DENR USE ONLY: ☐ Paper Report ☐ Electronic Data - Email CD (data loaded: Yes / No) Doc/Event #:

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	March 31, 2014

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

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 — June 6, 2014

Signature — Date

Affix NC Licensed/ Professional Geologist Seal

NORTH CAROLINA PROFESSIONAL SEAL 17661 ENGINEER WILLIAM M. MILLER

6/6/14

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)

Revised 6/2009

FGD Residue Landfill, Phase 1, Cell 1
Permit No. 1809

Semiannual Groundwater Monitoring Report

March 2014 Sampling Event

Marshall Steam Station

June 6, 2014

REPORT VERIFICATION

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

TITLE: MARCH 2014 SAMPLING EVENT

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

Prepared by: _____ Date: 6/6/2014

Checked by: _____ Date: 6/6/2014

Approved by: _____ Date: 6/6/2014

Project Manager: Brooke Ahrens, PE

Professional Engineer Seal:

6/6/14

HDR Engineering, Inc. of the Carolinas
440 South Church St., Suite 1000
Charlotte, NC 28202
North Carolina Engineering Firm Number F-0116

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Section 1 – Background

Marshall Steam Station (Marshall) is owned and operated by Duke Energy Carolinas, LLC (Duke Energy). The Marshall plant has a generating capacity of 2090 megawatts 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, C&D waste, asbestos waste, mill rejects (pyrites), waste limestone material, land clearing and inert debris, boiler slag, ball mill rejects, sand blast material, and coal waste. 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 waste 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 for the Marshall FGD Landfill, Phase 1, Cell 1 consists the following:

Monitoring Wells:	MS-8
	MS-9
	MS-10
	MS-11
	MS-12
	MS-13
	MS-14
	MS-15
	MS-16
Surface water sample:	SW-1
Leachate sample:	C1

[1] Marshall Steam Station Flue Gas Desulfurization (FGD) Residue Landfill Phase 1, Cell 1 Permit No. 1809 Groundwater Sampling and Analysis Plan. Dated August 19, 2011.

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

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

Section 2 – Methods

2.1 Sampling and Analysis Methods

Groundwater sampling, surface water sampling, and documentation of sampling activities 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).

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

- Barium, boron, copper, iron, manganese, nickel, silver, and zinc using U.S. Environmental Protection Agency (EPA) Method 200.7
- Arsenic, cadmium, chromium, lead, and selenium using EPA Method 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, surface water sample location SW-1, and leachate sampling location C1. The samples were collected on March 31, 2014, and HDR received the data on April 24, 2014.
- Reviewed the laboratory analytical results for samples. 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 attains or is greater than the laboratory's method reporting limit (MRL) but less than the Solid Waste Section Limit[3] (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.

[3] The Solid Waste Section Limit (SWSL) is defined by NCDENR 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 in the wells on the date of sampling.

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 to be toward surface water sample location SW-1.

3.2 Analytical Results

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

The field and analytical results of the groundwater samples collected at the monitoring wells are summarized in Table 2. The analysis results for these locations are compared to the 2L Standards. Concentrations with values that attain or exceed the 2L Standards are noted on Table 2 by bold font. A summary of the analytical results that attain or exceed the 2L Standards is presented in Table 4.

The field and analytical results for the leachate sampling are summarized in Table 3.

