

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 Dry Ash Landfill	8320 East NC Highway 150 Terrell, NC 28682	1804	.0500	February 24, 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  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

Signature

May 16, 2014

Affix NC Licensed Professional Geologist Seal

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)



*William M. Miller 5/16/2014*

**SEMIANNUAL GROUNDWATER  
MONITORING REPORT**

**MARSHALL STEAM STATION**

**DRY ASH LANDFILL  
PERMIT NO. 1804**

**FEBRUARY 2014 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**

**May 16, 2014**



REPORT VERIFICATION

**PROJECT: SEMIANNUAL GROUNDWATER MONITORING REPORT  
MARSHALL STEAM STATION  
DRY ASH LANDFILL  
PERMIT NO. 1804**

**TITLE: FEBRUARY 2014 SAMPLING EVENT**

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

Prepared by: *[Signature]*

Date: 5/16/2014

Checked by: *William M. Miller*

Date: 5/16/2014

Approved by: *Ty Ziegler*

Date: 5/16/2014

Project Manager: Ty Ziegler, PE

Professional Engineer Seal:



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  
DRY ASH LANDFILL  
PERMIT NO. 1804**

**FEBRUARY 2014 SAMPLING EVENT**

**TABLE OF CONTENTS**

<b>Section</b>	<b>Title</b>	<b>Page No.</b>
1.	BACKGROUND.....	1
2.	METHODS.....	3
2.1	Sampling and Analysis Methods .....	3
2.2	Statement of Work.....	3
3.	RESULTS .....	5
3.1	Site Groundwater Flow.....	5
3.2	Analytical Results.....	6

**FIGURES**

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

**TABLES**

1. Field Data Parameters
2. Field and Analytical Results
3. Field and Analytical Results that Equal or Exceed NCAC 2L Groundwater Quality Standards

**APPENDICES**

- A. Chain-of-Custody Forms

## Section 1

# Background

---

The Marshall Dry Ash Landfill is located at Marshall Steam Station which is owned and operated by Duke Energy Carolinas, LLC (Duke Energy). Marshall Steam Station is a four-unit, coal-fired generating facility, located on Lake Norman in Catawba County, North Carolina.

The Marshall Dry Ash Landfill consists of two separate disposal areas permitted in December 1983 under North Carolina Department of Environment and Natural Resources (NCDENR) Solid Waste Permit No. 1804. Placement of flyash began in September 1984 in the area designated as Phase I. Phase I consists of approximately 14.5 acres and approximately 280,000 tons of flyash was placed between September 1984 and March 1986. Placement of ash in this area was completed around March 1986. Placement of ash in Phase II, approximately 46 acres, began around March 1986 and was completed in 1999.

The location of the landfill and nearby surrounding areas is shown on Figure 1. The landfill is located north of the power plant and south of Island Point Road. The Marshall Steam Station ash basin is located adjacent to the western boundary of the landfill.

The groundwater monitoring system for the Marshall Dry Ash Landfill consists of the following:

Monitoring Wells:    MW-1  
                                 MW-2  
                                 MW-3  
                                 MW-4  
                                 MW-5

Observation Well:    OB-1

The locations of the wells are shown on Figure 2. Monitoring wells MW-2, MW-3, and MW-5 are located adjacent to the 46-acre landfill. Monitoring well MW-1 and observation well OB-1 are located adjacent to the 14.5-acre landfill. Observation well OB-1 is only used to measure groundwater levels.

Monitoring well MW-4 is located upgradient from the 46-acre landfill and is described in the *Post-Closure Ground-Water Monitoring Program Sampling and Analysis Plan*<sup>1</sup> (SAP) as representing upgradient groundwater quality. All of the groundwater monitoring wells are screened to monitor the shallow aquifer.

---

<sup>1</sup> Marshall Steam Station Industrial Landfill-Phase II Permit #18-04 *Post-Closure Ground-Water Monitoring Program Sampling and Analysis Plan*. Dated September 20, 1999.

## Section 2

# Methods

---

### 2.1 Sampling and Analysis Methods

Groundwater sampling and documentation of sampling activities were performed by Duke Energy personnel. The groundwater samples were analyzed by Duke Energy Analytical Laboratory (North Carolina Laboratory Certification #248), Pace Analytical Services, Inc., Asheville (North Carolina Laboratory Certification #40) and Summit Environmental Technologies, Inc. (North Carolina Laboratory Certification #631).

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

- Barium, boron, chromium, copper, iron, manganese, nickel, silver, and zinc using U.S. Environmental Protection Agency (EPA) Method 200.7
- Arsenic, cadmium, 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
- Biological oxygen demand using SM 5210B
- Chemical oxygen demand using the Hach Method 8000
- Total organic carbon using SM 5310C/EPA 9060A
- Total organic halide using EPA Method 9020

### 2.2 Statement of Work

HDR Engineering, Inc. (HDR) completed the following tasks:

- Received field sampling information provided by Duke Energy for monitoring wells MW-1, MW-2, MW-3, MW-4, and MW-5 and water level information for observation well OB-1. The samples were collected on February 24, 2014, and HDR received the data on March 5 and April 17, 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 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<sup>2</sup> (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.

