

August 9, 2016

Ms. Elizabeth Werner
Hydrogeologist
North Carolina Department of Environmental Quality
Solid Waste Section
1646 Mail Service Center
Raleigh, NC 27699-1646

**RE: LFG Probe Install and Abandonment
Harnett County Landfill – Dunn Erwin Facility (SWS Permit No. 43-02)
Dunn, North Carolina**

Dear Ms. Werner:

Smith Gardner, Inc. (S+G) recently completed the probe installation and abandonment for LFG locations related to the Active C&D over Closed MSW at the Harnett County Dunn Erwin Solid Waste Facility. The following is a summary of the above mentioned activities for this site.

Background

Quarterly LFG monitoring readings for the LFG monitoring probe GM-6, located slightly northeast of the maintenance building, have been consistently above 100% LEL since February 2015. This location is adjacent to the landfill, therefore, not representative of gas migration at the property line, located approximately 900 feet from this location. A replacement monitoring probe (GM-6A) was installed near the property line on April 8, 2016.

Probe Installation

On April 8, 2016 personnel from GeoTechnologies Inc.¹ mobilized at the Dunn Erwin Landfill Facility to perform the LFG monitoring probe installation. GM-6A was installed near the property line north of the active C&D over closed MSW landfill. The boring was advanced to 19ft bgs², just above the approximate groundwater table in this area. GM-6A was constructed with 13ft of 0.010 slotted, 2-inch diameter PVC screen, with 6ft of solid riser pipe and a 3ft above grade, then finished with a steel above-grade case, lock, ID tag and concrete pad.

The construction record and boring log are provided in **Attachment A. Figure 1** presents the updated LFG monitoring network.

¹ GeoTechnologies, Inc. P.A., 3200 Wellington Ct. Ste 108, Raleigh, NC 27615

² bgs = below ground surface

Probe Abandonment

GM-6, located on the east side of the active C&D over closed MSW landfill, was abandoned in accordance with the 2C Rules, by tremie grouting with a bentonite slurry and cement from the bottom of the borehole to the ground surface in one continuous operation. The entire 15ft, 1in PVC pipe was able to be removed. The probe abandonment records are provided in **Attachment B**. This monitoring location will be included in the monitoring network beginning with the April 2016 LFG monitoring event.

Landfill Gas Monitoring Network Update

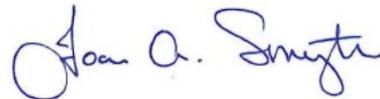
Due to recent, consistent LFG detections in GM-6, a replacement probe (GM-6A) was positioned near the property line. With a monitoring location further from the landfill, monitoring results will yield a more accurate picture of LFG migration at the site and monitoring locations GM-4, GM-6 and GM-8 can be removed from the network. The updated monitoring network will now include probes GM-2, GM-6A and GM-7. The updated landfill gas monitoring plan is provided as **Attachment C**.

Please contact us at (919) 828-0577 or by e-mail below if you have questions or require additional information.

Sincerely,
SMITH GARDNER, INC.



Madeline German, P.G.
Project Geologist
madeline@smithgardnerinc.com



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

Attachment Figure 1 – LFG Monitoring Network
 Attachment A – Construction Record and Boring Log
 Attachment B – Abandonment Record
 Attachment C – LFG Monitoring Plan

cc: Amanda Bader, P.E., Harnett County
 Randy Smith, Harnett County
 Pieter Scheer, P.E., S+G
 File

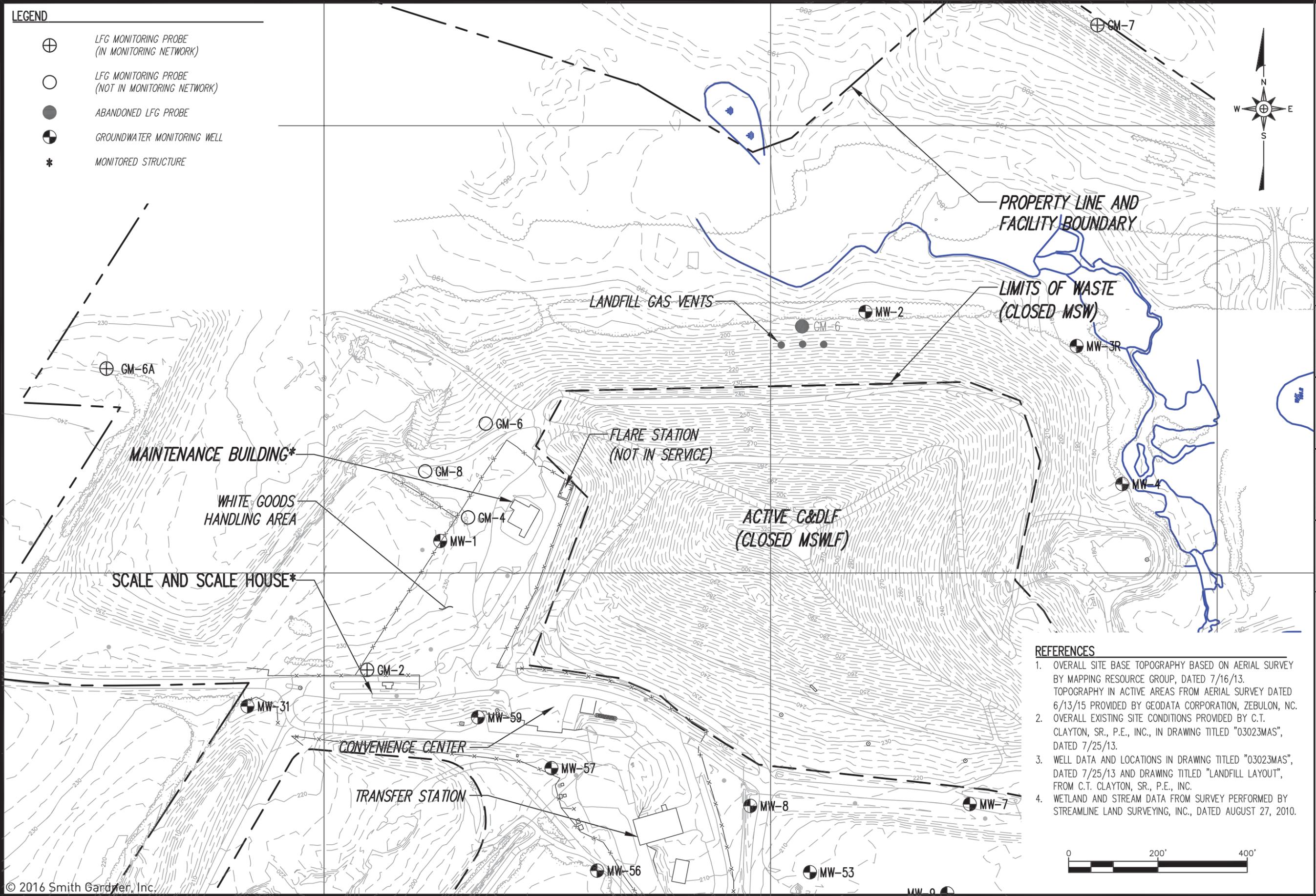
Figure

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LEGEND

- ⊕ LFG MONITORING PROBE (IN MONITORING NETWORK)
- LFG MONITORING PROBE (NOT IN MONITORING NETWORK)
- ABANDONED LFG PROBE
- ⊗ GROUNDWATER MONITORING WELL
- * MONITORED STRUCTURE



