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):

Smith Gardner, Inc.

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

Name: Joan A. Smyth, P.G. Phone: 919-828-0577 x 221

E-mail: joan@smithgardnerinc.com

Facility name:	Facility Address:	Facility Permit #	NC Landfill Rule: (.0500 or .1600)	Actual sampling dates (e.g., October 20-24, 2006)
Avery County Closed MSW landfill	Brushy Creek Rd Spruce Pine, NC	06-01	.0500	12/29/14

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.

Joan A. Smyth, P.G.	Senior Hydrogeologist	919-828-0577 x 221
Facility Representative Name (Print)	Title	(Area Code) Telephone Number

Signature — Date: 1/19/15

Affix NC Licensed/ Professional Geologist Seal

NORTH CAROLINA LICENSED SEAL 1369 GEOLOGIST JOAN A. SMYTH

14 N. Boylan Avenue Raleigh, NC 27603

Facility Representative Address

C-0828

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

Revised 6/2009

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SMITH+GARDNER
ENGINEERS

ADDRESS
14 N. Boylan Avenue, Raleigh NC 27603

TEL
919.828.0577

WEB
www.smithgardnerinc.com

January 19, 2015

Ms. Jaclynne Drummond
NCDENR DWM Solid Waste Section
1646 Mail Service Center
Raleigh, North Carolina 27699-1646

RE: Operations, Monitoring, and Maintenance Report – December 2014
Avery County Closed MSW Landfill
Spruce Pine, North Carolina

Dear Ms. Drummond:

Smith Gardner, Inc. (S+G) is pleased to present this report concerning the operation and maintenance (O&M) of the Avery County Closed MSW Landfill (Permit No. 06-01) Landfill Gas Collection and Control System (LFGCCS) and monitoring of the on- and off-site landfill gas probes for the November 2014 monitoring period, including an update on the temporary installation of LFG Monitoring Well P3 to the collection system. Mr. Jorge Montezuma with S+G performed the site visit on December 29, 2014. Site visit details are provided below.

CURRENT STATUS

S+G previously identified the following items to be addressed for the LFGCCS to operate as designed:

1. **LFGCCS System:** An expansion of the LFGCCS system, as proposed in the *Annual Landfill Gas Monitoring Report*[1], was previously approved[2] by the division of Waste Management. Phase One of the expansion project has been completed. S+G is reviewing the data collected to evaluate the improvements for effectiveness. A summary of this evaluation has been submitted to the division **under separate cover** including recommendations for additional work.

LFG EXTRACTION WELL MONITORING PROGRAM

Monthly monitoring of the LFGCCS will continue and shall include the following items:

- CH_4, O_2, CO_2, and pressure monitoring at each extraction well head;
- CH_4, O_2, CO_2, and pressure monitoring at the flare station; and
- Adjustment of the LFGCCS to balance recovery and ensure safe system operation.

[1] *Annual Landfill Gas Monitoring Report,* Closed Avery County MSW Landfill. Submitted by Smith Gardner, Inc., November 2012.

[2] Approval response letter, Closed Avery County MSW Landfill (Annual Landfill Gas Monitoring Report). Sent by Jaclynne Drummond, Solid Waste Section, November 15, 2012.

The County will maintain this LFGCCS and will continue to evaluate the effectiveness of increased LFG recovery from the waste mass in alleviating off-site LFG migration. Results from monthly monitoring events will be reported in accordance with the approved LFG Monitoring Plan.

LFG EXTRACTION WELL MONITORING ACTIVITIES

S+G personnel performed the flare station and well field monitoring on December 29, 2014. Initial measurements indicated there was approximately 42 inches of available vacuum average throughout the well field, ranging from42.9 to 37.5 inches of available vacuum at each of the LFG wells across the well field. The results from this event are summarized below. Recommended actions are underlined. Well field data and flare station data are provided in the attached **Table 1**.

