

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: John Whitehead

Phone: 864.574.2360

E-mail: jwhitehead@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 Dry Ash Landfill	8320 East Highway 150 Terrell, Catawba County, North Carolina	18-04	.0500	August 9, 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 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.

Stanford Lummus, P.E.

Senior Engineer

864.574.2360

Facility Representative Name (Print)

Title

(Area Code) Telephone Number

October 19, 2010

Affix NC License/Professional Geologist Seal

Signature

Date

301 Zima Park Drive Spartanburg, South Carolina 29301

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
AUGUST 2010 SAMPLING EVENT
S&ME Project No. 1411-09-047

Prepared For:



Prepared By:



S&ME, Inc.
301 Zima Park Drive
Spartanburg, South Carolina 29301

October 2010



October 19, 2010

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

Subject: **Duke Energy Carolinas – Marshall Steam Station
Dry Ash Landfill Permit # 18-04**
Catawba County, North Carolina
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 August 9, 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.

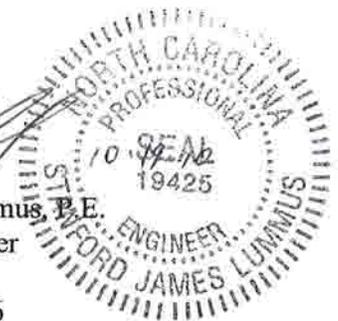
If you have questions or require additional information, please contact us at 864.574.2360.

Sincerely,

S&ME, Inc.


John Whitehead
Senior Geologist


Stanford Lummus, P.E.
Senior Engineer



North Carolina Professional Engineering Firm License No. F-0176

SA:ENVIRON\2009\1411 Projects\1411-09-047 Duke Landfill GW Reports\Marshall Ash Landfill\August 2010 Sampling Event\draft report\Marshall Ash LF -August 2010 Report.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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Table 2	Summary of Field and Analytical Results

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 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 groundwater monitoring wells are 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. 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 August 9, 2010.
- Reviewed of laboratory analytical results. 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 adapted to conform to the format requirements of the NCDENR Electronic Data Deliverable template.
- Developed a groundwater flow contour map using map data and groundwater elevation data supplied by Duke.

- Developed 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 monitoring wells from the August 9, 2010 sampling event 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:

- Field pH – Field pH values below 6.5 were measured at each of the five wells (MW-1, MW-2, MW-3, MW-4, MW-5). Values for pH ranged from 4.7 at MW-3 to 5.9 measured at MW-1. 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 (5.9) and MW-2 (5.2) are potentially influenced by groundwater from the landfill areas and the water quality in the ash basin. Values for pH in wells MW-3 (4.7) and MW-5 (5.5) 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 2770 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 2660 µg/L measured in February 2010 and 2720 µg/L measured in August 2009. The concentration of boron in this well is likely influenced 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.
- Manganese – Concentrations of manganese in excess of the 2L standard of 50 µg/L were measured in well MW-3 (60.3 µg/L) and well MW-5 (70.4 µg/L). This is consistent with the previous semi-annual sampling results of 56.3 µg/L in MW-3 and 46.7 µg/L in MW-5 measured in February 2010. These wells are located adjacent to areas that are former portions of the ash basin. The manganese concentrations observed in these wells could be caused by either the landfill or the former ash basin areas located adjacent to this well.

