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):

S&ME, Inc. (Consultant)

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

Name: William M. Miller, P.E. Phone: 828-687-9080

E-mail: wmiller@smeinc.com

Facility name:	Facility Address:	Facility Permit #	NC Landfill Rule: (.0500 or .1600)	Actual sampling dates (e.g., October 20-24, 2006)
Duke Energy Marshall Steam Station Ash Landfill	8320 East Hwy 150 Terrell, Catawba County, NC	18-04	.0500	February 8, 2010

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, P.E. | Senior Project Engineer | 828-687-9080

Facility Representative Name (Print) | Title | (Area Code) Telephone Number

William M. Miller | May 11, 2010 | Affix NC Licensed/ Professional Geologist Seal

Signature | Date

NORTH CAROLINA PROFESSIONAL SEAL 17661 ENGINEER WILLIAM M. MILLER

44 Buck Shoals Rd, Suite C-3, Arden, NC 28704

Facility Representative Address

F-0176

NC PE Firm License Number (if applicable effective May 1, 2009)

Revised 6/2009

DUKE ENERGY
MARSHALL STEAM STATION
DRY ASH LANDFILL PERMIT #18-04
GROUNDWATER MONITORING REPORT
FEBRUARY 2010 SAMPLING EVENT
S&ME Project No. 1411-09-047

Prepared For:

Prepared By:

S&ME, Inc.
44 Buck Shoals Road Suite C-3
Arden, North Carolina 28704

May 11, 2010

S&ME

May 11, 2010

Ms. Jackie Drummond
North Carolina Department of Environment and Natural Resources
Division of Waste Management
Solid Waste Section
1646 Mail Service Center
Raleigh, N.C. 27699-1646

Subject: Duke Energy Carolinas – Marshall Steam Station
Catawba County
Dry Ash Landfill Permit # 18-04
Semi-Annual Groundwater Monitoring Report
S&ME Project 1411-09-047

Dear Ms. Drummond:

On behalf of Duke Energy, attached is the groundwater monitoring report for the Marshall Steam Station Dry Ash Landfill (Permit # 18-04). Groundwater sampling for the landfill was performed on February 8, 2010.

The Groundwater Monitoring Report for the sampling event includes a summary of the analytical results, a figure showing groundwater contours at the site and the preliminary analyses of values in excess of the NC 2L groundwater standards. Also attached is the Environmental Monitoring Reporting Form. An EXCEL file containing the laboratory results in the Electronic Data Deliverable format will be sent to you by e-mail.

If you have questions or require additional information, please contact me by at 828-687-9080.

Sincerely,

NORTH CAROLINA PROFESSIONAL SEAL 17661 ENGINEER WILLIAM M. MILLER

William M. Miller, P.E.
Senior Project Engineer

Larry Armstrong, P.E.
Senior Engineer

North Carolina Professional Engineering Firm License No. F-0176

S:\2009 PROJECTS\1411\ENVIRONMENTAL PROJECTS\11 09 047 Duke Energy Landfills - GW Reports\Marshall Ash Landfill\Marshall Ash LF - Feb 2010\Final Report\Marshall Ash LF - Feb 2010 Report -Final.doc

cc:

Duke Energy
PO Box 1006
Charlotte, NC 28201-1006
Attn: Ed Sullivan, P.E. Mail Code EC13K

Duke Energy
Marshall Steam Station
8320 East Highway 150
Terrell, NC 28682
Attn: Donna Burrell, Environmental Coordinator

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Chain of Custody Form

1. PROJECT INFORMATION

Marshall Steam Station is owned and operated by Duke Energy Carolinas (Duke). Marshall Steam Station is located in Catawba County, on Highway NC 150, just west of Lake Norman. The Marshall plant generates 2090 MW of electric power by combustion of coal. Marshall is the second largest coal facility owned by Duke Energy. The Marshall station generates enough electricity to power over one and a half a million homes.

The plant is located in the Piedmont physiographic region. The subsurface conditions in the plant area consist of residual soils and partially weathered rock which have been formed by the in-place weathering of the parent rock.

The permitted landfill areas are located north and east of the steam station and are located adjacent to the Marshall Ash Basin. The location of the permitted landfill areas and the wells is shown on **Figure 1**.

Two dry fly ash fills are permitted under this permit; the larger fill has an area of approximately 47 acres and is adjacent to the Marshall Ash Basin. Monitoring wells MW-2, MW-3, and MW-5 are located adjacent to this fill. The smaller fill is located adjacent to the Marshall Ash Basin and is approximately 14.5 acres in area. Monitoring well MW-1 and observation well OB-1 are located adjacent to this fill.

Monitoring well MW-4 is located upgradient from the 47 acre landfill and serves as the background well. Observation OB-1 is located adjacent to the smaller fill and is used only to measure groundwater levels.