REFERENCES

1. OVERALL SITE BASE TOPOGRAPHY BASED ON AERIAL SURVEY BY MAPPING RESOURCE GROUP, DATED 7/16/13. TOPOGRAPHY IN ACTIVE AREAS FROM AERIAL SURVEY DATED 6/13/15 PROVIDED BY GEODATA CORPORATION, ZEBULON, NC. OVERALL EXISTING SITE CONDITIONS PROVIDED BY C.T. CLAYTON, SR., P.E., INC., IN DRAWING TITLED "03023MAS", DATED 7/25/13.
2. WELL DATA AND LOCATIONS IN DRAWING TITLED "03023MAS", DATED 7/25/13 AND DRAWING TITLED "LANDFILL LAYOUT", FROM C.T. CLAYTON, SR., P.E., INC.
3. WETLAND AND STREAM DATA FROM SURVEY PERFORMED BY STREAMLINE LAND SURVEYING, INC., DATED AUGUST 27, 2010.

PREPARED BY: _____ NC LIC. NO. C-0828 (ENGINEERING)

SMITH+GARDNER

14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577

FIGURE NO. _____ SCALE: _____ AS SHOWN

APPROVED: M.M.G. C.T.J.

PROJECT NO.: HARNETT-DE 13-2

FILENAME: HARNETT-B0102

PREPARED FOR: HARNETT COUNTY

**DUNN-ERWIN LANDFILL FACILITY
LANDFILL GAS MONITORING PLAN
LFG MONITORING LOCATIONS**

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Attachment A

Construction Record and Boring Log

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NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources - Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 4000-B

1. WELL CONTRACTOR:

Martin David Maulds
Well Contractor (Individual) Name

GeoTechnologies Drilling Inc.
Well Contractor Company Name

STREET ADDRESS 3200 Wellington Ct Suite 108
Raleigh NC 27615
City or Town State Zip Code

(919) 954-1574
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID #(if applicable) GM-6A

STATE WELL PERMIT #(if applicable)

DWQ or OTHER PERMIT #(if applicable)

WELL USE (Check Applicable Box) Monitoring Municipal/Public

Industrial/Commercial Agricultural Recovery Injection

Irrigation Other (list use)

DATE DRILLED 4-8-16

TIME COMPLETED 1:17 AM PM

3. WELL LOCATION:

CITY: Dunn COUNTY: Harnett

449 Daniels Road Dunn NC 28334
(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:

Slope Valley Flat Ridge Other
(check appropriate box)

LATITUDE 35 3692111340N May be in degrees, minutes, seconds or in a decimal format

LONGITUDE 78 64619156W

Latitude/longitude source: GPS Topographic map

(location of well must be shown on a USGS topo map and attached to this form if not using GPS)

4. FACILITY - is the name of the business where the well is located.

FACILITY ID #(if applicable)

NAME OF FACILITY Harnett County Landfill

STREET ADDRESS 449 Daniels Road

Dunn NC 28334
City or Town State Zip Code

CONTACT PERSON Randy Smith

MAILING ADDRESS 449 Daniels Road

Dunn NC 28334
City or Town State Zip Code

(910) 897-3222

Area code - Phone number

5. WELL DETAILS:

a. TOTAL DEPTH: 19'

b. DOES WELL REPLACE EXISTING WELL? YES NO

c. WATER LEVEL Below Top of Casing: 18 FT.
(Use "+" if Above Top of Casing)

d. TOP OF CASING IS 3.0 FT. Above Land Surface*

*Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. YIELD (gpm): _____ METHOD OF TEST _____

f. DISINFECTION: Type _____ Amount _____

g. WATER ZONES (depth):

From _____ To _____ From _____ To _____

From _____ To _____ From _____ To _____

From _____ To _____ From _____ To _____

6. CASING:

From 19 To +3' Ft. 2 Thickness/Weight .040 Material PVC

From _____ To _____ Ft. _____

From _____ To _____ Ft. _____

7. GROUT:

From 2 To +2" Ft. Saharok Material Borrow Method

From _____ To _____ Ft. _____

From _____ To _____ Ft. _____

8. SCREEN:

From 19 To 6 Ft. 2 in. .040 in. PVC Material

From _____ To _____ Ft. _____ in. _____ in. _____

From _____ To _____ Ft. _____ in. _____ in. _____

9. SAND/GRAVEL PACK:

From 19.0 To 4 Ft. #2 Size Well Sand Material

From 4.0 To 2 Ft. 3/8 Bentonite Pellets

From _____ To _____ Ft. _____

10. DRILLING LOG

From	To	Formation Description
0	2"	Top Soil
2"	1.5	Br Sa cl
1.5	6.0	or Sa cl
6.0	7.5	Br hard Sa cl slightly rocks
7.5	15.5	Br gr cl
15.5	19.0	Br very fine cl Sa