LFG Extraction Well Field

- **W-1 through W-10**: S+G performed methane (CH_4), oxygen (O_2), carbon dioxide (CO_2), and pressure monitoring. No adjustments were made to the extraction well heads during this monitoring event.

- **Orifice Plates:** S+G continues to evaluate orifice plate sizes at wells W-5, W-7, W-9, and W-10 during each site visit. As LFG flow potential at these locations is stable, the correct orifice plate sizes are currently installed.

Flare Station

- **Condensate Tank:** The condensate tank was observed during this site visit; the liquid was at an acceptable level. S+G will continue to monitor the liquid level of the condensate tank.

- **Filter Tank:** The filter tank was observed during this site visit; the liquid was at an acceptable level. S+G will continue to monitor the liquid level of the filter tank.

- **Flare operation**: The flare was off, however the spark was working. Flare operation continues to be intermittent due to poor overall gas quality and low flow rate. S+G will continue to adjust the system to optimize gas flow and quality.

LFG MONITORING WELL (PERIMETER) MONITORING PROGRAM

Mr. Montezuma performed monitoring of the perimeter LFG monitoring network on December 29, 2014. Monitoring wells P1 and P7 measured 43.4% and 29.2% by volume of CH_4, which is over the 100% Lower Explosive Limit (LEL). Monitoring wells P12 measured 0.9% by volume of CH_4 (18% LEL), and P13 measured 3 % by volume of CH_4 (60% LEL). All other wells, monitored during this event, had no detectable concentrations of CH_4. Results of

this monitoring event are included in **Attachment 1**. **Attachment 2** provides a CH_4 concentration graph over time for monitoring wells that have historically had methane present. The current well network will continue to be monitored and data will be reported to NCDENR and the County.

UPDATE ON TEMPORARY CONNECTION TO LFG MONITORING WELL P3 TO THE COLLECTION SYSTEM

Summary of work performed on September 12, 2014: a 3" PVC pipe connection was installed from monitoring well P3 to extraction well W-9.

Mr. Montezuma measured the CH_4 content at W-9 to be 22.7% and P3 measured 0%. Note that the gate valve at P3 was closed for almost 2 hours before the monitoring at P3 occurred, therefore any LFG in the vicinity should have equilibrated in P3.

Monitoring well P1 has increased in CH_4 content by volume compared to November 2014, however it remains below the 2014 average (49.9%), but it is still above the LEL. P7 shows a similar CH_4 content compared to earlier months in 2014, with a concentration still above the LEL. Compared to November 2014 measurements, P11 measured 0% CH_4 by volume; but P12 measured 0.9% CH_4 by volume. The only other time that P12 has shown a measurement other than 0% was December 2011. Lastly P13 shows a slightly higher CH_4 content (3%) compared to 2014 average (2.5%), but it is still below the LEL.

The next routine monitoring event is scheduled for January 2015. If you have any questions, or require additional information, please contact us at your earliest convenience at 919-828-0577 or by e-mail (address below).

Sincerely,
SMITH GARDNER, INC.

