Attachment M

Landfill Gas Monitoring Plan

Permit to Construct Application
Wake Reclamation, LLC - Brownfield Road C&D Landfill – Phase 2B
Raleigh, North Carolina

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Landfill Gas Management Plan

Brownfield Road C&D Landfill
Wake County, North Carolina (SWS Permit No. 92-31)

Prepared for:

Wake Reclamation, LLC.
Raleigh, North Carolina
(A Subsidiary of Waste Industries, USA. Inc.)

October 2015

NC LIC. NO. C-0828 (ENGINEERING)

SMITH+GARDNER

14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577

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Landfill Gas Management Plan

Brownfield Road C&D Landfill Facility
Wake County, North Carolina

Prepared For:

Wake County Solid Waste Department
Raleigh, North Carolina
(A Subsidiary of Waste Industries, Inc.)

S+G Project No. BROWNFIELD-15-1

NORTH CAROLINA LICENSED SEAL 2275 GEOLOGIST MADELINE GERMAN

Madeline German, P.G.
Project Geologist

Joan A. Smyth, P.G.
Senior Hydrogeologist

October 2015

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Wake Reclamation, LLC.
Brownfield Road C&D Landfill Facility
Landfill Gas Management Plan

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1.0 INTRODUCTION

This Landfill Gas (LFG) Management Plan (plan) was prepared by Smith Gardner, Inc. to describe the LFG monitoring program at the Brownfield Road C&D Landfill owned and operated by Wake Reclamation, LLC. (NC Solid Waste Permit 92-31), which is located at 2600 Brownfield Road, Raleigh, North Carolina. This plan describes the necessary procedures to satisfy applicable regulatory requirements (see **Section 1.1**) for landfill gas monitoring.

The best available site data, practices, experience, and judgment were utilized 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 (CH_4)) 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 percent of the lower explosive limit 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 lower explosive limit for methane or other explosive gases 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 North Carolina Department of Environment Quality (NC DEQ), Division of Waste Management (DWM)[1].

1.3 Contact Information

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

1.3.1 Owner

Wake Reclamation, LLC.
2600 Brownfield Road
Raleigh, North Carolina 27601
Phone: (919) 779-3339
Contacts: Don Plessinger, Landfill Manager
Donald.plessinger@wasteindustries.com
Richard Call, Solid Waste Operations Manager
richard.call@wasteindustries.com

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
Stacey A. Smith, P.E., Senior Engineer
stacey@smithgardnerinc.com

1.3.3 North Carolina Department of Environment and Natural Resources

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

1.4 Existing Site Conditions

The facility is located at 2600 Brownfield Road in southeastern Wake County off Rock Quarry Road. The surrounding area is primarily rural with industrial, agriculture and rural residential. The Wake County law enforcement center and City of Raleigh waste water treatment plant are located north of the facility. Rural residential development is primarily to the southwest.

The facility is located on approximately 210 acres owned by Waste Industries, USA. The site location and surrounding area is provided as **Figure 1**. The site is bound to the north by an unnamed tributary of the Neuse River and property owned by the City of Raleigh, to the east by Brownfield Road and property owned by the City of Raleigh, to the south and west by undeveloped land and rural residential. As shown on the figure, there are perennial streams surrounding a significant portion of the site. These existing water features create a natural barrier to LFG migration.

1.4.1 Site Geology

The Brownfield Road C&D Landfill facility is located in the eastern portion of the North Carolina Piedmont Physiographic Province. Regionally the Eastern Piedmont encompasses crystalline rock, Cretaceous and Tertiary sediments, various metamorphic belts and multiple intrusions. Locally, the site is located in the Raleigh belt of the Eastern Piedmont; typically layered hornblend geniss, amphibolite and biotite granitoid gneiss. Many medium to high grade gneiss and schist have been intruded by granitoid plutons. The Rolesville Batholith is one of the largest plutons in the Eastern United States; it is located the southern core of the Raleigh Belt, roughly along the Wake-Warren Anticlinorium[2]. The Rolesville Batholith is present on the Brownfield Road site.

1.4.2 Local Groundwater Regime

In the Phase 2B area, the uppermost, unconfined aquifer is located at an approximate elevation of 200 feet to 215 feet amsl[3]. The primary aquifer at the site is generally found in the highly weathered PWR or in the secondary porosity joints and fractures. Tributaries of the Neuse River nearly surround the site, with only a small break on the eastern side. Groundwater generally flows northwest across the site.

[2] Stoddard, E. F., Farrar, S. S., Horton, J. W., Butler, J. R. and Druhan, R. M., 1991, The Eastern Piedmont in North Carolina, *in* Horton, J. W. and Zullo, V. A., eds., *The Geology of the Carolinas*, Carolina Geological Society Fiftieth Anniversary Volume, Knoxville, University of Tennessee Press, pp. 79-92.
[3] amsl = above mean sea level

2.0 MONITORING PROGRAM

In 2007 a voluntary Alternate Source Demonstration (ASD) was submitted to the then NC Department of Environment and Natural Resources (now NCDEQ) that resolved tetrachloroethene (PCE) detections in MW-3 were the result of landfill gas migration. A landfill gas cutoff trench was installed in the fall of 2010 to reduce PCE concentrations in MW-3, and is currently in the evaluation period[4].

The landfill gas monitoring plan contained herein includes landfill gas monitoring wells to monitor for subsurface landfill gas migration as well as landfill gas monitoring in on-site structures.

2.1 Monitoring Wells

The monitoring wells and structures are shown on **Figure 1**.

