SMITH+GARDNER
ENGINEERS

ADDRESS 14 N. Boylan Avenue, Raleigh NC 27603 TEL 919.828.0577 WEB www.smithgardnerinc.com

July 21, 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 – June 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 June 2015 monitoring period. Mr. Don Misenheimer with S+G performed the site visit on June 26, 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 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 June 26, 2015. Initial measurements indicated there was approximately 21 inches of available vacuum average throughout the well field, ranging from approximately 21 to 22 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 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 June 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 39.9% and 27.4% by volume of CH_4, which is over the 100% Lower Explosive Limit (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.

CONCLUSIONS

The CH_4 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 July2015. 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.

0 200' 400'

PREPARED BY:

NC LIC. NO. C-0928 [ENGINEERING]

SMITH+GARDNER

14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577

DRAWN:	APPROVED:	SCALE:	FIGURE NO:	PREPARED BY:
K.C.B.	D.M.M.	AS SHOWN	1	

DATE:	PROJECT NO:	FILENAME:
Dec 2013	AVERY 13-6	AVERY-B0216

PREPARED FOR:

LANDFILL GAS MONITRO1NG SYSTEM
AVERY COUNTY CLOSED MSWLF
SPRUCE PINE, NORTH CAROLINA

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TABLE

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SMITH+GARDNER

DATE: June 26, 2015
BY: DMM

TABLE 1
Avery County Closed MSW Landfill
Landfill Gas Collection and Control System Monitoring
June 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	6/26/2015 10:19	70.3	29.4	0.2	0.1	78	-20.9	-21	0	<<>>	0	-21.09
AVERY-W2	6/26/2015 10:27	54.1	29.3	0.2	16.4	79	-21.1	-21.1	-0.074	<<>>	<<>>	-21.13
AVERY-W3	6/26/2015 10:32	66.6	30	0.4	3	80	-21.1	-21.1	-0.029	<<>>	<<>>	-21.09
AVERY-W4	6/26/2015 10:30	48.4	29.7	0.3	21.6	82	-20.6	-20.6	-0.057	<<>>	<<>>	-21.12
AVERY-W5	6/26/2015 10:38	5.7	5.7	17.6	71	83	-20.7	-20.3	0.611	3	4	-21.18
AVERY-W6	6/26/2015 10:42	10.1	19.5	5.5	64.9	83	-5.1	-5.2	0.016	9	6	-21.11
AVERY-W7	6/26/2015 10:47	16.4	14.4	3.7	65.5	83	-1.8	-1.8	2.818	<<>>	1	-21.04
AVERY-W8	6/26/2015 10:59	12.1	16.3	6.6	65	85	-21	-21.3	0.032	12	19	-21.09
AVERY-W9	6/26/2015 10:22	24.8	31.1	0.1	44	83	-20.9	-20.9	-0.035	<<>>	<<>>	-21.03
AveryW10	6/26/2015 10:34	38.6	21.3	6.8	33.3	83	-21	-21	0.025	0	0	-21.07
Av-Flare	6/26/2015 11:07	13.7	12.3	12.5	61.5	0	2.1	2.1	2.354	24	28	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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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 Co Closed MSW Landfill	Brushy Creek Road Spruce Pine, NC	06-01	.0500	6/26/15

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. — Facility Representative Name (Print)

Senior Hydrogeologist — Title

919-828-0577 x 221 — (Area Code) Telephone Number

Joan Smyth — Signature

7/22/15 — Date

Affix NC Licensed/ Professional Geologist Seal

NORTH CAROLINA LICENSED SEAL 1369 GEOLOGIST JOAN A. SMYTH 7/22/15

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

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: 6/26/15 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: 11/17/2014

Date and Time of Field Calibration: 6/26/15 11:15AM

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: 92 Barometric Pressure: 27.23 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
P-1	> 60 s	11:44	> 60 s	>100	>100	39.9	4.1	18.6	
P-2	> 60 s	11:42	> 60 s	0	0	0	20.5	0.1	
P-3	> 60 s	11:40	> 60 s	0	0	0	21.0	0.3	
P-4	> 60 s	11:38	> 60 s	0	0	0	19.3	0.5	
P-5	> 60 s	11:31	> 60 s	0	0	0	20.4	0.2	
P-6	> 60 s	11:24	> 60 s	0	0	0	17.9	1.2	
P-7	> 60 s	11:21	> 60 s	>100	>100	27.4	1.3	11.7	
P-8	> 60 s	11:17	> 60 s	0	0	0	20.0	2.7	
P-9	> 60 s	11:51	> 60 s	0	0	0	19.5	0.8	
P-10	> 60 s	11:53	> 60 s	0	0	0	15.2	3.7	
P-11	> 60 s	11:57	> 60 s	0	0	0	20.5	0.2	
P-12	> 60 s	11:19	> 60 s	0	0	0	15.4	8.6	
P-13	> 60 s	12:17	> 60 s	0	0	0	0.3	14.1	

