

ALTAMONT ENVIRONMENTAL, INC.

ENGINEERING & HYDROGEOLOGY

231 HAYWOOD STREET, ASHEVILLE, NC 28801

TEL. 828.281.3350 FAC. 828.281.3351

WWW.ALTAMONTENVIRONMENTAL.COM

February 9, 2012

Ms. Elizabeth Werner
North Carolina Department of Environment and Natural Resources
Division of Waste Management
Solid Waste Section
1646 Mail Service Center
Raleigh, NC 27699-1636

Subject: Duke Energy Carolinas, LLC
Belews Creek Steam Station
Stokes County, NC
Pine Hall Road Ash Landfill, Permit No. 8503
Monitoring Wells MW-3 and MW-6 Assessment

Dear Ms. Werner:

On behalf of Duke Energy Carolinas, LLC (Duke), Altamont Environmental Inc. submits the proposed *Groundwater Assessment Work Plan, Belews Creek Steam Station, Pine Hall Road Ash Landfill, Permit No. 8503, February 9, 2012*. This proposed assessment work plan is submitted in response to your letter of November 9, 2011 to Mr. Ed Sullivan, P.E. (Duke Energy), DOC ID 15485.

Altamont Environmental Inc. appreciates the opportunity to provide this information to the North Carolina Department of Environment and Natural Resources and to assist Duke Energy with these projects. Please call (828) 281-3350 if you have any questions or require additional information.

Sincerely,

ALTAMONT ENVIRONMENTAL, INC.



William M. Miller, P.E.
Project Manager

enclosure: *Groundwater Assessment Work Plan, Belews Creek Steam Station, Pine Hall Road Ash Landfill, Permit No. 8503, February 9, 2012.*

cc: Mark Poindexter, SWS, mark.poindexter@ncdenr.gov
Jason Watkins, SWS, jason.watkins@ncdenr.gov
Ellen Lorscheider, SWS, ellen.lorscheider@ncdenr.gov
Hugh Jernigan, SWS, hugh.jernigan@ncdenr.gov
Ed Sullivan, P.E., Duke, Ed.Sullivan@duke-energy.com
Kimberlee Benson, P.E., Duke, Kimberlee.Benson@duke-energy.com
Melonie Martin, Duke, Melonie.Martin@duke-energy.com

ALTAMONT ENVIRONMENTAL, INC.

E N G I N E E R I N G & H Y D R O G E O L O G Y



Groundwater Assessment Work Plan

Belews Creek Steam Station

Pine Hall Road Ash Landfill, Permit No. 8503

February 9, 2012

Prepared for
Duke Energy Carolinas, LLC
Belews Creek Steam Station
3195 Pine Hall Road
Belews Creek, NC 27042
Project Number 2371.13

Prepared by
Altamont Environmental, Inc.
231 Haywood Street
Asheville, NC 28801
(828) 281-3350

Professional Certification

On behalf of Altamont Environmental, Inc., a firm licensed to practice engineering (certification number C-2185) in the State of North Carolina, I do hereby certify that the information contained in this report is correct and accurate to the best of my knowledge.



William M. Miller, P.E.

Table of Contents

Professional Certification	ii
1.0 Introduction	1
2.0 Background	2
2.1 Site Description	2
2.2 Site Geology and Hydrogeology	2
2.3 Description of Monitoring System	3
2.4 Site Groundwater Flow.....	3
3.0 Groundwater Quality	4
4.0 Proposed Groundwater Assessment Work Plan	5
4.1 Proposed Groundwater Assessment Work Plan for Wells MW-3 and MW-6.....	5
4.2 Proposed Groundwater Assessment Work Plan for Remaining Wells and Surface Water Sampling Locations.....	5
5.0 Assessment Report and Project Schedule.....	6

Figures

1. Site Location Map
2. Sample Locations
3. Generalized Groundwater Surface Contours

Tables

1. 2L Standard Groundwater Quality Exceedances for Wells at or Beyond the Compliance Boundary
2. 2L Standard Groundwater Quality Exceedances for Wells at or Beyond the Review Boundary
3. 2L Standard Groundwater Quality Exceedances for Surface Water Sample Locations at or Beyond the Review Boundary
4. Method of Assessment for Monitoring Wells at or Beyond the Compliance Boundary
5. Method of Assessment for Monitoring Wells at or Beyond the Review Boundary
6. Method of Assessment for Surface Water Sample Locations at or Beyond the Review Boundary

Appendices

- A. Letter from North Carolina Department of Environment and Natural Resources. November 9, 2011. To Ed Sullivan, P.E., Duke Energy. DOC ID 15485.

1.0 Introduction

The Pine Hall Road Ash Landfill, Permit No. 8503, is located at the Belews Creek Steam Station in Stokes County. The station is owned and operated by Duke Energy Carolinas, LLC (Duke).

In a letter, dated November 9, 2011,¹ to Mr. Ed Sullivan, P.E. of Duke Energy Carolinas, LLC (Duke), the North Carolina Department of Environment and Natural Resources (DENR) Division of Waste Management (DWM) stated that exceedances of groundwater standards, established in Title 15A North Carolina Administrative Code (NCAC) Subchapter 2L .0202 Groundwater Quality Standards (2L standards), were reported in groundwater samples collected from groundwater monitoring wells MW-3 and MW-6 during the April 19, 2011 monitoring event. The letter is included as Appendix A.