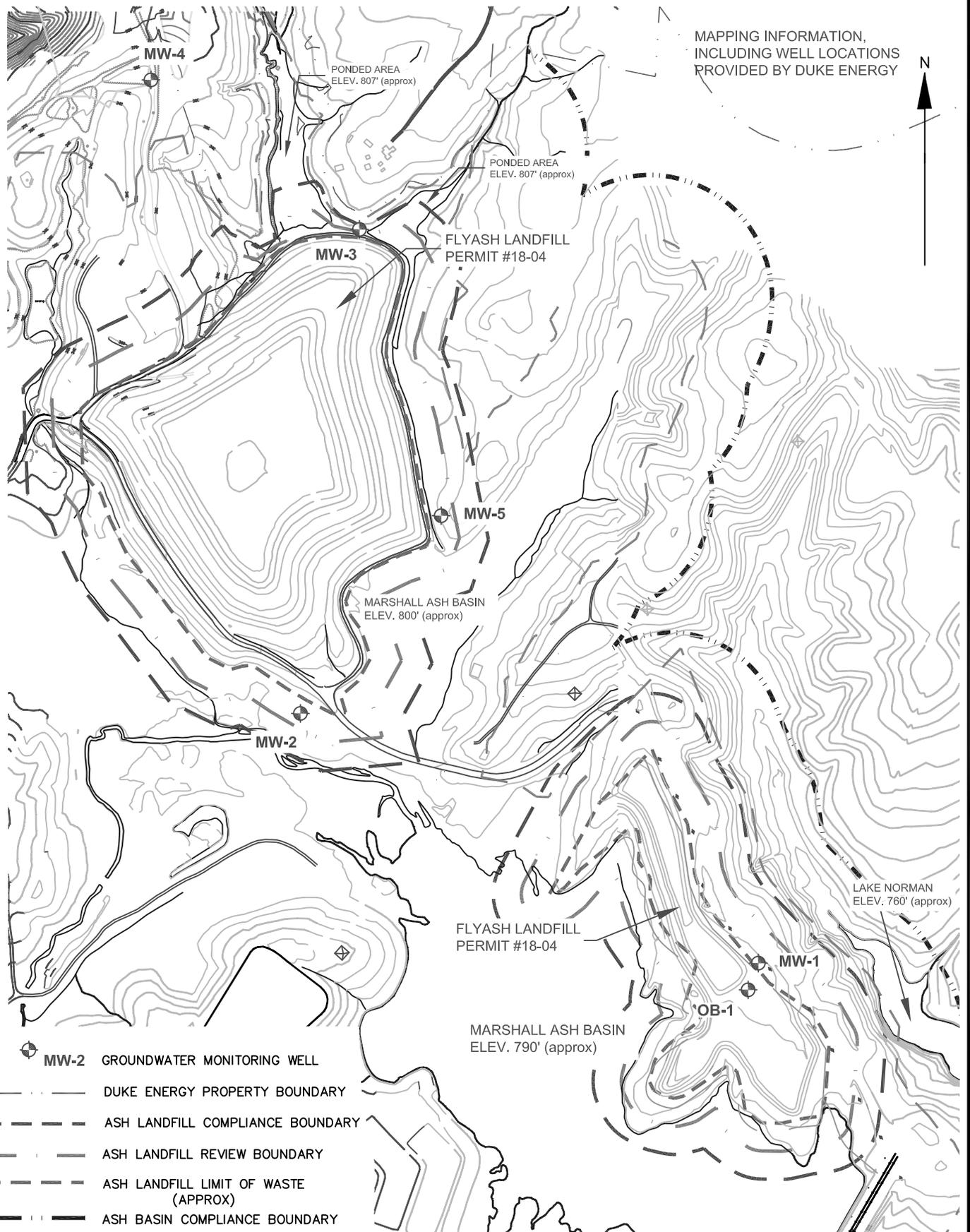
In addition to the compounds and wells listed above, the groundwater analytical results for the following compounds were equal to or above the corresponding Solid Waste Section Limits (SWSL):

- A barium concentration equal to or in excess of the SWSL of 100 µg/L was measured in well MW-3.
- A selenium concentration equal to or in excess of the SWSL of 10 µg/L was measured in well MW-2.
- A zinc concentration equal to or in excess of the SWSL of 10 µg/L was measured in well MW-3.

FIGURES



MAPPING INFORMATION,
INCLUDING WELL LOCATIONS
PROVIDED BY DUKE ENERGY



-  **MW-2** GROUNDWATER MONITORING WELL
-  DUKE ENERGY PROPERTY BOUNDARY
-  ASH LANDFILL COMPLIANCE BOUNDARY
-  ASH LANDFILL REVIEW BOUNDARY
-  ASH LANDFILL LIMIT OF WASTE (APPROX)
-  ASH BASIN COMPLIANCE BOUNDARY

