

August 20, 2015

Ms. Jaclynne Drummond
NCDENR DWM Solid Waste Section
2090 U.S. 70 Highway
Swannanoa, North Carolina 28778-8211

**RE: Operations, Monitoring, and Maintenance Report – July 2015
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 July 2015 monitoring period. Mr. Don Misenheimer with S+G performed the site visit on July 23, 2015. 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 approved² 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:

- CH₄, O₂, CO₂, and pressure monitoring at each extraction well head;
- CH₄, O₂, CO₂, 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 July 23, 2015. Initial measurements indicated there was approximately 24 inches of available vacuum average throughout the well field, ranging from approximately 24 to 25 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 (CH₄), oxygen (O₂), carbon dioxide (CO₂), 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 W5, W7, W9, and W10 during each site visit. As LFG flow potential at these locations remains 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 the July 2015 site visit and the liquid level was found to be at an acceptable level. S+G will continue to monitor the liquid level of the filter tank.
- **Flare operation:** The flare was off when S+G arrived on-site, however the spark was working. The flare was able to be ignited prior to S+G leaving the site. S+G will continue to adjust the system to optimize gas flow and quality.

LFG MONITORING WELL (PERIMETER) MONITORING PROGRAM

Mr. Misenheimer performed monitoring of the perimeter LFG monitoring network during this event. Monitoring wells P1 and P7 measured 36.6% and 24.6% by volume of CH₄, which is over the 100% Lower Explosive Limit (LEL); well P13 measured 2.1% by volume of CH₄. All other wells, monitored during this event, had no detectable concentrations of CH₄. Results of this monitoring event are included in **Attachment 1**. **Attachment 2** provides a CH₄ 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.

CONCLUSIONS

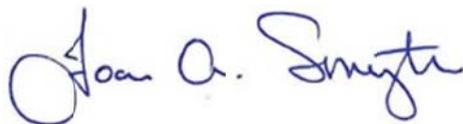
The CH₄ content in monitoring wells P1 and P7 decreased from the previous month, however the concentrations remains above the LEL.

The next routine monitoring event is scheduled for the third week of 2nd week August 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.



Don M. Misenheimer
Project Scientist, ext. 224
don@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.

PREPARED BY: **SMITH+GARDNER**
NC LIC. NO. C-0828 (ENGINEERING)
14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577

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

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

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TABLE

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TABLE 1
Avery County Closed MSW Landfill
Landfill Gas Collection and Control System Monitoring
July 2015

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	7/23/2015 8:31	68.7	31.1	0.1	0.1	80	-22.1	-22	0	<<>>	0	-24.14
AVERY-W2	7/23/2015 8:41	54.7	29.5	0.1	15.7	79	-24.9	-24.9	-0.08	<<>>	<<>>	-24.95
AVERY-W3	7/23/2015 8:53	62.2	35.5	0.2	2.1	80	-24.8	-24.7	-0.031	<<>>	<<>>	-24.01
AVERY-W4	7/23/2015 8:49	49.7	29	0.3	21	81	-23.6	-23.6	-0.048	<<>>	<<>>	-24.08
AVERY-W5	7/23/2015 9:13	6.6	8.4	16.2	68.8	82	-23.7	-23.8	0.016	2	6	-24.33
AVERY-W6	7/23/2015 9:20	12.8	21.9	5.2	60.1	82	-7.2	-7.1	0.111	8	8	-24.21
AVERY-W7	7/23/2015 9:08	14.4	18.1	4.1	63.4	82	-2.3	-2.2	2.616	<<>>	2	-24.43
AVERY-W8	7/23/2015 9:27	11.4	22	6.8	59.8	81	-24	-24.8	0.021	10	14	-24.11
AVERY-W9	7/23/2015 8:36	23.3	36.1	0.1	40.5	80	-22.9	-22.9	-0.047	<<>>	<<>>	-24.32
AveryW10	7/23/2015 8:59	38.1	25.2	6.7	30	81	-24	-24	0.099	0	0	-24.19
Av-Flare	7/23/2015 9:33	12.9	15.5	11.8	59.8	N/A	2.4	2.4	2.214	25	26	N/A

*The differential pressure measurement should be positive. A negative differential pressure indicates no gas flow. Negative differential pressure may be the result of dirt or water obstructing the pitot tube perforations. Overpulling by adjacent extraction 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: 7/23/2015 NC Landfill Rule (.0500 or .1600): .0500

Name and Position of Sample Collector: Don Misenheimer, S+G

Type and Serial Number of Gas Meter: GEM2000 / GM07002HP Calibration Date of Gas Meter: 7/17/2015

Date and Time of Field Calibration: 7/23/15 8:11 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

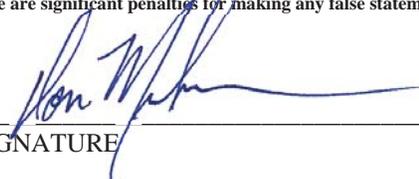
Ambient Air Temperature: 84 Barometric Pressure: 27.26 in Hg General Weather Conditions: Sunny