Jorge Montezuma
Project Scientist, ext. 140
jorge@smithgardnerinc.com

Joan A. Smyth, P.G.
Senior Hydrogeologist ext. 221
joan@smithgardnerinc.com

Attachments

cc: Buddy Norris – Avery County
Deb Aja – NCDENR
file

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FIGURE

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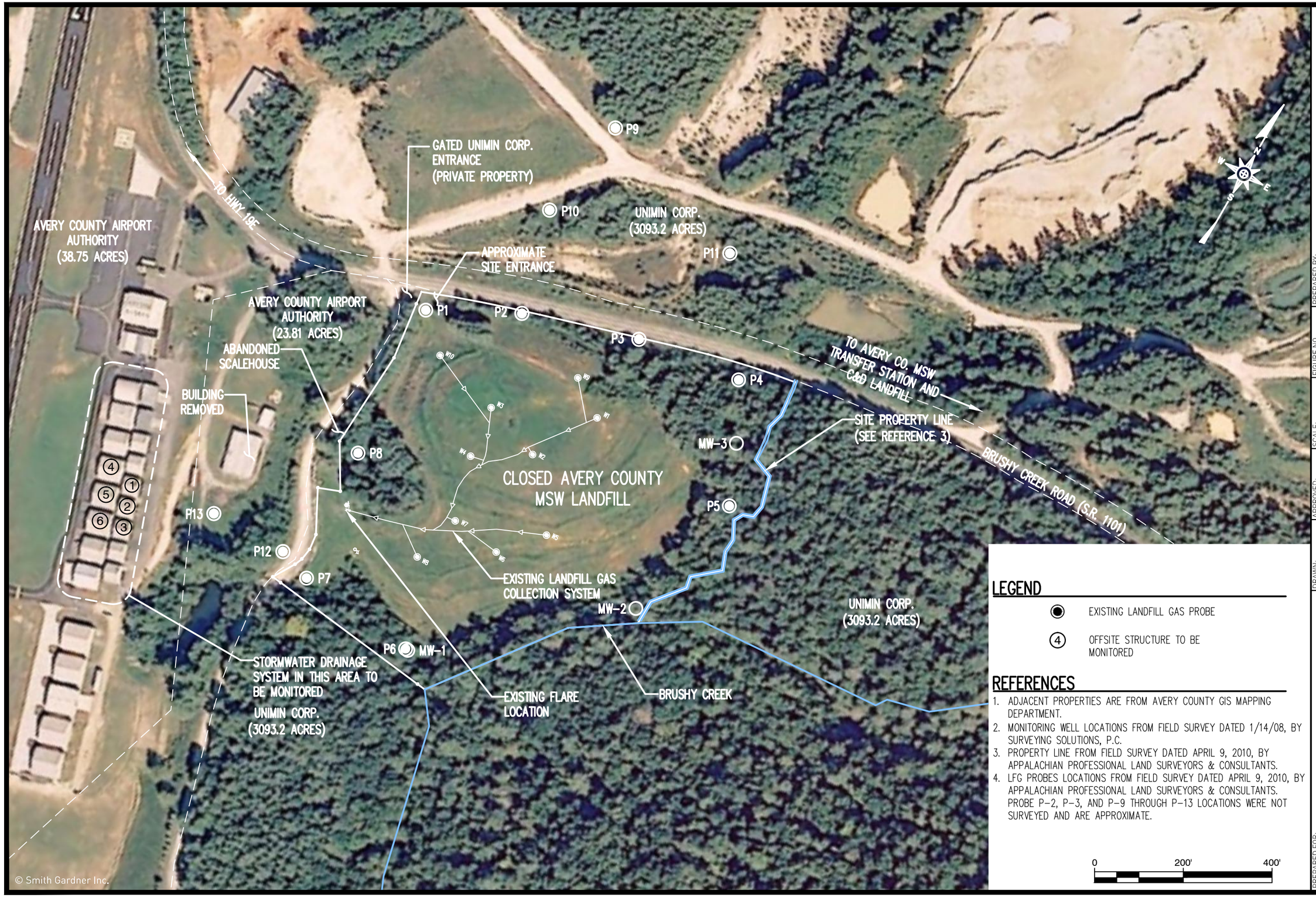

LEGEND

- EXISTING LANDFILL GAS PROBE
- ④ OFFSITE STRUCTURE TO BE MONITORED

REFERENCES

1. ADJACENT PROPERTIES ARE FROM AVERY COUNTY GIS MAPPING DEPARTMENT.
2. MONITORING WELL LOCATIONS FROM FIELD SURVEY DATED 1/14/08, BY SURVEYING SOLUTIONS, P.C.
3. PROPERTY LINE FROM FIELD SURVEY DATED APRIL 9, 2010, BY APPALACHIAN PROFESSIONAL LAND SURVEYORS & CONSULTANTS.
4. LFG PROBES LOCATIONS FROM FIELD SURVEY DATED APRIL 9, 2010, BY APPALACHIAN PROFESSIONAL LAND SURVEYORS & CONSULTANTS. PROBE P-2, P-3, AND P-9 THROUGH P-13 LOCATIONS WERE NOT SURVEYED AND ARE APPROXIMATE.