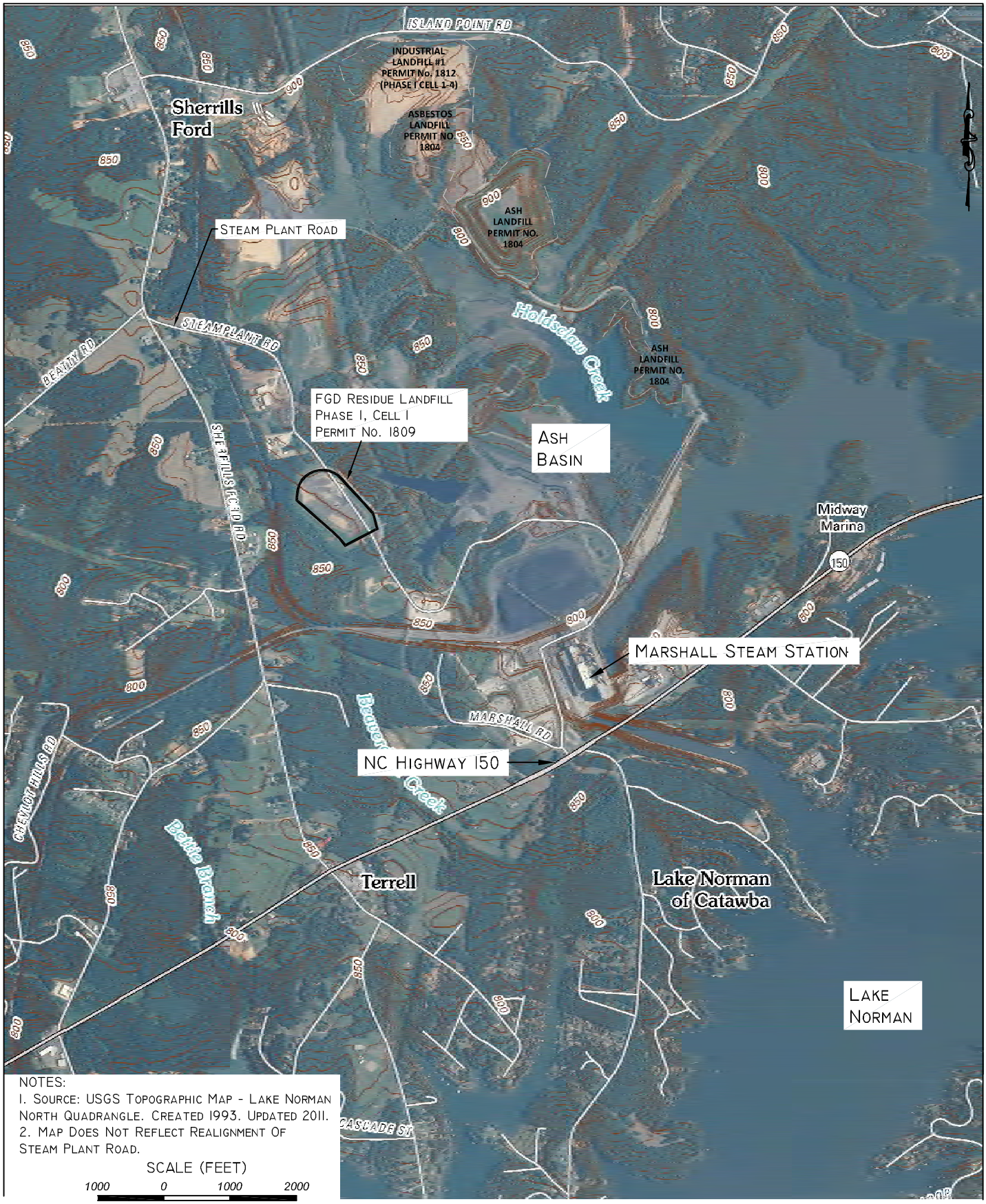
Concentrations with values that attain or exceed the SWSLs are noted on Tables 2 and 3 by gray cells.

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.

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

HDR prepared and submitted an assessment to NCDENR on historical 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 iron and chromium at MW-8, chromium at MS-15, iron at MS-16, and iron and manganese at SW-1. The assessment report concluded that the historical exceedances of the 2L Standards at the site were naturally occurring and are not related to impacts from the landfill.