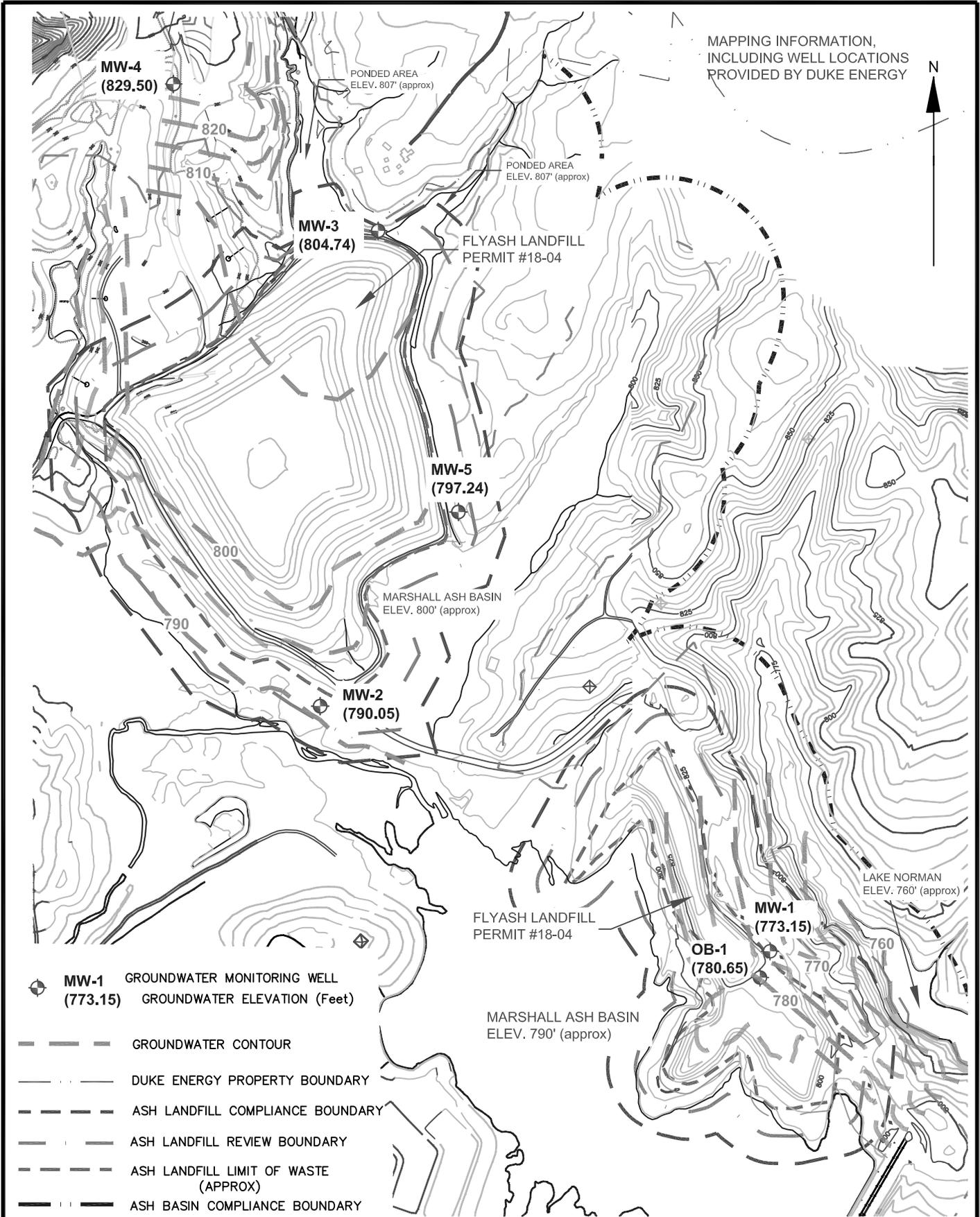
SCALE:	1 inch = 600 ft
CHECKED BY:	JWW
DRAWN BY:	MEC
DATE:	09.08.10



DUKE ENERGY MARSHALL STEAM STATION FLYASH LANDFILL PERMIT #18-04 LANDFILL WASTE LIMITS, BOUNDARIES
JOB NO: 1411-09-047

FIGURE NO: 1

MAPPING INFORMATION,
INCLUDING WELL LOCATIONS
PROVIDED BY DUKE ENERGY



-  **MW-1** GROUNDWATER MONITORING WELL
(773.15) GROUNDWATER ELEVATION (Feet)
-  GROUNDWATER CONTOUR
-  DUKE ENERGY PROPERTY BOUNDARY
-  ASH LANDFILL COMPLIANCE BOUNDARY
-  ASH LANDFILL REVIEW BOUNDARY
-  ASH LANDFILL LIMIT OF WASTE (APPROX)
-  ASH BASIN COMPLIANCE BOUNDARY

SCALE:	1 inch =600 ft
CHECKED BY:	JWW
DRAWN BY:	MEC
DATE:	09.08.10



DUKE ENERGY
MARSHALL STEAM STATION
FLYASH LANDFILL PERMIT #18-04
GROUNDWATER CONTOURS
AUGUST 2010

JOB NO: 1411-09-047

FIGURE NO:
2

TABLES



TABLE 1 - FIELD PARAMETERS
DUKE ENERGY MARSHALL STEAM STATION
FLY ASH LANDFILL - PERMIT #18-04
GROUNDWATER MONITORING REPORT
S&ME PROJECT 1411-09-047