0 200' 400'

PREPARED FOR:

LANDFILL GAS MONITROING SYSTEM
AVERY COUNTY CLOSED MSWLF
SPRUCE PINE, NORTH CAROLINA

PREPARED BY:

SMITH+GARDNER
NC LIC. NO. C-0828 [ENGINEERING]
14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577

FIGURE NO:	1
FILENAME:	AVERY-B0216
SCALE:	AS SHOWN
APPROVED:	D.M.M.
PROJECT NO:	AVERY 13-6
DRAWN:	K.C.B.
DATE:	Dec 2013

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TABLE

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SMITH+GARDNER

DATE: January 11, 2015
BY: JLM

TABLE 1
Avery County Closed MSW Landfill
Landfill Gas Collection and Control System Monitoring
December 2014

DataField - GEM Mode Data Output

Device ID	Date/Time	CH4	CO2	O2	Balance	Init. Temperature	Init. Static Pressure	Adj. Static Pressure	Adj. Diff. Pressure*	Init. Flow	Adj. Flow	System Pressure
	mm/dd/yyyy	%	%	%	%	deg F	in H2O	in H2O	in H2O	Scfm	Scfm	in H2O
AVERY-W1	12/29/2014 9:58	43.1	18.4	7.6	30.9	52	-42.5	-42.5	-0.005	<<>>	<<>>	-42.58
AVERY-W2	12/29/2014 8:41	51.5	27.3	1	20.2	58	-42.6	-42.6	-6.437	<<>>	<<>>	-42.64
AVERY-W3	12/29/2014 8:37	52.6	24.5	4.1	18.8	57	-42.5	-42.4	-5.686	<<>>	<<>>	-42.47
AVERY-W4	12/29/2014 8:45	24.1	20.7	3.2	52	54	-39.9	-39.9	2.686	<<>>	60	-42.69
AVERY-W5	12/29/2014 9:04	30	26.1	0.1	43.8	58	-41.3	-41.3	6.519	<<>>	7	-42.79
AVERY-W6	12/29/2014 9:00	7	16.6	5.9	70.5	63	-8.8	-8	0.065	<<>>	16	-42.88
AVERY-W7	12/29/2014 8:53	8.9	16	5.6	69.5	63	-3.1	-3.1	1.918	0	0	-42.88
AVERY-W8	12/29/2014 8:56	12.9	21	3.8	62.3	60	-11.8	-11.8	1.599	<<>>	82	-42.84
AVERY-W9	12/29/2014 7:51	22.7	19.6	0.5	57.2	53	-37.8	-37.5	2.57	5	5	-37.52
AVERY-W10	12/29/2014 8:32	4.4	3	19.6	73	54	14.92	-42.6	8.149	4	8	-42.6
Av-Flare	12/29/2014 10:14	11.7	14.8	7.4	66.1	0	1.7	1.8	2.121	35	34	N/A

*The differential pressure measurement should be positive. A negative differential pressure indicates no gas flow. Negative differential pressure may be he result of dirt or water obstructing the pitot tube perforations. Overpulling by adjacent extractions wells may also result in negative pressure being displayed.

<<>> = measurement out of range of GEM 2000 meter. The reading was likely too low for measurement by the instrument.

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ATTACHMENT 1

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NC Division of Waste Management - Solid Waste Section
Landfill Gas Monitoring Data 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).