2.1.1 Modifications from Previous LFG Monitoring Network

The location of streams to the north, west and south of the site limit the possibility of landfill gas migration in these directions. The existing LFG monitoring network includes four bar-hole locations north of the landfill and six landfill gas monitoring probes numbered LFG-5 through LFG-10 east of the landfill. Because surface water is a known barrier to LFG migration we recommend cessation of monitoring for locations BH-1 through BH-4, LFG-5 and LFG-6. A summary of the past two years of monitoring data is included below:

Percent Methane Readings
Brownfield Road C&D Landfill

Well	3/5/2014	6/10/2014	9/4/2014	12/3/2014	3/6/2015	6/8/2015	9/2/2015
BH-1	0	0	0.1	0	0	0	0
BH-2	0	0	0.1	0	0	0	0
Bh-3	0	0	0	0	0	0	0
BH-4	0	0	0.1	0.1	0	0	0
LFG-5	0	0	0	0.1	0	0	0
LFG-6	0	0	0	0.1	0	0	0
LFG-7	0	0.1	0	0.1	0	0	0
LFG-8	0	0	0	0.1	0.1	1.1	1.9
LFG-9	0	0.2	0	0	0	0	0
LFG-10	0	0.2	0	0.1	0	0	0.1

It should be noted that the meter's accuracy range is within 0.2% Methane. This means the low readings detected in some locations are likely false positive readings.

[4] Letter from Jaclynne Drummond to Donald Plessinger, September 18, 2013, DIN 19796

Historical groundwater data indicated VOC detections that were previously determined to be due to landfill gas phase transition. In response a landfill gas venting trench was installed in the area upgradient of MW-3 and also BH-2. S+G proposes to continue monitoring the vents in the vent trench to evaluate landfill gas in this area.

Landfill gas monitoring points are focused along the eastern property line where natural barriers are less prevalent to possible migration pathways; and just beyond MW-3 where PCE and TCE have been detected due to LFG migration. The revised landfill gas monitoring network includes the wells summarized below:

LFG Monitoring Well	Screened Interval (ft bgs)	Total Depth (ft bgs)
Vent #1	NA	NA
Vent #2	NA	NA
LFG-8	10-5	10
LFG-9	18-5	18
LFG-10	13-5	13

Note: Total depth for LFG-8, LFG-9 and LFG-10 is well bottom depth.

The monitoring well locations are shown on **Figure 2**.

2.1.2 LFG Monitoring Well Construction

The LFG monitoring wells were reportedly installed above groundwater in accordance with 15A NCAC 2C by Geologic Explorations, Inc. in May 2011. Wells were advanced using hollow stem auger (has) drilling technology and constructed of two-inch diameter, manufactured PVC well screens with 10-slot per inch intake spacing and solid PVC riser pipe. A sand filter pack was placed around the screened interval, to a height of up to two feet above the screen and a hydrated bentonite plug of two to five feet in thickness was positioned above the sand pack to seal each well. A protective anodized aluminum casing and a cement pad for surface protection was also installed. Quick-connect fittings or stop-cock valves were installed in the cap as a monitoring port in accordance with SWS guidance.

2.2 Monitoring of Facility Structures

Occupied structures on the property will be monitored quarterly. The following facility structures will be monitored:

- Scalehouse; and
- Maintenance Building.

If desired, a dedicated methane monitor may be installed within one or more of these structures. Otherwise, monitoring will be conducted quarterly with the landfill gas monitoring wells.

2.3 Monitoring and Reporting

Monitoring and reporting of LFG concentrations 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 requirements of this plan 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

A LandtecTM GEM-2000 infrared portable gas analyzer (or equivalent) will be used to monitor probes and LFGCCS components. This analyzer, which is calibrated to methane (CH_4), operates using the infrared spectral property of methane to measure concentrations in air. Measurements of oxygen (O_2) and carbon dioxide (CO_2) will also be made with this meter. This meter may be used in oxygen deficient areas (less than 10% O_2) 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% CH_4)**, 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% CH_4), 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 Landfill Manager, 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 Landfill Manager and the Engineer.
3) Implement the Compliance Action Plan located in **Section 3.1**.

A flowchart of potential actions if exceedances are noted, is included 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 Landfill 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 2600 Brownfield Road, Raleigh, North Carolina 27610. 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 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 technician will perform the actions in the immediate action and plan and prepare a remediation plan as described below.

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 Landfill Manager.
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 migration path that 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, begin corrective action to control methane concentrations in structures surrounding the landfill site.

3.1.1 Reporting and Documentation

Within seven days of the detection of a high methane concentration, the Facility will prepare and submit an Environmental Monitoring Reporting Form (see **Appendix A**) with the results of the monitoring event to the DWM. The Facilityy 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 the detection of a high methane concentration, a remediation plan describing the problem nature, extent, and proposed remedy will be submitted to NCDEQ 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 the plan has been implemented.

An extension may be granted by the DWM on written request and depending on severity of the situation.