---

<sup>2</sup> The Solid Waste Section Limit (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 the groundwater elevations measured in the wells on the date of sampling, and using the approximate surface water elevations for the Marshall Ash Basin and the adjacent Lake Norman.

The ground surface in the area of the larger landfill slopes from the elevation along Island Point Road (located north of MW-4), approximate elevation 880 feet to 890 feet, downward toward the Marshall Ash Basin, which has a surface water elevation of approximately 790 feet. Lake Norman is located to the east of the Marshall Ash Basin. The full pond elevation of Lake Norman is 760 feet.

Groundwater flow at the site is from areas of higher topography toward the ash basin and on toward Lake Norman. Monitoring well MW-4 is located north of the 46-acre landfill and is at the highest topographic elevation. Groundwater flow is generally from MW-4 toward the 46-acre landfill and to the ash basin. It is expected that flow would be from the topographically higher region north of MW-3 and MW-5 toward the 46-acre landfill, or in the case of MW-5, toward the portion of ash basin located to the east of the 46-acre landfill.

Based on an August 6, 2012 survey, monitoring well MW-2 is located approximately 100 feet inside the landfill review boundary and approximately 25 feet to 30 feet outside the edge of waste.

Duke Energy has acquired property north of the 46-acre landfill. The compliance boundary on the north side of the 46-acre landfill was previously coincident with the property boundary. The revised property and compliance boundaries are depicted on Figure 2.

The water elevation at monitoring well MW-3 is approximately the same as the pond elevation of two adjacent ponded areas. These ponded areas were part of the original ash basin and were cut off from the main body of the ash basin during construction of the 46-acre landfill.

Monitoring well MW-5 is located on the east side of the 46-acre landfill adjacent to an inactive portion of the ash basin. This inactive portion of the ash basin no longer contains appreciable free water and is filled with ash that was sluiced from the ash basin.

The groundwater flow in the region near the 14.5-acre landfill area appears to be from the ash basin (elevation 790 feet) toward the arm of Lake Norman (elevation 760 feet) located east of OB-1 and MW-1.

### **3.2 Analytical Results**

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

The field and laboratory results of groundwater sampling are summarized in Table 2. Concentrations with values that attain or exceed the SWSLs are noted on Table 2 by gray cells. Concentrations with values that attain or exceed the Title 15A NCAC 02L .0202 (g) Standards (2L Standards) are noted on Table 2 by bold font.

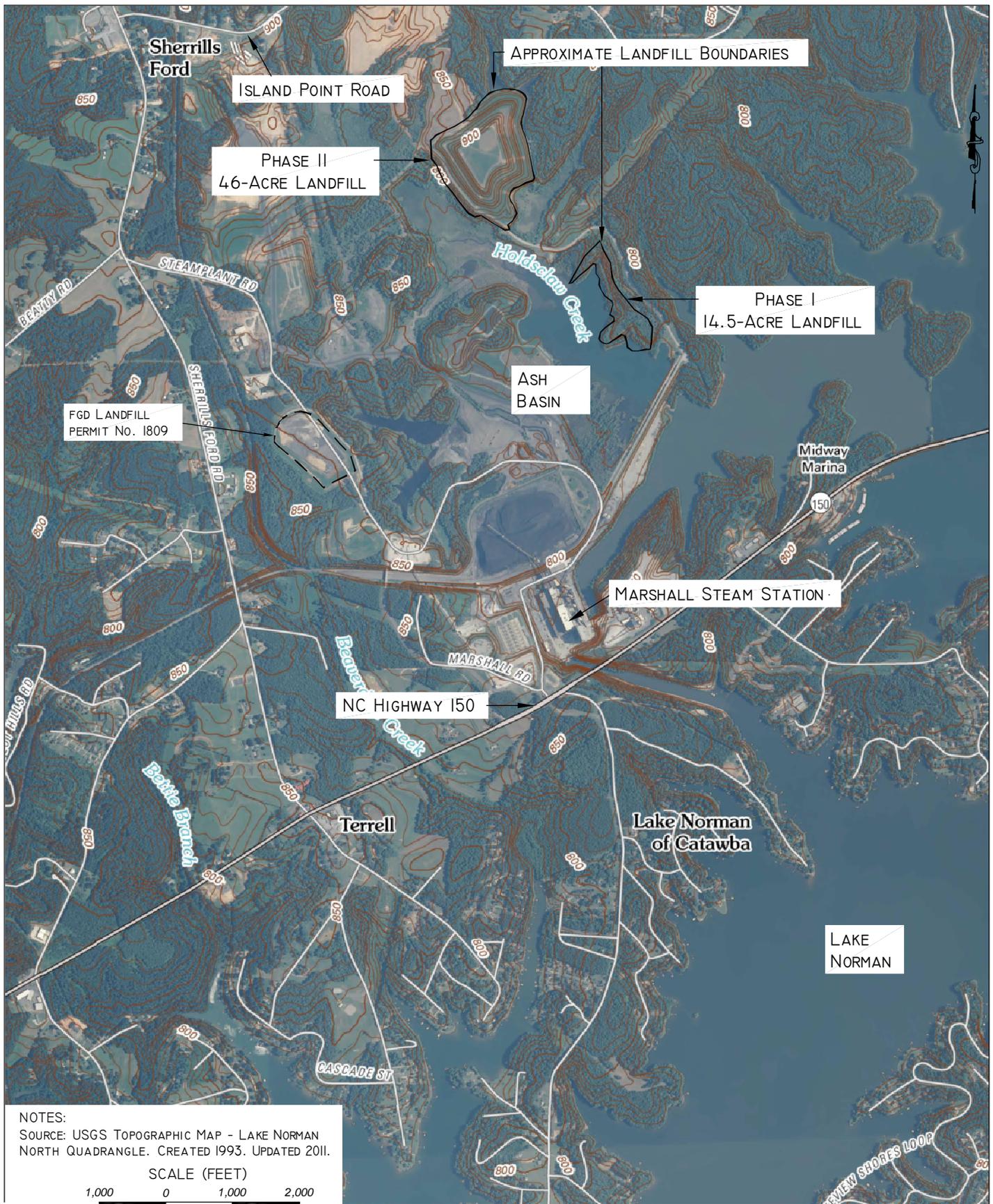
A summary of the analytical results that attain or exceed the 2L Standards are presented in Table 3.