Facility Name: Avery County Closed Landfill Permit Number: 06-01

Date of Sampling: 12/29/14 NC Landfill Rule (.0500 or .1600): .0500

Name and Position of Sample Collector: Jorge L. Montezuma, EI, Staff Engineer, S+G

Type and Serial Number of Gas Meter: GEM2000 / GM12266 Calibration Date of Gas Meter: 11/10/2014

Date and Time of Field Calibration: 12/29/14 @ 9:34 AM

Type of Field Calibration Gas (15/15 or 35/50): 15/15 Expiration Date of Field Calibration Gas Canister: 9/7/2017

Pump Rate of Gas Meter: 0.5 L/min

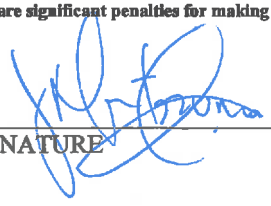
Ambient Air Temperature: 55 Barometric Pressure: 27.17 " Hg General Weather Conditions: Cloudy

Instructions: Under "Location or LFG Well" identify the monitoring wells or describe the location for other tests (e.g., inside buildings). A drawing showing the location of test must be attached. Report methane readings in both % LEL and % methane by volume. A reading in percent methane by volume can be converted to % LEL as follows: % methane by volume = % LEL/20

Location or LFG Well ID	Sample Tube Purge	Time	Time Pumped (s)	Initial %LEL	Stabilized %LEL	%CH4 by Volume	%O2	%CO2	Notes
Avery County Airport Structure #1									
NE Corner	>60s	9:40	>60s	0	0	0	20.8	0	
NW Corner	>60s	9:42	>60s	0	0	0	20.9	0	
SE Corner	>60s	9:44	>60s	0	0	0	20.7	0	
SW Corner	>60s	9:46	>60s	0	0	0	20.8	0	
Avery County Airport Structure #2									
NE Corner	>60s	9:48	>60s	0	0	0	20.8	0	
NW Corner	>60s	9:50	>60s	0	0	0	20.8	0	
SE Corner	>60s	9:52	>60s	0	0	0	20.7	0	
SW Corner	>60s	9:54	>60s	0	0	0	20.9	0	
Avery County Airport Structure #3									
NE Corner	>60s	9:56	>60s	0	0	0	20.9	0	
NW Corner	>60s	9:58	>60s	0	0	0	21.0	0	
SE Corner	>60s	10:00	>60s	0	0	0	21.0	0	
SW Corner	>60s	10:02	>60s	0	0	0	20.9	0	
Avery County Airport Structure #4									
NE Corner	>60s	10:04	>60s	0	0	0	20.9	0	
NW Corner	>60s	10:06	>60s	0	0	0	20.8	0	
SE Corner	>60s	10:08	>60s	0	0	0	21.0	0	
SW Corner	>60s	10:10	>60s	0	0	0	20.9	0	
Avery County Airport Structure #5									
NE Corner	>60s	10:12	>60s	0	0	0	20.8	0	
NW Corner	>60s	10:14	>60s	0	0	0	21.0	0	
SE Corner	>60s	10:16	>60s	0	0	0	20.8	0	
SW Corner	>60s	10:18	>60s	0	0	0	20.9	0	

If your facility has more gas monitoring locations than there is room on this form, please attach additional sheets listing the same information as contained on this form.

Certification To the best of my knowledge, the information reported and statements made on this data submittal and attachments are true and correct. I am aware that there are significant penalties for making any false statement, representation, or certification including the possibility of a fine and imprisonment.



SIGNATURE

STAFF ENGINEER, S+G
TITLE

NC Division of Waste Management - Solid Waste Section
Landfill Gas Monitoring Data 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).