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Figures

Landfill Gas Management Plan
Wake Reclamation, LLC.
Brownfield Road C&D Landfill
Raleigh, North Carolina

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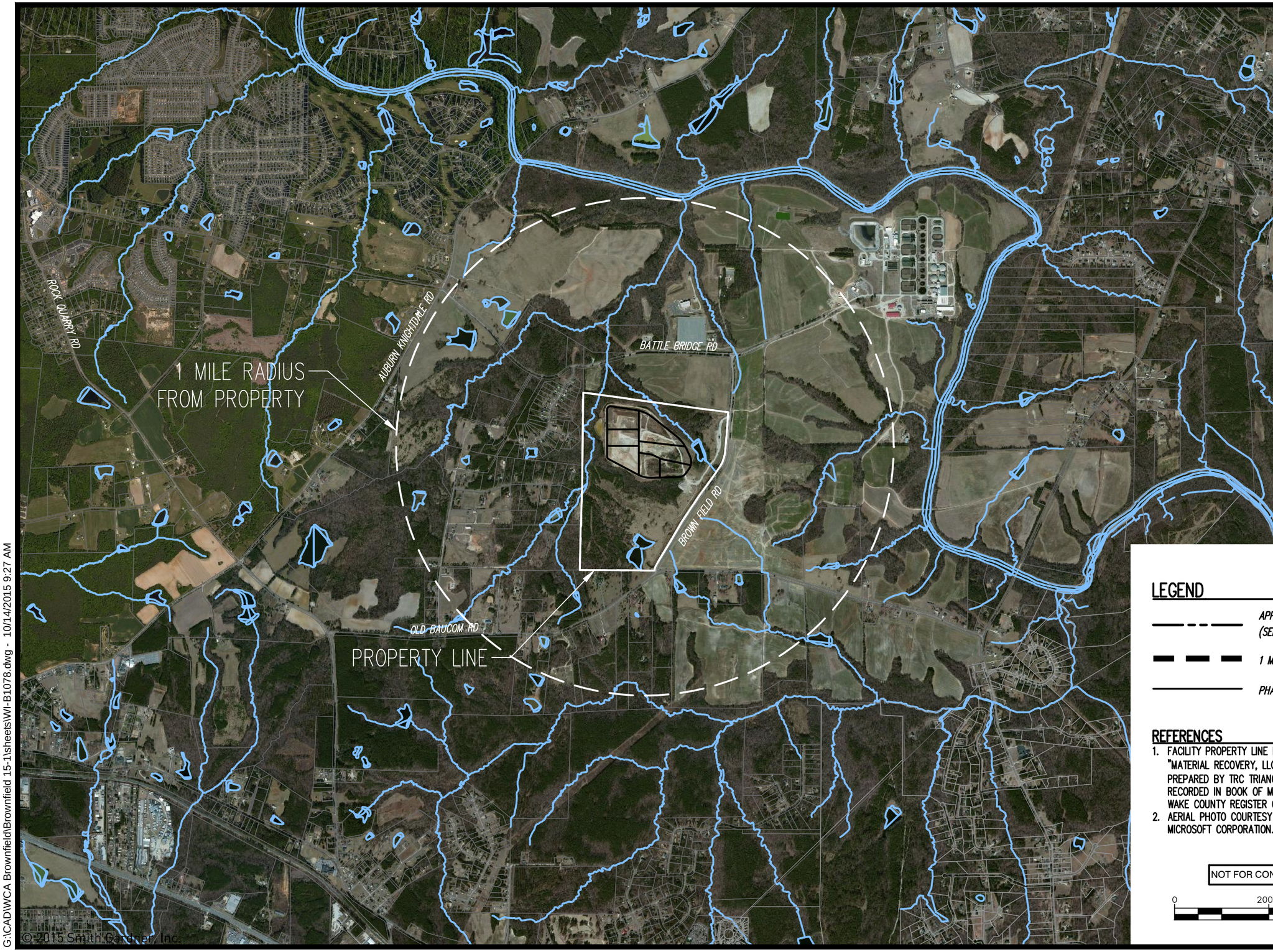

LEGEND

- APPROXIMATE PROPERTY LINE (SEE REFERENCE 1)
- 1 MILE RADIUS FROM PROPERTY
- PHASE LIMITS

REFERENCES

1. FACILITY PROPERTY LINE FROM A MAP ENTITLED "MATERIAL RECOVERY, LLC. & MAGARET TALTON" PREPARED BY TRC TRIANGLE, DATED 7/16/03, RECORDED IN BOOK OF MAPS 2003, PAGE 1508, WAKE COUNTY REGISTER OF DEEDS.
2. AERIAL PHOTO COURTESY OF USGS 2015 MICROSOFT CORPORATION.

NOT FOR CONSTRUCTION

0 2000' 4000'

PREPARED FOR:

BROWNFIELD ROAD C&D LANDFILL
PHASE 2B PERMIT TO CONSTRUCT
LANDFILL GAS MONITORING PLAN
AERIAL PHOTO

DRAWN:	APPROVED:	SCALE:	FIGURE NO.
T.R.S.	M.M.G.	AS SHOWN	1
DATE:	PROJECT NO:	FILENAME:	
Oct 2015	BROWNFIELD 15-1	WI-B1078	

PREPARED BY:

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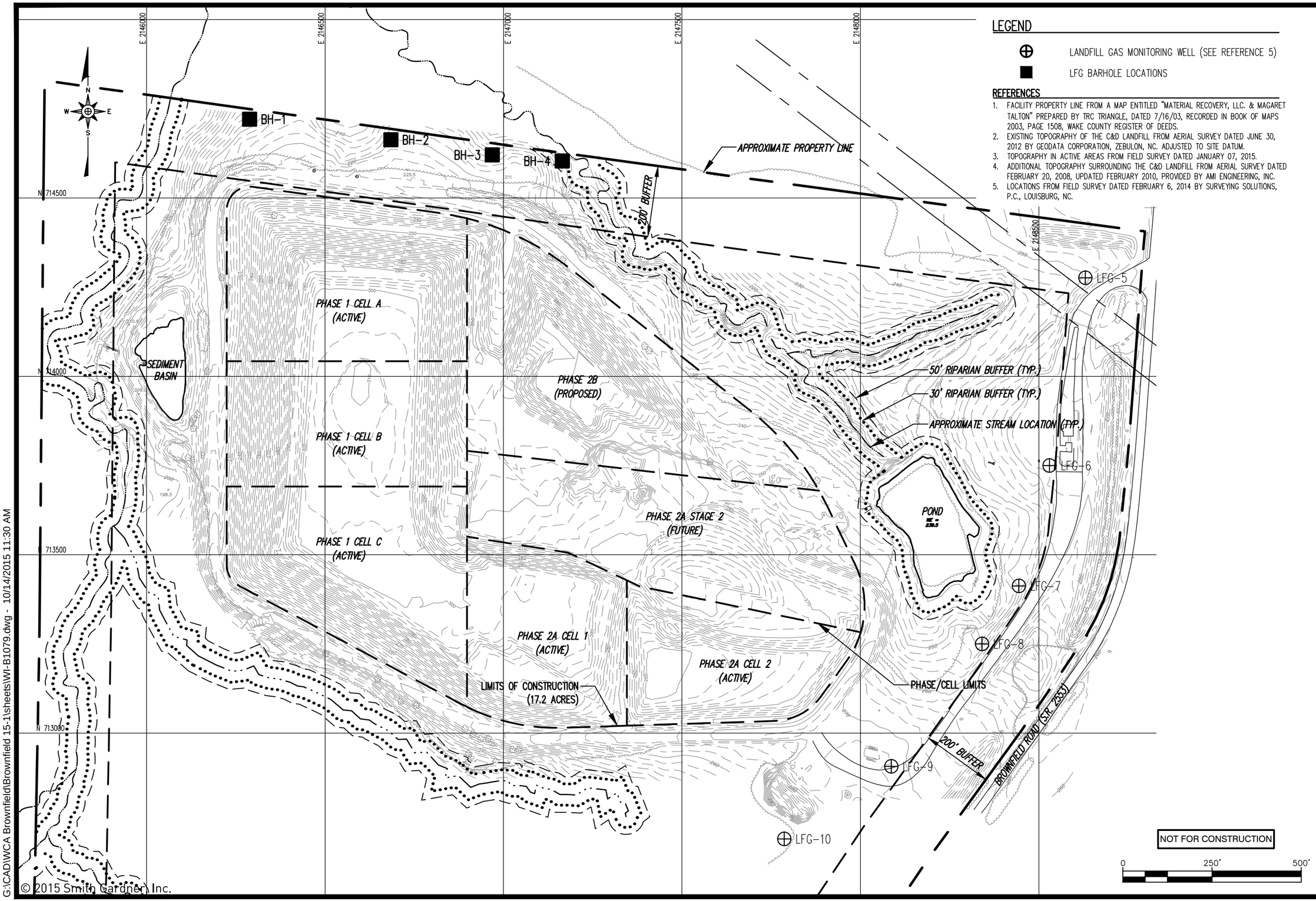

LEGEND

⊕ LANDFILL GAS MONITORING WELL (SEE REFERENCE 5)

■ LFG BARHOLE LOCATIONS

REFERENCES

1. FACILITY PROPERTY LINE FROM A MAP ENTITLED "MATERIAL RECOVERY, LLC. & MAGARET TALTON" PREPARED BY TRC TRIANGLE, DATED 7/16/03, RECORDED IN BOOK OF MAPS 2003, PAGE 1508, WAKE COUNTY REGISTER OF DEEDS.
2. EXISTING TOPOGRAPHY OF THE C&D LANDFILL FROM AERIAL SURVEY DATED JUNE 30, 2012 BY GEODATA CORPORATION, ZEBULON, NC. ADJUSTED TO SITE DATUM.
3. TOPOGRAPHY IN ACTIVE AREAS FROM FIELD SURVEY DATED JANUARY 07, 2015.
4. ADDITIONAL TOPOGRAPHY SURROUNDING THE C&D LANDFILL FROM AERIAL SURVEY DATED FEBRUARY 20, 2008, UPDATED FEBRUARY 2010, PROVIDED BY AMI ENGINEERING, INC.
5. LOCATIONS FROM FIELD SURVEY DATED FEBRUARY 6, 2014 BY SURVEYING SOLUTIONS, P.C., LOUISBURG, NC.

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.
T.R.S.	J.L.M.	AS SHOWN	2

DATE:	PROJECT NO:	FILENAME:
Oct 2015	BROWNFIELD 15-1	WI-B1079

PREPARED FOR:

WAKE RECLAMATION, LLC
BROWNFIELD ROAD C&D LANDFILL
PHASE 2B
LANDFILL GAS MONITORING PLAN

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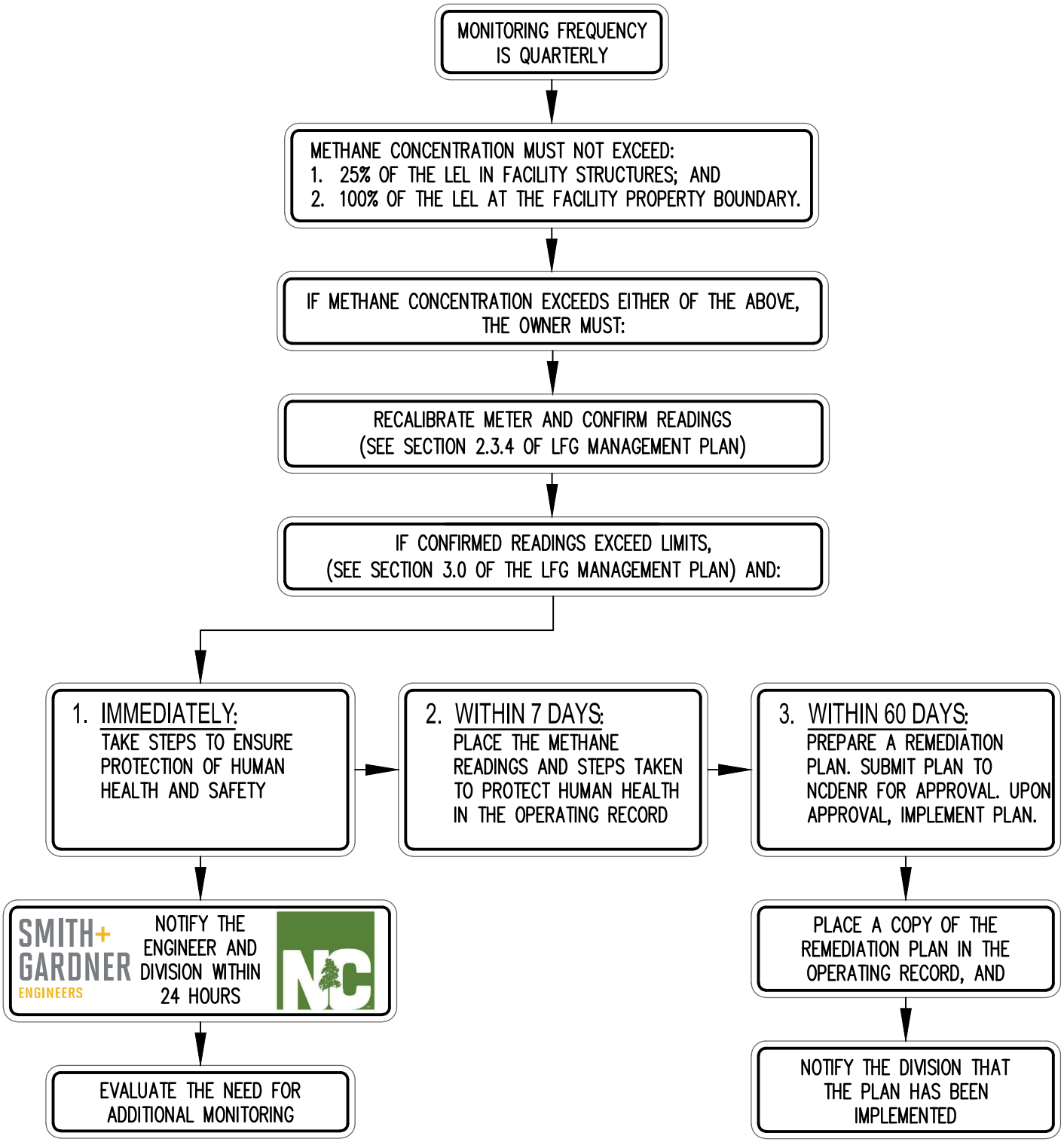

PREPARED FOR:

FLOWCHART OF
METHANE MONITORING REQUIREMENTS
WASTE INDUSTRIES BROWNFIELD ROAD
WAKE COUNTY, NC

PREPARED BY:

NC LIC. NO. C-0828 (ENGINEERING)

SMITH+GARDNER

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DRAWN:	APPROVED:	SCALE:	DATE:	PROJECT NO.:	FIGURE NO.:	FILE NAME:
T.R.S.	J.A.S.	N.T.S.	Oct 2015	BROWNFIELD 15-1	3	WI-A1080

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Appendix A

Well Logs

Landfill Gas Management Plan
Wake Reclamation, LLC.
Brownfield Road C&D Landfill
Raleigh, North Carolina

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RECORD OF BOREHOLE LFG-8

PROJECT: WCA-Material Recovery, LLC
PROJECT NUMBER: 073-9602411.400
DRILLED DEPTH: 15.0 ft
LOCATION: Raleigh, NC

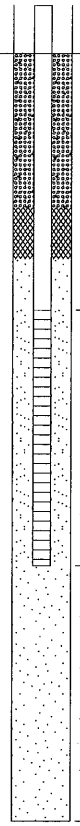
DRILL RIG: Deidrich D-120
DATE STARTED: 5/9/11
DATE COMPLETED: 5/12/11

NORTHING: 713,252.1
EASTING: 2,148,339.3
GS ELEVATION: 250.0 ft
TOC ELEVATION: 252.9 ft

DEPTH W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC
0	250	0.0 - 0.5 Topsoil, organic material.	N/A		249.5					
		0.5 - 3.0 Lt. Brown to tan clayey SILT, loose, moist, slight plasticity.	ML		0.5 / 247.0					
		3.0 - 5.0 Brown to gray clayey SILT w/ organics, loose, moist.	OL		3.0 / 245.0	4-6'	SPT	4-5-7-9	12	100% / 2.0
5	245	5.0 - 10.0 PWR, white to orange granitic, large quartz grains w/feldspar, muscovite, slightly firm.	PWR		5.0 / 240.0	9-11'	SPT	3-4-6-6	10	70% / 2.0
10	240	10.0 - 15.0 Orange clayey SILT, some quartz, loose, moist, soft, wet at 14-15' bgs, mafic minerals @ 15' grading to granitic PWR at bottom of boring.	ML		10.0 / 235.0	13-15'	SPT	2-3-4-5	7	25% / 2.0
15	235	Boring completed at 15.0 ft								
20	230									
25	225									
30	220									

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-5'
Material: PVC
Diameter: 2"
Joint Type: threaded

WELL SCREEN
Interval: 5-10'
Material: PVC
Diameter: 2"
Slot Size: 0.010"
End Cap: PVC

