

NC DENR
Division of Waste Management - Solid Waste

Environmental Monitoring Reporting Form

Notice: This form and any information attached to it are "Public Records" as defined in NC General Statute 132-1. As such, these documents are available for inspection and examination by any person upon request (NC General Statute 132-6).

Instructions:

- Prepare one form for each individually monitored unit.
- Please type or print legibly.
- Attach a notification table with values that attain or exceed NC 2L groundwater standards or NC 2B surface water standards. The notification must include a preliminary analysis of the cause and significance of each value. (e.g. naturally occurring, off-site source, pre-existing condition, etc.).
- Attach a notification table of any groundwater or surface water values that equal or exceed the reporting limits.
- Attach a notification table of any methane gas values that attain or exceed explosive gas levels. This includes any structures on or nearby the facility (NCAC 13B .1629 (4)(a)(i)).
- Send the original signed and sealed form, any tables, and Electronic Data Deliverable to: Compliance Unit, NCDENR-DWM, Solid Waste Section, 1646 Mail Service Center, Raleigh, NC 27699-1646.

Solid Waste Monitoring Data Submittal Information

Name of entity submitting data (laboratory, consultant, facility owner):

HDR Engineering, Inc. of the Carolinas (Consultant)

Contact for questions about data formatting. Include data preparer's name, telephone number and E-mail address:

Name: William M. Miller Phone: 828-891-6296
E-mail: bill.miller@hdrinc.com

Facility name:	Facility Address:	Facility Permit #	NC Landfill Rule: (.0500 or .1600)	Actual sampling dates (e.g., October 20-24, 2006)
Duke Energy Carolinas, LLC Marshall Steam Station FGD Residue Landfill Phase 1, Cell 1	8320 East NC Highway 150 Terrell, NC 28682	1809	.0500	September 17-18, 2012

Environmental Status: (Check all that apply)

- Initial/Background Monitoring Detection Monitoring Assessment Monitoring Corrective Action

Type of data submitted: (Check all that apply)

- Groundwater monitoring data from monitoring wells Methane gas monitoring data
 Groundwater monitoring data from private water supply wells Corrective action data (specify) _____
 Leachate monitoring data Other(specify) _____
 Surface water monitoring data

Notification attached?

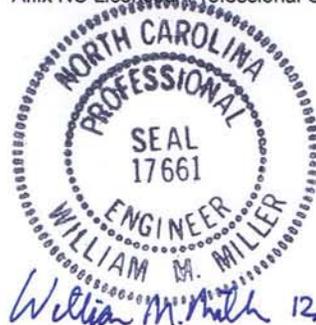
- No. No groundwater or surface water standards were exceeded.
 Yes, a notification of values exceeding a groundwater or surface water standard is attached. It includes a list of groundwater and surface water monitoring points, dates, analytical values, NC 2L groundwater standard, NC 2B surface water standard or NC Solid Waste GWPS and preliminary analysis of the cause and significance of any concentration.
 Yes, a notification of values exceeding an explosive methane gas limit is attached. It includes the methane monitoring points, dates, sample values and explosive methane gas limits.

Certification

To the best of my knowledge, the information reported and statements made on this data submittal and attachments are true and correct. Furthermore, I have attached complete notification of any sampling values meeting or exceeding groundwater standards or explosive gas levels, and a preliminary analysis of the cause and significance of concentrations exceeding groundwater standards. I am aware that there are significant penalties for making any false statement, representation, or certification including the possibility of a fine and imprisonment.

William M. Miller Senior Engineer (828) 891-6296
 Facility Representative Name (Print) Title (Area Code) Telephone Number
William M. Miller December 14, 2012 Affix NC Licensed Professional Geologist Seal
 Signature Date

440 S. Church Street Suite 1000, Charlotte, NC 28202
 Facility Representative Address
 F-0116
 NC PE Firm License Number (if applicable effective May 1, 2009)



**SEMIANNUAL GROUNDWATER
MONITORING REPORT**

MARSHALL STEAM STATION

**FGD RESIDUE LANDFILL, PHASE 1, CELL 1
PERMIT NO. 1809**

SEPTEMBER 2012 SAMPLING EVENT

**Prepared for:
DUKE ENERGY CAROLINAS, LLC
8320 East NC Highway 150
Terrell, NC 28682**

**Prepared by:
HDR ENGINEERING, INC. OF THE CAROLINAS
Charlotte, North Carolina**

December 14, 2012



REPORT VERIFICATION

PROJECT: SEMIANNUAL GROUNDWATER MONITORING REPORT
MARSHALL STEAM STATION
FGD RESIDUE LANDFILL, PHASE 1, CELL 1
PERMIT NO. 1809

TITLE: SEPTEMBER 2012 SAMPLING EVENT

This document has been reviewed for accuracy and quality commensurate with the intended application.

Prepared by: Albrigait Vorobeev Date: 12/14/2012
Checked by: Justin Schumacher Date: 12/14/2012
Approved by: William M. Miller Date: Dec 14, 2012

Project Manager: Ty Ziegler, PE

Professional Engineer Seal:



William M. Miller 12/14/12
HDR Engineering, Inc. of the Carolinas
440 South Church St., Suite 1000
Charlotte, NC 28202

North Carolina Engineering Firm Number F-0116

**SEMIANNUAL GROUNDWATER MONITORING REPORT
MARSHALL STEAM STATION
FGD RESIDUE LANDFILL, PHASE 1, CELL 1
PERMIT NO. 1809**

SEPTEMBER 2012 SAMPLING EVENT

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Section 1

Background

Marshall Steam Station is owned and operated by Duke Energy Carolinas, LLC (Duke Energy). The Marshall plant has a generating capacity of 2090 megawatts (MW) of electric power by the combustion of coal. The plant is located in Catawba County, North Carolina, on Lake Norman, and is in the Piedmont physiographic region.

The flue gas desulfurization (FGD) landfill is located northwest of the power plant and west of the Marshall Ash Basin as shown on Figure 1. In general, the topography of the landfill site slopes from the west-northwest to the east-southeast towards the Marshall Ash Basin.