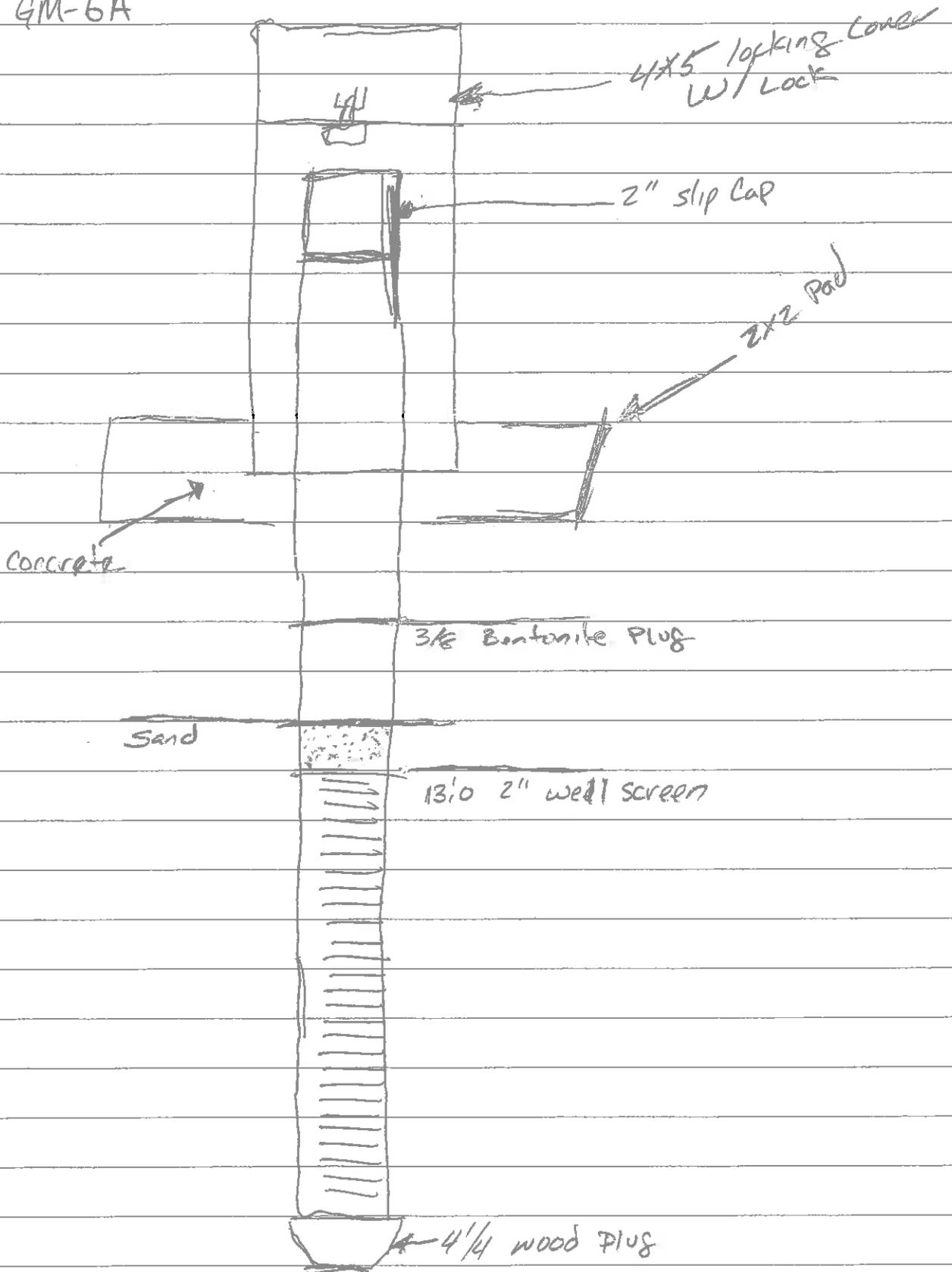
11. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Martin David Maulds 4-8-16
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

Martin David Maulds
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

GM-6A

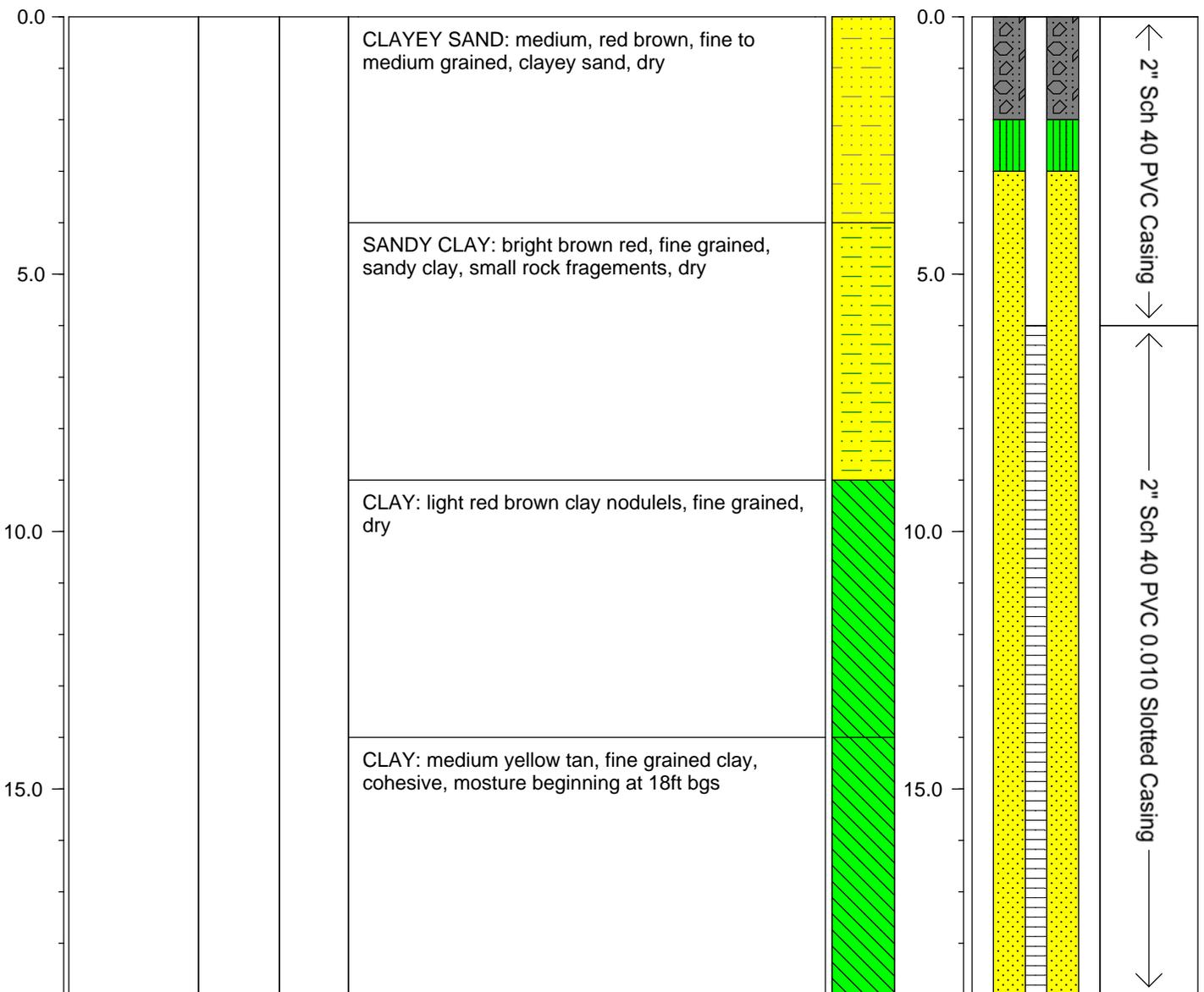


PROJECT NAME: **Landfill Gas Monitoring**
 LOCATION: **Dunn Erwin Landfill**
 DRILLING CO: **GeoTechnologies, Inc.**
 DRILLING METHOD: **Hollow Stem Auger**
 FIELD PARTY: **Martin Moulds**
 GEOLOGIST: **M. German**
 DATE BEGUN: **4/8/16** COMPLETED: **4/8/16**