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

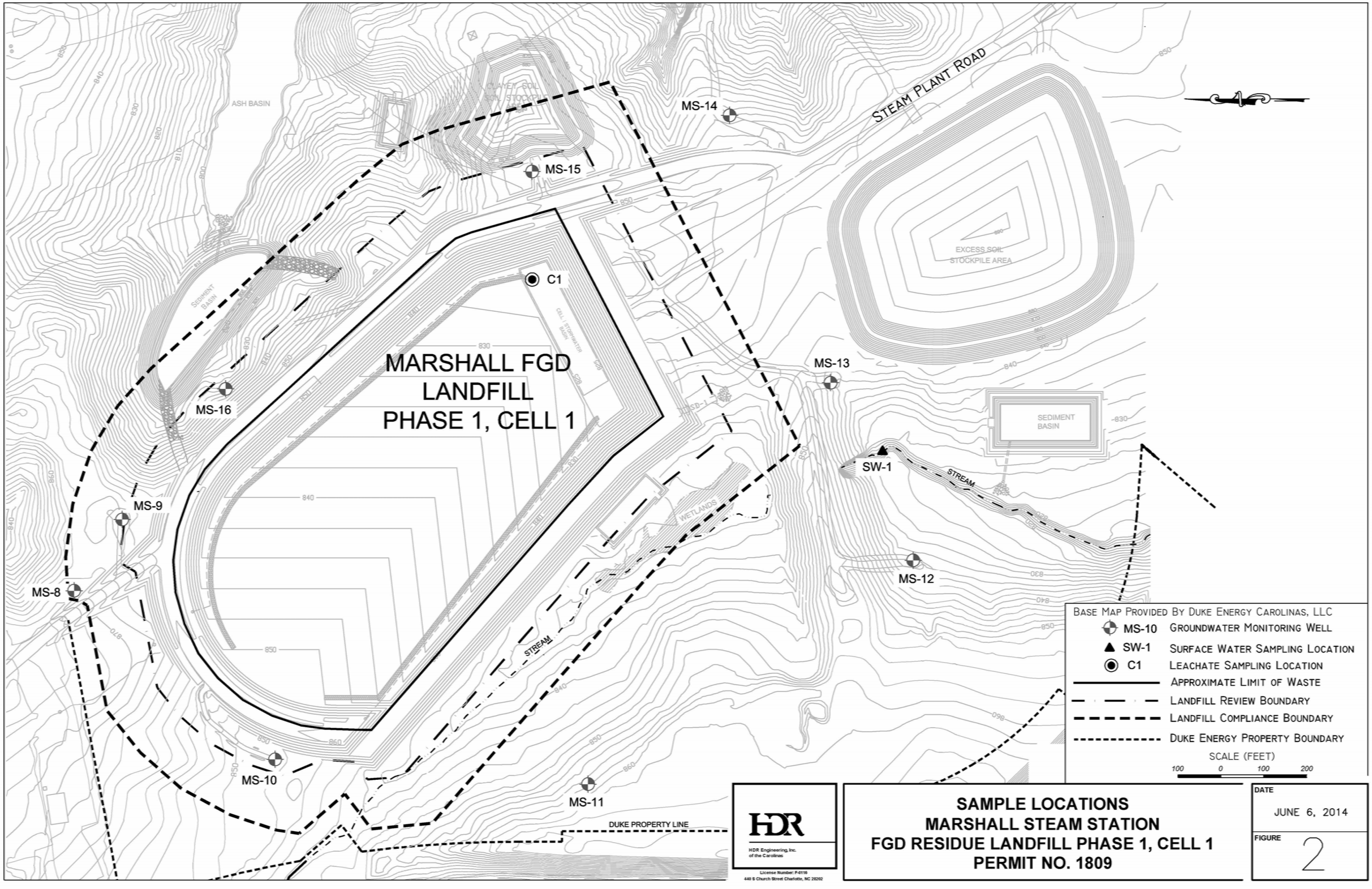
HDR Engineering, Inc. of the Carolinas
License Number: F-0116
440 South Church Street Charlotte, NC 28202

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

DATE
JUNE 6, 2014

FIGURE
1

C:\pwworking\tpa\d0448416\Site Location Map.dwg



HDR Engineering, Inc. of the Carolinas

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

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

DATE: JUNE 6, 2014

FIGURE: 2

C:\pwworking\tpa\d0447087\MSS FGD LF.dwg

MS-14
(808.99)

MS-15
(810.24)

STEAM PLANT ROAD

ASH BASIN

EXCESS SOIL STOCKPILE AREA

C1

MARSHALL FGD
LANDFILL
PHASE 1, CELL 1

MS-13
(814.10)

MS-16
(812.94)

SEDIMENT BASIN

SW-1

STREAM

MS-9
(825.55)

WETLANDS

MS-12
(814.08)

MS-8
(827.32)

STREAM

MS-10
(834.87)

MS-11
(827.16)

DUKE PROPERTY LINE

BASE MAP PROVIDED BY DUKE ENERGY CAROLINAS, LLC

MS-10 (834.87)	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 MARCH 31, 2014
MARSHALL STEAM STATION
FGD RESIDUE LANDFILL PHASE 1, CELL 1
PERMIT NO. 1809