The DENR letter stated that iron and manganese were reported at concentrations greater than their respective 2L standards in groundwater samples collected from MW-3 and MW-6 during this event. Monitoring well MW-3 is located outside the compliance boundary and MW-6 appears to be located near the compliance boundary. DENR also stated that industrial landfills are required to comply with the 2L standards at the compliance boundary in accordance with 15A NCAC 13B .0503 (2)(d)(iv).

In addition, the DENR letter stated that concentrations of boron, chromium, iron, manganese, nitrate, selenium and sulfate were reported at concentrations above their respective 2L standards in groundwater monitoring wells MW2-7, MW2-9, and MW-4. These wells are located at or beyond the review boundary.

DENR stated that based on these exceedances, Duke shall submit a groundwater assessment work plan to the DWM Solid Waste Section. This document, prepared by Altamont Environmental Inc. (Altamont) on behalf of Duke, presents the proposed groundwater assessment work plan.

¹ North Carolina Department of Environment and Natural Resources. Division of Waste Management. November 9, 2011, Monitoring Well MW-3 and MW-6 Assessment. Duke Energy – Belews Creek Pine Hall Road Landfill. DOC ID 15485.

2.0 Background

2.1 Site Description

The Pine Hall Road Ash Landfill is located at the Duke Belews Creek Steam Station, in Stokes County, North Carolina. Belews Creek Steam Station is a two-unit coal-fired generating facility located on Belews Lake in Stokes County, North Carolina. It is Duke Energy's largest coal-burning power plant in the Carolinas and consistently ranks among the most efficient coal facilities in the United States. The landfill is permitted under the North Carolina Department of Environment and Natural Resources (DENR) Solid Waste Permit No. 8503 and was closed in December 2008. The ash landfill was permitted to accept only fly ash from Belews Creek Steam Station operations.

The landfill was originally permitted in 1983. The original landfill was unlined and was permitted with a soil cap 1-foot thick on the side slopes and 2-feet thick on flatter areas. A subsequent expansion (Phase 1 Expansion) was permitted in 2003. This phase was also unlined, but was permitted with a synthetic cap system to be applied at closure.

After exceedances of 2L standards were observed in groundwater monitoring wells installed near the landfill, the placement of additional ash in the Phase 1 Expansion was halted. The closure design was revised to utilize an engineered, synthetic cover system for the entire landfill, including both the original landfill and the Phase 1 Expansion. The construction of the synthetic cover system was completed in December 2008.

The ash landfill and nearby surrounding area are portrayed on Figure 1. The ash landfill is located to the north of the surface water divide that runs parallel to Pine Hall Road and is located to the east of a surface water divide that runs parallel to Middleton Loop Road. The Belews Creek Steam Station ash basin is located to the north of the landfill and is labeled as a "tailings pond" on Figure 1. The ash basin is operated as a water treatment facility and is permitted by the National Pollutant Discharge Elimination System (NPDES) program (NPDES Permit #NC0024406).

Two surface water drainage features are located in the area of the landfill. One surface water drainage feature is on the eastern side of the landfill and drains to the ash basin. The second surface water drainage feature is located on the western side of the landfill and also drains to the ash basin.

2.2 Site Geology and Hydrogeology

The Belews Creek Steam Station is located in the Piedmont Physiographic Province of North Carolina, within the Milton Belt. The rocks of the Milton belt were formed during the Precambrian era and metamorphosed during the Paleozoic era. The bedrock in the vicinity of the landfill generally consists of schist and gneiss. The soils that overlie the bedrock in the area have generally formed from the in-place weathering of the parent bedrock. These soils are termed residuum (residual soils) and saprolite. The residuum is typically finer-grained and has a higher clay content than the underlying saprolite. The highly weathered saprolite generally retains the overall structure and appearance of the underlying bedrock. The saprolite grades into partially weathered rock and finally into bedrock.

Groundwater generally occurs within the residuum and saprolite under unconfined conditions. Often, the heterogeneous nature of the soil results in variable porosities and permeabilities both laterally and vertically. However, low permeability units that would result in confining conditions between the overlying soils and bedrock are generally absent. In the underlying bedrock, groundwater occurs predominately in fractures and joints, and flow may occur under either unconfined or confined conditions.

2.3 Description of Monitoring System

The groundwater monitoring system at the landfill consists of the following sample locations as listed below.

Monitoring Wells:	MW-1	MW-1D
	MW-2	MW-3
	MW-4	MW-5
	MW-6	MW-7
	MW2-7	MW2-9
	OB-4	OB-5
	OB-9	
Surface Water Sample Locations	SW-1A	SW-2

The locations of the monitoring wells and surface water sample locations are shown on Figure 2. Monitoring well MW-3 is defined by the *Groundwater Monitoring Sampling and Analysis Plan* (SAP) for the Pine Hall Road Ash Landfill dated November 8, 2010, to represent “background” groundwater quality. MW-1D extends into fractured bedrock and the other wells are screened to monitor groundwater in the saprolite layer.

The surface water sample locations SW-1A and SW-2 are groundwater seeps and are considered to be groundwater. Therefore, analytical results from groundwater samples collected from these locations are compared to 2L standards.

2.4 Site Groundwater Flow

Pine Hall Road is located along a topographic high and appears to be coincident with a groundwater divide. Groundwater flow at the site is from areas of higher topography along Pine Hall Road to discharge areas located at lower elevations. The ash basin appears to be the discharge area for groundwater flowing generally northward from the groundwater divide.