TOTAL DEPTH: **19** Stickup: **3'**
 TOP OF CASING ELEV.: GROUND ELEV.:
 NORTHING: **0** EASTING: **0**

STATIC WATER LEVEL (from ground)		
Depth (ft)		
Time		
Date		

DEPTH Feet	BLOW COUNT Per 6"	SAMPLING METHOD	RECOVERY (Inches)	DESCRIPTION	LITHOLOGY	DEPTH Feet	WELL INSTALLATION	CONSTRUCTION DETAILS
---------------	----------------------	-----------------	----------------------	-------------	-----------	---------------	----------------------	-------------------------



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Attachment B

Abandonment Record

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WELL ABANDONMENT RECORD

This form can be used for single or multiple wells

1. Well Contractor Information:

Martin David Moulds
Well Contractor Name (or well owner personally abandoning well on his/her property)

NC 4000-B
NC Well Contractor Certification Number

Geotechnologies Drilling Inc.
Company Name

2. Well Construction Permit #:

List all applicable well permits (i.e. County, State, Variance, Injection, etc.) if known

3. Well use (check well use):

Water Supply Well:	
<input type="checkbox"/> Agricultural	<input type="checkbox"/> Municipal/Public
<input type="checkbox"/> Geothermal (Heating/Cooling Supply)	<input type="checkbox"/> Residential Water Supply (single)
<input type="checkbox"/> Industrial/Commercial	<input type="checkbox"/> Residential Water Supply (shared)
<input type="checkbox"/> Irrigation	
Non-Water Supply Well:	
<input checked="" type="checkbox"/> Monitoring	<input type="checkbox"/> Recovery
Injection Well:	
<input type="checkbox"/> Aquifer Recharge	<input type="checkbox"/> Groundwater Remediation
<input type="checkbox"/> Aquifer Storage and Recovery	<input type="checkbox"/> Salinity Barrier
<input type="checkbox"/> Aquifer Test	<input type="checkbox"/> Stormwater Drainage
<input type="checkbox"/> Experimental Technology	<input type="checkbox"/> Subsidence Control
<input type="checkbox"/> Geothermal (Closed Loop)	<input type="checkbox"/> Tracer
<input type="checkbox"/> Geothermal (Heating/Cooling Return)	<input type="checkbox"/> Other (explain under 7g)

4. Date well(s) abandoned: 4-8-16

5a. Well location:

Harrnett County Landfill
Facility/Owner Name

449 Daniels Road Dunc NC 28334
Physical Address, City, and Zip

Harrnett
County

Facility ID# (if applicable)

Parcel Identification No. (PIN)

5b. Latitude and longitude in degrees/minutes/seconds or decimal degrees:
(if well field, one lat/long is sufficient)

35° 22' 00.74" N 78° 38' 48.07" W

CONSTRUCTION DETAILS OF WELL(S) BEING ABANDONED

Attach well construction record(s) if available. For multiple injection or non-water supply wells ONLY with the same construction/abandonment, you can submit one form.

6a. Well ID#: GM-6

6b. Total well depth: 15 (ft.)

6c. Borehole diameter: 4 1/4 (in.)

6d. Water level below ground surface: 13.0 (ft.)

6e. Outer casing length (if known): 0 (ft.)

6f. Inner casing/tubing length (if known): 0 (ft.)

6g. Screen length (if known): 12.0 (ft.)

For Internal Use ONLY:

WELL ABANDONMENT DETAILS

7a. Number of wells being abandoned: 1 of 1
For multiple injection or non-water supply wells ONLY with the same construction/abandonment, you can submit one form.

7b. Approximate volume of water remaining in well(s): _____ (gal.)

FOR WATER SUPPLY WELLS ONLY:

7c. Type of disinfectant used: _____

7d. Amount of disinfectant used: _____

7e. Sealing materials used (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> Neat Cement Grout | <input type="checkbox"/> Bentonite Chips or Pellets |
| <input type="checkbox"/> Sand Cement Grout | <input type="checkbox"/> Dry Clay |
| <input type="checkbox"/> Concrete Grout | <input type="checkbox"/> Drill Cuttings |
| <input type="checkbox"/> Specialty Grout | <input type="checkbox"/> Gravel |
| <input checked="" type="checkbox"/> Bentonite Slurry | <input type="checkbox"/> Other (explain under 7g) |

7f. For each material selected above, provide amount of materials used:

27 gallons water
1 bag Bentonite Grout

7g. Provide a brief description of the abandonment procedure:

Removed 4x5 Locking Cover,
Pulled all pipe out of the ground
Pumped Bentonite grout through
1" pipe from bottom to top

8. Certification:

Martin David Moulds 4-8-16
Signature of Certified Well Contractor or Well Owner Date

By signing this form, I hereby certify that the well(s) was (were) abandoned in accordance with 15A NCAC 02C .0100 or 2C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner.

9. Site diagram or additional well details:

You may use the back of this page to provide additional well site details or well abandonment details. You may also attach additional pages if necessary.

SUBMITTAL INSTRUCTIONS

10a. For All Wells: Submit this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Information Processing Unit,
1617 Mail Service Center, Raleigh, NC 27699-1617

10b. For Injection Wells: In addition to sending the form to the address in 10a above, also submit one copy of this form within 30 days of completion of well abandonment to the following:

Division of Water Resources, Underground Injection Control Program,
1636 Mail Service Center, Raleigh, NC 27699-1636

10c. For Water Supply & Injection Wells: In addition to sending the form to the address(es) above, also submit one copy of this form within 30 days of completion of well abandonment to the county health department of the county where abandoned.

