on a variable basis (i.e., dependent on DRSS operations) via sluice pipes.

Flow is routed from the Primary Cell to the Secondary Cell through a concrete discharge tower. Effluent from the Secondary Cell is routed to the Dan River via a concrete discharge tower located in the Secondary Cell. The water surface in both the Primary and Secondary Cells is controlled by the use of stoplogs.

2.3 Site Geologic/Soil Framework

The Dan River site is located within the Piedmont province. The Piedmont 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 msl to the base of the Blue Ridge Mountains at an elevation of 1,500feet msl (LeGrand, 2004).

The Piedmont region is underlain by bedrock of Precambrian and Paleozoic age comprised of igneous and metamorphosed igneous and sedimentary rocks (Heath, 1984). The predominant rock types are gneisses, schists, and metamorphosed granitic rocks (LeGrand, 2004) with undeformed, unmetamorphosed plutonic rocks also present throughout the Piedmont. These formations are oriented with the regional geologic structure in parallel belts trending northeast southwest. Throughout the Piedmont, the bedrock is overlain by a variably thick regolith that can consist of any or all of the following horizons: the residual soil, in-situ, clay-rich weathered rock referred to as saprolite, and alluvial deposits (Heath, 1984).

The Dan River site is located in the Triassic Dan River Basin located just north of the contact of the Milton Terrane and the Basin. Locally, the Milton terrane is represented by a Precambrian metasedimentary unit consisting of metagraywacke and muscovite-biotite schist. The rocks of the Dan River Basin were deposited within a graben formed between the Piedmont terrane and the Milton terrane (LeGrand, 1988). Stratigraphy within the basin consists of a lower sequence of mainly arkosic, coarse-grained sandstone and conglomerate passing upward into siltstone (Pine Hall Formation), a middle sequence of fossiliferous sandstone, carbonaceous shale, and thin coal beds (Cow Branch Formation); and an upper sequence of siltstone, arkosic sandstone, pebbly sandstone, mudstone, and conglomerate (Stoneville Formation; Carpenter, 1982). Alluvial deposits consisting of unconsolidated sand, silt, and clay with occasional sub-rounded to well-rounded pebbles occur along the Dan River and major tributaries.

Groundwater occurs within the basin in a system of two interconnected layers: residuum and weathered rock overlying fractured bedrock. Underlying sandstone layers with the Triassic sequence likely have some porosity capable of water storage but are generally not used for water supply. Typically, the residuum is saturated and the water table fluctuates in response to varying recharge and discharge within it. Lateral movement of groundwater typically occurs in the weathered rock and fractured bedrock.

The Dan River site is generally bounded to the south by the earthen dike and a natural ridge on the north bank of the Dan 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 embankment 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 Dan River site ash basin dams (ROCKI-237 and ROCKI-238) were constructed with a drainage system, which is monitored by Duke Energy. The drainage 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 July 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 Dan River site ash basin 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 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

Jurisdictional determinations regarding the extent of waters of the United States and their relationship with identified seeps at the subject facilities will be obtained from the United States Army Corps of Engineers (USACE). Until jurisdictional determinations are finalized by USACE, preliminary information will be used to evaluate the seeps as described in the section below.

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. Sampling procedures should prevent the entrainment of soils and sediment in water samples that can result in analytical results not being representative of the flow. Because Areas of Wetness (AOWs)/seeps often have poorly defined flow channels and minimal channel depth, conventional grab samples collected directly into laboratory containers or intermediate vessels is not possible without disturbance and entrainment of soils and sediments. Further, many AOWs are contiguous with low-lying areas subject to surface water runoff and resulting heavy sediment loading during storm events or are near surface waters subject to flooding such that representative samples of the AOW cannot be obtained. If the facility is unable to obtain an AOW sample due to the dry, low flow or high flow conditions preventing the facility from obtaining a representative sample, a “no flow” result or “excessive flow” will be recorded.

  - 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: F, As, Cd, Cu, Cr, Ni, Pb, Se, and Hg. 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.

- o 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.

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

- In addition to sampling conducted with the semi-annual assessments, additional seep sampling will be conducted at locations and at a frequency as determined through discussions with NC DEQ personnel.

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 NC DEQ within 90 days from the Observation and Sampling event.

Section 4 - References

Carpenter, P. A., III. 1982. Geologic map of Region G, North Carolina: North Carolina Department of Natural Resources and Community Development, Geological Survey Section, Regional Geology Series 2, Scale 1:125,000.

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

LeGrand, H.E. 1988. Region 21, Piedmont and Blue Ridge. In Hydrogeology, The Geology of North America, vol. O-2, ed. W.B. Back, J.S. Rosenshein, and P.R. Seaber, 201–207. Geological Society of America. Boulder CO: Geological Society of America.

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).