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 amount, 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 historic exceedances of the 2L Standards at this landfill (*Groundwater Assessment, Marshall Steam Station, Dry Ash Landfill, December 21, 2012*). The report assessed 2L Standard exceedances for manganese at monitoring wells MW-3 and MW-5. The report concluded that the manganese exceedances at monitoring wells MW-3 and MW-5 were likely the result of naturally-occurring manganese and not caused by impacts from the landfill.

## **FIGURES**

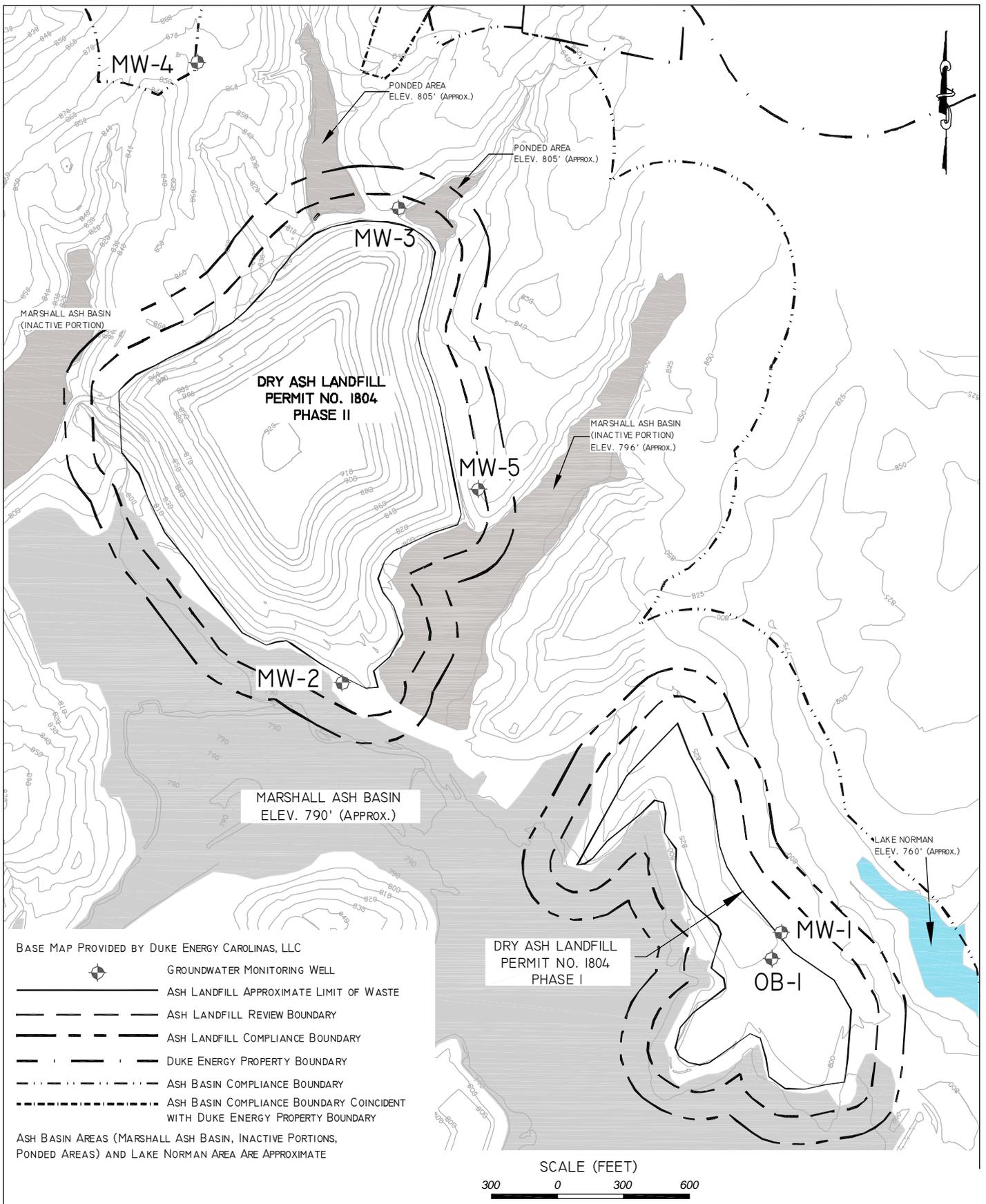


NOTES:  
SOURCE: USGS TOPOGRAPHIC MAP - LAKE NORMAN  
NORTH QUADRANGLE. CREATED 1993. UPDATED 2011.



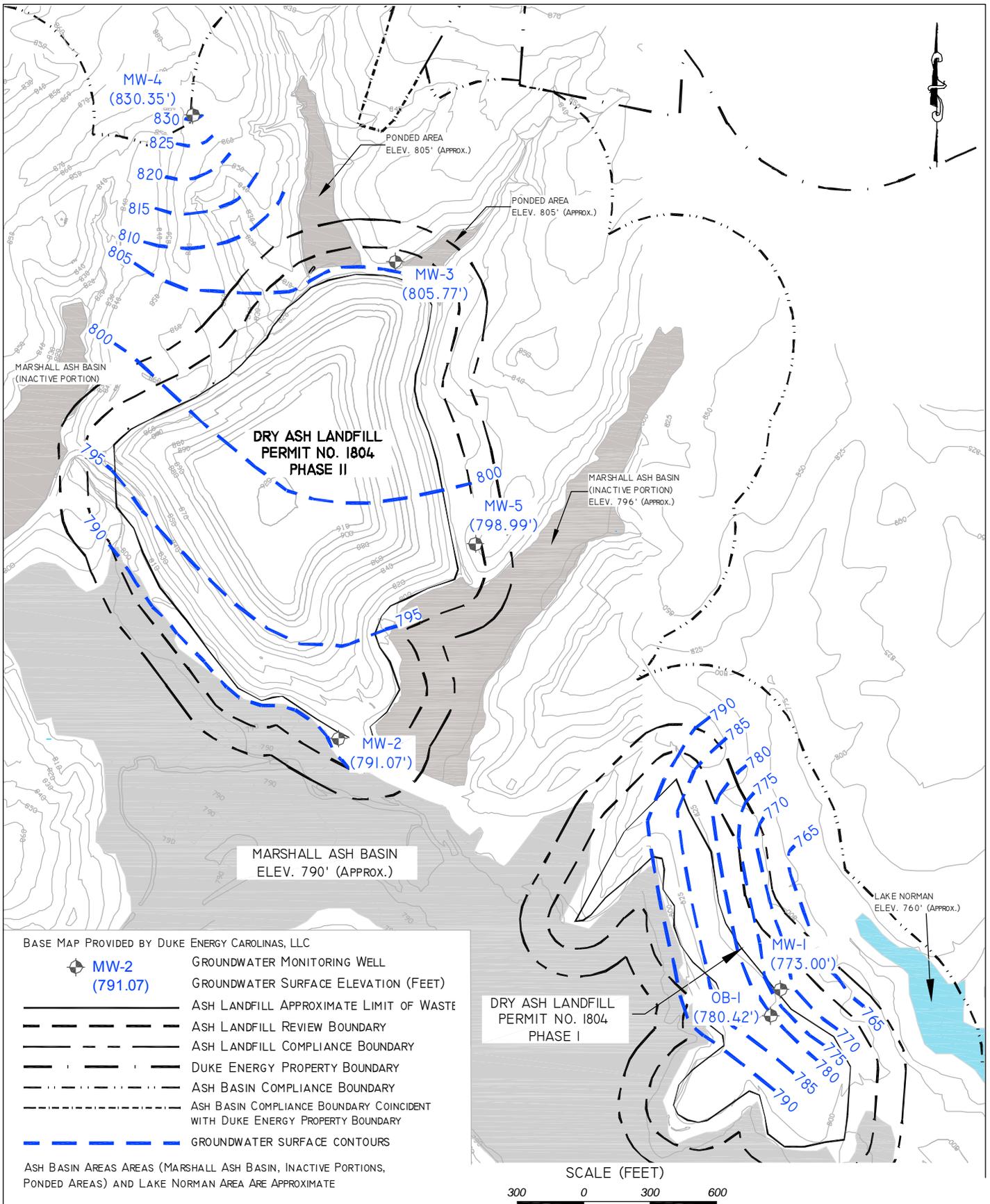
**SITE LOCATION MAP  
MARSHALL STEAM STATION  
DRY ASH LANDFILL  
PERMIT NO. 1804**