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Attachment C

LFG Monitoring Plan

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Landfill Gas Monitoring Plan

**Harnett County Dunn-Erwin Landfill Facility
Harnett County, North Carolina**

Prepared for:

**Harnett County Solid Waste Department
Lillington, North Carolina**

July 2016

NC LIC. NO. C-0828 (ENGINEERING)

SMITH+GARDNER

14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577



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Landfill Gas Monitoring Plan

**Harnett County Dunn-Erwin Landfill Facility
Harnett County, North Carolina**

Prepared For:
**Harnett County Solid Waste Department
Lillington, North Carolina**

S+G Project No. HARNETT-DE



DocuSigned by:

Joan A. Smyth

Joan A. Smyth, P.G.
Senior Hydrogeologist



DocuSigned by:

Pieter K. Scheer

Pieter K. Scheer, P.E.
Vice President, Senior Engineer

July 2016

NC LIC. NO. C-0828 (ENGINEERING)

SMITH+GARDNER

14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577

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Harnett County Dunn-Erwin Landfill Facility Harnett County, North Carolina

Landfill Gas Monitoring Plan

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FIGURES

Figure 1	Site Vicinity Map
Figure 2	Landfill Gas Monitoring Locations
Figure 3	Flowchart of Methane Monitoring Requirements

APPENDIX

Appendix A	Reporting Forms
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1.0 INTRODUCTION

This Landfill Gas (LFG) Monitoring Plan (plan) was prepared by Smith Gardner, Inc. to describe the LFG monitoring program at the Dunn-Erwin Landfill Facility (NC Solid Waste Permit 43-02), which is located at 449 Daniels Road in Dunn, North Carolina. The facility contains a closed unlined municipal solid waste (MSW) and construction & demolition (C&D) landfill units, an operating C&D landfill located on top of a closed unlined MSW landfill, and an operating MSW transfer station (NC Solid Waste Permit 43-07T). This plan describes the necessary procedures to satisfy applicable regulatory requirements (see **Section 1.1**) for landfill gas monitoring.

The Engineer has utilized the best available site data, practices, experience, and judgment to develop this plan. However, the plan may require modifications over time to accommodate changing landfill conditions, changing receptors in areas adjacent to and around the landfill, or other conditions that cannot be fully anticipated.

Uncontrolled migration of LFG (particularly methane (CH₄)) can result in, loss of life, injury, loss of property, vegetative damage, and intolerable odors. Landfill monitoring includes exposure to explosive gases. Monitoring personnel should be specifically trained in the management and response for situations such as fire or explosion and confined space entry and possess an awareness of changing conditions around the landfill.

Note that this plan does not address landfill gas collection and control, air quality, or other related landfill gas regulations or requirements which may be applicable to this site at present or in the future.

1.1 Regulatory Requirements – C&D Landfills

Rule 15A NCAC 13B .0544(d) of the North Carolina Solid Waste Management Rules requires the following for facilities having a C&D landfill:

- Owners or operators of C&D landfill units must ensure that:
 - the concentration of methane gas or other explosive gases generated by the facility does not exceed 25% of the lower explosive limit (LEL) for methane (1.25% methane) in on-site facility structures (excluding gas control or recovery system components);
 - the concentration of methane gas or other explosive gases does not exceed the LEL for methane (5% methane) at the facility property boundary; and
 - the facility does not release methane gas or other explosive gases in any concentration that can be detected in off-site structures.
- Owners or operators of C&D landfill units must implement a routine methane monitoring program and perform monitoring on at least a quarterly basis.
- If regulatory limits for methane gas concentrations are exceeded, a contingency plan must be implemented for the protection of human health and safety.

1.2 Guidance Document

This plan was developed generally following the Landfill Gas Monitoring Guidance document prepared by the former North Carolina Department of Environment and Natural Resources (NC DENR), now the Department of Environmental Quality (DEQ), Division of Waste Management (DWM)¹.

1.3 Contact Information

Correspondence and questions concerning this plan should be directed to the appropriate contact below:

1.3.1 Owner

Harnett County - Solid Waste Department
102 E. Front Street
P.O. Box 2773
Lillington, North Carolina 27546
Phone: (910) 814-6156

Dunn Erwin Landfill Facility
449 Daniels Road
Dunn, NC 28390
Phone: (910) 897-3222

Contacts: Amanda Bader, P.E., County Engineer
abader@harnett.org
Randy Smith, Solid Waste Operations Manager
rwsmith@harnett.org

1.3.2 Engineer

Smith Gardner, Inc.
14 N. Boylan Avenue
Raleigh, North Carolina 27603
Phone: (919) 828-0577

Contacts: Joan A. Smyth, P.G., Senior Hydrogeologist
joan@smithgardnerinc.com
Pieter K. Scheer, P.E., Project Manager
pieter@smithgardnerinc.com

¹ NC DENR DWM (2010), "Landfill Gas Monitoring Guidance", NC DENR DWM Solid Waste Section, November 2010.

1.3.3 North Carolina Department of Environmental Quality

Division of Waste Management (DWM) - Solid Waste Section:

North Carolina DEQ – Raleigh Central Office (RCO)

217 W Jones Street

Raleigh, North Carolina 27603

Phone: (919) 707-8200

Contact: Ms. Elizabeth Werner

Elizabeth.werner@ncdenr.gov

1.4 Existing Site Conditions

The facility is located approximately eight miles north of downtown Dunn on Daniels Road. The properties immediately adjacent to the site are undeveloped or agricultural fields. Further from the property, rural residential properties exist along Turlington Road.

The facility is located on approximately 325 acres owned by Harnett County. The permitted facility is bounded to the west by Stewart Creek, to the east by an unnamed creek, and south of the Active C&D over MSW by an unnamed tributary of Stewart Creek, which crosses through the central portion of the facility. Small ponds are located across the property as well as to the east, south and southeast. These existing water features create a natural barrier to LFG migration.

Ground surface elevations range from approximately El. 180 (feet above mean sea level) along unnamed tributary around the site to El. 250 at the top of the closed MSW landfill unit. The facility location is shown on **Figure 1**.

1.4.1 Site Geology

According to the 1985 North Carolina Geological Map the landfill is situated in the Coastal Plain Physiographic Province. The Dunn-Erwin area in Harnett County is underlain by the cretaceous age Middendorf formation that is primarily light gray sand, sandstone and mudstone which acts as a confining unit. The Middendorf formation was deposited in a deltaic system and varies from 15m to over 100m thick.

1.4.2 Local Groundwater Regime

Groundwater depths generally range from 5 ft to 25 ft below ground surface (bgs) across the facility. Groundwater generally flows southwest toward the stream in the central portion of the site. There are minor seasonal variations in the flow pattern, but overall flow direction is consistent.

2.0 MONITORING PROGRAM

The plan contained herein includes landfill gas monitoring to monitor subsurface landfill gas migration in well and on-site structures. LFG monitoring locations are shown on **Figure 2**.

2.1 Monitoring Wells

The close location of streams to the east, south and west of the active C&D over closed MSW landfill limit the possibility of landfill gas migration in these directions. Therefore, landfill gas is only monitored along the northern side of the facility. The landfill gas monitoring network includes three existing wells (GM-2, GM-6A and GM-7).