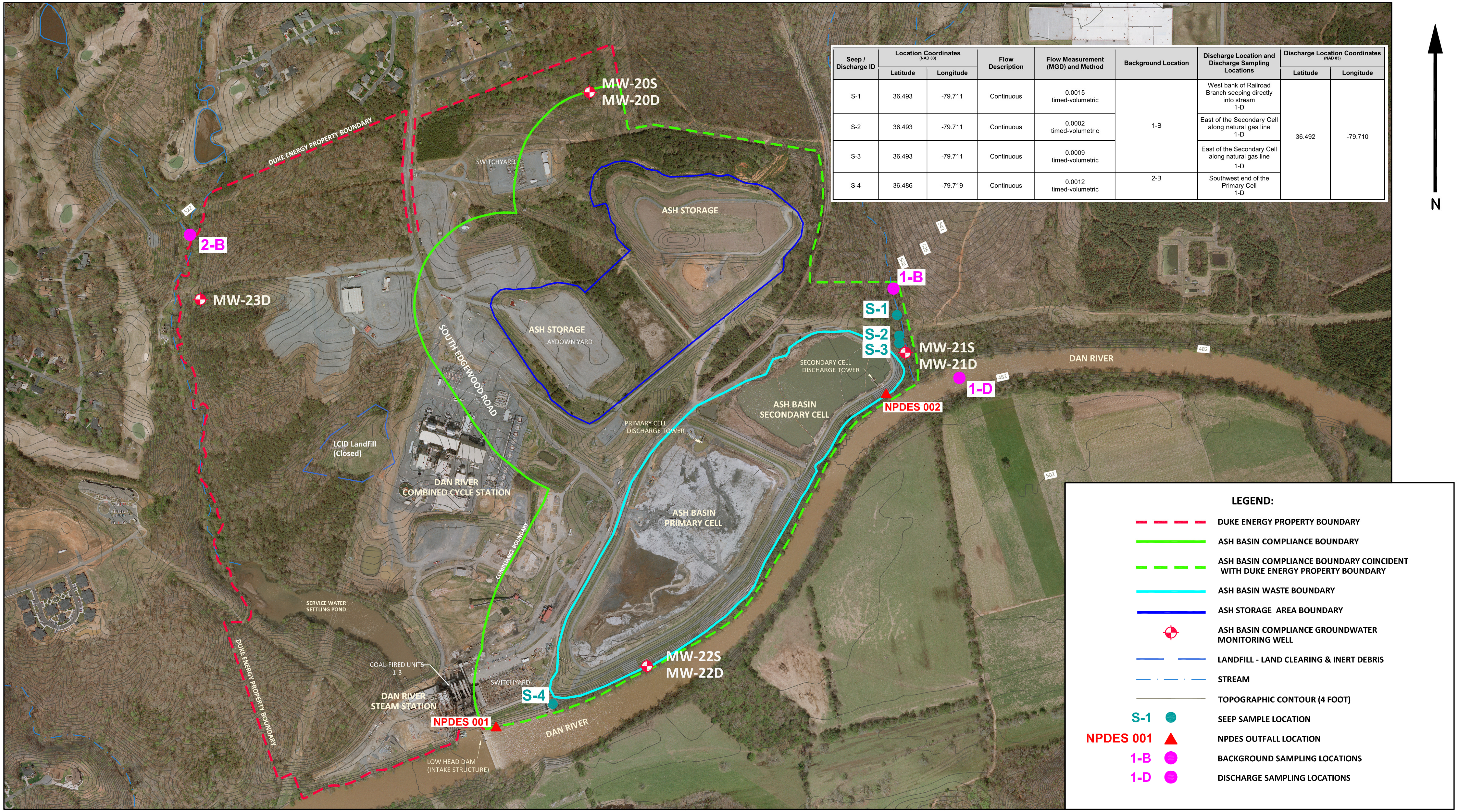
FIGURES AND TABLES

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

SITE LOCATION MAP
DAN RIVER COMBINED CYCLE STATION ASH BASIN
DUKE ENERGY CAROLINAS, LLC
ROCKINGHAM COUNTY, NORTH CAROLINA

DATE
SEPTEMBER 30, 2014

FIGURE
1



Seep / Discharge ID	Location Coordinates (NAD 83)		Flow Description	Flow Measurement (MGD) and Method	Background Location	Discharge Location and Discharge Sampling Locations	Discharge Location Coordinates (NAD 83)	
	Latitude	Longitude					Latitude	Longitude
S-1	36.493	-79.711	Continuous	0.0015 timed-volumetric	1-B	West bank of Railroad Branch seeping directly into stream 1-D	36.492	-79.710
S-2	36.493	-79.711	Continuous	0.0002 timed-volumetric		East of the Secondary Cell along natural gas line 1-D		
S-3	36.493	-79.711	Continuous	0.0009 timed-volumetric		East of the Secondary Cell along natural gas line 1-D		
S-4	36.486	-79.719	Continuous	0.0012 timed-volumetric	2-B	Southwest end of the Primary Cell 1-D		