DATE	APRIL 18, 2014
FIGURE	1



**SAMPLE LOCATIONS  
MARSHALL STEAM STATION  
DRY ASH LANDFILL  
PERMIT NO. 1804**

DATE	MAY 16, 2014
FIGURE	2



BASE MAP PROVIDED BY DUKE ENERGY CAROLINAS, LLC

- MW-2 (791.07) GROUNDWATER MONITORING WELL
- GROUNDWATER SURFACE ELEVATION (FEET)
- ASH LANDFILL APPROXIMATE LIMIT OF WASTE
- ASH LANDFILL REVIEW BOUNDARY
- ASH LANDFILL COMPLIANCE BOUNDARY
- DUKE ENERGY PROPERTY BOUNDARY
- ASH BASIN COMPLIANCE BOUNDARY
- ASH BASIN COMPLIANCE BOUNDARY COINCIDENT WITH DUKE ENERGY PROPERTY BOUNDARY
- GROUNDWATER SURFACE CONTOURS

ASH BASIN AREAS (MARSHALL ASH BASIN, INACTIVE PORTIONS, PONDED AREAS) AND LAKE NORMAN AREA ARE APPROXIMATE

DRY ASH LANDFILL PERMIT NO. 1804 PHASE I

SCALE (FEET)

300 0 300 600

HDR Engineering, Inc. of the Carolinas  
 License Number: F-0118  
 440 South Church Street, Charlotte, NC 28202

**GENERALIZED GROUNDWATER SURFACE CONTOURS FEBRUARY 24, 2014**  
**MARSHALL STEAM STATION DRY ASH LANDFILL PERMIT NO. 1804**

DATE	MAY 16, 2014
FIGURE	3

## **TABLES**

**Table 1 - Field Data Parameters  
Duke Energy Carolinas, LLC/Marshall Steam Station  
Dry Ash Landfill - Permit No. 1804**

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)
2/24/2014	MW-1	78.75	50.70	773.00	Normal	None	CP	N/A	4.57	19.00	NO	15.46	122	5.6	4.9	325	0.70
2/24/2014	MW-2	35.10	6.15	791.07	Normal	None	CP	N/A	4.72	14.25	NO	15.82	382	5.2	1.6	358	0.62
2/24/2014	MW-3	28.15	7.30	805.77	Normal	None	CP	N/A	3.40	11.75	NO	15.87	89	4.7	1.8	441	2.85
2/24/2014	MW-4	50.20	37.03	830.35	Normal	None	CP	N/A	2.15	4.00	NO	16.06	46	5.7	3.3	390	8.17
2/24/2014	MW-5	30.71	23.70	798.99	Normal	None	CP	N/A	1.14	5.00	NO	14.95	36	5.2	3.0	378	1.60
2/24/2014	OB-1	65.50	45.43	780.42	N/A	N/A	LO	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

1. Purge Methods; LF=Low Flow, CP=Conventional Purge (3-5 well volumes), NP=No Purge (HydraSleeve), EOP=Equipment Only Purge, LO=Level Only. 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. mL/min indicates milliliters per minute.
6. SU indicates Standard Units.
7. NTU indicates Nephelometric Turbidity Units.
8. mV-NHE indicates millivolts-Normal Hydrogen Electrode.
9. N/A indicates not applicable.
10. mg/L indicates milligrams per liter.
11. Information provided by Tim Hunsucker of Duke Energy Carolinas, LLC on March 25, 2014.

**Table 2 - Groundwater Field and Analytical Results  
Duke Energy Carolinas, LLC/Marshall Steam Station  
Dry Ash Landfill - Permit No. 1804**

Sample Date: February 24, 2014

Laboratory Certificate Codes:  
Duke Energy Carolinas, LLC Field #5193  
Duke Energy Analytical Laboratory #248  
Pace Analytical Services, Inc. #40  
Summit Environmental Technologies, Inc. #631