FILTER PACK
Interval: 4-15'
Type: #2 filter sand

FILTER PACK SEAL
Interval: 3-4'
Type: 3/8" bentonite chips

ANNULUS SEAL
Interval: 0-3'
Type: Portland cement

WELL COMPLETION
Pad: 3'x3' concrete pad
Protective Casing: 4" round anodized aluminum

DRILLING METHODS
Soil Drill: 4.25-inch ID Hollow Stem Augers
Rock Drill: N/A

LOG SCALE: 1 in = 4 ft
DRILLING COMPANY: Geologic Exploration
DRILLER: Brian Thomas

GA INSPECTOR: Jeremy DeVore
CHECKED BY: David Reedy, P.G.
DATE: 5/12/11

Golder Associates

RECORD OF BOREHOLE LFG-9

PROJECT: WCA-Material Recovery, LLC
PROJECT NUMBER: 073-9602411.400
DRILLED DEPTH: 30.0 ft
LOCATION: Raleigh, NC

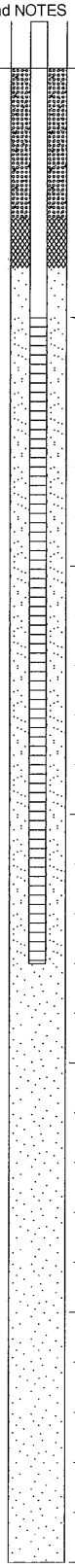
DRILL RIG: Deidrich D-120
DATE STARTED: 5/10/11
DATE COMPLETED: 5/12/11

NORTHING: 712,908.7
EASTING: 2,148,085.0
GS ELEVATION: 272.0 ft
TOC ELEVATION: 274.4 ft

DEPTH W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC
0		0.0 - 4.0 Orange silty CLAY, loose, soft, dry, low plasticity.	CL		268.0					
	270									
		4.0 - 5.0 Brownish-red clayey SILT, stiff, dry.	ML		4.0 267.0					
5		5.0 - 10.0 Orangish-pink clayey SILT, loose, slightly moist, soft, relic granitic texture.	ML		5.0	4-6'	SPT	8-6-5-6	11	70% / 2.0
	265									
10		10.0 - 15.0 Brown to tan clayey SILT, loose, slightly moist, relic granitic structure and fractures w/quartz and feldspar.	ML		262.0 10.0	9-11'	SPT	7-7-4-5	11	50% / 2.0
	260									
15		15.0 - 15.5 PWR, granitic, large quartz fragments w/feldspar, loose, soft, micaceous, slightly moist.	PWR		257.0 256.5	14-16'	SPT	5-9-6-6	15	100% / 2.0
	255	15.5 - 28.0 Lt. Brown, inorganic SILT, some clay, loose, soft, w/muscovite, biotite, mafic banding, moist at 26-28' bgs.	ML		15.5					
20						19-21'	SPT	5-4-5-7	9	75% / 2.0
	250									
25						24-26'	SPT	8-4-4-5	8	10% / 2.0
	245				244.0					
		28.0 - 30.0 PWR, granitic, large quartz fragments w/muscovite, biotite, relic fractures, wet.	PWR		28.0	28-30'	SPT	2-2-4-5	6	25% / 2.0
30		Boring completed at 30.0 ft			242.0					

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-5'
Material: PVC
Diameter: 2"
Joint Type: threaded

WELL SCREEN
Interval: 5-18'
Material: PVC
Diameter: 2"
Slot Size: 0.010"
End Cap: PVC

FILTER PACK
Interval: 4-30'
Type: #2 filter sand

FILTER PACK SEAL
Interval: 3-4'
Type: 3/8" bentonite chips

ANNULUS SEAL
Interval: 0-3'
Type: Portland cement

WELL COMPLETION
Pad: 3'x3' concrete pad
Protective Casing: 4" round anodized aluminum

DRILLING METHODS
Soil Drill: 4.25-inch ID Hollow Stem Augers
Rock Drill: N/A

LOG SCALE: 1 in = 4 ft
DRILLING COMPANY: Geologic Exploration
DRILLER: Brian Thomas

GA INSPECTOR: Jeremy DeVore
CHECKED BY: David Reedy, P.G.
DATE: 5/12/11

Golder Associates

RECORD OF BOREHOLE LFG-10

SHEET 1 of 1

PROJECT: WCA-Material Recovery, LLC
PROJECT NUMBER: 073-9602411.400
DRILLED DEPTH: 13.0 ft
LOCATION: Raleigh, NC

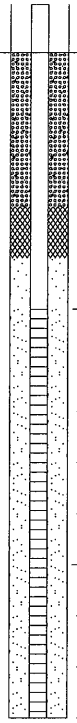
DRILL RIG: Deidrich D-120
DATE STARTED: 5/10/11
DATE COMPLETED: 5/12/11