DATE
JUNE 6, 2014

FIGURE
3

C:\pwworking\tpa\d0447097\MSS FGD LF.dwg

TABLES

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

DATE	SAMPLE ID	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)
3/31/2014	MS-8	51.58	45.02	827.32	Normal	None	CP	N/A	1.07	2.75	YES	15.25	41	5.8	20.8	546	6.65
3/31/2014	MS-9	53.00	42.49	825.55	Normal	None	LF	340	1.71	3.70	N/A	15.47	90	6.2	2.2	519	7.87
3/31/2014	MS-10	23.34	16.42	834.87	Normal	None	LF	200	1.13	1.05	N/A	15.59	21	4.9	2.2	551	6.73
3/31/2014	MS-11	42.72	32.62	827.16	Normal	None	LF	220	1.65	1.95	N/A	13.17	60	5.0	4.1	384	7.29
3/31/2014	MS-12	31.09	21.58	814.08	Normal	None	CP	N/A	1.55	4.75	NO	14.33	25	4.7	2.7	446	7.63
3/31/2014	MS-13	41.52	27.80	814.10	Normal	None	CP	N/A	2.24	6.25	NO	14.07	89	5.3	3.2	407	3.82
3/31/2014	MS-14	44.38	35.08	808.99	Normal	None	CP	N/A	1.52	8.75	NO	15.12	50	5.7	11.1	476	7.32
3/31/2014	MS-15	63.08	51.23	810.24	Normal	None	CP	N/A	1.93	10.00	NO	15.36	127	6.4	3.7	436	6.99
3/31/2014	MS-16	37.46	24.04	812.94	Normal	None	CP	N/A	2.19	6.25	NO	16.96	110	5.8	73.4	363	0.00*
3/31/2014	SW-1	N/A	N/A	N/A	Normal	None	NP	N/A	N/A	N/A	N/A	9.12	57	6.2	40.1	297	10.10
3/31/2014	C1-LEACHATE	N/A	N/A	N/A	Normal	None	NP	N/A	N/A	N/A	N/A	14.76	3,189	4.3	6.5	492	6.05

Notes:

1. Purge Methods; LF=Low Flow, CP=Conventional Purge (3-5 well volumes), NP=No Purge (HydraSleeve), LO= Level Only. Average pump rate applicable to LF purging only.
2. Field sampling performed by Duke Energy Carolinas, LLC personnel.
3. EVAC indicates whether the water level in the well was drawn down to the level of the pump during purging.
4. umho/cm indicates micromhos per centimeter.
5. SU indicates Standard Units.
6. NTU indicates Nephelometric Turbidity Units.
7. mV-NHE indicates millivolts-Normal Hydrogen Electrode.
8. mg/L indicates milligrams per liter.
9. N/A indicates not applicable.
10. * DO probe malfunctioned after initial well volume was removed in monitoring well MS-16.
11. Information provided by Tim Hunsucker of Duke Energy Carolinas, LLC on April 24, 2014.

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

Sample Date: March 31, 2014

Field Sampling performed by Duke Energy Carolinas, LLC

Laboratory Certificate Codes:
Duke Energy Carolinas Field #5193
Duke Energy Analytcial Laboratory #248