Generalized groundwater surface contours for the site are shown on Figure 3. These contours were developed using the groundwater elevations measured in the wells from the October 10-11, 2011 groundwater sampling event.

Based on the groundwater contours developed from groundwater elevations measured during sampling events, the groundwater flow under the landfill is flowing generally toward the surface water drainage features located to the west and east of the landfill and to the northwest and north toward the ash basin.

3.0 Groundwater Quality

In accordance with the SAP for the Pine Hall Road Ash Landfill dated November 8, 2010, the groundwater monitoring is performed semiannually in April and October. Sampling results are submitted to DENR within 60 days of sampling.

As noted in the DENR letter dated November 9, 2011, exceedances of the 2L standards were reported for groundwater monitoring wells during the April 19, 2011 monitoring event. After review of the DENR November 9, 2011 letter, a telephone conversation was conducted between representatives from DENR, Duke, and Altamont concerning these exceedances. Participating in that conversation were Ms. Elizabeth Werner, Hydrogeologist (DENR), Mr. Ed Sullivan, P.E. (Duke), and Mr. Bill Miller, P.E. (Altamont). During the conversation, Duke proposed that exceedances reported in groundwater sampling events, conducted more recently than the event noted in the DENR letter of November 9, 2011, would be addressed in the proposed assessment work plan. DENR agreed with this proposal.

Table 1 presents the 2L exceedances reported for groundwater monitoring wells (MW-3 and MW-6) located at or beyond the compliance boundary.

Table 2 presents the 2L exceedances reported for groundwater monitoring wells (MW2-7, MW2-9, and MW-4) located at or beyond the review boundary.

Table 3 presents the 2L exceedances reported for surface water sample locations (SW-1A and SW-2) located at or beyond the review boundary.

4.0 Proposed Groundwater Assessment Work Plan

4.1 Proposed Groundwater Assessment Work Plan for Wells MW-3 and MW-6

The proposed groundwater assessment plan for evaluating the 2L standard exceedances at wells MW-3 and MW-6 is provided in Table 4. In general, the proposed groundwater assessment plan for these wells is to evaluate if the 2L exceedances at these wells can be attributed to the site background water quality and/or if the exceedance can be attributed to sediment or particulate matter which is preserved in the groundwater samples as a result of well construction or groundwater sampling.

4.2 Proposed Groundwater Assessment Work Plan for Remaining Wells and Surface Water Sampling Locations

As described in Section 2.0, Duke modified the landfill closure design to utilize an engineered, synthetic cover system for the entire landfill, including both the original landfill and the Phase 1 Expansion. The construction of the synthetic cover system was completed in December 2008. This synthetic cover system was installed to minimize the infiltration of rainfall through the placed fly ash, minimizing additional impacts to the site groundwater from leachate produced by rainfall.

Figure 2 shows the locations for the landfill monitoring locations and the landfill compliance and review boundaries. This figure also shows the location of the ash basin compliance boundary, located 500 feet from the edge of the ash basin. Monitoring wells MW2-7, MW2-9, MW-4 and surface water sample location SW-1A are located within the ash basin compliance boundary. Surface water sample location SW-2 appears to be located near or immediately adjacent to the ash basin compliance boundary.

Based on a review of site groundwater flow directions and on the constituents measured in these wells, Altamont believes that these groundwater monitoring wells and surface water sampling locations are impacted by ash leachate. However, due to the proximity of the ash basin relative to the landfill and to these sample locations, it would be difficult to determine if the impact would be attributed to the landfill, or the ash basin, or if both the landfill and ash basin contribute to the exceedances at these locations.

With reduced infiltration of rainfall due to the engineered, synthetic cover system for the landfill, Altamont anticipates that the groundwater concentrations of constituents attributable to fly ash measured in these wells, if caused by the landfill, will decrease over time. The proposed groundwater assessment plan for evaluating the 2L exceedances at wells MW2-7, MW2-9, and MW-4 and at surface water sampling locations SW-1A and SW-2 is provided in Tables 5 and 6. Duke will continue to perform groundwater monitoring on a semiannual basis to monitor the performance of the synthetic cover system.