NORTHING: 712,705.1
EASTING: 2,147,785.9
GS ELEVATION: 272.1 ft
TOC ELEVATION: 274.6 ft

DEPTH W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC
0		0.0 - 4.0 Orange clayey SILT, loose, soft, low plasticity, slightly moist.	ML		268.1					
	270	4.0 - 5.0 Brown to tan clayey SILT, loose, soft, low plasticity, slightly moist.	ML		4.0 / 267.1	4-6'	SPT	4-5-7-9	12	100%
5		5.0 - 5.5 Orange to red silty CLAY, low plasticity, firm.	CL		266.6					2.0
	265	5.5 - 9.5 Brown to red clayey SILT, loose, soft, micaceous.	ML		5.5 / 262.6					
10		9.5 - 11.0 Tan to beige sandy SILT, loose, dry, soft, w/ brownish-orange layers, micaceous, relic granitic texture.	SM		9.5 / 261.1	9-11'	SPT	3-6-5-4	11	100% 2.0
	260	11.0 - 12.0 PWR, white to gray granitic, firm to hard w/quartz, feldspar, muscovite, biotite.	PWR		11.0 / 260.1	11-13'	SPT	50/5	50/5	10% 2.0
		12.0 - 13.0 GRANITE, competent bedrock, abundant quartz, feldspar, muscovite, biotite, amphibole, very hard, dry.	BR		12.0 / 259.1					
		Boring completed at 13.0 ft								
15										
	255									
20										
	250									
25										
	245									
30										

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-5'
Material: PVC
Diameter: 2"
Joint Type: threaded

WELL SCREEN
Interval: 5-13'
Material: PVC
Diameter: 2"
Slot Size: 0.010"
End Cap: PVC

FILTER PACK
Interval: 4-13'
Type: #2 filter sand

FILTER PACK SEAL
Interval: 3-4'
Type: 3/8" bentonite chips

ANNULUS SEAL
Interval: 0-3'
Type: Portland cement

WELL COMPLETION
Pad: 3'x3' concrete pad
Protective Casing: 4" round anodized aluminum

DRILLING METHODS
Soil Drill: 4.25-inch ID Hollow Stem Augers
Rock Drill: N/A

LOG SCALE: 1 in = 4 ft
DRILLING COMPANY: Geologic Exploration
DRILLER: Brian Thomas

GA INSPECTOR: Jeremy DeVore
CHECKED BY: David Reedy, P.G.
DATE: 5/12/11

Golder Associates

Project Name	WCA-Method Recovery	Project Number	0739602411
Project Location	Raleigh, NC	Client	WCA
Drilling Company	Geologic Exploration	Driller Name	Brian Thomas
Ground Elevation	N/A	Rig Type	Diedrich D-120
Groundwater elevation	N/A	Logged By	JAO
Date Start/Finish	5/9/11 - 5/12/11	Total Depth	10' bgs

BORING NO. LFG-8

Page 1 of 1

Elev. Ft.	Depth ft.	Sample Type & No.	Sample Blows per 6"	Sample Pen in.	Sample Rec %	Remarks	Graphic Log (USCS)	Soil and Rock Descriptions
								0-0.5 topsoil
		SS					ML	0.5-3 light brown to tan clayey silt, loose, moist slight plasticity
	5	4-6'	4 5 7 9		100%		OL	3-5 brown to gray, organic ~~silty clay~~ clayey silt, loose, moist
								5-10' PWR, white to orange granitic texture, large quartz crystals, feldspar, muscovite, slightly firm
	10	9-11'	3 4 6 6		70%		ML	10'-15' orange clayey silt, some quartz, loose moist, soft, wet @ 14-15' dark minerals @ 15' in to PWR
	15	13-15'	2 3 4 5		25%			
	20							Set @ 10' based on wetness @ 14-15' Screen 5-10'

Blows per 6 in. - 140lb hammer falling 30 in. to drive a 2.0 in. OD split spoon sampler.
Pen - Penetration Length of Sampler or Core Barrell
Rec - Recovery Length of Sample RQD - Lenght of Sound Cores >4in./Length Cored %
S - Split Spoon Sample U - Undisturbed Samples

Notes: (Rig Type, drilling method, bit or auger size, PSI, Equipment Failures, possible contamination, deviations from drilling plan, drilling difficulties, ect.)
4.25" H.S.A Splitspoon 5' centers

Golder Associates

Golder Associates

MONITORING WELL INSTALLATION SKETCH

Project:	WCA-Material Recovery	Monitoring Well No.:	LFG-8
Drilling Subcontractor:	Geologic Exploration	Date/time of Well Installation:	5/9/11 17:00
Driller:	Brian Thomas	Depth to Bottom of Well From Top of Monitoring Well Pipe:	13.10'
Logged By:	JAD		

Depth or Height (ft) From Ground Surface

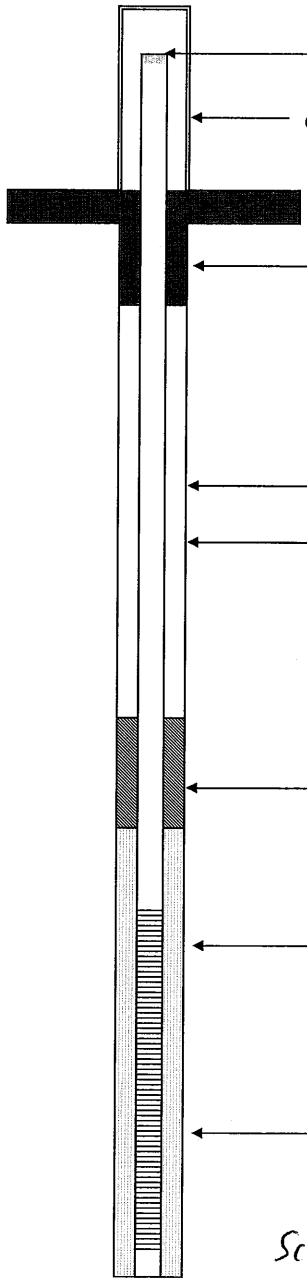
0'

3'

4'

5'

10'



Approx. Stickup 2.5'

O.D. of Outer Protective Casing 4"

Dimensions of Concrete Pad 3'x3'x0.5'

Type of Surface Seal Portland cement

Type of Backfill cement grout

Diameter of Borehole 8"