The landfill is permitted to receive FGD residue (gypsum), clarifier sludge, fly ash, bottom ash, asbestos waste, C&D waste, and mill rejects (pyrites). The clarifier sludge is generated from the FGD wastewater treatment system. Only Cell 1 of the landfill is in operation and is approximately 18 acres in area. The landfill is constructed with an engineered liner system. Contact stormwater and leachate are collected in the lined Cell 1, and then piped to the ash basin. The landfill began receiving wastes in 2007.

The subsurface conditions at the site consist of residual soils and partially weathered rock, which have been formed by the in-place weathering of the parent rock. These materials are underlain by bedrock. The site hydrogeological description and information on the monitoring wells can be found in the *Groundwater Sampling and Analysis Plan*.¹

The monitoring system at the landfill consists of nine groundwater monitoring wells (MS-8, MS-9, MS-10, MS-11, MS-12, MS-13, MS-14, MS-15, and MS-16), one surface water sample location (SW-1), and one leachate sample location (C1). The locations of the wells, surface water sample location, and the leachate sampling location are shown on Figure 2. The leachate sampling requirement was added in the revised Permit to Operate for the Marshall FGD Landfill² in September 2011. Well MS-8 is located north of the landfill and, according to the *Groundwater Sampling and Analysis Plan*, is the background monitoring well for the site. Surface water sample location SW-1 is a groundwater seep and the analytical results are compared to Title

¹ Marshall Steam Station Flue Gas Desulfurization (FGD) Residue Landfill Phase 1, Cell 1 Permit No. 18-09 *Groundwater Sampling and Analysis Plan*. Dated August 19, 2011.

² Attachment 3 – Conditions of Operating Permit, Part I: General Facility Conditions, Monitoring and Reporting Requirements, #13.

15A, North Carolina Administrative Code (NCAC), Subchapter 2L Standards (2L Standards) for Class GA groundwater.

Section 2

Methods

2.1 Sampling and Analysis Methods

Groundwater sampling, surface water sampling, and documentation of sampling were performed by Duke Energy personnel. The groundwater and surface water samples were analyzed by the Duke Energy Analytical Laboratory (North Carolina Laboratory Certification #248) and provided to HDR Engineering, Inc. (HDR) by Duke Energy.

The groundwater samples were analyzed for the following constituents and/or parameters:

- Select metals using U.S. Environmental Protection Agency (EPA) Methods 200.7 and 200.8
- Mercury using EPA Method 245.1
- Total dissolved solids using Standard Method (SM) 2540C
- Chloride, fluoride, nitrate as nitrogen, and sulfate using EPA Method 300.0

2.2 Statement of Work

HDR completed the following tasks:

- Received field sampling information provided by Duke Energy (performed by Duke Energy personnel) for monitoring wells MS-8, MS-9, MS-10, MS-11, MS-12, MS-13, MS-14, MS-15, MS-16, and leachate sampling location C1. Surface water sampling location SW-1 was reported to be dry, therefore no sample was collected. The samples were collected on September 17, 2012 and HDR received the data on October 1, 2012.
- Reviewed the laboratory analytical results for the samples noted above. The Electronic Data Deliverable (EDD), provided by Duke Energy, was adapted to conform to the format requirements of the North Carolina Department of Environment and Natural Resources (NCDENR) EDD template. HDR added an italicized J data qualifier (*J*) to indicate a detected concentration that is greater than the laboratory's method reporting

limit (MRL), but less than the Solid Waste Section Limit³ (SWSL). A copy of the original EDD is retained in HDR's files.

- Developed a generalized groundwater surface contour map using map data and groundwater elevation data supplied by Duke Energy.
- Prepared and submitted this Semiannual Groundwater Monitoring Report to Duke Energy and to NCDENR.

Selected samples were diluted as is normal laboratory practice to bring samples to the calibrated range of the analysis. Specifics regarding the samples that were diluted, including the dilution factor, are reported in the EDD.

³ Solid Waste Section Limits (SWSL) is defined by DENR as the lowest amount of analyte in a sample that can be quantitatively determined with suitable precision and accuracy. The SWSL is the concentration below which reported results must be qualified as estimated. NCDENR Division of Waste Management Memorandum dated February 23, 2007.

Section 3

Results

3.1 Site Groundwater Flow

Generalized groundwater surface contours for the site are shown on Figure 3. These contours were developed using groundwater elevations measured at the wells on September 17, 2012.

Groundwater flow in the area of the landfill is generally from areas of higher topography, located to the north and west of the landfill, toward the Marshall Ash Basin, located to the east of the landfill. To a lesser extent, some component of groundwater flow is expected toward surface water sample location SW-1.

3.2 Analytical Results

A summary of the field data is presented in Table 1.

The results of the field and laboratory analyses are summarized in Tables 2 and 3.

A summary of the 2L Standard exceedances and a preliminary analysis of the cause and significance of the exceedances are presented in Table 4.

Concentrations for constituents listed in Table 4 were measured at levels equal to or above the respective SWSLs at those wells, other than pH.