Field Sampling performed by Duke Energy Carolinas, LLC

Parameter	SWS ID	Units	Certificate Code	Monitoring Wells					QC Sample	SWSL	15A NCAC 2L Standard
				1804 MW-1	1804 MW-2	1804 MW-3	1804 MW-4	1804 MW-5	1804 Field Blank		
Field pH	320	SU	5193	5.6	5.2	4.7	5.7	5.2	-	NE	6.5-8.5
Field Specific Conductivity	323	umho/cm	5193	122	382	89	46	36	-	NE	NE
Temperature	325	°C	5193	15.46	15.82	15.87	16.06	14.95	-	NE	NE
Top of Casing	328	feet	-	823.70	797.22	813.07	867.38	822.69	-	NE	NE
Depth to Water	318	feet	-	50.70	6.15	7.30	37.03	23.70	-	NE	NE
Water Elevation	319	feet	-	773.00	791.07	805.77	830.35	798.99	-	NE	NE
Well Depth	411	feet	-	78.75	35.10	28.15	50.20	30.71	-	NE	NE
Arsenic	14	µg/L	248	0.254 J	0.078 U	0.078 U	0.078 U	0.078 U	0.078 U	10	10
Barium	15	µg/L	248	72.3 J'	56.5 J'	289	47.8 J'	47.1 J'	0.245 J	100	700
Biological Oxygen Demand, 5-day	316	mg/L	40	2 U	2 U	2 U	2 U	2 U	2 U	NE	NE
Boron	428	µg/L	248	313	3,230	3.3 U	3.3 U	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	0.101 U	1	2
Chloride	455	µg/L	248	3,680	5,070	9,780	2,150	2,900	29.6 J	NE	250,000
Chromium	51	µg/L	248	9.56 J'	0.5 U	0.986 J	1.88 J	0.5 U	0.5 U	10	10
Chemical Oxygen Demand	317	µg/L	248	3,780 U	3,780 U	3,780 U	3,780 U	3,780 U	3,780 U	NE	NE
Copper	54	µg/L	248	2.75 J	1.59 J	2.21 J	1 U	1 U	1.53 J	10	1,000
Fluoride	312	µg/L	248	108 J'	83.9 J	69.7 J	93.8 J	38.3 J	34.1 J	2,000	2,000
Iron	340	µg/L	248	781	6.14 J	22.7 J'	91.2 J'	82.3 J'	1.3 U	300	300
Lead	131	µg/L	248	0.46 J	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	10	15
Manganese	342	µg/L	248	21.4 J'	13.6 J'	51.5	6.37 J'	21.3 J'	0.2 U	50	50
Mercury	132	µg/L	248	0.006 U	0.006 U	0.007 J	0.006 U	0.01 J	0.011 J	0.2	1
Nickel	152	µg/L	248	0.733 J	0.693 J	2.32 J	0.5 U	0.5 U	0.5 U	50	100
Nitrate as Nitrogen	303	µg/L	248	183 J'	483 J'	5,850 J'	27.8 J'	5.4 U	5.4 U	10,000	10,000
Selenium	183	µg/L	248	1.88 J	27.6	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	0.7 U	10	20
Sulfate	315	µg/L	248	32,800 J'	153,000 J'	105 J'	123 J'	36.3 J	18 U	250,000	250,000
Total Dissolved Solids	311	µg/L	248	102,000	276,000	50,000	50,000	43,000	-	NE	500,000
Total Organic Carbon	357	µg/L	248	114	314	91 J	182	196	18 U	NE	NE
Total Organic Halide	396	mg/L	631	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NE	NE
Zinc	213	µg/L	248	8.57 J'	8.56 J'	20.9	4.58 J	3.24 J	3.02 J	10	1,000

Notes:

- Concentrations presented in micrograms per liter (µg/L) and milligrams per liter (mg/L).
- SWS ID is the Solid Waste Section Identification Number.
- SWSL is the Solid Waste Section Limit. NCDENR defines the SWSL as the lowest amount of analyte in a sample that can be quantitatively determined with suitable precision and accuracy.
- 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.
- Grayed values indicate values that attain or exceed the SWSL Standard.
- Bold values indicate values that attain or exceed the 15A NCAC 2L Standard.
- NE indicates not established. Blank cells indicate that there is no information relevant to the respective row.
- 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.
- SU indicates Standard Units.
- umho/cm indicates micromhos per centimeter.
- 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).
- Data obtained from Electronic Data Deliverable (EDD) provided by Tim Hunsucker of Duke Energy Carolinas, LLC on April 17, 2014.

**Table 3 - Field and Analytical Results that Equal or Exceed  
NCAC 2L Groundwater Quality Standards  
Duke Energy Carolinas, LLC/Marshall Steam Station  
Dry Ash Landfill - Permit No. 1804**