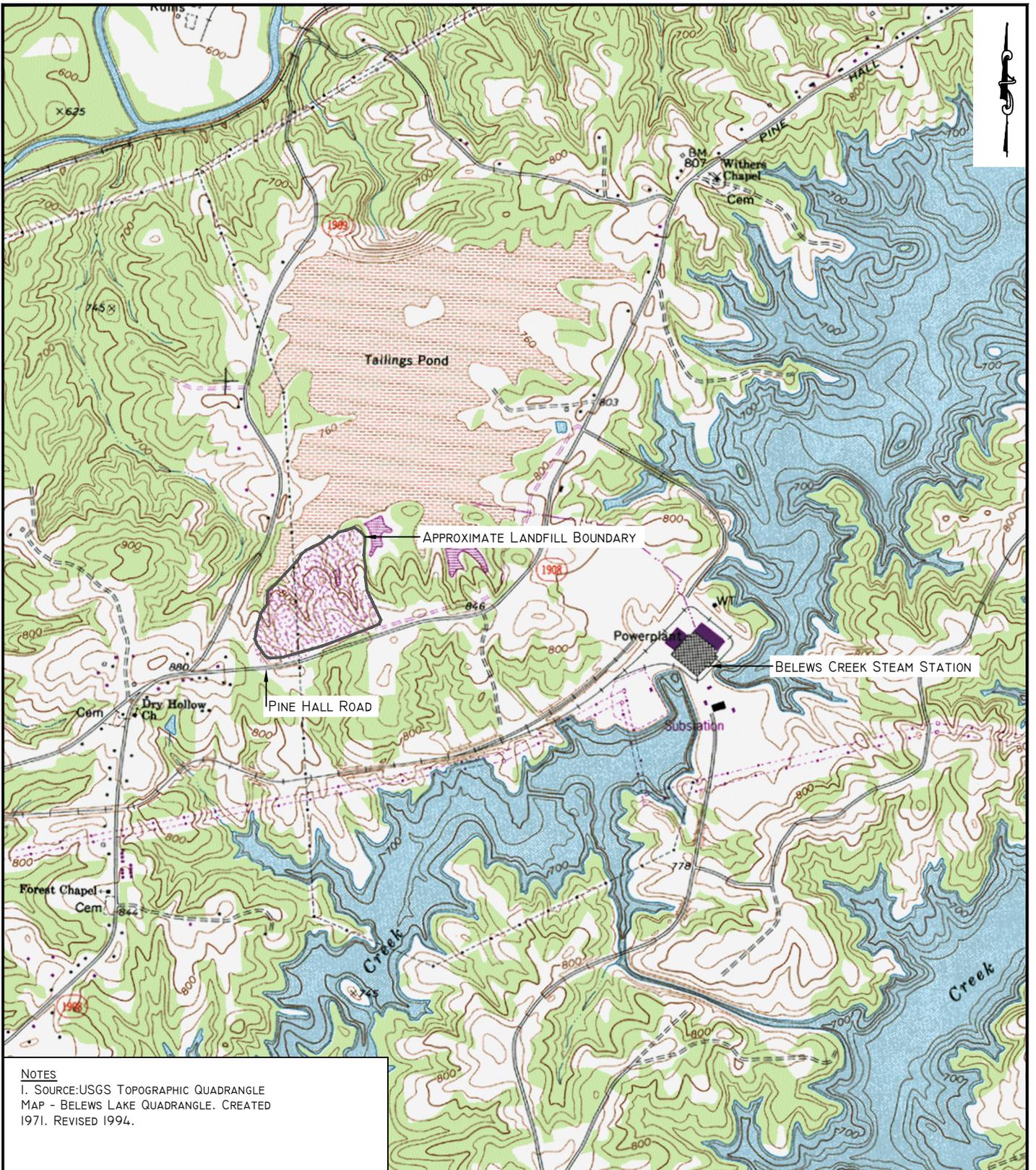
5.0 Assessment Report and Project Schedule

The groundwater assessment report will present results of the work proposed in Section 4.0 and will include interpretations of the results and recommendations for additional work, if deemed necessary. The next groundwater sampling event is scheduled to occur in April 2012. The groundwater assessment report will include analytical results from the April 2012 groundwater sampling event.

The report will be prepared by a North Carolina Professional Engineer.

The project schedule is to submit the groundwater assessment report 120 days after the next scheduled groundwater sampling event unless redevelopment of one or more of the monitoring wells is required. The groundwater assessment report will be submitted 150 days after the next scheduled groundwater sampling event if redevelopment of one or more of the monitoring wells is required. The next groundwater sampling event is scheduled in April 2012. The proposed report submittal date is contingent upon DENR's approval of the proposed groundwater assessment work plan by March 1, 2012.

FIGURES



NOTES

1. SOURCE: USGS TOPOGRAPHIC QUADRANGLE MAP - BELEWS LAKE QUADRANGLE. CREATED 1971. REVISED 1994.

ALTAMONT ENVIRONMENTAL, INC.