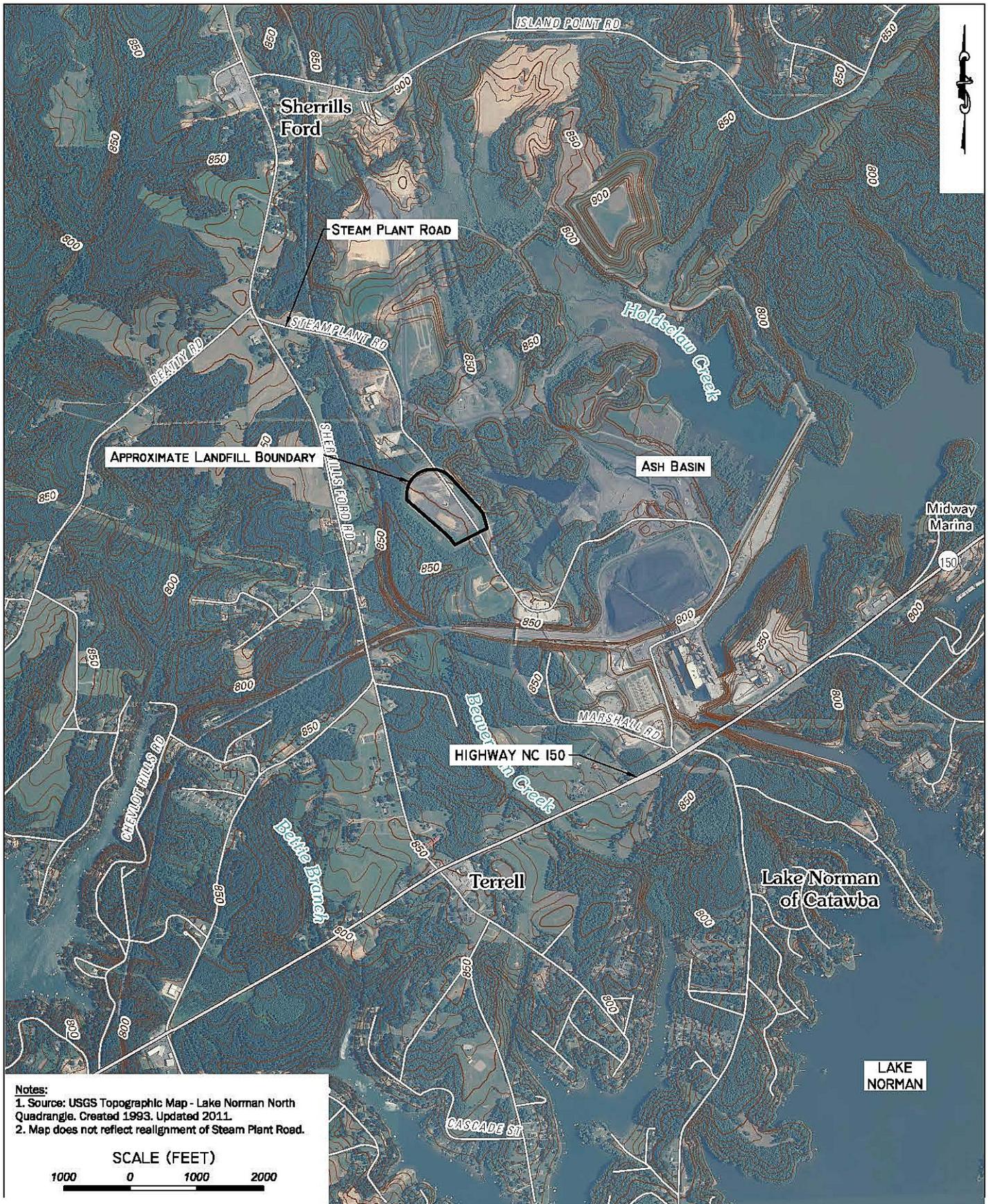
The constituents at the following groundwater monitoring locations were detected at concentrations equal to or above the corresponding SWSL but did not exceed the 2L Standards:

- Barium in MS-10 and MS-13

HDR prepared and submitted an assessment to NCDENR on historic exceedances of 2L Standards at this landfill (*Groundwater Assessment Marshall Steam Station FGD Landfill, Phase 1, Cell 1, July 12, 2012*). The report assessed 2L Standard exceedances for chromium at MS-15 and for iron at MS-16. The assessment report concluded that the historic exceedances of the 2L Standards at the site were naturally occurring and are not related to impacts from the landfill.

The chain-of-custody forms can be found in Appendix A.

FIGURES



Notes:
 1. Source: USGS Topographic Map - Lake Norman North Quadrangle. Created 1993. Updated 2011.
 2. Map does not reflect realignment of Steam Plant Road.