2.2 Monitoring of Facility Structures

The following facility structures will be monitored:

- Scalehouse; and
- Maintenance building.

If desired by the County, a dedicated methane monitor may be installed within one or more of these structures.

2.3 Monitoring and Reporting

LFG concentration monitoring and reporting will be performed as outlined below.

2.3.1 Frequency

Routine LFG monitoring will be conducted on a quarterly basis.

2.3.2 Personnel

LFG monitoring will be performed by personnel who are familiar with the plan requirements and who are trained in LFG hazards and explosive gas meter use. As practical, a designated technician will be assigned to regular LFG monitoring duty.

2.3.3 Equipment

An infrared portable gas analyzer will be used to collect measurements from the landfill gas monitoring network. This analyzer, which is calibrated to methane (CH₄), operates using the infrared spectral property of methane to measure concentrations in air. Measurements of oxygen (O₂) and carbon dioxide (CO₂) will also be made with this meter. This meter may be used in oxygen deficient areas (less than 10% O₂) since oxygen is not required for a chemical combustion of flammable gases within the meter.

On the day of monitoring, prior to monitoring activities, this meter will be field calibrated. Additionally, all monitoring equipment should be regularly calibrated in accordance with manufacturer's specifications and operated only as instructed.

2.3.4 Procedures

Prior to each monitoring event, the portable gas analyzer will be calibrated with a known calibration standard in accordance with manufacturer's recommendations. General information related to the monitoring event, equipment used, calibration procedures, weather conditions, and results for each monitoring event will be recorded on the landfill gas monitoring data form (see **Appendix A**).

The following steps outline the procedure for the monitoring of LFG wells and facility structures:

- Check calibration date on the meter and calibrate according to manufacturers instructions; allowing equipment to warm up properly prior to use, per manufacturers direction.
- Purge sample tube for one minute before monitoring.

LFG Monitoring Wells:

- Connect instrument tubing to sample port on the monitoring well without removing the cap.
- Open the valve and record both the initial and stabilized methane concentrations. A stabilized concentration will not vary more than 0.5 percent by volume on the instrument's scale. Also record the oxygen concentration (at two percent per volume or less to indicate air is not being drawn into the system and providing false readings) and the carbon dioxide concentration.
- Close the valve and disconnect the tubing.
- Record monitoring data on the LFG monitoring data form provided in **Appendix A**.
- If any methane concentration is **greater than 50% of the LEL (2.5% CH₄)**, monitoring personnel should implement the Precautionary Action Plan (see **Section 2.3.5**).
- If both initial and stabilized methane concentrations are less than 50% of the LEL (2.5% CH₄), move to next LFG monitoring well.

Structures:

- Walk through the facility structure with a methane analyzer and monitor the perimeter wall interface of the structure, the floor to wall interface in hallways and rooms, and any floor penetrations in the structure. Record the initial and stabilized methane

- concentrations, oxygen concentration and carbon dioxide concentration.
- Record monitoring data on the LFG monitoring data form provided in **Appendix A**.
 - Notify the Solid Waste Operations Manager and the Engineer for any methane concentration greater than 0% of the LEL.

IF A STABILIZED METHANE CONCENTRATION IS GREATER THAN 100% OF THE LEL IN A LFG MONITORING WELL OR GREATER THAN 25% OF THE LEL IN A FACILITY STRUCTURE, THE FOLLOWING ACTIONS WILL BE IMPLEMENTED:

- 1) Recalibrate monitoring equipment and confirm results.
- 2) If results are confirmed, **IMMEDIATELY** contact the County Engineer, Solid Waste Operations Manager and the Engineer.
- 3) Implement the Compliance Action Plan located in **Section 3.1**.

A flowchart of proposed action for noted exceedances is presented as **Figure 3**.

2.3.5 Precautionary Action Plan

If an initial or stabilized methane concentration is equal to or greater than 50% of the LEL in a LFG monitoring well, monitoring personnel should perform the following additional steps at this location:

- Measure gas pressure in the well head (in inches of water) using magnehelic gauge or other appropriate metering device.
- Record at least one additional methane concentration measurement, inside the well just below the top of casing.
- Evaluate the surrounding area for potential receptors to or signs of LFG migration. LFG can stress vegetation and can kill trees and grass by root asphyxiation. Note stressed/dead vegetation areas on the monitoring form.
- Notify the County Engineer, Solid Waste Operations Manager and the Engineer for further evaluation.

2.3.6 Record Keeping

Routine LFG monitoring events will be documented on the LFG monitoring data form provided in **Appendix A**. Completed forms will be placed in the landfill operating record located at the landfill office and/or Harnett County Solid Waste Department office at 103 E. Ivy Street, Lillington, North Carolina 27546. These forms will be available for review by DWM personnel on request.

Documentation of any contingency plan actions (see **Section 3.0**) will also be kept in the operating record.

2.4 Maintenance

Periodic maintenance and site observations will be conducted routinely to address monitoring program components (at a minimum):

- Maintain access to LFG monitoring locations.
- Perform LFG monitoring well maintenance (maintain well locks, steel casing, concrete pad, etc.).
- Observe landfill cover conditions, areas of dead vegetation, leachate seeps, odors, etc. as indications of potential LFG-related problems.

Note deficiencies on the monitoring forms and report to the County Engineer and Solid Waste Operations Manager for repair or replacement as necessary.

3.0 CONTINGENCY PLAN

If a stabilized methane concentration is **greater than 100% of the LEL in a LFG monitoring well or greater than 25% of the LEL in a facility structure**, the County will perform both an immediate action and plan and a remediation plan as described below and as summarized on **Figure 3**.

3.1 Immediate Action Plan

The Solid Waste Operations Manager will perform the following actions for the protection of human health and safety:

- 1) Evacuate affected facility structures and the immediately surrounding area.
- 2) Determine nearby potential receptors (facility and off-site structures).
- 3) Perform monitoring in any other facility structure near the monitoring location having the high concentration.
- 4) Contact the County Fire Department (911). Coordinate evaluation of potentially affected off-site structures with the Fire Department.
- 5) Verbally notify the County Engineer, or his designee.
- 6) Verbally notify the NCDEQ DWM (see **Section 1.1**) as soon as practical.
- 7) Investigate and identify the potential source(s) and conduit(s) for LFG migration that may have caused the high concentration (i.e. the path the LFG may be following to the monitoring location).
- 8) Identify the LFG extent using bar hole punch sampling methodology or other applicable alternative method as practical.
- 9) As appropriate, evaluate corrective actions to control methane concentrations in structures surrounding the landfill site.

3.1.1 Reporting and Documentation

Within seven days of the high methane concentration detection, the County will prepare and submit an Environmental Monitoring Reporting Form (see **Appendix A**) with the monitoring event results to the DWM. The County will also place a description of the actions performed to protect human health in the operating record.