ENGINEERING & HYDROGEOLOGY

231 HAYWOOD STREET, ASHEVILLE, NC 28801
 TEL. 828.281.3350 FAC. 828.281.3351
 WWW.ALTAMONTENVIRONMENTAL.COM

SITE LOCATION MAP

BELEWS CREEK STEAM STATION
 PINE HALL ROAD ASH LANDFILL
 PERMIT No. 8503

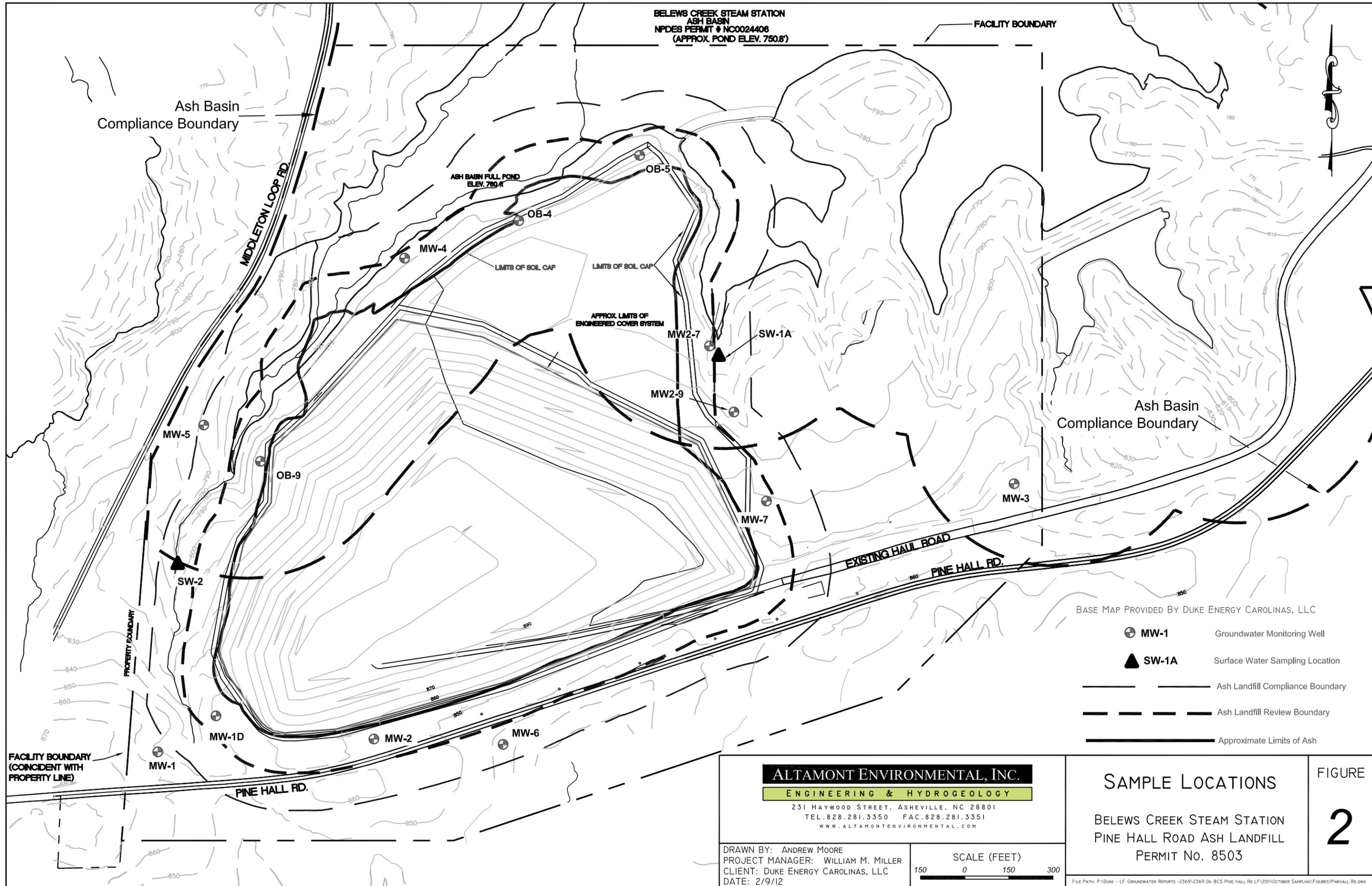
FIGURE

1

DRAWN BY: ANDREW MOORE
 PROJECT MANAGER: WILLIAM M. MILLER
 CLIENT: DUKE ENERGY CAROLINAS, LLC
 DATE: 2/9/12

SCALE (FEET)

1000 0 1000 2000



BELEWS CREEK STEAM STATION
 ASH BASIN
 NPDES PERMIT # NC0024408
 (APPROX. POND ELEV. 750.8')

FACILITY BOUNDARY

Ash Basin
 Compliance Boundary

ASH BASIN FULL POND
 ELEV. 780.4'

Ash Basin
 Compliance Boundary

BASE MAP PROVIDED BY DUKE ENERGY CAROLINAS, LLC

- ⊕ MW-1 Groundwater Monitoring Well
- ▲ SW-1A Surface Water Sampling Location
- Ash Landfill Compliance Boundary
- - - Ash Landfill Review Boundary
- Approximate Limits of Ash

ALTAMONT ENVIRONMENTAL, INC.