Facility Name: Avery County Closed Landfill Permit Number: 06-01

Date of Sampling: 12/29/14 NC Landfill Rule (.0500 or .1600): .0500

Name and Position of Sample Collector: Jorge L. Montezuma, EI, Staff Engineer, S+G

Type and Serial Number of Gas Meter: GEM2000 / GM12266 Calibration Date of Gas Meter: 11/10/2014

Date and Time of Field Calibration: 12/29/14 @ 9:34 AM

Type of Field Calibration Gas (15/15 or 35/50): 15/15 Expiration Date of Field Calibration Gas Canister: 9/7/2017

Pump Rate of Gas Meter: 0.5 L/min

Ambient Air Temperature: 55 Barometric Pressure: 27.17 " Hg General Weather Conditions: Cloudy

Instructions: Under "Location or LFG Well" identify the monitoring wells or describe the location for other tests (e.g., inside buildings). A drawing showing the location of test must be attached. Report methane readings in both % LEL and % methane by volume. A reading in percent methane by volume can be converted to % LEL as follows: % methane by volume = % LEL/20

Location or LFG Well ID	Sample Tube Purge	Time	Time Pumped (s)	Initial %LEL	Stabilized %LEL	%CH4 by Volume	%O2	%CO2	Notes
Avery County Airport Structure #6									
NE Corner	>60s	10:20	>60s	0	0	0	20.9	0	
NW Corner	>60s	10:22	>60s	0	0	0	20.8	0	
SE Corner	>60s	10:24	>60s	0	0	0	20.8	0	
SW Corner	>60s	10:26	>60s	0	0	0	20.8	0	

If your facility has more gas monitoring locations than there is room on this form, please attach additional sheets listing the same information as contained on this form.

Certification To the best of my knowledge, the information reported and statements made on this data submittal and attachments are true and correct. I am aware that there are significant penalties for making any false statement, representation, or certification including the possibility of a fine and imprisonment.

SIGNATURE

STAFF ENGINEER, S+G
TITLE

NC Division of Waste Management - Solid Waste Section
Landfill Gas Monitoring Data Form

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Facility Name: Avery County Closed Landfill Permit Number: 06-01

Date of Sampling: 12/29/14 **NC Landfill Rule (.0500 or .1600):** .0500

Name and Position of Sample Collector: Jorge L. Montezuma, EI, Staff Engineer, S+G

Type and Serial Number of Gas Meter: GEM2000 / GM07002HP Calibration Date of Gas Meter: 11/17/2014

Date and Time of Field Calibration: 12/29/14 9:34 AM

Type of Field Calibration Gas (15/15 or 35/50): 15/15 Expiration Date of Field Calibration Gas Canister: 9/7/2017

Pump Rate of Gas Meter: 0.5 L/min

Ambient Air Temperature: 55 Barometric Pressure: 27.17 in Hg General Weather Conditions: Cloudy

Instructions: Under "Location or LFG Well" identify the monitoring wells or describe the location for other tests (e.g., inside buildings). A drawing showing the location of test must be attached. Report methane readings in both % LEL and % methane by volume. A reading in percent methane by volume can be converted to % LEL as follows: % methane by volume = % LEL/20

Location or LFG Well ID	Sample Tube Purge	Time	Time Pumped (s)	Initial %LEL	Stabilized %LEL	%CH4 by Volume	%O2	%CO2	Notes
P-1	> 60 s	11:22	> 60 s	0	>100	43.4	2.5	22.7	
P-2	> 60 s	11:05	> 60 s	0	0	0	21.1	0	
P-3	> 60 s	12:50	> 60 s	0	0	0	21.0	0	
P-4	> 60 s	11:00	> 60 s	0	0	0	19.5	3.4	
P-5	> 60 s	12:31	> 60 s	0	0	0	20.6	0.7	
P-6	> 60 s	12:39	> 60 s	0	0	0	19.4	1.7	
P-7	> 60 s	12:21	> 60 s	>100	>100	29.3	1.9	12.8	
P-8	> 60 s	12:17	> 60 s	0	0	0	20.0	2.8	
P-9	> 60 s	11:15	> 60 s	0	0	0	20.1	1.1	
P-10	> 60 s	11:19	> 60 s	0	0	0	18.6	2.3	
P-11	> 60 s	11:11	> 60 s	0	0	0	21.1	0	
P-12	> 60 s	12:24	> 60 s	5	18	0.9	14.7	17.8	
P-13	> 60 s	10:36	> 60 s	56	60	3	12.3	2.8	

If your facility has more gas monitoring locations than there is room on this form, please attach additional sheets listing the same information as contained on this form.