NOTES:
1. PARCEL DATA FOR THE SITE WAS OBTAINED FROM DUKE ENERGY REAL ESTATE AND IS APPROXIMATE.
2. ASH BASIN WASTE BOUNDARY AND ASH STORAGE AREA BOUNDARIES ARE APPROXIMATE.
3. AS-BUILT MONITORING WELL LOCATIONS PROVIDED BY DUKE ENERGY.
4. ORTHOPHOTOGRAPHY WAS PROVIDED BY DUKE ENERGY (DATED 2014).
5. TOPOGRAPHIC CONTOURS WERE OBTAINED FROM NCDOT WEB SITE (DATED 2010) AND ARE APPROXIMATE.
6. THE ASH BASIN COMPLIANCE BOUNDARY IS ESTABLISHED ACCORDING TO THE DEFINITION FOUND IN 15A NCAC 02L .0107 (a.)
7. HYDROGRAPHY WAS OBTAINED FROM THE USGS NATIONAL MAP VIEWER AND DOWNLOAD PLATFORM ON JULY 8, 2014 (http://nationalmap.gov/viewer.html)
8. SEEP SAMPLING LOCATIONS ARE APPROXIMATE.
9. NPDES OUTFALL AND WATER QUALITY SAMPLE LOCATIONS PROVIDED BY DUKE ENERGY.

SCALE (FEET)
300' 0 300' 600'
1" = 600'

HDR
North Carolina Engineering Firm Number F-0116
440 South Church Street Charlotte, NC 28202

IDENTIFIED SEEPS AND WATER QUALITY SAMPLE LOCATION MAP
DUKE ENERGY CAROLINAS, LLC
DAN RIVER COMBINED CYCLE STATION ASH BASIN
NPDES PERMIT #NC0003468
ROCKINGHAM COUNTY, NORTH CAROLINA

DATE
DECEMBER 2014

FIGURE
2

Table 1 – Dan River Combined Cycle 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 (NAD 83)	
	Latitude	Longitude					Latitude	Longitude
S-1	36.493	-79.711	Continuous	0.0015 timed-volumetric	1-B	West bank of Railroad Branch seeping directly into stream 1-D	36.492	-79.710
S-2	36.493	-79.711	Continuous	0.0002 timed-volumetric		East of the Secondary Cell along natural gas line 1-D		
S-3	36.493	-79.711	Continuous	0.0009 timed-volumetric		East of the Secondary Cell along natural gas line 1-D		
S-4	36.486	-79.719	Continuous	0.0012 timed-volumetric	2-B	Southwest end of the Primary Cell 1-D		

Notes:

1. Flow description for each seep sample location is based on observation during site visits performed by HDR in June and July 2014
2. Flow measurements and analytical samples were collected on July 7 and 14, 2014
3. Location coordinates for seep sampling locations are approximate
4. Location coordinates (degrees) 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 – Dan River Combined Cycle Station – Example Surface Water/Seep Monitoring Flow and Analysis Results Table

Parameter	Units	S-1	S-2	S-3	S-4	Dan River-Upstream	Dan River-Downstream
Fluoride	**mg/l**	< 1	< 1	< 1	< 1	< 1	< 1
Hg - Mercury (71900)	**µg/l**	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
As - Arsenic (01002)	**µg/l**	7.21	8.24	3.1	154	< 1	< 1
Cd - Cadmium (01027)	**µg/l**	< 1	< 1	< 1	< 1	< 1	< 1
Cr - Chromium (01034)	**µg/l**	2.47	2.1	2.85	< 1	1.5	1.62
Cu - Copper (01042)	**µg/l**	2.24	5.57	7.08	< 1	1.7	1.46
Pb - Lead (01051)	**µg/l**	3.24	2.57	2.37	< 1	< 1	< 1
Ni - Nickel (01067)	**µg/l**	2.66	2.31	2.93	1.36	< 1	< 1
Se - Selenium (01147)	**µg/l**	< 1	< 1	< 1	< 1	< 1	< 1
pH	**s.u.**	6.27	7.26	6.17	7.38	6.56	6.53
Temperature	**°C**	18.2	20.7	19.8	24	23.9	24.6
Flow	**MGD**	0.0015	0.0002	0.0009	0.0012	405	405

Notes:

1. Flow measurements and analytical samples were collected on July 7 and 14, 2014
2. Flow at locations upstream and downstream of DRSS in the Dan River is the summation of USGS Dan River-Wentworth and USGS Smith River-Eden daily average flows for the date of river sampling