Sample Date: February 24, 2014						
Field Sampling performed by Duke Energy Carolinas, LLC						
Parameter	Well ID	Result	Units	15A NCAC 2L Standard	Historical Concentrations	Cause and Significance
pH	MW-1	5.6	SU	6.5 - 8.5	5.2 - 6.2	pH in MW-1 is consistent with historical readings at well.
	MW-2	5.2	SU		5.1 - 6.1	pH in MW-2 is consistent with historical readings at well.
	MW-3	4.7	SU		4.4 - 5.4	pH in MW-3 is consistent with historical readings at well.
	MW-4	5.7	SU		5.1 - 6.3	pH in MW-4 is consistent with historical readings at well.
	MW-5	5.2	SU		5.1 - 5.8	pH in MW-5 is consistent with historical readings at well.
Boron	MW-2	3,230	µg/L	700	2,175 - 3,230	Boron concentration in MW-2 is the highest concentration measured over the period of monitoring. Monitoring well MW-2 is located approximately 100 feet inside the landfill review boundary and approximately 25 feet to 30 feet outside of the edge of waste.
Iron	MW-1	781	µg/L	300	13 - 5,477	Iron concentration in MW-1 is consistent with historical readings at well.
Manganese	MW-3	51.5	µg/L	50	51.5 - 176	Manganese concentration in MW-3 is the lowest concentration measured over the period of monitoring.
Selenium	MW-2	27.6	µg/L	20	<1 - 44.05	Selenium concentration in MW-2 is consistent with historical readings at well. Monitoring well MW-2 is located approximately 100 feet inside the landfill review boundary and approximately 25 feet to 30 feet outside of the edge of waste.

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. < indicates the analytical result is reported as less than the laboratory method reporting limit (<MRL). The Duke Energy analytical results database does not contain estimated values less than the laboratory MRL.
5. Historical concentrations based on data in Duke Energy Carolinas, LLC (Duke Energy) analytical results database.
6. Analytical results obtained from Electronic Data Deliverable (EDD) provided by Tim Hunsucker of Duke Energy Carolinas on April 17, 2014.

## **APPENDICES**

**APPENDIX A**  
**CHAIN-OF-CUSTODY FORMS**



# CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

9291016

Customer must complete Page 28 of 29

For Detailed Instructions, see:  
http://dewwww/lesseny/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

1) Project Name <b>MARSHALL DRY ASH LANDFILL</b> Permit #18-04		2) Phone No: 980-875-5257
3) Client <b>LDC / TSH / Ed Sullivan</b>		4) Fax No: 875-4349
5) Business Unit: 20035	6) Process: ENVWT	7) Resp. To: MS00
8) Project ID:	9) Activity ID:	10) Mail Code: MGO3A3

Analytical Laboratory Use Only					
LIMS #	<b>J14010273</b>		MATRIX: GW-RCRA	Samples Originating From	NC <input checked="" type="checkbox"/> SC <input type="checkbox"/>
Logged By	Date & Time		SAMPLE PROGRAM Water <input checked="" type="checkbox"/> Ground NPDES <input type="checkbox"/> Drinking Water UST <input type="checkbox"/> RCRA Waste		
VENDOR	<b>PACE</b>		Cooler Temp (C) <b>0.8</b>		
PO #	<b>PO# 653787</b>		<sup>15</sup> Preserv.: 1=HCL 2=H <sub>2</sub> SO <sub>4</sub> 3=HNO <sub>3</sub> 4=Ice 5=None		
MR #			4	2, 4	3
<b>Customer to complete all appropriate NON-SHADED areas.</b>					

<sup>19</sup>Page 1 of 1  
DISTRIBUTION  
ORIGINAL to LAB,  
COPY to CLIENT

Revised 5/14/13

LAB USE ONLY  
<sup>11</sup>Lab ID  
Customer to complete appropriate columns to right

<sup>11</sup> Lab ID	<sup>13</sup> Sample Description or ID	<sup>14</sup> Collection Information			<sup>16</sup> TESTS	<sup>18</sup> Grab	NO <sub>3</sub> -N, Cl, F, SO <sub>4</sub> (IC)	lab pH, F, Alk (4.5)	TOC, COD	Metals Prep - TRM (ICP - EPA 200.7) Ag, B, Ba, Ca, Cu, Cr, Fe, K, Mg, Mn, Na, Ni, Zn (13)  Hg (EPA 245.1) (1)  (IMS - EPA 200.8) As, Cd, Pb, Se (4)	TOX - Pace w/ St EDD	BOD - Pace w/ St EDD	TDS	Chlorine (ppm)	<sup>20</sup> Total # of Containers
		Date	Time	Signature											
2014001424	MW-1	02/24/14	09:00	PSP	11	X	1	1		1 001	1	1	1	0	6
2014001425	MW-2	02/24/14	10:05	PSP	11	X	1	1		1 002	1	1	1	0	6
2014001426	MW-3	02/24/14	12:20	PSP	11	X	1	1		1 003	1	1	1	0	6
2014001427	MW-4	02/24/14	13:15	PSP	11	X	1	1		1 004	1	1	1	0	6
2014001428	MW-5	02/24/14	11:05	PSP	11	X	1	1		1 005	1	1	1	0	6
2014001429	QC SAMPLE (WELL # <del>W</del> MW-1) PSP	02/24/14	09:00	PSP	1					006		1		0	1
2014001430	FIELD BLANK	02/24/14	14:25	PSP	9	X	1	1		1 007	1			n/a	4