SCALE (FEET)
 1000 0 1000 2000

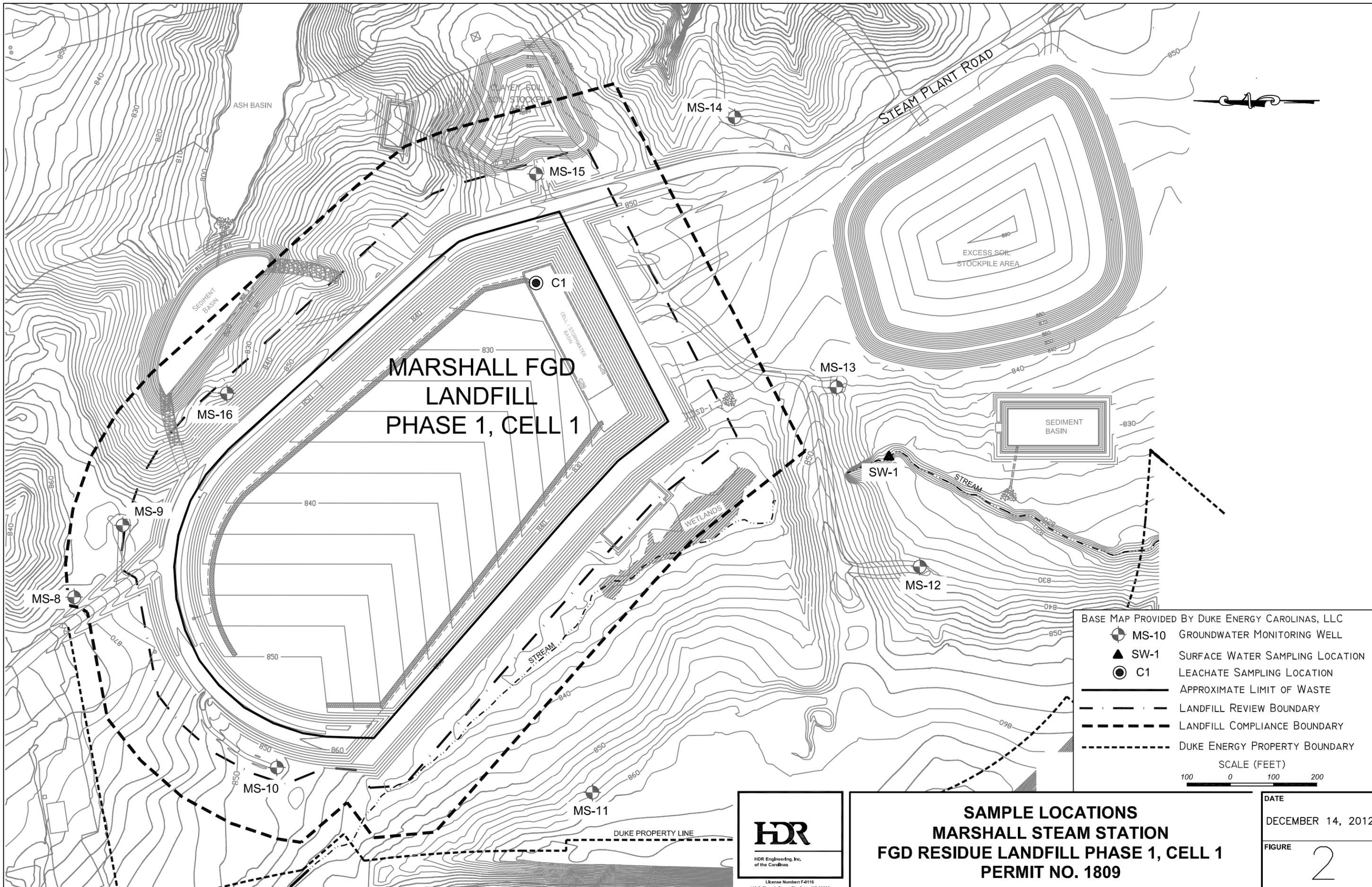
HDR Engineering, Inc.
 of the Carolinas

License Number: F-0118
 440 South Church Street Charlotte, NC 28202

SITE LOCATION MAP
MARSHALL STEAM STATION
FGD RESIDUE LANDFILL PHASE 1, CELL 1
PERMIT NO. 1809

DATE	December 14, 2012
FIGURE	1

C:\pwworking\pawd0410761\MSS FGD LF.dwg, Fig 2, 12/12/2012 3:16:17 PM, avoorhee

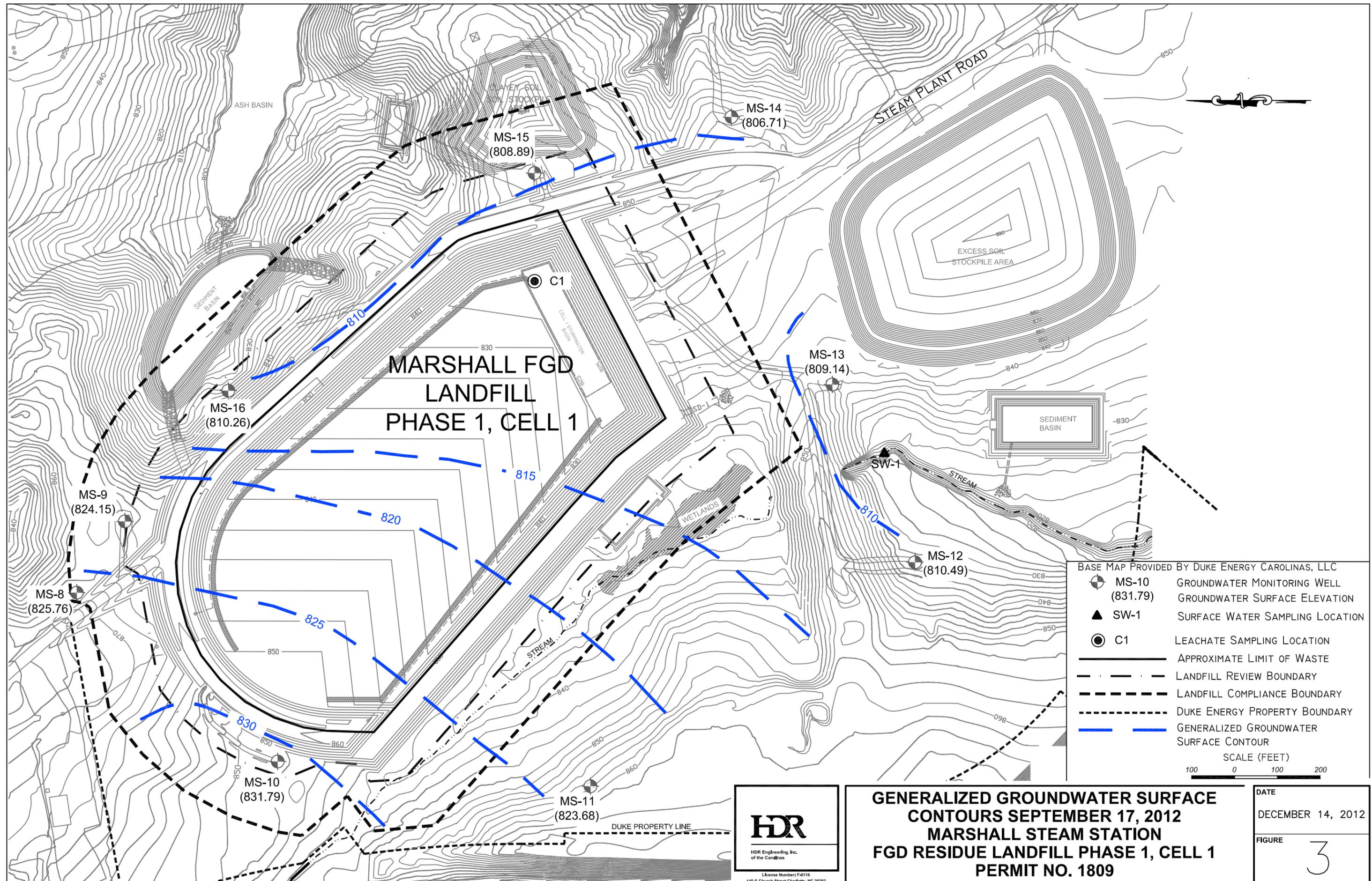


**SAMPLE LOCATIONS
MARSHALL STEAM STATION
FGD RESIDUE LANDFILL PHASE 1, CELL 1
PERMIT NO. 1809**

DATE
DECEMBER 14, 2012

FIGURE
2

C:\pwworking\pa\d0410761\MSS FGD LF.dwg, Fig 3, 12/12/2012 3:16:47 PM, avoohnee



BASE MAP PROVIDED BY DUKE ENERGY CAROLINAS, LLC

	MS-10 (831.79)	GROUNDWATER MONITORING WELL
		GROUNDWATER SURFACE ELEVATION
	SW-1	SURFACE WATER SAMPLING LOCATION
	C1	LEACHATE SAMPLING LOCATION
		APPROXIMATE LIMIT OF WASTE
		LANDFILL REVIEW BOUNDARY
		LANDFILL COMPLIANCE BOUNDARY
		DUKE ENERGY PROPERTY BOUNDARY
		GENERALIZED GROUNDWATER SURFACE CONTOUR

SCALE (FEET)
100 0 100 200

HDR
HDR Engineering, Inc.
of the Carolinas
License Number: F-0116
440 S Church Street Charlotte, NC 28202

**GENERALIZED GROUNDWATER SURFACE
CONTOURS SEPTEMBER 17, 2012
MARSHALL STEAM STATION
FGD RESIDUE LANDFILL PHASE 1, CELL 1
PERMIT NO. 1809**

DATE
DECEMBER 14, 2012
FIGURE
3

TABLES

Table 1–Field Data Parameters
Duke Energy Carolinas, LLC/Marshall Steam Station
FGD Residue Landfill, Phase 1, Cell 1–Permit No. 1809
Groundwater Monitoring Report

DATE	WELL No.	WELL DEPTH (feet)	DEPTH TO WATER (feet)	WATER ELEV. (feet)	APPEARANCE	ODOR	PURGE METHOD	PUMP RATE (mL/min)	WELL VOLUME (gal)	EVAC VOLUME (gal)	EVAC (yes/no)	TEMP (deg C)	SPECIFIC CONDUCTANCE (umho/cm)	pH (SU)	TURBIDITY (NTU)	ORP (mV-NHE)	DO (mg/L)