October 19, 2010

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DATE	WELL NO.	WELL DEPTH (feet)	DEPTH TO WATER (feet)	WATER ELEV. (feet)	ODOR	Purge Method	AVG * PMP RATE (ml/min)	WELL VOL (gal)	EVAC VOL (gal)	EVAC (yes/no)	TEMP (deg C)	SPECIFIC CONDUCTANCE (umho/cm)	pH (units)	TURBIDITY (NTU)	ORP (mV-NHE)	DO (mg/l)
8/9/2010	MW-1	78.75	50.55	773.15	N/A	CP	N/A	4.60	14.25	NO	17.1	142	5.9	1.9	N/A	N/A
8/9/2010	MW-2	35.10	7.17	790.05	N/A	CP	N/A	4.56	13.50	NO	16.2	338	5.2	1.1	N/A	N/A
8/9/2010	MW-3	28.15	8.33	804.74	N/A	CP	N/A	3.23	10.50	NO	16.3	87	4.7	3.5	N/A	N/A
8/9/2010	MW-4	50.20	37.88	829.50	N/A	CP	N/A	2.01	2.50	YES	17.4	44	5.7	4.5	N/A	N/A
8/9/2010	MW-5	30.71	25.45	797.24	N/A	CP	N/A	0.86	3.00	NO	16.7	39	5.5	1.4	N/A	N/A
8/9/2010	OB-1	65.50	45.20	780.65	N/A	N/A	N/A	3.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Sampling performed by Duke Energy

NA = Not Applicable

Purge Methods

LF = Low Flow

CP = Coventional Purge (3 to 5 well vol)

BP = No Purge (HydraSleeve)

NP = Not Purged

TABLE 2 - FIELD AND ANALYTICAL RESULTS
DUKE ENERGY MARSHALL STEAM STATION
FLY ASH LANDFILL - PERMIT #18-04
GROUNDWATER MONITORING REPORT
S&ME PROJECT 1411-09-047

October 19, 2010

Page 1 of 1

Sample Date: August 9, 2010 (Field and Geochemistry Data)

Laboratory Certificate Codes:

Duke Power Field #5193

Field sampling performed by Duke Energy

Pace Lab #12

Summit Analytical Labs #631

Parameter	SW ID	Units	Certificate Codes	Monitoring Well Identification						Field Blank	SWSL	15A NCAC 2L
				1804-MW-1	1804-MW-2	1804-MW-3	1804-MW-4	1804-MW-5	1804-OB-1			
Field pH	320	Std. Units	5193	5.9	5.2	4.7	5.7	5.5			6.5-8.5	
Field Spec. Conductance	323	umho/cm	5193	142	338	87	44	39				
Temperature	325	C	5193	17.1	16.2	16.3	17.4	16.7				
Depth to Water	318	feet		50.55	7.17	8.33	37.88	25.45	45.20			
Water Elevation	319	feet		773.15	790.05	804.74	829.50	797.24	780.65			
Well Depth	41	feet		78.75	35.10	28.15	50.20	30.71	65.50			
Arsenic	14	µg/L	12	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U		2.7 U	10	
Barium	15	µg/L	12	71.2 J	62.2 J	340	47.7 J	47.3 J		0.2 U	100	
Boron	428	µg/L	12	538	2770	27.6	4.7 U	4.7 U		4.7 U	NE	
BOD, 5 day	316	mg/L	12	2 U	2 U	2 U	2 U	2 U			NE	
Cadmium	34	µg/L	12	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U		0.5 U	1.0	
Chemical Oxygen Demand	317	µg/L	12	25000 U	25000 U	25000 U	25000 U	25000 U		25000 U	NE	
Chloride	455	µg/L	12	5000 U	5530	10800	5000 U	5000 U		5000 U	NE	
Chromium	51	µg/L	12	8.2 J	0.46 J	1.4 J	1.4 J	0.4 U		0.4 U	10	
Copper	54	µg/L	12	0.3 U	0.3 U	0.38 J	0.3 U	0.78 J		0.3 U	10	
Fluoride	312	µg/L	12	100 U	100 U	100 U	100 U	100 U		100 U	2000	
Iron	340	µg/L	12	25.7 J	14 U	37 J	47.5 J	103 J		14 U	300	
Lead	131	µg/L	12	4 U	4 U	4 U	4 U	4 U		4 U	10	
Manganese	342	µg/L	12	7.8 J	10.8 J	60.3	2.4 J	70.4		0.3 U	50	
Mercury	132	µg/L	12	0.07 U	0.07 U	0.07 U	0.07 U	0.07 U		0.07 U	0.20	
Nickel	152	µg/L	12	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U		1.7 U	50	
Nitrate, as Nitrogen	303	µg/L	12	100 U	425 J	6900 J	100 U	100 U		100 U	10000	
Selenium	183	µg/L	12	3.8 U	18.7	3.8 U	3.8 J	4 J		4.6 J	10	
Silver	184	µg/L	12	0.44 J	1 J	0.1 U	0.16 J	0.12 J		0.1 U	10	
Sulfate	315	µg/L	12	41600 J	145000 J	5000 U	5000 U	5000 U		15400 J	250000	
Total Dissolved Solids	311	µg/L	12	102000	232000	55000	40000	40000			NE	
Total Organic Carbon	357	µg/L	12	1230	3470	1110	9890	1920		1000 U	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	
Zinc	213	µg/L	12	2.3 J	3.2 J	16.6	3.4 J	0.92 J		0.4 U	10	