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

2. SCOPE OF WORK

To complete the scope of work, S&ME completed the following tasks:

- Received information provided by Duke on field sampling and measurement of groundwater elevations (performed by Duke) for monitoring wells MW-1, MW-2, MW-3, MW-4, MW-5, and observation well OB-1. This sampling was conducted on February 8, 2010.
- Review of laboratory analytical results for samples. These analyses were performed by a North Carolina certified laboratory, using State approved methods. These results were provided to S&ME by Duke in both in paper format and in the form of an EXCEL file. The EXCEL file was manipulated to conform to the format requirements of the NCDENR Electronic Data Deliverable template.

- Develop a groundwater flow contour map using map data and groundwater elevation data supplied by Duke.
- Develop a preliminary analysis of the cause and significance of values exceeding NC 2L groundwater standards.
- Prepared and submitted this Groundwater Monitoring Report to Duke and to NCDENR.

3. RESULTS

3.1 Site Groundwater Flow

Groundwater flow contours for the site are shown on **Figure 2**. These contours were developed using the measured groundwater elevations in the wells from the February 8, 2010 sampling and from using the approximate surface water elevations for the Marshall Ash Basin and the adjacent Lake Norman.

Groundwater flow at the site is from areas of higher topography towards the Ash Basin and on towards Lake Norman. Well MW-4 is located north of the landfill and is at the highest topographic elevation. Groundwater flow is generally from MW-4 towards the 47 acre portion of the 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 towards the landfill, or in the case of MW-5, towards the portion of Ash Basin located to the east of the landfill.

The water elevation in well MW-2 is approximately the same as the pond elevation in the Ash Basin. Well MW-2 is located approximately 200 feet from the shore of the Ash Basin. Based in the location of the well and the observed water levels in the well relative to the Ash Basin, the well is likely influenced more by the water levels in the Ash basin than from groundwater flowing from the landfill.

The water elevation at well MW-3 is approximately the same as the pond elevation of the two adjacent ponded areas. These ponded areas are part of the ash basin that was cut off from the remainder of the ash basin by construction of the landfill.

Well MW-5 is located adjacent to the landfill and to an arm that was a part of the ash basin. This arm 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 smaller fill area (14.5 acres landfill) appears to be from the ash basin (Elev. 790 feet) towards the arm of Lake Norman (Elev. 760 feet) located east of wells OB-1 and MW-1.

3.2 Groundwater Analytical Results

Table 1 presents the results of the of field parameters measured during collection of the groundwater samples. The results of the laboratory analyses for the groundwater monitoring well samples are summarized in **Table 2.**

Results from the five monitoring wells were below the corresponding NCAC 2L groundwater quality standards with the exceptions noted below. The preliminary analyses of the causes of these exceptions are provided below:

- pH – pH values below 6.5 were measured at all five wells (MW-1, MW-2, MW-3, MW-4, MW-5). Values for pH ranged from 6.3 at MW-4 to 5.2 measured at MW-3. Well MW-4 is considered to be the background well and is not influenced by the landfill or the ash basin.

  The values for pH in wells MW-1 (6.1) and MW-2 (5.6) are potentially influenced by groundwater from the landfill areas and the water quality in the ash basin. Values for pH in wells MW-3 (5.2) and MW-5 (5.8) could be influenced by the landfill and by the adjacent former portions of the ash basin. However, it is important to note that these values are in the range of historic pH values measured in background well MW-4. MW-4 has measured pH values as low as 5.1.

- Boron – The concentration of boron measured in well MW-2 was 2660 µg/L and was in excess of the 2L standard of 700 µg/L. The concentration is consistent with the previous semi-annual sampling results of 2720 µg/L measured in August 2009. The concentration of boron in this well is likely from the water quality in the ash basin. As described in Section 3.1, this well is likely influenced by water level and water quality in the ash basin.

- Iron – The concentration of iron measured in well MW-4 was 533 µg/L and was in excess of the 2L standard of 300 µg/L. The turbidity measured in this well was 3.6 NTU. Well MW-4 is the background well and is not influenced by the landfill or the ash basin.

- Manganese – The concentration of manganese measured in well MW-3 was 56.3 µg/L and is in excess of the 2L standard of 50 µg/L. This is consistent with the previous semi-annual sampling results of 66.5 µg/L measured in August 2009. This well is located adjacent to areas that are former portions of the ash basin. The manganese concentrations observed in this well could be caused by either the landfill or the former ash basin areas located adjacent to this well.

- Selenium - The concentration of selenium was measured in well MW-2 was 23.5 µg/L and is in excess of the 2L standard of 20 µg/L. The concentration is consistent with the previous semi-annual sampling results of 27.6 µg/L measured in August 2009. The concentration of selenium in this well is likely from the water quality in the ash basin. As described in Section 3.1, this well is likely influenced by water level and water quality in the ash basin.

In addition to the compounds and wells listed above, the groundwater analytical results for the compounds at the following wells and surface water sample locations were equal to or above the corresponding Solid Waste Section Limits (SWSL):

- Barium in excess of the SWSL of 100 µg/L was measured in well MW-3.
- Nitrogen, as Nitrate in excess of the SWSL of 1000 µg/L was measured in well MW-3.
- Zinc in excess of the SWSL of 10 µg/L was measured in wells MW-2 and MW-3.