

December 7, 2012

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

RE: **Operations, Monitoring, and Maintenance Report – June 2012**  
**Avery County Closed MSW Landfill**  
**Spruce Pine, North Carolina**

Dear Ms. Drummond:

This report provides information concerning the operation and monitoring (O&M) of the Avery County Closed MSW Landfill (Permit No. 06-01) Landfill Gas Collection and Control System (LFGCCS). This report covers the November 2012 monitoring period. Mr. Don Misenheimer with S+G performed the November site visit on November 29, 2012. Details of this inspection are provided below.

## **ACTION LIST**

S+G has identified the following items to be addressed in order 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*<sup>1</sup>, has been approved<sup>2</sup> by the division of Waste Management. Phase One of the expansion project will consist of:
  - installation of two (2) landfill gas extraction wells that are four inches in diameter and approximately 60 feet deep on the northern portion of the property between current landfill gas extraction wells W1 and W3 and the limits of waste near Brushy Creek Road;
  - installation of an isolation valve along the landfill gas header to isolate the southern landfill gas extraction wells; and
  - installation of a flare collar extension;

Phase Two of the expansion project will be discussed in a similar report when Phase One has been evaluated as effective. Phase One of the system expansion is currently planned for January 2013. Monthly LFG monitoring will continue at the site.

<sup>1</sup> *Annual Landfill Gas Monitoring Report*, Closed Avery County MSW Landfill. Submitted by Smith Gardner, November 2012.

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

2. **W-1 and W-3:** These wells have been determined to be watered out/totally clogged. **The approved expansion discussed above should improve over-all gas quality at the flare as well as substantially increasing LFG flow across the site.**
3. **W-2 and W-4:** These wells have been determined to be partially watered out/partially clogged and are only able have minimal system pressure applied for LFG extraction. **The approved expansion discussed above should improve over-all gas quality at the flare as well as substantially increasing LFG flow across the site.**
4. **Flare:** Flare “blow out” and re-lighting problems seem to be present during steady wind conditions. An extended flare collar should be considered. **The approved expansion discussed above includes the installation of a flare collar extension.**

### **LFG EXTRACTION WELL MONITORING REQUIREMENTS**

As set forth in the *Off-site Landfill Gas Mitigation Plan*<sup>3</sup>, approved, via letter, on February 10, 2011 by NCDENR Division of Waste Management<sup>4</sup>, monthly monitoring of the LFGCCS will include the following:

- CH<sub>4</sub>, O<sub>2</sub>, CO<sub>2</sub>, and Pressure monitoring at each extraction well head;
- CH<sub>4</sub>, O<sub>2</sub>, CO<sub>2</sub>, and Pressure monitoring at the flare station; and
- Adjustment of LFGCCS to balance recovery and ensure safe operation of the system.

The County will maintain this LFGCCS for a period of at least 12 months to evaluate the effectiveness of increased LFG recovery from the waste mass in alleviating off-site migration of LFG. During this time, LFG monitoring at the landfill and for off-site properties will be continued on a monthly basis. Reporting of these results will be accordance with the approved LFG Monitoring Plan.

S+G submitted a revised Landfill Gas Monitoring Plan in February 2012. If this plan is approved by NCDENR, monitoring requirements may be updated.

### **LFG EXTRACTION WELL MONITORING ACTIVITIES**

S+G performed the flare station and well field monitoring on November 29, 2012. When S+G arrived to the site, there was approximately 30 inches of available vacuum at each of the LFG wells across the well field. The results of this event are summarized below. Recommended actions are made in **bold**. Well field data and flare station data are provided in the **attached Table 1**.

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<sup>3</sup> *Off-Site Gas Mitigation Plan*. Richardson Smith Gardner and Assoc. January 18, 2011

<sup>4</sup> *Off-Site Gas Mitigation Plan- Approval*. Letter from Jaclynne Drummond, NCDENR, February 10, 2011

The following actions were taken at the well field and flare station during this period:

### **Well Field**

- **W-1 through W-8:** S+G performed CH<sub>4</sub>, O<sub>2</sub>, CO<sub>2</sub>, and pressure monitoring and any required/needed adjustment at each extraction well head (adjustments consisted of slight changes of applied vacuum to the well)
- **Orifice Plates:** S+G continues to evaluate orifice plate sizes on wells W-5 through W-8 as necessary.