9/17/2012	MS-8	51.58	46.58	825.76	Normal	None	CP	N/A	0.82	3.00	NO	18.59	41	6.1	8.2	N/A	N/A
9/17/2012	MS-9	53.00	43.89	824.15	Normal	None	CP	N/A	1.49	7.50	NO	16.28	92	6.5	1.9	N/A	N/A
9/17/2012	MS-10	23.34	19.50	831.79	Normal	None	CP	N/A	0.63	3.75	NO	16.53	25	5.0	6.9	N/A	N/A
9/17/2012	MS-11	42.72	36.10	823.68	Normal	None	CP	N/A	1.08	5.00	NO	15.49	40	5.6	7.8	N/A	N/A
9/17/2012	MS-12	31.09	25.17	810.49	Normal	None	CP	N/A	0.97	4.00	NO	14.84	26	5.0	7.5	N/A	N/A
9/17/2012	MS-13	41.52	32.76	809.14	Normal	None	CP	N/A	1.43	4.50	NO	14.89	82	5.3	7.6	N/A	N/A
9/17/2012	MS-14	44.38	37.36	806.71	Normal	None	CP	N/A	1.14	3.75	NO	15.60	50	5.9	5.7	N/A	N/A
9/17/2012	MS-15	63.08	52.58	808.89	Normal	None	CP	N/A	1.71	5.25	NO	16.44	153	8.6	3.5	N/A	N/A
9/17/2012	MS-16	37.46	26.72	810.26	Normal	None	CP	N/A	1.75	2.00	YES	16.72	98	6.1	22.5	N/A	N/A
9/17/2012	SW-1	N/A	N/A	N/A	Normal	None	NP	N/A	N/A	N/A	N/A	NS	NS	NS	NS	N/A	N/A
9/17/2012	C1-LEACHATE	N/A	N/A	N/A	Normal	None	NP	N/A	N/A	N/A	N/A	18.81	4969	5.6	10.6	N/A	N/A

Notes:

1. Purge Methods; LF=Low Flow, CP=Conventional Purge (3-5 well volumes), NP=No Purge (HydraSleeve), NS=Not Sampled.
2. Field sampling performed by Duke Energy Carolinas, LLC personnel.
3. umho/cm indicates micro mhos per centimeter.
4. SU indicates Standard Units.
5. NTU indicates Nephelometric Turbidity Units.
6. mV-NHE indicates millivolts-Normal Hydrogen Electrode.
7. Information provided by Tim Hunsucker of Duke Energy Carolinas, LLC on October 1, 2012.

Table 2–Field and Analytical Results
Duke Energy Carolinas, LLC/Marshall Steam Station
FGD Residue Landfill, Phase 1, Cell 1–Permit No. 1809
Groundwater Monitoring Report

Sample Date: September 17, 2012

Laboratory Certificate Codes:

Duke Energy Carolinas Field #5193

Field Sampling performed by Duke Energy Carolinas, LLC

Duke Energy Analytical Laboratory #248

Parameter	SWS ID	Units	Certificate Code	Monitoring Wells					SWSL	15A NCAC 2L
				1809 MS-8	1809 MS-9	1809 MS-10	1809 MS-11	1809 MS-12		
Field pH	320	SU	5193	6.1	6.5	5.0	5.6	5.0	-	6.5-8.5
Field Specific Conductance	323	umho/cm	5193	41	92	25	40	26	-	-
Temperature	325	°C	5193	18.59	16.28	16.53	15.49	14.84	-	-
Top of Casing	328	feet	-	872.34	868.04	851.29	859.78	835.66	-	-
Depth to Water	318	feet	-	46.58	43.89	19.50	36.10	25.17	-	-
Water Elevation	319	feet	-	825.76	824.15	831.79	823.68	810.49	-	-
Well Depth	411	feet	-	51.58	53.00	23.34	42.72	31.09	-	-
Arsenic	14	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	0.667 U	10	10
Barium	15	µg/L	248	33 J'	35.1 J'	155	67.3 J'	82.8 J'	100	700
Boron	428	µg/L	248	33.4 U	33.4 U	33.4 U	33.4 U	33.4 U	NE	700
Cadmium	34	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	0.667 U	1	2
Chloride	301	µg/L	248	1,170	1,070	1,230	2,350	3,220	NE	250,000
Chromium	51	µg/L	248	4.21 J'	2.37 J'	0.669 J	2.96 J'	0.844 J	10	10
Copper	54	µg/L	248	3.34 U	3.34 U	3.34 U	3.69 J	3.34 U	10	1,000
Fluoride	312	µg/L	248	165 J'	159 J'	77 J	78.5 J	67.1 J	2,000	2,000
Iron	340	µg/L	248	213 J'	38.7 J'	98.2 J'	191 J'	67.8 J'	300	300
Lead	131	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	0.667 U	10	15
Manganese	342	µg/L	248	6.71 J'	5.26 J'	30.6 J'	11.3 J'	21.7 J'	50	50
Mercury	132	µg/L	248	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.2	1
Nickel	152	µg/L	248	3.34 U	3.34 U	3.34 U	3.34 U	3.34 U	50	100
Nitrate as Nitrogen	303	µg/L	248	97.2 J'	237 J'	1,220 J'	19.7 J	51.2 J'	10,000	10,000
Selenium	183	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	0.667 U	10	20
Silver	184	µg/L	248	3.34 U	3.34 U	3.34 U	3.34 U	3.34 U	10	20
Sulfate	315	µg/L	248	279 J'	436 J'	58.9 J	182 J'	111 J'	250,000	250,000
Total Dissolved Solids	311	µg/L	248	57,000	77,000	24,000	42,000	24,000	NE	500,000
Zinc	213	µg/L	248	6.33 J'	3.34 U	7.31 J'	4.56 J	4.68 J	10	1,000

Notes:

- Concentrations presented in micrograms per liter (µg/L) except where noted.
- SWS ID is the Solid Waste Section Identification Number.
- SWSL is the Solid Waste Section Limit. This limit (identified by NCDENR) is the lowest amount of analyte in a sample that can be quantitatively determined with suitable precision and accuracy.
- 15A NCAC 2L Standard is from "North Carolina Administrative Code, Title 15A: Department of Environment and Natural Resources, Subchapter 2L - Groundwater Classifications and Standards," NCDENR (last amended on January 1, 2010).
- Bold values indicate values that attain or exceed the 15A NCAC 2L Standard.
- Grayed values indicate values that attain or exceed the SWSL standard.
- NE means Not Established. Blank cells indicate that there is no information relevant to the respective row and column.
- Qualifiers in non-italicized text are laboratory data qualifiers or "flags". "U" is used for parameters not detected at concentrations above the method detection limit (MDL). "J" is used for parameters detected at estimated concentrations above the MDL but below the laboratory's method reporting limit (MRL). An italicized J'-flag is a data qualifier, added by HDR to indicate a detected concentration that is greater than the laboratory's MRL but less than the SWSL.
- Data obtained from Electronic Data Deliverable (EDD) provided by Tim Hunsucker of Duke Energy Carolinas, LLC on October 1, 2012.
- According to the Constituent Look-up webpage on the NCDENR Division of Waste Management webpage, there is no SWSL or 2L standard for choride associated with CAS number 16887-00-6, which is the CAS reported by the laboratory for the analyses completed. Therefore, the SWSL and 2L listed are for the chloride with CAS number SW301 as specified on the Constituent Look-up webpage (last updated June 13, 2011).

Table 2–Field and Analytical Results
Duke Energy Carolinas, LLC/Marshall Steam Station
FGD Residue Landfill, Phase 1, Cell 1–Permit No. 1809
Groundwater Monitoring Report

Sample Date: September 17, 2012				Laboratory Certificate Codes: Duke Energy Carolinas Field #5193 Duke Energy Analytical Laboratory #248								
Field Sampling performed by Duke Energy Carolinas, LLC				Monitoring Wells					1809	15A		
Parameter	SWS ID	Units	Certificate Code	1809 MS-13	1809 MS-14	1809 MS-15	1809 MS-16	1809 SW-1	Field Blank	SWSL	NCAC 2L	
Field pH	320	SU	5193	5.3	5.9	8.6	6.1	NS	-	-	6.5-8.5	
Field Specific Conductance	323	umho/cm	5193	82	50	153	98	NS	-	-	-	
Temperature	325	°C	5193	14.89	15.60	16.44	16.72	NS	-	-	-	
Top of Casing	328	feet	-	841.90	844.07	861.47	836.98	-	-	-	-	
Depth to Water	318	feet	-	32.76	37.36	52.58	26.72	N/A	-	-	-	
Water Elevation	319	feet	-	809.14	806.71	808.89	810.26	N/A	-	-	-	
Well Depth	411	feet	-	41.52	44.38	63.08	37.46	N/A	-	-	-	
Arsenic	14	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	NS	0.667 U	10	10	
Barium	15	µg/L	248	105	40.6 J'	87.5 J'	88.1 J'	NS	3.34 U	100	700	
Boron	428	µg/L	248	33.4 U	33.4 U	33.4 U	33.4 U	NS	33.4 U	NE	700	
Cadmium	34	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	NS	0.667 U	1	2	
Chloride	301	µg/L	248	3,970	908	2,340	1,440	NS	22 U	NE	250,000	
Chromium	51	µg/L	248	0.667 U	0.667 U	20.8	2.36 J'	NS	0.667 U	10	10	
Copper	54	µg/L	248	3.34 U	3.34 U	3.34 U	3.34 U	NS	3.34 U	10	1,000	
Fluoride	312	µg/L	248	127 J'	156 J'	123 J'	243 J'	NS	42.8 J	2,000	2,000	
Iron	340	µg/L	248	49.2 J'	150 J'	51.4 J'	871	NS	6.67 U	300	300	
Lead	131	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	NS	0.667 U	10	15	
Manganese	342	µg/L	248	13.8 J'	4.05 J	3.34 U	19.1 J'	NS	3.34 U	50	50	
Mercury	132	µg/L	248	0.006 U	0.006 U	0.006 U	0.006 U	NS	0.006 U	0.2	1	
Nickel	152	µg/L	248	3.34 U	3.34 U	3.34 U	3.34 U	NS	3.34 U	50	100	
Nitrate as Nitrogen	303	µg/L	248	2,570 J'	5.4 U	346 J'	407 J'	NS	5.4 U	10,000	10,000	
Selenium	183	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	NS	0.667 U	10	20	
Silver	184	µg/L	248	3.34 U	3.34 U	3.34 U	3.34 U	NS	3.34 U	10	20	
Sulfate	315	µg/L	248	283 J'	168 J'	1,070 J'	306 J'	NS	18 U	250,000	250,000	
Total Dissolved Solids	311	µg/L	248	70,000	61,000	103,000	93,000	NS	-	NE	500,000	
Zinc	213	µg/L	248	4.38 J	3.34 U	3.34 U	5.08 J'	NS	3.34 U	10	1,000	