ENGINEERING & HYDROGEOLOGY

231 HAYWOOD STREET, ASHEVILLE, NC 28801
 TEL. 828.281.3350 FAC. 828.281.3351
 WWW.ALTAMONTENVIRONMENTAL.COM

SAMPLE LOCATIONS

BELEWS CREEK STEAM STATION
 PINE HALL ROAD ASH LANDFILL
 PERMIT No. 8503

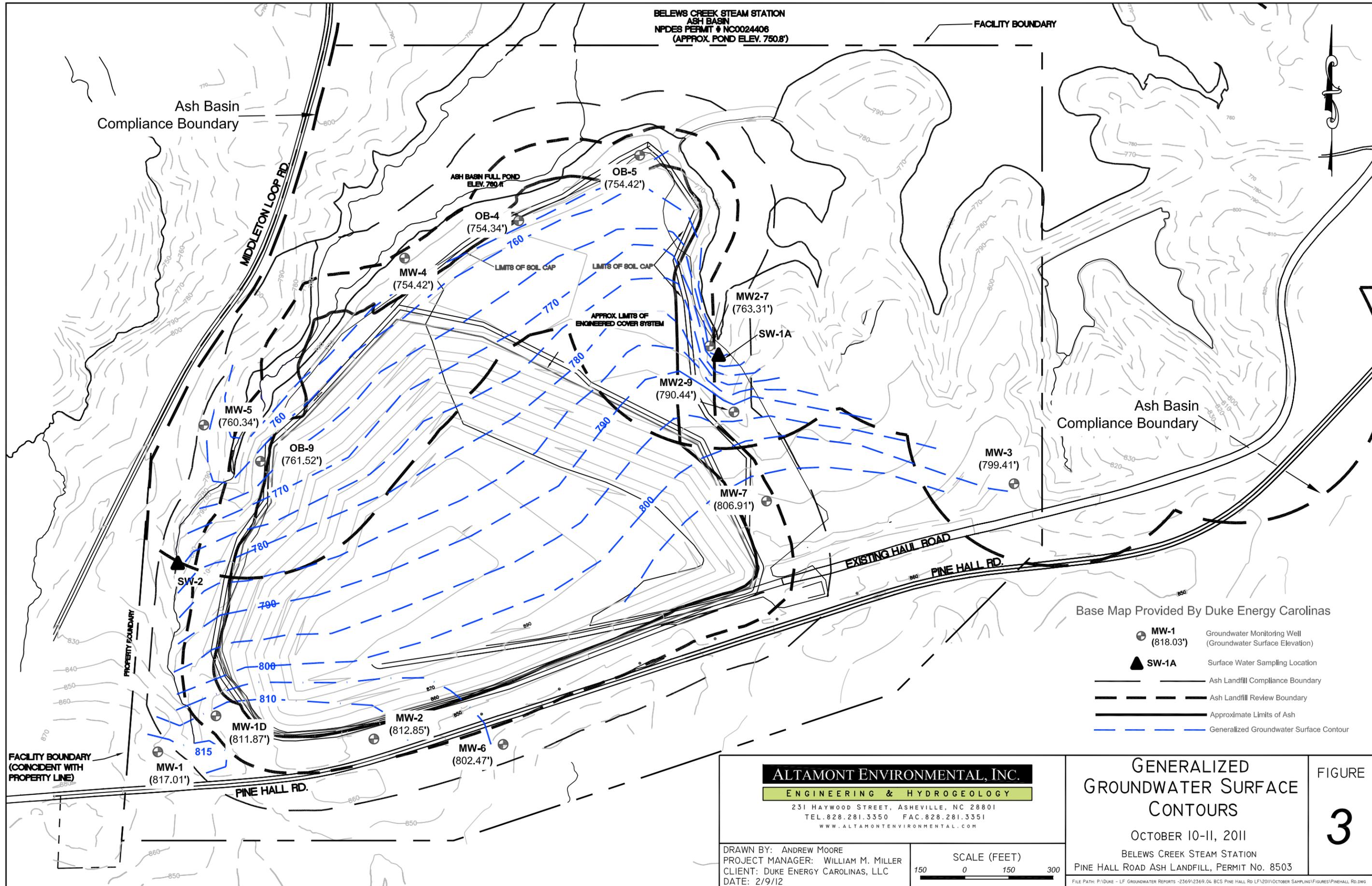
FIGURE

2

DRAWN BY: ANDREW MOORE
 PROJECT MANAGER: WILLIAM M. MILLER
 CLIENT: DUKE ENERGY CAROLINAS, LLC
 DATE: 2/9/12



FILE PATH: F:\DUKE - LF GROUNDWATER REPORTS - 236912369.04 BCS PINE HALL RD LF 12/10/OCTOBER SAMPLING/FIGURES/PINEHALL RD.DWG



BELEWS CREEK STEAM STATION
 ASH BASIN
 NPDES PERMIT # NC0024408
 (APPROX. POND ELEV. 750.8')

FACILITY BOUNDARY

Ash Basin
 Compliance Boundary

MIDDLETON LOOP RD

ASH BASIN FULL POND
 ELEV. 750.8'

OB-5
 (754.42')

OB-4
 (754.34')

MW-4
 (754.42')

LIMITS OF SOIL CAP

APPROX. LIMITS OF
 ENGINEERED COVER SYSTEM

MW2-7
 (763.31')

SW-1A

MW2-9
 (790.44')

MW-7
 (806.91')

EXISTING HALL ROAD

Ash Basin
 Compliance Boundary

PINE HALL RD.

MW-5
 (760.34')

OB-9
 (761.52')

SW-2

MW-1D
 (811.87')

MW-2
 (812.85')

MW-6
 (802.47')

MW-1
 (817.01')

PINE HALL RD.

Base Map Provided By Duke Energy Carolinas

- ⊕ MW-1 (818.03') Groundwater Monitoring Well (Groundwater Surface Elevation)
- ▲ SW-1A Surface Water Sampling Location
- Ash Landfill Compliance Boundary
- Ash Landfill Review Boundary
- Approximate Limits of Ash
- - - Generalized Groundwater Surface Contour

FACILITY BOUNDARY
 (COINCIDENT WITH
 PROPERTY LINE)

ALTAMONT ENVIRONMENTAL, INC.