Parameter	SWS ID	Units	Certificate Code	Sample Location										SWSL	15A NCAC 2L
				1809 MS-8		1809 MS-9		1809 MS-10		1809 MS-11		1809 MS-12			
Field pH	320	SU	5193	**5.8**		**6.2**		**4.9**		**5.0**		**4.7**		NE	6.5-8.5
Field Specific Conductance	323	umho/cm	5193	41		90		21		60		25		NE	NE
Temperature	325	°C	5193	15.25		15.47		15.59		13.17		14.33		NE	NE
Top of Casing	328	feet	-	872.34		868.04		851.29		859.78		835.66		NE	NE
Depth to Water	318	feet	-	45.02		42.49		16.42		32.62		21.58		NE	NE
Water Elevation	319	feet	-	827.32		825.55		834.87		827.16		814.08		NE	NE
Well Depth	411	feet	-	51.58		53.00		23.34		42.72		31.09		NE	NE
Arsenic	14	µg/L	248	0.263	J	0.13	J	0.078	U	0.085	J	0.078	U	10	10
Barium	15	µg/L	248	57.1	J'	40.9	J'	150		108		78.6	J'	100	700
Boron	428	µg/L	248	8.59	J	9.34	J	8.83	J	3.3	U	3.3	U	NE	700
Cadmium	34	µg/L	248	0.101	U	0.101	U	0.101	U	0.101	U	0.101	U	1	2
Chloride	301	µg/L	248	1,110		963		1,310		7,970		3,130		NE	250,000
Chromium	51	µg/L	248	7.46	J'	2.11	J'	1.94	J'	3.13	J'	1.09	J	10	10
Copper	54	µg/L	248	3.46	J	1.69	J	1.55	J	2.77	J	1	U	10	1,000
Fluoride	312	µg/L	248	173	J'	165	J'	88	J	54.5	J	72.6	J	2,000	2,000
Iron	340	µg/L	248	**1,740**		50.5	J'	82.5	J'	247	J'	31.9	J'	300	300
Lead	131	µg/L	248	0.535	J	0.107	J	0.12	J	0.211	J	0.124	J	10	15
Manganese	342	µg/L	248	21.5	J'	4.27	J	26	J'	20.3	J'	14.1	J'	50	50
Mercury	132	µg/L	248	0.006	U	0.006	U	0.006	U	0.01	J	0.006	U	0.2	1
Nickel	152	µg/L	248	6.86	J'	0.602	J	2.75	J	2.43	J	0.719	J	50	100
Nitrate as Nitrogen	303	µg/L	248	27.9	J'	192	J'	774	J'	15.4	J	152	J'	10,000	10,000
Selenium	183	µg/L	248	0.092	U	0.092	U	0.092	U	0.092	U	0.092	U	10	20
Silver	184	µg/L	248	0.7	U	0.7	U	0.7	U	0.7	U	0.7	U	10	20
Sulfate	315	µg/L	248	183	J'	334	J'	61.7	J	3,520	J'	80.6	J	250,000	250,000
Total Dissolved Solids	311	µg/L	248	59,000		76,000		19,000	J	45,000		16,700	U	NE	500,000
Zinc	213	µg/L	248	5.93	J'	2.6	U	6.95	J'	8.06	J'	3.57	J	10	1,000

Notes:

1. Concentrations presented in micrograms per liter (µg/L).
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. 15A NCAC 2L Standard refers to Class GA Standards as found in 15A NCAC 02L .0202 Groundwater Quality Standards, last amended on April 1, 2013.
5. Grayed values indicate values that attain or exceed the SWSL Standard.
6. Bold values indicate values that attain or exceed the 15A NCAC 2L Standard.
7. NE indicates not established. NA indicates not analyzed. Blank cells indicate that there is no information relevant to the respective row.
8. SU indicates Standard Units.
9. umho/cm indicates micromhos per centimeter.
10. Qualifiers in non-italicized text are laboratory data qualifiers or "flags". "U" is used to identify results not detected at concentrations which attain the laboratory's method detection limit (MDL).
    "J" is used to identify estimated concentrations which attain or exceed the MDL but are less than the laboratory's method reporting limit (MRL).
    An italicized *J'* -flag is a data qualifier, added by HDR to indicate concentrations which attain or exceed the laboratory's MRL but are less than the SWSL.
11. 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 Standards listed are for the chloride with CAS number SW301 as specified on the Constituent Look-up webpage (last updated June 13, 2011).
12. Analytical results obtained from Electronic Data Deliverable (EDD) provided by Tim Hunsucker of Duke Energy Carolinas, LLC on April 24, 2014.

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

Sample Date: March 31, 2014

Field Sampling performed by Duke Energy Carolinas, LLC

Laboratory Certificate Codes:
Duke Energy Carolinas Field #5193
Duke Energy Analytical Laboratory #248