Certification To the best of my knowledge, the information reported and statements made on this data submittal and attachments are true and correct. I am aware that there are significant penalties for making any false statement, representation, or certification including the possibility of a fine and imprisonment.

SIGNATURE

STAFF ENGINEER, S+G
TITLE

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ATTACHMENT 2

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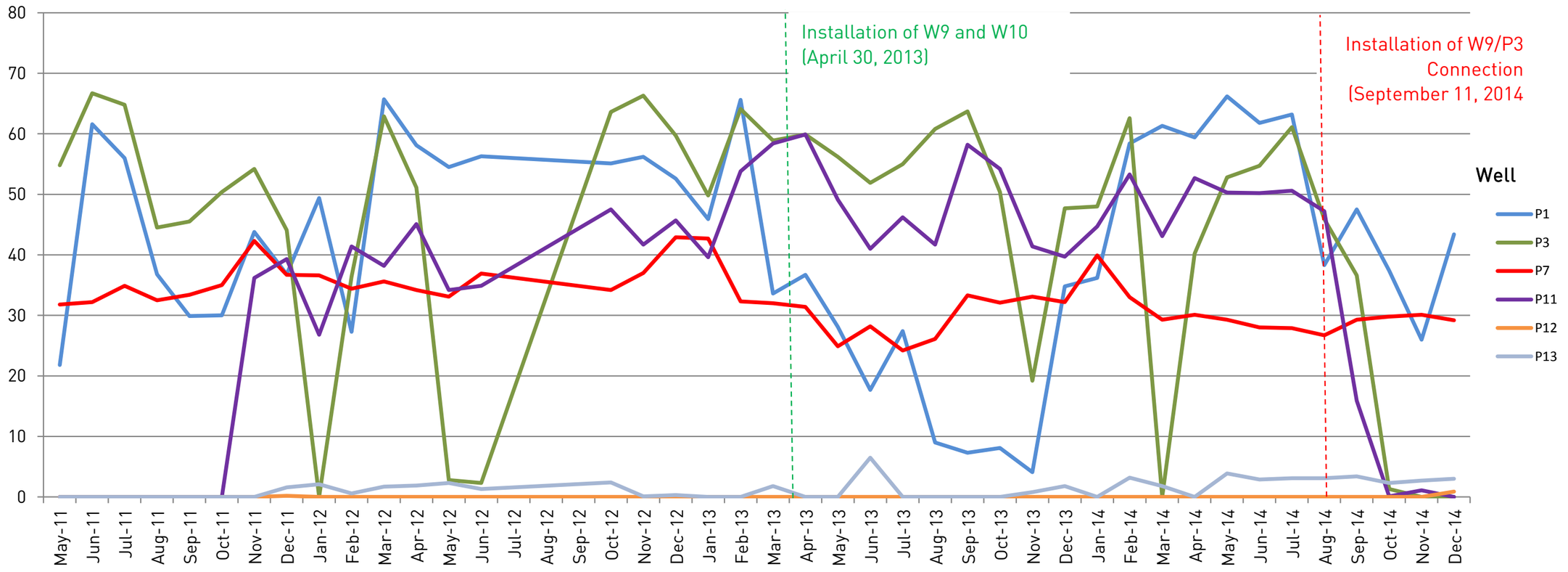
SMITH+GARDNER

By: DMM
Updated by: JLM
Date: 1/11/2015

Avery County MSW Landfill
Landfill Gas Monitoring Well Network
Methane Concetrations Between May 2011 and December 2014



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