### **Flare Station**

- **Flare:** The flare was not burning when S+G arrived at the site. S+G manually restarted the flare twice during the site visit. The igniter was observed to be operational. Steady winds were present during the site visit and may be causing flare "blow out" and relighting problems. An extended flare collar installation is planned during the system expansion discussed above. S+G will replace the spark plug for the igniter during the December site visit.
- **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.**

### **LFG MONITORING WELL (PERIMETER) MONITORING**

S+G personnel conducted the November 2012 monitoring of the perimeter LFG monitoring wells on November 29, 2012. Results of this monitoring event are included in **Attachment 1**. Monitoring wells P1, P3, P7 and P11 each measured over the 100% LEL or 5% by volume of CH<sub>4</sub>. Monitoring well P13 measured less than 50% LEL or 2.5% by volume of CH<sub>4</sub>, while all other wells had no detectable concentrations of CH<sub>4</sub>. These wells will continue to be monitored and data will be submitted in this reporting format.

Ms. Jaclyne Drummond

December 7, 2012

Page 4

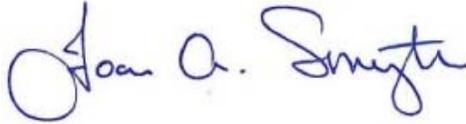
The next routine monitoring event is tentatively scheduled for the third week of December 2012. If you have any questions, or require additional information, please contact us at your earliest convenience at 919-828-0577 or by e-mail (address below).

Sincerely,

**SMITHGARDNER, INC.**



Don Misenheimer  
Project Scientist, ext. 224  
[don@rsgengineers.com](mailto:don@rsgengineers.com)



Joan A. Smyth, P.G.  
Senior Hydrogeologist ext. 221  
[joan@rsgengineers.com](mailto:joan@rsgengineers.com)

#### Attachments

CC: Buddy Norris – Avery County  
Deb Aja – NCDENR  
Stacey Smith, P.E. – S+G  
File

**FIGURE**

**Operations Monitoring and Maintenance Report - LFGCCS  
Avery County Closed MSW Landfill  
Permit No. 06-91**

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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: \_\_\_\_\_ NC LIC. NO. C-0828 (ENGINEERING)

**SMITH+GARDNER**  
14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577

DRAWN:	W.R.B.	APPROVED:	D.M.M.	FIGURE NO.:	1
SCALE:	AS SHOWN	PROJECT NO.:	AVERY 12-6	FILENAME:	AVERY-B0192
DATE:	Oct 2012	PREPARED FOR:			

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

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**TABLE**

**Operations, Monitoring and Maintenance Report - LFGCCS  
Avery County Closed MSW Landfill  
Permit No. 06-91**

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**TABLE 1**  
**Avery County Closed MSW Landfill**  
**Landfill Gas Collection and Control System Monitoring**  
**November 2012**

DataField CS - GEM Mode Data Output

Device ID	Date/Time mm/dd/yyyy	CH4 %	CO2 %	O2 %	Balance %	Adj. Temperature degF	Init. Static Pressure in H2O	Adj. Static Pressure in H2O	Adj. Diff. Pressure in H2O	Init. Flow Scfm	Adj. Flow Scfm	System Pressure in H2O
Avery-W1	11/29/2012 12:55	69.2	30.3	0.4	0.1	70	-32.7	-32.4	0.005	7	2	-33.22
Avery-W2	11/29/2012 13:00	74.4	25.2	0.2	0.2	72	-0.3	-3.8	0.017	5	5	-32.07
Avery-W3	11/29/2012 13:04	66.8	32.9	0.2	0.1	75	-30.9	-31.3	0.286	0	2	-31.23
Avery-W4	11/29/2012 13:08	36	19.4	8.1	36.5	75	-13.2	-13.3	0.063	4	3	-31.47
Avery-W5	11/29/2012 13:20	44.2	33.3	0.2	22.3	75	-19.5	-24.1	2.009	3	4	-30.49
Avery-W6	11/29/2012 13:24	14.4	23.8	2.3	59.5	75	-7.4	-6.5	0.829	4	2	-29.61
Avery-W7	11/29/2012 13:27	12.2	21.5	1.8	64.5	75	-1	-1	7.638	1	1	-30.23
Avery-W8	11/29/2012 13:30	20.1	28.9	0	51	75	-4.2	-5.7	1.605	2	3	-28.59
Flare Station	11/29/2012 13:39	37.2	27.2	3.4	32.2	N/A	0.9	N/A	0.637	17	N/A	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 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**

**Operations, Monitoring and Maintenance Report - LFGCCS  
Avery County Closed MSW Landfill  
Permit No. 06-91**

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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 MSW Landfill Permit Number: 06-01