Parameter	SWS ID	Units	Certificate Code	Sample Location					1809 Field Blank	SWSL	15A NCAC 2L
				1809 MS-13	1809 MS-14	1809 MS-15	1809 MS-16	1809 SW-1			
Field pH	320	SU	5193	**5.3**	**5.7**	**6.4**	**5.8**	**6.2**	-	NE	6.5-8.5
Field Specific Conductance	323	umho/cm	5193	89	50	127	110	57	-	NE	NE
Temperature	325	°C	5193	14.07	15.12	15.36	16.96	9.12	-	NE	NE
Top of Casing	328	feet	-	841.90	844.07	861.47	836.98	-	-	NE	NE
Depth to Water	318	feet	-	27.80	35.08	51.23	24.04	-	-	NE	NE
Water Elevation	319	feet	-	814.10	808.99	810.24	812.94	-	-	NE	NE
Well Depth	411	feet	-	41.52	44.38	63.08	37.46	-	-	NE	NE
Arsenic	14	µg/L	248	0.098 J	0.213 J	0.119 J	0.339 J	0.51 J	0.078 U	10	10
Barium	15	µg/L	248	114	49.5 J'	84.6 J'	123	73.3 J'	0.611 J	100	700
Boron	428	µg/L	248	3.3 U	4.84 J	5.26 J	3.3 U	12.3 J	3.3 U	NE	700
Cadmium	34	µg/L	248	0.101 U	0.101 U	0.101 U	0.101 U	0.101 U	0.101 U	1	2
Chloride	301	µg/L	248	2,990	837	2,420	1,430	2,940	27.8 J	NE	250,000
Chromium	51	µg/L	248	0.334 J	0.524 J	**21.2**	3.66 J'	1.2 J'	0.185 J	10	10
Copper	54	µg/L	248	1 U	1.14 J	1 U	1.52 J	2.39 J	1 U	10	1,000
Fluoride	312	µg/L	248	147 J'	156 J'	141 J'	254 J'	103 J'	23.7 J	2,000	2,000
Iron	340	µg/L	248	33.6 J'	**445**	150 J	**1,890**	**2,250**	3.42 J	300	300
Lead	131	µg/L	248	0.136 J	0.242 J	0.13 J	0.76 J	0.99 J	0.092 J	10	15
Manganese	342	µg/L	248	10.7 J'	5.88 J'	2.7 J	28.6 J'	**80.7**	0.578 J	50	50
Mercury	132	µg/L	248	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.2	1
Nickel	152	µg/L	248	0.79 J	0.5 U	2.03 J	2.85 J	1.84 J	0.5 U	50	100
Nitrate as Nitrogen	303	µg/L	248	2,360 J'	8.24 J	285 J'	263 J'	8.74 J	7.43 J	10,000	10,000
Selenium	183	µg/L	248	0.115 J	0.092 U	0.092 U	0.12 J	0.156 J	0.101 J	10	20
Silver	184	µg/L	248	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	10	20
Sulfate	315	µg/L	248	315 J'	47.9 J	1,280 J'	359 J'	4,500 J'	18 U	250,000	250,000
Total Dissolved Solids	311	µg/L	248	66,000	65,000	102,000	107,000	71,000	NA	NE	500,000
Zinc	213	µg/L	248	4.23 J	2.6 U	2.6 U	13.7	18.4	2.6 U	10	1,000

Notes:

1. Concentrations presented in micrograms per liter (µg/L).
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. 15A NCAC 2L Standard refers to Class GA Standards as found in 15A NCAC 02L .0202 Groundwater Quality Standards, last amended on April 1, 2013.
5. Grayed values indicate values that attain or exceed the SWSL Standard.
6. Bold values indicate values that attain or exceed the 15A NCAC 2L Standard.
7. NE indicates not established. NA indicates not analyzed. Blank cells indicate that there is no information relevant to the respective row.
8. SU indicates Standard Units.
9. umho/cm indicates micromhos per centimeter.
10. Qualifiers in non-italicized text are laboratory data qualifiers or "flags". "U" is used to identify results not detected at concentrations which attain the laboratory's method detection limit (MDL).
    "J" is used to identify estimated concentrations which attain or exceed the MDL but are less than the laboratory's method reporting limit (MRL).
    An italicized *J'* -flag is a data qualifier, added by HDR to indicate concentrations which attain or exceed the laboratory's MRL but are less than the SWSL.
11. 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 Standards listed are for the chloride with CAS number SW301 as specified on the Constituent Look-up webpage (last updated June 13, 2011).
12. Analytical results obtained from Electronic Data Deliverable (EDD) provided by Tim Hunsucker of Duke Energy Carolinas, LLC on April 24, 2014.