Notes:

- Concentrations presented in micrograms per liter (µg/L) except where noted.
- SWS ID is the Solid Waste Section Identification Number.
- SWSL is the Solid Waste Section Limit. This limit (identified by NCDENR) is the lowest amount of analyte in a sample that can be quantitatively determined with suitable precision and accuracy.
- 15A NCAC 2L Standard is from "North Carolina Administrative Code, Title 15A: Department of Environment and Natural Resources, Subchapter 2L - Groundwater Classifications and Standards," NCDENR (last amended on January 1, 2010).
- Bold values indicate values that attain or exceed the 15A NCAC 2L Standard.
- Grayed values indicate values that attain or exceed the SWSL standard.
- NE means Not Established. Blank cells indicate that there is no information relevant to the respective row and column.
- NS means Not Sampled.
- Qualifiers in non-italicized text are laboratory data qualifiers or "flags". "U" is used for parameters not detected at concentrations above the method detection limit (MDL). "J" is used for parameters detected at estimated concentrations above the MDL but below the laboratory's method reporting limit (MRL). An italicized J'-flag is a data qualifier, added by HDR to indicate a detected concentration that is greater than the laboratory's MRL but less than the SWSL.
- Data obtained from Electronic Data Deliverable (EDD) provided by Tim Hunsucker of Duke Energy Carolinas, LLC on October 1, 2012.
- According to the Constituent Look-up webpage on the NCDENR Division of Waste Management webpage, there is no SWSL or 2L standard for choride associated with CAS number 16887-00-6, which is the CAS reported by the laboratory for the analyses completed. Therefore, the SWSL and 2L listed are for the chloride with CAS number SW301 as specified on the Constituent Look-up webpage (last updated June 13, 2011).

Table 3–Leachate Analytical Results
Duke Energy Carolinas, LLC/Marshall Steam Station
FGD Residue Landfill, Phase 1, Cell 1–Permit No. 1809
Groundwater Monitoring Report

Sample Date: September 17, 2012					
Field Sampling performed by Duke Energy Carolinas, LLC					
Parameter	SWS ID	Units	Certificate Code	C1-LEACHATE	SWSL
Field pH	320	SU	5193	5.6	-
Field Specific Conductance	323	umho/cm	5193	4969	-
Temperature	325	°C	5193	18.81	-
Arsenic	14	µg/L	248	0.695 J	10
Barium	15	µg/L	248	29.1 J'	100
Boron	428	µg/L	248	27,100	NE
Cadmium	34	µg/L	248	0.667 U	1
Chloride	301	µg/L	248	737,000	NE
Chromium	51	µg/L	248	0.667 U	10
Copper	54	µg/L	248	3.34 U	10
Fluoride	312	µg/L	248	3,670 J	2,000
Iron	340	µg/L	248	331,000	300
Lead	131	µg/L	248	0.667 U	10
Manganese	342	µg/L	248	4,490	50
Mercury	132	µg/L	248	0.006 U	0.2
Nickel	152	µg/L	248	122	50
Nitrate as Nitrogen	303	µg/L	248	5,420 J'	10,000
Selenium	183	µg/L	248	223	10
Silver	184	µg/L	248	3.34 U	10
Sulfate	315	µg/L	248	2,260,000	250,000
Total Dissolved Solids	311	µg/L	248	4,700,000	NE
Zinc	213	µg/L	248	167	10

Notes:

1. Concentrations presented in micrograms per liter (µg/L) except where noted.
2. SWS ID is the Solid Waste Section Identification Number.
3. SWSL is the Solid Waste Section Limit. This limit (identified by NCDENR) is the lowest amount of analyte in a sample that can be quantitatively determined with suitable precision and accuracy.
4. Grayed values indicate values that attain or exceed the SWSL standard.
5. Qualifiers in non-italicized text are laboratory data qualifiers or "flags". "U" is used for parameters not detected at concentrations above the method detection limit (MDL). "J" is used for parameters detected at estimated concentrations above the MDL but below the laboratory's method reporting limit (MRL). An italicized *J'*-flag is a data qualifier, added by HDR to indicate a detected concentration that is greater than the laboratory's MRL but less than the SWSL.
6. NE means Not Established.
7. Data obtained from Electronic Data Deliverable (EDD) provided by Tim Hunsucker of Duke Energy Carolinas, LLC on October 1, 2012.
8. According to the Constituent Look-up webpage on the NCDENR Division of Waste Management webpage, there is no SWSL or 2L standard for choride associated with CAS number 16887-00-6, which is the CAS reported by the laboratory for the analyses completed. Therefore, the SWSL and 2L listed are for the chloride with CAS number SW301 as specified on the Constituent Look-up webpage (last updated June 13, 2011).