Date of Sampling: 11-29-12 NC Landfill Rule (.0500 or .1600): .0500

Name and Position of Sample Collector: DON MISENHEIMER (S+G)

Type and Serial Number of Gas Meter: GMDS 397 GEM 2000 Calibration Date of Gas Meter: 11-26-12

Date and Time of Field Calibration: 11-29-12 12:00p + 1:42p

Type of Field Calibration Gas (15/15 or 35/50): 15/15 Expiration Date of Field Calibration Gas Canister: 04/13

Pump Rate of Gas Meter: 0.5 L/min

Ambient Air Temperature: 58° Barometric Pressure: 27.44 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
P1	7605	2:10p	7605	7100	7100	56.2	0.2	28.6	
P2	7605	2:06p	7605	0	0	0	20.4	0.2	
P3	7605	2:02p	7605	7100	7100	66.3	1.3	33.9	
P4	7605	2:00p	7605	0	0	0	17.9	3.7	
P5	7605	1:56p	7605	0	0	0	19.6	0.2	
P6	7605	1:53p	7605	0	0	0	18.0	2.8	
P7	7605	1:50p	7605	7100	7100	33.7	2.9	13.1	
P8	7605	1:44p	7605	0	0	0	19.9	2.2	
P9	7605	12:23p	7605	0	0	0	19.8	1.7	
P10	7605	12:20p	7605	0	0	0	19.2	0.7	

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.

Don Misener S+G  
SIGNATURE

PROJECT SCIENTIST  
TITLE

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

Date of Sampling: \_\_\_\_\_ NC Landfill Rule (.0500 or .1600): .0500

Name and Position of Sample Collector: [SAME AS PAGE 1]

Type and Serial Number of Gas Meter: \_\_\_\_\_ Calibration Date of Gas Meter: \_\_\_\_\_

Date and Time of Field Calibration: \_\_\_\_\_

Type of Field Calibration Gas (15/15 or 35/50): \_\_\_\_\_ Expiration Date of Field Calibration Gas Canister: \_\_\_\_\_

Pump Rate of Gas Meter: \_\_\_\_\_

Ambient Air Temperature: \_\_\_\_\_ Barometric Pressure: \_\_\_\_\_ General Weather Conditions: \_\_\_\_\_

**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	%CH <sub>4</sub> by Volume	%O <sub>2</sub>	%CO <sub>2</sub>	Notes
P11	7605	12:30p	7605	7100	7100	41.7	3.8	21.2	
P12	7605	12:16p	7605	0	0	0	20.1	2.3	
P13	7605	2:17p	7605	0	0	0.1	10.6	9.3	

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Don Muef STG  
SIGNATURE

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Date of Sampling: \_\_\_\_\_ NC Landfill Rule (.0500 or .1600): .0500

Name and Position of Sample Collector: SAME AS PAGE 1

Type and Serial Number of Gas Meter: \_\_\_\_\_ Calibration Date of Gas Meter: \_\_\_\_\_

Date and Time of Field Calibration: \_\_\_\_\_

Type of Field Calibration Gas (15/15 or 35/50): \_\_\_\_\_ Expiration Date of Field Calibration Gas Canister: \_\_\_\_\_

Pump Rate of Gas Meter: \_\_\_\_\_

Ambient Air Temperature: \_\_\_\_\_ Barometric Pressure: \_\_\_\_\_ General Weather Conditions: \_\_\_\_\_

**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	760s	2:18p	760s	0	0	0	✓	✓	} O <sub>2</sub> + CO <sub>2</sub> NORMAL
NW Corner	760s	2:22p	760s	0	0	0	✓	✓	
SE Corner	760s	2:24p	760s	0	0	0	✓	✓	
SW Corner	760s	2:26p	760s	0	0	0	✓	✓	
ADD ANY ADDITIONAL LOCATIONS AT OR NEAR STRUCTURE WITH METHANE PRESENT BELOW OR ON ADDITIONAL SHEETS									

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[Signature]  
SIGNATURE

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Date of Sampling: \_\_\_\_\_ NC Landfill Rule (.0500 or .1600): .0500

Name and Position of Sample Collector: [ SAME AS PAGE 1 ]

Type and Serial Number of Gas Meter: \_\_\_\_\_ Calibration Date of Gas Meter: \_\_\_\_\_

Date and Time of Field Calibration: \_\_\_\_\_

Type of Field Calibration Gas (15/15 or 35/50): \_\_\_\_\_ Expiration Date of Field Calibration Gas Canister: \_\_\_\_\_