3.2 Remediation Plan

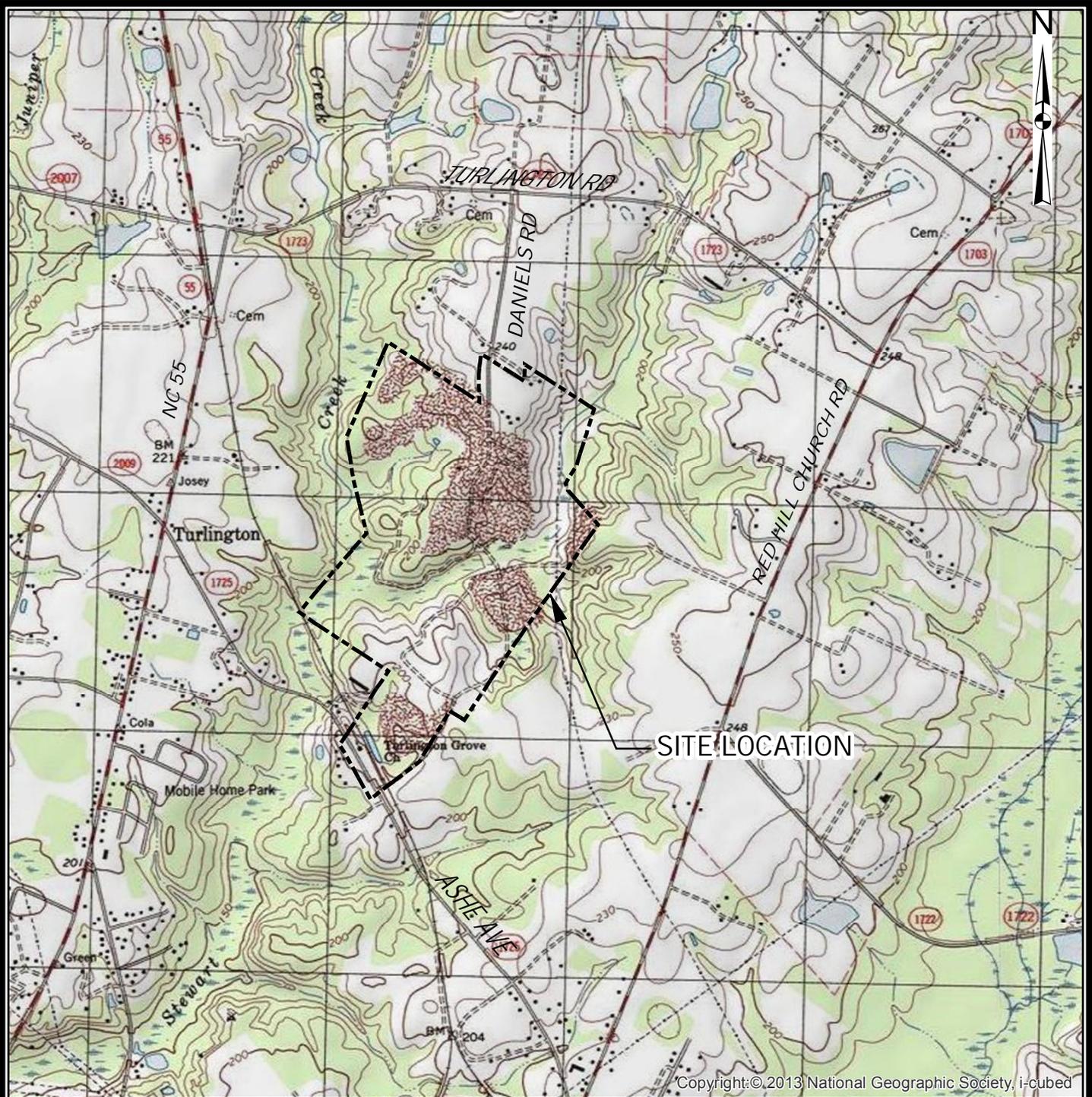
Within sixty days of a high methane concentration detection, a remediation plan describing the problem nature, extent, and proposed remedy will be prepared and submitted to DWM for approval. Following approval, the plan will be implemented and a copy will be placed in the operating record. The DWM will also be notified once the plan has been implemented.

An extension may be requested from the DWM depending on severity of the situation.

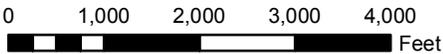
Figures

**Landfill Gas Monitoring Plan
Harnett County Dunn-Erwin Landfill Facility
Harnett County, North Carolina**

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HARNETT COUNTY
 DUNN-ERWIN LANDFILL FACILITY
 LANDFILL GAS MONITORING PLAN
 SITE VICINITY MAP

NC LIC. NO. C-0828 (ENGINEERING)