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

Sample Date: March 31, 2014

Field Sampling performed by Duke Energy Carolinas, LLC

Parameter	SWS ID	Units	Certificate Code	C1-LEACHATE		SWSL
Field pH	320	SU	5193	4.3		NE
Field Specific Conductance	323	umho/cm	5193	3,189		NE
Temperature	325	°C	5193	14.76		NE
Arsenic	14	µg/L	248	5.87	J	10
Barium	15	µg/L	248	30.6	J'	100
Boron	428	µg/L	248	12,000		NE
Cadmium	34	µg/L	248	1.01	U	1
Chloride	301	µg/L	248	294,000		NE
Chromium	51	µg/L	248	6.02	J	10
Copper	54	µg/L	248	10		10
Fluoride	312	µg/L	248	3,430		2,000
Iron	340	µg/L	248	150,000		300
Lead	131	µg/L	248	2.22	J	10
Manganese	342	µg/L	248	4,550		50
Mercury	132	µg/L	248	0.024	J	0.2
Nickel	152	µg/L	248	133		50
Nitrate as Nitrogen	303	µg/L	248	1,480	J'	10,000
Selenium	183	µg/L	248	178		10
Silver	184	µg/L	248	0.7	U	10
Sulfate	315	µg/L	248	1,820,000		250,000
Total Dissolved Solids	311	µg/L	248	3,200,000		NE
Zinc	213	µg/L	248	258		10

Notes:

1. Concentrations presented in micrograms per liter (µg/L).
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. SU indicates Standard Units.
6. umho/cm indicates micromhos per centimeter.
7. NE indicates not established.
8. Qualifiers in non-italicized text are laboratory data qualifiers or "flags". "U" is used to identify results not detected at concentrations which attain the laboratory's method detection limit (MDL).
   "J" is used to identify estimated concentrations which attain or exceed the MDL but are less than the laboratory's method reporting limit (MRL).
   An italicized *J'* -flag is a data qualifier, added by HDR to indicate concentrations which attain or exceed the laboratory's MRL but are less than the SWSL.
9. According to the Constituent Look-up webpage on the NCDENR Division of Waste Management webpage, there is no SWSL 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 Standard listed is for the chloride with CAS number SW301 as specified on the Constituent Look-up webpage (last updated June 13, 2011).
10. Analytical results obtained from Electronic Data Deliverable (EDD) provided by Tim Hunsucker of Duke Energy Carolinas, LLC on April 24, 2014.

Table 4–Field and Analytical Results that Equal or Exceed 15A NCAC 2L Groundwater Quality Standards Duke Energy Carolinas, LLC/Marshall Steam Station FGD Residue Landfill, Phase 1, Cell 1 - Permit No. 1809

Sample Date: March 31, 2014						
Parameter	**Well ID**	**Result**	**Units**	**15A NCAC 2L Standard**	**Historical Concentrations**	**Cause and Significance**
pH	MS-8	5.8	SU	6.5-8.5	5.2 - 6.3	pH in MS-8 is consistent with historical readings at well.
	MS-9	6.2	SU		6.2 - 10.3	pH in MS-9 is consistent with the lowest historical reading at well.
	MS-10	4.9	SU		4.5 - 5.3	pH in MS-10 is consistent with historical readings at well.
	MS-11	5.0	SU		5.0 - 5.6	pH in MS-11 is the lowest reading measured over the period of monitoring.
	MS-12	4.7	SU		4.5 - 5.1	pH in MS-12 is consistent with historical readings at well.
	MS-13	5.3	SU		4.9 - 5.4	pH in MS-13 is consistent with historical readings at well.
	MS-14	5.7	SU		5.5 - 6.2	pH in MS-14 is consistent with historical readings at well.
	MS-15	6.4	SU		6.4 - 9.8	pH in MS-15 is the lowest reading measured over the period of monitoring.
	MS-16	5.8	SU		5.8 - 6.4	pH in MS-16 is consistent with the lowest historical reading at well.
	SW-1	6.2	SU		5.0 - 6.2	pH is SW-1 is the highest reading at SW-1 over the period of monitoring.
Chromium	MS-15	21.2	µg/L	10	11.5 - 22.3	Chromium concentration in MS-15 is consistent with historical readings at well.
Iron	MS-8	1,740	µg/L	300	213 - 22,000	Iron concentration in MS-8 is consistent with historical readings at well. Turbidity measured at 20.8 NTUs.
	MS-14	445	µg/L		46.2 - 1,052	Iron concentration in MS-14 is consistent with historical readings at well. Turbidity measured at 11.1 NTUs.
	MS-16	1,890	µg/L		294 - 57,572	Iron concentration in MS-16 is consistent with historical readings well. Turbidity measured at 73.4 NTUs.
	SW-1	2,250	µg/L		334 - 3,816	Iron concentration at SW-1 is consistent with historical readings. Turbidity measured at 40.1 NTUs.
Manganese	SW-1	80.7	µg/L	50	22.1 - 447	Manganese concentration at SW-1 is consistent with historical readings. Turbidity measured at 40.1 NTUs.