Pump Rate of Gas Meter: \_\_\_\_\_

Ambient Air Temperature: \_\_\_\_\_ Barometric Pressure: \_\_\_\_\_ General Weather Conditions: \_\_\_\_\_

**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 #2									
NE Corner	760s	2:28p	760s	0	0	0	✓	✓	} O <sub>2</sub> + CO <sub>2</sub> } NORMAL
NW Corner	760s	2:30p	760s	0	0	0	✓	✓	
SE Corner	760s	2:52p	760s	0	0	0	✓	✓	
SW Corner	760s	2:34p	760s	0	0	0	✓	✓	
ADD ANY ADDITIONAL LOCATIONS AT OR NEAR STRUCTURE WITH METHANE PRESENT BELOW OR ON ADDITIONAL SHEETS									

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]  
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Date of Sampling: \_\_\_\_\_ NC Landfill Rule (.0500 or .1600): .0500

Name and Position of Sample Collector: [SAME AS PAGE 1]

Type and Serial Number of Gas Meter: \_\_\_\_\_ Calibration Date of Gas Meter: \_\_\_\_\_

Date and Time of Field Calibration: \_\_\_\_\_

Type of Field Calibration Gas (15/15 or 35/50): \_\_\_\_\_ Expiration Date of Field Calibration Gas Canister: \_\_\_\_\_

Pump Rate of Gas Meter: \_\_\_\_\_

Ambient Air Temperature: \_\_\_\_\_ Barometric Pressure: \_\_\_\_\_ General Weather Conditions: \_\_\_\_\_

**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 #3									
NE Corner	760s	2:36p	760s	0	0	0	✓	✓	} O <sub>2</sub> + CO <sub>2</sub> NORMAL
NW Corner	760s	2:38p	760s	0	0	0	✓	✓	
SE Corner	760s	2:40p	760s	0	0	0	✓	✓	
SW Corner	760s	2:42p	760s	0	0	0	✓	✓	
ADD ANY ADDITIONAL LOCATIONS AT OR NEAR STRUCTURE WITH METHANE PRESENT BELOW OR ON ADDITIONAL SHEETS									

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SIGNATURE TITLE

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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 #4									
NE Corner	7605	2:44p	7605	0	0	0	✓	✓	} O <sub>2</sub> + CO <sub>2</sub> } NORMAL
NW Corner	7605	2:46p	7605	0	0	0	✓	✓	
SE Corner	7605	2:48p	7605	0	0	0	✓	✓	
SW Corner	7605	2:50p	7605	0	0	0	✓	✓	
ADD ANY ADDITIONAL LOCATIONS AT OR NEAR STRUCTURE WITH METHANE PRESENT BELOW OR ON ADDITIONAL SHEETS									

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[Signature]  
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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 #5									
NE Corner	760s	2:52p	760s	0	0	0	✓	✓	} O2 + CO2 } Normal
NW Corner	760s	2:54p	760s	0	0	0	✓	✓	
SE Corner	760s	2:56p	760s	0	0	0	✓	✓	
SW Corner	760s	2:58p	760s	0	0	0	✓	✓	
ADD ANY ADDITIONAL LOCATIONS AT OR NEAR STRUCTURE WITH METHANE PRESENT BELOW OR ON ADDITIONAL SHEETS									

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]  
SIGNATURE

PROJECT SCIENTIST  
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 MSW Landfill Permit Number: 06-01

Date of Sampling: \_\_\_\_\_ NC Landfill Rule (.0500 or .1600): .0500

Name and Position of Sample Collector: [SAME AS PAGE 1]

Type and Serial Number of Gas Meter: \_\_\_\_\_ Calibration Date of Gas Meter: \_\_\_\_\_

Date and Time of Field Calibration: \_\_\_\_\_

Type of Field Calibration Gas (15/15 or 35/50): \_\_\_\_\_ Expiration Date of Field Calibration Gas Canister: \_\_\_\_\_

Pump Rate of Gas Meter: \_\_\_\_\_

Ambient Air Temperature: \_\_\_\_\_ Barometric Pressure: \_\_\_\_\_ General Weather Conditions: \_\_\_\_\_

**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	7605	3:00p	7605	0	0	0	✓	✓	} O2 + CO2 Normal
NW Corner	7605	3:02p	7605	0	0	0	✓	✓	
SE Corner	7605	3:04p	7605	0	0	0	✓	✓	
SW Corner	7605	3:06p	7605	0	0	0	✓	✓	
ADD ANY ADDITIONAL LOCATIONS AT OR NEAR STRUCTURE WITH METHANE PRESENT BELOW OR ON ADDITIONAL SHEETS									

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**

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