ENGINEERING & HYDROGEOLOGY

231 HAYWOOD STREET, ASHEVILLE, NC 28801
 TEL. 828.281.3350 FAC. 828.281.3351
 WWW.ALTAMONTENVIRONMENTAL.COM

DRAWN BY: ANDREW MOORE
 PROJECT MANAGER: WILLIAM M. MILLER
 CLIENT: DUKE ENERGY CAROLINAS, LLC
 DATE: 2/9/12

SCALE (FEET)
 150 0 150 300

**GENERALIZED
 GROUNDWATER SURFACE
 CONTOURS**

OCTOBER 10-11, 2011
 BELEWS CREEK STEAM STATION
 PINE HALL ROAD ASH LANDFILL, PERMIT NO. 8503

FIGURE

3

FILE PATH: F:\DUKE - LF GROUNDWATER REPORTS - 236912369.04 BCS PINE HALL RD LF12011OCTOBER SAMPLING\FIGURES\PINEHALL RD.DWG

TABLES

Table 1
2L Standard Groundwater Quality Exceedances for Wells
at or Beyond the Compliance Boundary
Belews Creek Pine Hall Road Landfill, Stokes County, North Carolina

Well ID	Parameter	Sample Dates for Exceedance	Date of Report	Analytical Result (µg/L)	15A NCAC 2L Standard (µg/L)
MW-3	Iron	October 10-11, 2011	December 2, 2011	344	300
	Cobalt	October 10-11, 2011	December 2, 2011	1.05	1*
	Vanadium	October 10-11, 2011	December 2, 2011	1.43	0.3
MW-6	Iron	April 19-20, 2011	June 17, 2011	666	300
	Manganese	April 19-20, 2011	June 17, 2011	55.1	50

Notes:

1. 15A NCAC 2L standard is from "North Carolina Administrative Code, Title 15A: Department of Environment and Natural Resources, Subchapter 2L - Groundwater Classifications and Standards," DENR (last amended on January 1, 2010).
 2. Analytical results provided by Duke Energy Carolinas, LLC.
 3. Since the compliance boundary is located beyond the review boundary, these wells are located beyond the review boundary.
- * Indicates a 2L Interim Maximum Allowable Concentration (IMAC).

Table 2
2L Standard Groundwater Quality Exceedances for Wells
at or Beyond the Review Boundary
Belews Creek Pine Hall Road Landfill, Stokes County, North Carolina

Well ID	Parameter	Sample Dates for Exceedance	Date of Report	Analytical Result (µg/L)	15A NCAC 2L Standard (µg/L)
MW2-7	Boron	October 10-11, 2011	December 2, 2011	22,900	700
	Manganese	October 10-11, 2011	December 2, 2011	469	50
	Nitrate as Nitrogen	October 10-11, 2011	December 2, 2011	38,250	10,000
	Selenium	October 10-11, 2011	December 2, 2011	204	20
	Sulfate	October 10-11, 2011	December 2, 2011	1,140,000	250,000
	Total Dissolved Solids	October 10-11, 2011	December 2, 2011	1,947,000	500,000
MW2-9	Boron	October 10-11, 2011	December 2, 2011	1,421	700
	Iron	October 10-11, 2011	December 2, 2011	5,778	300
	Manganese	October 10-11, 2011	December 2, 2011	5,223	50
	Cobalt	October 10-11, 2011	December 2, 2011	11.92	1*
MW-4	Chromium	October 10-11, 2011	December 2, 2011	10.14	10
	Vanadium	October 10-11, 2011	December 2, 2011	2.42	0.3*

Notes:

1. 15A NCAC 2L standard is from "North Carolina Administrative Code, Title 15A: Department of Environment and Natural Resources, Subchapter 2L - Groundwater Classifications and Standards," DENR (last amended on January 1, 2010).
 2. Analytical results provided by Duke Energy Carolinas, LLC.
 3. Since the compliance boundary is located beyond the review boundary, these wells are located inside of the compliance boundary.
- * Indicates a 2L Interim Maximum Allowable Concentration (IMAC).

Table 3
2L Standard Groundwater Quality Exceedances for Surface Water Sample Locations
at or Beyond the Review Boundary
Belews Creek Pine Hall Road Landfill, Stokes County, North Carolina

Sample Location	Parameter	Sample Dates for Exceedance	Date of Report	Analytical Result (µg/L)	15A NCAC 2L Standard (µg/L)
SW-1A	Boron	October 10-11, 2011	December 2, 2011	20,250	700
	Manganese	October 10-11, 2011	December 2, 2011	941	50
	Nitrate as Nitrogen	October 10-11, 2011	December 2, 2011	30,560	10,000
	Selenium	October 10-11, 2011	December 2, 2011	159	20
	Sulfate	October 10-11, 2011	December 2, 2011	960,600	250,000
	Total Dissolved Solids	October 10-11, 2011	December 2, 2011	1,717,000	500,000
SW-2	Boron	October 10-11, 2011	December 2, 2011	3,279	700
	Manganese	October 10-11, 2011	December 2, 2011	63.65	50
	Selenium	October 10-11, 2011	December 2, 2011	22.76	20

Notes:

1. 15A NCAC 2L standard is from "North Carolina Administrative Code, Title 15A: Department of Environment and Natural Resources, Subchapter 2L - Groundwater Classifications and Standards," DENR (last amended on January 1, 2010)
2. Analytical results provided by Duke Energy Carolinas, LLC.
3. The surface water sample locations SW-1A and SW-2 are groundwater seeps and are considered to be groundwater. Therefore analytical results from these locations are compared to 2L standards.

* Indicates a 2L Interim Maximum Allowable Concentration (IMAC).