Customer to sign & date below

21) Relinquished By <i>Ed Sullivan</i> 2/25/14 0500	Accepted By: <i>Peggy Kendall</i> 2-25-14 7:13
Relinquished By <i>Peggy Kendall</i> 2-25-14 14:00	Accepted By: <i>[Signature]</i> 2-25-14 1400
Relinquished By <i>[Signature]</i> 2-25-14 15:15	Accepted By: <i>[Signature]</i> 2/25/14 15:15
23) Seal/Loeked By	Sealed/Lock Opened By

Customer, important please indicate desired turnaround

<sup>22</sup>Requested Turnaround

14 Days

\*7 Days \_\_\_\_\_

-48 Hr \_\_\_\_\_

\*Other \_\_\_\_ \*Add. Cost Will Apply

24) Comments  
Regulatory Agency : NCDENR/DWM -SW Section - State EDD Fomat Required NOTE: As, Cd, Pb, Se - analyzed by IMS - All other metals analyzed by ICP.



# 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  
 (980) 875-5245  
 Fax: (980) 875-5038

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

Analytical Laboratory Use Only			
LIMS #	<b>J14010273</b>	MATRIX: GW-RCRA	Samples Originating From <span style="float: right;">NC <input checked="" type="checkbox"/> SC <input type="checkbox"/></span>
Logged By	Date & Time		SAMPLE PROGRAM <input checked="" type="checkbox"/> Ground Water <input type="checkbox"/> NPDES Drinking Water <input type="checkbox"/> UST <input type="checkbox"/> RCRA Waste <input type="checkbox"/>
VENDOR	<b>PACE</b>	Cooler Temp (C)	0.8
PO #	<b>PO# 653787</b>	<sup>15</sup> Preserv.: 1=HCL 2=H <sub>2</sub> SO <sub>4</sub> 3=HNO <sub>3</sub> 4=Ice 5=None	
MR #	<b>Customer to complete all appropriate NON-SHADED areas.</b>		

<sup>19</sup>Page 1 of 1  
**DISTRIBUTION**  
 ORIGINAL to LAB,  
 COPY to CLIENT

Revised 5/14/13

Customer must Complete

1) Project Name <b>MARSHALL DRY ASH LANDFILL Permit #18-04</b>	2) Phone No: 980-875-5257
3) Client <b>LDC / TSH / Ed Sullivan</b>	4) Fax No: 875-4349
5) Business Unit: 20035	6) Process: ENVWT
7) Resp. To: MS00	8) Project ID:
9) Activity ID:	10) Mail Code: MGO3A3

LAB USE ONLY  
<sup>11</sup>Lab ID

LAB USE ONLY <sup>11</sup> Lab ID	Sample Description or ID	Collection Information			TESTS	Grab	NO <sub>3</sub> -N, Cl, F, SO <sub>4</sub> (IC)	lab pH, F, Alk (4.5)	TOC, COD	Metals Prep - TRM (ICP - EPA 200.7) Ag, B, Ba, Ca, Cu, Cr, Fe, K, Mg, Mn, Na, Ni, Zn (13)  Hg (EPA 245.1) (1)  (IMS - EPA 200.8) As, Cd, Pb, Se (4)	TOX - Pace w/ St EDD	BOD - Pace w/ St EDD	TDS	Chlorine (ppm)	Total # of Containers
		Date	Time	Signature											
2014001424	MW-1	02/24/14	09:00	PSP	11	X	1	1		1	1	1	1	0	6
2014001425	MW-2	02/24/14	10:05	PSP	11	X	1	1		1	1	1	1	0	6
2014001426	MW-3	02/24/14	12:20	PSP	11	X	1	1		1	1	1	1	0	6
2014001427	MW-4	02/24/14	13:15	PSP	11	X	1	1		1	1	1	1	0	6
2014001428	MW-5	02/24/14	11:05	PSP	11	X	1	1		1	1	1	1	0	6
2014001429	QC SAMPLE (WELL # <del>WW</del> MW-1) PSP	02/24/14	09:00	PSP	1							1		0	1
2014001430	FIELD BLANK	02/24/14	14:25	PSP	9	X	1	1		1	1			n/a	4

Customer to sign & date below

21) Relinquished By <i>Ed Sullivan</i>	Date/Time 2/25/14 05:00	Accepted By <i>Peggy Kendall</i>	Date/Time 2-25-14 7:13
Relinquished By <i>Peggy Kendall</i>	Date/Time 2-25-14 14:00	Accepted By <i>[Signature]</i>	Date/Time 2-25-14 14:00
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 Fomat Required NOTE: As, Cd, Pb, Se - analyzed by IMS - All other metals analyzed by ICP.			

Customer, important please indicate desired turnaround

**<sup>22</sup>Requested Turnaround**

14 Days

\*7 Days

\*48 Hr

\*Other  \* Add. Cost Will Apply