SMITH + GARDNER

14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577

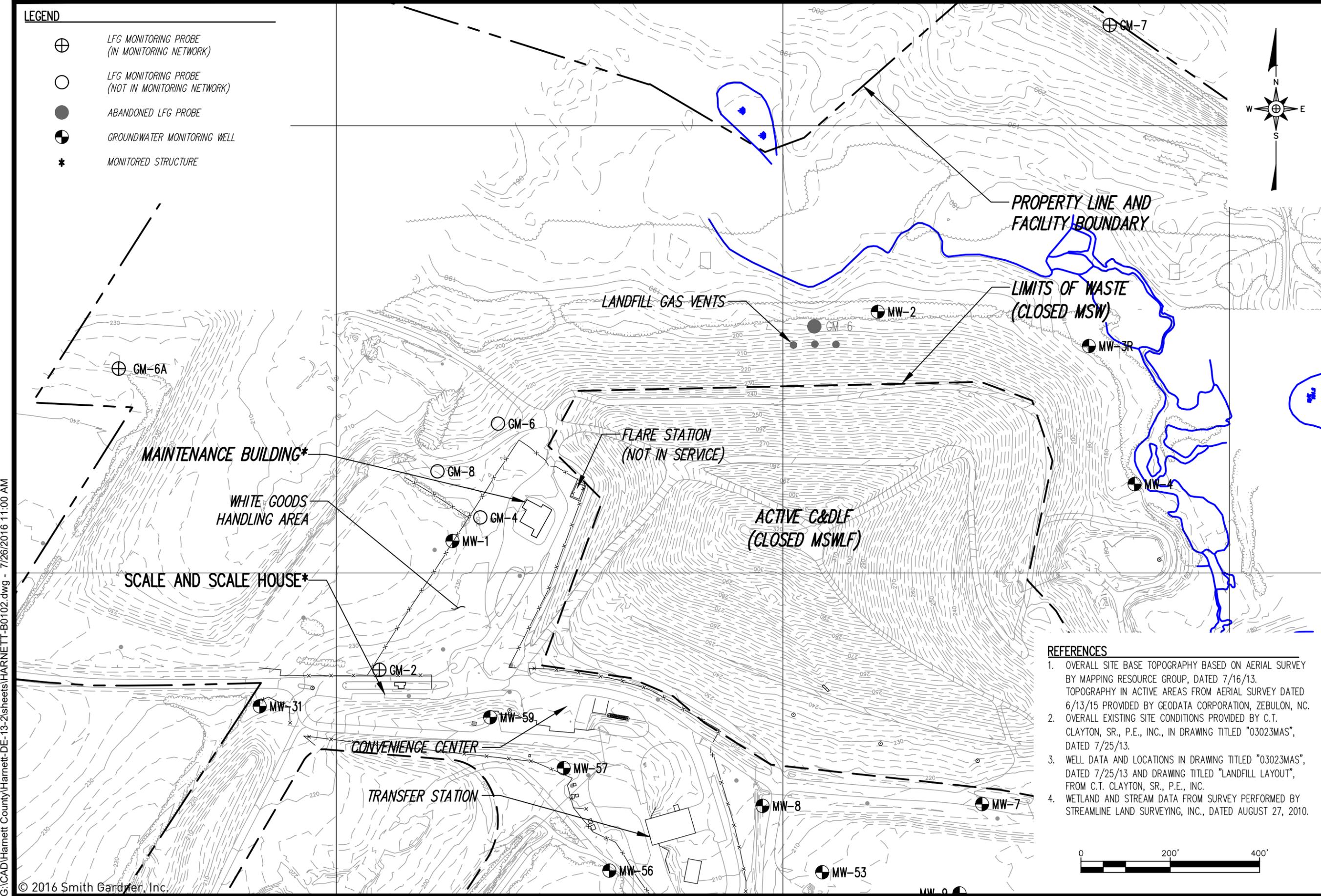
DRAWN: J.A.L.	APPROVED: M.M.G.	SCALE: AS SHOWN	DATE: May, 2014	PROJECT NO.: HARNETT-DE 14-1	FIGURE NO.: 1
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LEGEND

- ⊕ LFG MONITORING PROBE (IN MONITORING NETWORK)
- LFG MONITORING PROBE (NOT IN MONITORING NETWORK)
- ABANDONED LFG PROBE
- ◐ GROUNDWATER MONITORING WELL
- * MONITORED STRUCTURE



- REFERENCES**
- OVERALL SITE BASE TOPOGRAPHY BASED ON AERIAL SURVEY BY MAPPING RESOURCE GROUP, DATED 7/16/13. TOPOGRAPHY IN ACTIVE AREAS FROM AERIAL SURVEY DATED 6/13/15 PROVIDED BY GEODATA CORPORATION, ZEBULON, NC.
 - OVERALL EXISTING SITE CONDITIONS PROVIDED BY C.T. CLAYTON, SR., P.E., INC., IN DRAWING TITLED "03023MAS", DATED 7/25/13.
 - WELL DATA AND LOCATIONS IN DRAWING TITLED "03023MAS", DATED 7/25/13 AND DRAWING TITLED "LANDFILL LAYOUT", FROM C.T. CLAYTON, SR., P.E., INC.
 - WETLAND AND STREAM DATA FROM SURVEY PERFORMED BY STREAMLINE LAND SURVEYING, INC., DATED AUGUST 27, 2010.

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

FIGURE NO.	2
SCALE:	AS SHOWN
APPROVED:	M.M.G.
DRAWN:	C.T.J.
PROJECT NO.:	HARNETT-DE 13-2
FILENAME:	HARNETT-B0102
DATE:	Jul 2016

PREPARED FOR:

HARNETT COUNTY
DUNN-ERWIN LANDFILL FACILITY
LANDFILL GAS MONITORING PLAN
LFG MONITORING LOCATIONS

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MONITORING FREQUENCY IS QUARTERLY

METHANE CONCENTRATION MUST NOT EXCEED:
 1. 25% OF THE LEL IN FACILITY STRUCTURES; AND
 2. 100% OF THE LEL AT THE FACILITY PROPERTY BOUNDARY.

IF METHANE CONCENTRATION EXCEEDS EITHER OF THE ABOVE, THE OWNER MUST:

RECALIBRATE METER AND CONFIRM READINGS
 (SEE SECTION 2.3.4 OF LFG MANAGEMENT PLAN)

IF CONFIRMED READINGS EXCEED LIMITS,
 (SEE SECTION 3.0 OF THE LFG MANAGEMENT PLAN) AND:

1. IMMEDIATELY:
 TAKE STEPS TO ENSURE PROTECTION OF HUMAN HEALTH AND SAFETY

2. WITHIN 7 DAYS:
 PLACE THE METHANE READINGS AND STEPS TAKEN TO PROTECT HUMAN HEALTH IN THE OPERATING RECORD

3. WITHIN 60 DAYS:
 PREPARE A REMEDIATION PLAN. SUBMIT PLAN TO NCDEQ FOR APPROVAL. UPON APPROVAL, IMPLEMENT PLAN.

SMITH+GARDNER ENGINEERS NOTIFY THE ENGINEER AND DIVISION WITHIN 24 HOURS **NC Environmental Quality**

PLACE A COPY OF THE REMEDIATION PLAN IN THE OPERATING RECORD, AND

EVALUATE THE NEED FOR ADDITIONAL MONITORING

NOTIFY THE DIVISION THAT THE PLAN HAS BEEN IMPLEMENTED

PREPARED FOR:
HARNETT COUNTY, NC
DUNN-ERWIN LANDFILL FACILITY
FLOWCHART OF
METHANE MONITORING REQUIREMENTS

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

DRAWN: C.T.J.	APPROVED: J.A.S.	SCALE: N.T.S.	DATE: May 2016	PROJECT NO.: HARNETT-DE-14-1	FIGURE NO.: 3	FILE NAME: HARNETT-A0021
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Appendix A

Reporting Forms

**Landfill Gas Monitoring Plan
Harnett County Dunn-Erwin Landfill Facility
Harnett County, North Carolina**

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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):

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

Name: _____ Phone: _____

E-mail: _____

Facility name:	Facility Address:	Facility Permit #	NC Landfill Rule: (.0500 or .1600)	Actual sampling dates (e.g., October 20-24, 2006)

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
- Surface water monitoring data 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.

Facility Representative Name (Print) _____ Title _____ (Area Code) Telephone Number _____
Affix NC Licensed/ Professional Geologist Seal

Signature _____ Date _____

Facility Representative Address _____

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