Notes:

15A NCAC 2L = 15A NCAC 2L .0200, Groundwater Quality Standards for Class GA groundwater (effective 1/1/10)

BOLD VALUES indicate values that attain or exceed the 15A NCAC 2L MCL.

NC SWSL = North Carolina Solid Waste Section Limit

NE = Not established

Values in gray cells indicate values that equal or exceed the SWSL.

J = Parameters are values greater than Method Detection Limit (MDL) but less than the SWSL

Analytical results provided by Duke Energy and are found in Pace Lab Report 9275126, dated August 25, 2010.

APPENDIX





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

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

1) Project Name: MARSHALL DRY ASH LANDFILL
 2) Phone No: 875-5257
 3) Client: LDC / TSH / Ed Sullivan
 4) Fax No: 875-4349
 5) Business Unit: 20035
 6) Process: ENWWT
 7) Resp. To: MSD0
 9) Project ID:
 10) Mail Code: MGO3A3

Analytical Laboratory Use Only
 Sample Class: GWATER
 Date & Time: 7/27/10 15:20
 Logged By: CPK
 Cooler Temp (C): 13.8
 1) Preserv.: 1-HCl
 2-H₂SO₄ 3-HNO₃
 4-Ice 5-Substrate

18) Page 1 of 1
 DISTRIBUTION
 ORIGINAL TO LAB,
 COPY TO CLIENT

003526

LAB USE ONLY 1) Lab ID	12) Chem Desktop No.	13) Sample Description or ID	14) Collection Information		15) Preserv. 1-HCl 2-H ₂ SO ₄ 3-HNO ₃ 4-Ice 5-Substrate	16) Analyses Required	17) Comp. Grab	18) Alk, SO ₄ lab pH, NO ₃ , Cl, Fluoride	19) TOC	20) Hg	21) METALS (Ag, As, B, Ba, Ca, Cd, Cr, K, Mg, Na, Ni, Pb, Se, Cu, Fe, Mn, Zn)	22) COD	23) TOX	24) BOD	25) TDS	26) Chlorine (ppm)	27) Total # of Containers
			Date	Time													
30012110	MW-1	RW	8/9/10	0955	RW	X		2	1	1	1	1	1	1	1	9	
30012111	MW-2	RW	8/9/10	0740	RW	X		2	1	1	1	1	1	1	1	9	
30012112	MW-3	VC	8/9/10	0905	VC	X		2	1	1	1	1	1	1	1	9	
30012113	MW-4	VC	8/9/10	0750	VC	X		2	1	1	1	1	1	1	1	9	
30012114	MW-5	VC	8/9/10	0840	VC	X		2	1	1	1	1	1	1	1	9	
30012116	QC SAMPLE (WELL # MW3)	VC	8/9/10	0905	VC	X		2	1	1	1	1	1	1	1	9	
30012115	FIELD BLANK	VC	8/9/10	0955	VC	X		2	1	1	1	1	1	1	1	9	

Customer to sign & date below

21) Relinquished By: [Signature] Date/Time: 8-9-10 11:30
 Relinquished By: [Signature] Date/Time: 8/10/10 08:30
 Relinquished By: [Signature] Date/Time: 8/10/10 08:30
 23) Seal/Locked By: [Signature] Date/Time: 8/10/10 08:30
 24) Comments: Regulatory Agency: NCDENRDWM-SW Section - State EDD Format Required

22) Requested Turnaround: 8-19-10