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	1048	>60s	0	0	0	21.0	0	
NW Corner	>60s	1050	>60s	0	0	0	21.0	0	
SE Corner	>60s	1052	>60s	0	0	0	20.9	0	
SW Corner	>60s	1054	>60s	0	0	0	20.9	0	
Avery County Airport Structure #2									
NE Corner	>60s	1056	>60s	0	0	0	20.9	0	
NW Corner	>60s	1058	>60s	0	0	0	20.9	0	
SE Corner	>60s	1100	>60s	0	0	0	20.9	0	
SW Corner	>60s	1102	>60s	0	0	0	20.9	0	
Avery County Airport Structure #3									
NE Corner	>60s	1104	>60s	0	0	0	21.0	0	
NW Corner	>60s	1106	>60s	0	0	0	20.9	0	
SE Corner	>60s	1108	>60s	0	0	0	20.9	0	
SW Corner	>60s	1110	>60s	0	0	0	21.0	0	
Avery County Airport Structure #4									
NE Corner	>60s	1112	>60s	0	0	0	20.9	0	
NW Corner	>60s	1114	>60s	0	0	0	20.9	0	
SE Corner	>60s	1116	>60s	0	0	0	20.9	0	
SW Corner	>60s	1118	>60s	0	0	0	20.9	0	
Avery County Airport Structure #5									
NE Corner	>60s	1120	>60s	0	0	0	20.9	0	
NW Corner	>60s	1122	>60s	0	0	0	20.9	0	
SE Corner	>60s	1124	>60s	0	0	0	21.0	0	
SW Corner	>60s	1126	>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

Project Scientist, S+G

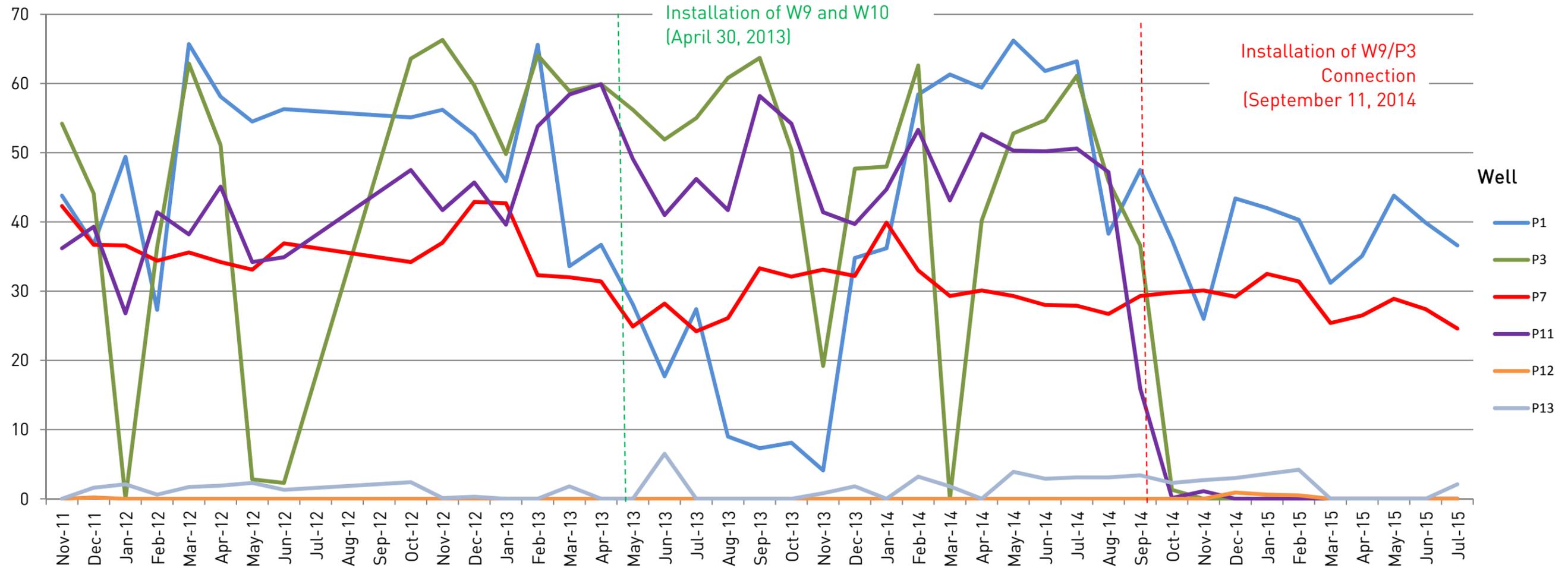
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ATTACHMENT 2

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Avery County MSW Landfill Landfill Gas Monitoring Well Network Methane Concentrations Between May 2011 and July 2015

% CH4 by
 Volume



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