Notes:

1. 15A NCAC 2L Standard refers to Class GA Standards as found in 15A NCAC 02L .0202 Groundwater Quality Standards, last amended on April 1, 2013.
2. µg/L indicates micrograms per liter.
3. SU indicates Standard Units.
4. NTU indicates Nephelometric Turbidity Units.
5. Analytical results obtained from Electronic Data Deliverable (EDD) provided by Tim Hunsucker of Duke Energy Carolinas, LLC on April 24, 2014.
6. Historical concentrations based on data in Duke Energy Carolinas, LLC (Duke Energy) analytical results database.

A

APPENDIX A

CHAIN-OF-CUSTODY FORMS

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

DUKE ENERGY

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

Duke Energy Analytical Lab Services
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd
Huntersville, N. C. 28078
(980) 875-5245
Fax: (980) 875-5038

Analytical Laboratory Use Only

LIMS # J14020271 | MATRIX: (W-RCRA | Samples Originating From | NC √ SC

Logged By | Date & Time | SAMPLE PROGRAM: Ground Water √ NPDES Drinking Water UST RCRA Waste

VENDOR | Cooler Temp (C)

PO # | [15]Preser .:1=HCL 2=H_2SO_4 3=HNO_3 4=Ice 5=None

MR #

Customer to complete all appropriate NON-SHADED areas.

Customer must Complete

1)Project Name: *MARSHALL FGD LANDFILL Permit # 18-09* | 2)Phone No: 980-875-5257

3)Client: LDC / TSH / Ed Sullivan | 4)Fax No:875-4349

5)Business Unit: 20035 | 6)Process: BENVWS | 7)Resp. To: MS00

8)Project ID: | 9)Activity ID: | 10)Mail Code: MGO3A3

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

Revised 5/14/13

LAB USE ONLY [11]Lab ID	[13]Sample Description or ID	[14]Collection Information Date	Time	Signature	[16]Analyses Required TESTS	[18]Grab	NO3-N, Cl, F, SO4 (IC), and F_Alk (4.5) 4	Metals Prep - TRM: (ICP - EPA 200.7) Ag, B, Ba, Ca, Cu, Fe, K, Mg, Mn, Na, Ni, Zn (12)	Hg (EPA 245.1) (1)	(IMS - EPA 200.8) As, Cd, Cr, Pb, Se (5) 3	TDS 4	[20]Total # of Containers
2014004081	MS-8	3/31/14	1030	DC	6	X	1	1		1	3	
2014004082	MS-9	3/31/14	0945	DC	6	X	1	1		1	3	
2014004083	MS-10	3/31/14	1115	DC	6	X	1	1		1	3	
2014004084	MS-11	03/31/14	0840	PSP	6	X	1	1		1	3	
2014004085	MS-12	03/31/14	0930	PSP	6	X	1	1		1	3	
2014004086	MS-13	03/31/14	1100	PSP	6	X	1	1		1	3	
2014004087	MS-14	3/31/14	1215	DC	6	X	1	1		1	3	
2014004088	MS-15	3/31/14	0850	DC	6	X	1	1		1	3	
2014004089	MS-16	03/31/14	1230	PSP	6	X	1	1		1	3	
2014004090	SW-1	03/31/14	1000	PSP	6	X	1	1		1	3	
2014004091	C1-Leachate	3/31/14	1250	PSP	6	X	1	1		1	3	
2014004092	FIELD BLANK	03/31/14	1310	PSP	5	X	1	1			2	

Customer to complete appropriate columns to right

Customer to sign & date below

21)Relinquished By: DC Cull 3/31/14 1420	Date/Time	Accepted By:	Date/Time
Relinquished By	Date/Time	Accepted By: 3/31/14 1420	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 comparible analytical methods

Customer, important please indicate desired turnaround

[22]Requested Turnaround

14 Days √

*7 Days

*48 Hr

*Other
* Add. Cost Will Apply