Table 4
Method of Assessment for Monitoring Wells
at or Beyond the Compliance Boundary
Belews Creek Pine Hall Road Landfill, Stokes County, North Carolina

Well ID	Parameter	Method of Assessment
MW-3	Iron, Cobalt, Vanadium	<p>a. Review site groundwater flow and hydrogeologic reports to determine if groundwater flow from the landfill is toward MW-3:</p> <ol style="list-style-type: none"> 1. Evaluate groundwater flow from landfill with respect to MW-3 location. 2. Review site hydrogeologic reports. <p>b. Evaluate if the sources of exceedances are naturally occurring and are from sediment or other particulate matter by performing one or more of the following:</p> <ol style="list-style-type: none"> 1. Evaluate exceedances against turbidity values. 2. Evaluate sampling flow rates. 3. Collect and analyze filtered and non-filtered samples. 4. Redevelop well and clean pump if steps above do not resolve issue.
MW-6	Iron, Manganese	<p>Assessment not required since Oct 2011 sample results for iron and manganese are below the 2L standard. However, the following assessment will be performed:</p> <p>a. Evaluate if the sources of exceedances are naturally occurring and are from sediment or other particulate matter by performing one or more of the following:</p> <ol style="list-style-type: none"> 1. Evaluate exceedances against turbidity values. 2. Evaluate sampling flow rates. 3. Collect and analyze filtered and non-filtered samples. 4. Redevelop well and clean pump if steps above do not resolve issue.

Table 5
Method of Assessment for Wells
at or Beyond the Review Boundary
Belews Creek Pine Hall Road Landfill, Stokes County, North Carolina

Well ID	Parameter	Method of Assessment
MW2-7	Boron, Manganese, Nitrate as Nitrogen, Selenium, Sulfate, Total Dissolved Solids	a. Perform a review of the landfill hydrogeologic boundaries. b. Continue to perform groundwater monitoring on a semiannual basis to monitor the performance of the cover system. Synthetic cover system was installed in December 2008 to minimize rainwater infiltration through the placed fly ash. With reduced infiltration, the groundwater concentrations of constituents attributable to fly ash measured in these wells will likely decrease over time.
MW2-9	Boron, Iron, Manganese, Cobalt	
MW-4	Chromium, Vanadium	

Table 6
Method of Assessment for Surface Water Sample Locations
at or Beyond the Review Boundary
Belews Creek Pine Hall Road Landfill, Stokes County, North Carolina

Sample Location	Parameter	Method of Assessment
SW-1A	Boron, Manganese, Nitrate as Nitrogen, Selenium, Sulfate, Total Dissolved Solids	a. Perform a review of the landfill hydrogeologic boundaries. b. Continue to perform groundwater monitoring on a semiannual basis to monitor the performance of the cover system. Synthetic cover system was installed in December 2008 to minimize rainwater infiltration through the placed fly ash. With reduced infiltration, the groundwater concentrations of constituents attributable to fly ash measured in these wells will likely decrease over time.
SW-2	Boron, Manganese, Selenium	

APPENDIX A
LETTER FROM NORTH CAROLINA DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES, NOVEMBER 9, 2011.
TO ED SULLIVAN, P.E., DUKE ENERGY. DOC ID 15485.



North Carolina Department of Environment and Natural Resources

Division of Waste Management

Dexter R. Matthews

Director

Beverly Eaves Perdue
Governor

Dee Freeman
Secretary

November 9, 2011

Mr. Ed Sullivan, P.E.
Mail Code EC13K
PO Box 1006
Charlotte, NC. 28201

RE: Monitoring Wells MW-3 and MW-6 Assessment
Duke Energy - Belews Creek Pine Hall Road Landfill
Permit #85-03
Stokes County
DOC ID 15485

Dear Mr. Sullivan:

A review of groundwater analytical data from the Pine Hall Road Landfill indicates exceedances of groundwater standards established in 15A NCAC 2L .0202 (2L Standards) during the April 19, 2011 monitoring event. Iron and manganese have been reported at concentrations greater than their respective 2L Standards in groundwater samples collected from MW-3 and MW-6. Monitor well MW-3 is located outside the compliance boundary and MW-6 appears to be located near the compliance boundary. Industrial landfills are required to comply with the 2L standards at the compliance boundary in accordance with 15A NCAC 13B .503 (2)(d)(iv).

Duke Energy shall acquire the services of a North Carolina licensed professional geologist and submit a groundwater assessment work plan to the Solid Waste Section (Section) outlining how the reported metals contamination in MW-3 and MW-6 will be delineated. The Section will review the submitted work plan, approve, or request additional information or amendments before implementation. Please submit this work plan within 90 days of receiving this letter. The work plan may include, but not limited to an alternate source demonstration for the metals contamination. In addition, monitoring wells MW2-7, MW2-9 and MW-4 have boron, chromium, iron, manganese, nitrate, selenium and sulfate concentrations above their respective 2L Standards and appear to be located at or beyond the review boundary, which triggers the need for assessment.

The Section solicits your cooperation and would like to remind you that it is your responsibility to comply with the requirements of the rules and statues since the rules are self-implementing. Please contact me at (919) 707-8253 or via email Elizabeth.werner@ncdenr.gov if you have any questions or concerns regarding this letter. Thank you in advance for your anticipated cooperation in this matter.

Sincerely,

Elizabeth S Werner
Hydrogeologist

cc: William M. Miller, PE, Altamont Environmental Inc.
Mark Poindexter, SWS Jason Watkins, SWS
Ellen Lorscheider, SWS Hugh Jernigan, SWS
Central File