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
TITLE

NC Division of Waste Management - Solid Waste Section
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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	12:08	>60s	0	0	0	21.0	0	
NW Corner	>60s	12:10	>60s	0	0	0	21.0	0	
SE Corner	>60s	12:12	>60s	0	0	0	20.9	0	
SW Corner	>60s	12:14	>60s	0	0	0	20.9	0	
Avery County Airport Structure #2									
NE Corner	>60s	12:16	>60s	0	0	0	21.0	0	
NW Corner	>60s	12:18	>60s	0	0	0	20.9	0	
SE Corner	>60s	12:20	>60s	0	0	0	21.0	0	
SW Corner	>60s	12:22	>60s	0	0	0	20.9	0	
Avery County Airport Structure #3									
NE Corner	>60s	12:24	>60s	0	0	0	21.0	0	
NW Corner	>60s	12:26	>60s	0	0	0	21.0	0	
SE Corner	>60s	12:28	>60s	0	0	0	21.0	0	
SW Corner	>60s	12:30	>60s	0	0	0	21.0	0	
Avery County Airport Structure #4									
NE Corner	>60s	12:32	>60s	0	0	0	20.9	0	
NW Corner	>60s	12:34	>60s	0	0	0	21.0	0	
SE Corner	>60s	12:36	>60s	0	0	0	20.9	0	
SW Corner	>60s	12:38	>60s	0	0	0	20.9	0	
Avery County Airport Structure #5									
NE Corner	>60s	12:40	>60s	0	0	0	20.9	0	
NW Corner	>60s	12:42	>60s	0	0	0	20.9	0	
SE Corner	>60s	12:44	>60s	0	0	0	20.9	0	
SW Corner	>60s	12:46	>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
TITLE

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

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Date of Sampling: 6/26/2015 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: 11/17/2014

Date and Time of Field Calibration: 6/26/15 11:15 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: 92 Barometric Pressure: 27.23 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 #6									
NE Corner	>60s	12:48	>60s	0	0	0	20.9	0	
NW Corner	>60s	12:50	>60s	0	0	0	20.9	0	
SE Corner	>60s	12:52	>60s	0	0	0	20.9	0	
SW Corner	>60s	12:54	>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.

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SIGNATURE

Project Scientist, S+G
TITLE

ATTACHMENT 2

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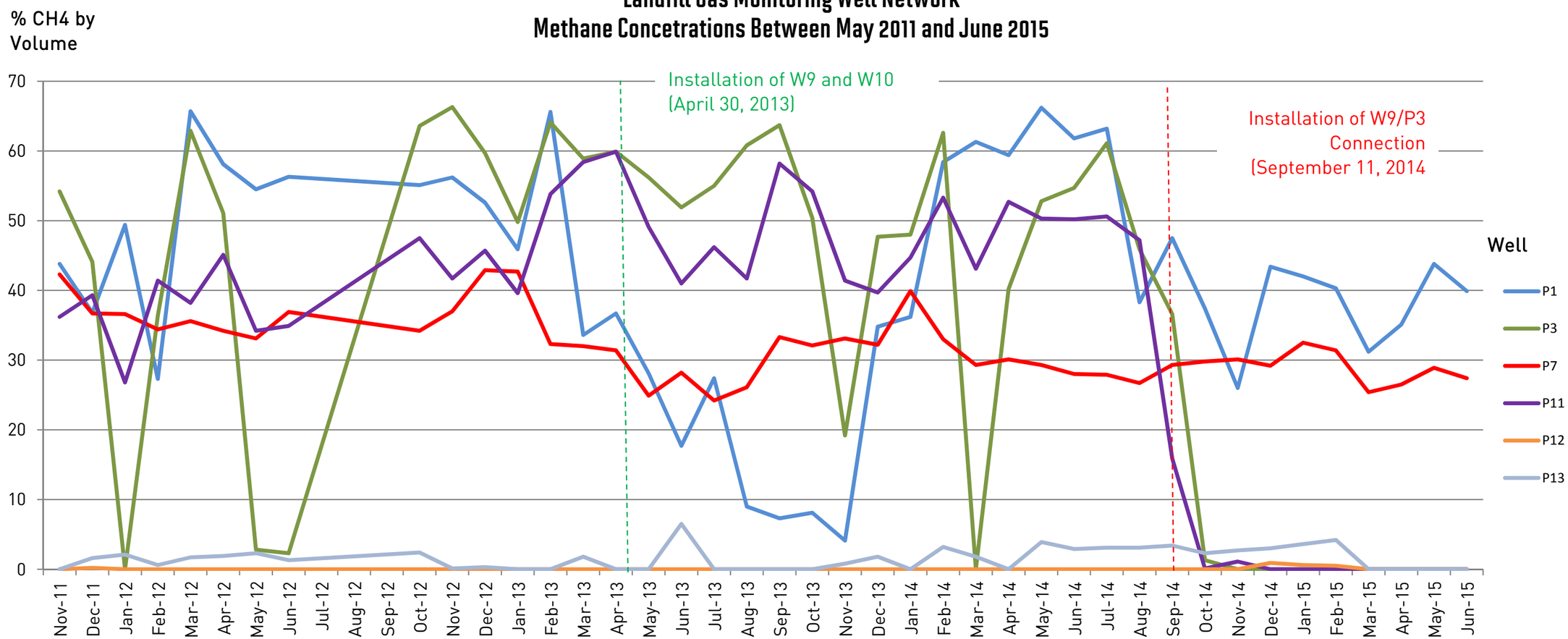
SMITH+GARDNER

By: DMM
Updated by: DMM
Date: 7/21/2015

Avery County MSW Landfill
Landfill Gas Monitoring Well Network
Methane Concetrations Between May 2011 and June 2015



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