**Table 4--North Carolina Administrative Code (NCAC) 2L Groundwater Quality Exceedances
Duke Energy Carolinas, LLC/Marshall Steam Station
FGD Residue Landfill, Phase 1, Cell 1 - Permit No. 1809
Groundwater Monitoring Report**

Sample Date: September 17, 2012						
Parameter	Well ID	Result	Units	15A NCAC 2L Standard	Historic Concentrations	Cause and Significance
Field pH	MS-8	6.1	SU	6.5-8.5	5.2 - 6.3	pH consistent with historic readings at well.
	MS-9	6.5	SU		6.4 - 10.3	pH consistent with historic readings at well.
	MS-10	5.0	SU		4.5 - 5.3	pH consistent with historic readings at well.
	MS-11	5.6	SU		5.1 - 5.6	pH in well highest since sampling began.
	MS-12	5.0	SU		4.5 - 5.1	pH consistent with historic readings at well.
	MS-13	5.3	SU		4.9 - 5.4	pH consistent with historic readings at well.
	MS-14	5.9	SU		5.5 - 6.2	pH consistent with historic readings at well.
	MS-15	8.6	SU		6.5 - 9.8	pH consistent with historic readings at well.
	MS-16	6.1	SU		5.8 - 6.4	pH consistent with historic readings at well.
Chromium	MS-15	20.8	µg/L	10	11.5 - 21.5	Chromium concentration consistent with historic readings at well.
Iron	MS-16	871	µg/L	300	359 - 57,572	Iron concentration consistent with historic readings at well.

Notes:

- Concentrations presented in micrograms per liter (µg/L) except where noted.
- 15A NCAC 2L Standard is from "North Carolina Administrative Code, Title 15A: Department of Environment and Natural Resources, Subchapter 2L - Groundwater Classifications and Standards," NCDENR (last amended on January 1, 2010).
- Data obtained from Electronic Data Deliverable (EDD) provided by Tim Hunsucker of Duke Energy Carolinas, LLC on October 1, 2012.
- Historic concentrations based on data in Duke Energy Carolinas, LLC analytical results database.

APPENDICES

APPENDIX A
CHAIN-OF-CUSTODY FORMS



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

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

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

Analytical Laboratory Use Only			
LIMS # J12090152	MATRIX: GW-RCRA	Samples Originating From	NC <input checked="" type="checkbox"/> SC <input type="checkbox"/>
Logged By <i>RJS</i>	Date & Time <i>9/17/12 1538</i>	SAMPLE PROGRAM Ground Water <input checked="" type="checkbox"/> NPDES <input type="checkbox"/> Drinking Water <input type="checkbox"/> UST <input type="checkbox"/> RCRA Waste <input type="checkbox"/>	
VENDOR		3.3 Cooler Temp (C)	

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 19 Page 1 of 1
DISTRIBUTION
 ORIGINAL to LAB,
 COPY to CLIENT

1) Project Name MARSHALL FGD LANDFILL Permit # 18-09	2) Phone No: 875-5257
3) Client LDC / TSH / Ed Sullivan	4) Fax No: 875-4349
5) Business Unit: 20035	6) Process: BENVWS
8) Project ID:	7) Resp. To: MS00
9) Activity ID:	10) Mail Code: MGO3A3

PO #	15 Preserv.: 1=HCL 2=H ₂ SO ₄ 3=HNO ₃ 4=Ice 5=None	4	3	3	4	20 Total # of Containers
MR #	Customer to complete all appropriate NON-SHADED areas.	16 Analyses Required			TDS	

Customer must Complete

Customer to complete appropriate columns to right

LAB USE ONLY 11 Lab ID	12 Chem Desktop No.	13 Sample Description or ID	14 Collection Information			TESTS	18 Grab	ALK (4.5)	NO ₃ -N, Cl, F, SO ₄ (IC)	Hg (EPA 245.1)	16 Metals Prep - 3030C				TDS	20 Total # of Containers
			Date	Time	Signature						(ICP - EPA 200.7) Ag, B, Ba, Ca, Cu, Fe, K, Mg, Mn, Na, Ni, Zn					
2012019619		MS-8	9/17/12	1200	MJR	6	X	1	1		1			1	4	
2012019620		MS-9	9/17/12	1010	MJR	6	X	1	1		1			1	4	
2012019621		MS-10	9/17/12	0845	MJR	6	X	1	1		1			1	4	
2012019622		MS-11	9/17/12	1005	WC	6	X	1	1		1			1	4	
2012019623		MS-12	9/17/12	0910	WC	6	X	1	1		1			1	4	
2012019624		MS-13	9/17/12	0830	WDC	6	X	1	1		1			1	4	
2012019625		MS-14	9/17/12	1250	WC	6	X	1	1		1			1	4	
2012019626		MS-15	9/17/12	1310	MJR	6	X	1	1		1			1	4	
2012019627		MS-16	9/17/12	1115	WC	6	X	1	1		1			1	4	
2012019628		← SW-1 — NO SAMPLE — DRY LOC ATTON — WC	9/17/12	1345	MJR	6	X	1	1		1			1	4	
2012019629		FIELD BLANK	9/17/12	1345	MJR	5	X	1	1		1				3	
2012019745		C1-Leachate	9/17/12	1145	WC	6	X	1	1		1			1	4	

Customer to sign & date below

21) Relinquished By <i>Michael Rayburn</i>	Date/Time <i>9/17/12 1520</i>	Accepted By: <i>B. Lewis</i>	Date/Time <i>9/17/12 1520</i>	Customer, important please indicate desired turnaround	22) Requested Turnaround 14 Days <input checked="" type="checkbox"/> *7 Days _____ *48 Hr _____ *Other _____ * Add. Cost Will Apply
Relinquished By	Date/Time	Accepted By:	Date/Time		
Relinquished By	Date/Time	Accepted By:	Date/Time		
23) Seal/Locked By	Date/Time	Sealed/Lock Opened By	Date/Time		
24) Comments Regulatory Agency : NCDENR/DWM -SW Section - State EDD Format Required / Permit # 18-09 Use indicated or comparable analytical methods					