Type of Seal bentonite holeplug

I.D. of screen 2"

Size of Screen Opening 0.010"

Type of Screen PVC Sch.40

Size of Filter Sand #2

Screened interval 13.1'-8.1' from TOC

WATER LEVEL MEASUREMENTS

Date	5/10/11	5/12/11					
Depth from TOC	dry	dry					
Time	12:48	8:30					

Project Name	WCA - Material Recovery	Project Number	0739602411
Project Location	Raleigh, NC	Client	WCA
Drilling Company	Geologic Exploration	Driller Name	Brian Thomas
Ground Elevation	N/A	Rig Type	Diedrich D-120
Groundwater elevation	NA	Logged By	JAD
Date Start/Finish	5/10/11 - 5/12/11	Total Depth	18' bgs

BORING NO. LFG-9

Page 1 of 1

Elev. Ft.	Depth ft.	Sample Type & No.	Blows per 6"	Pen in.	Rec %	Remarks	Graphic Log (USCS)	Soil and Rock Descriptions
		SS					CL	0-4' Orange silty CLAY, loose, soft, dry, low plasticity
	5	4-6'	8 6 5 6		70%		ML	4-5' Brownish red clayey SILT, stiff, dry
							ML	5-10' ~~Brown to~~ Orangish pink, clayey SILT, loose, slightly moist, soft, relic granitic texture.
	10	9-11'	7 7 4 5		50%		ML	10-15' Brown to tan clayey SILT, loose, slightly moist, relic granitic structure + fractures, with quartz + feldspar
	15	14-16'	5 9 6 6		100%		PWR	15-15.5' PWR, granitic, large quartz fragments, feldspar, loose, soft, micaceous, slightly moist.
	20	19-21'	5 4 5 7		75%		ML	15.5-28' Lt. brown, inorganic SILT, micaceous, loose, soft, slightly moist, some clay, with muscovite, biotite, mafic bands moist @ 26-28'
	25	24-26'	8 4 4 5		10%			
							PWR	28-30' PWR, granitic, large quartz fragments, w/ muscovite, biotite, relic fractures, wet
	30	28-30	2 2 4 5		25%			
								Set well @ 18' Screen @ 5-18'

Blows per 6 in. - 140lb hammer falling 30 in. to drive a 2.0 in. OD split spoon sampler.
Pen - Penetration Length of Sampler or Core Barrell
Rec - Recovery Length of Sample RQD - Lenght of Sound Cores >4in./Length Cored %
S - Split Spoon Sample U - Undisturbed Samples

Notes: (Rig Type, drilling method, bit or auger size, PSI, Equipment Failures, possible contamination, deviations from drilling plan, drilling difficulties, ect.)
4.25" ID HSA, 5ft center splitspoons

Golder Associates

Golder Associates

MONITORING WELL INSTALLATION SKETCH

Project: WCA. Material Recovery

Drilling Subcontractor: Geologic Exploration

Driller: Brian Thomas

Logged By: JRD

Monitoring Well No.: LFG-9

Date/time of Well Installation: 5/10/11 9:20

Depth to Bottom of Well From Top of Monitoring Well Pipe: 20.40' ~~(well not set yet)~~ 90

Depth or Height (ft) From Ground Surface

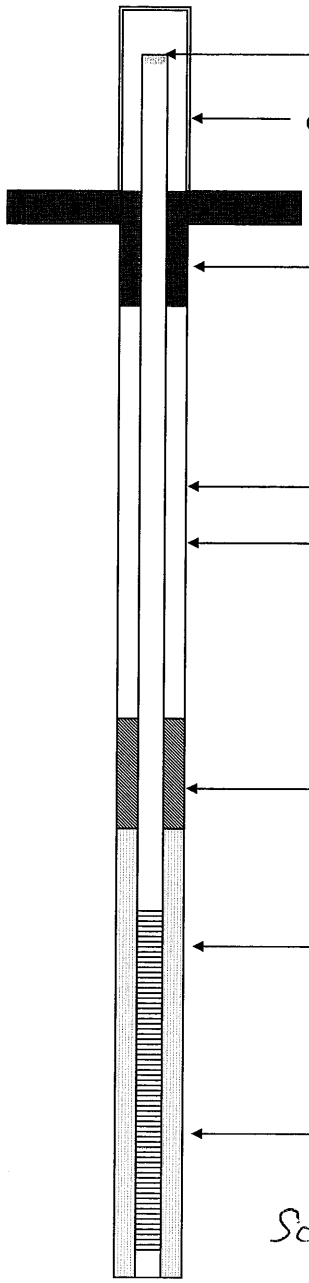
0'

3'

4'

5'

18'



Approx. Stickup 2.0'

O.D. of Outer Protective Casing 4"

Dimensions of Concrete Pad 3'x3'x0.5'

Type of Surface Seal Portland cement

Type of Backfill cement grout

Diameter of Borehole 8"

Type of Seal bentonite holeplug

I.D. of screen 2"

Size of Screen Opening 0.010"

Type of Screen PVC Sch. 40

Size of Filter Sand #2

Screened interval 20.4'-7.4' from TOC

WATER LEVEL MEASUREMENTS

Date	5/10/11	5/12/11					
Depth from TOC	dry	dry					
Time	12:50	8:23					

Project Name	WCA - Material Recovery	Project Number	0739602411
Project Location	Raleigh, NC	Client	WCA
Drilling Company	Geologic Exploration	Driller Name	Brian Thomas
Ground Elevation	N/A	Rig Type	Diedrich D-120
Groundwater elevation	N/A	Logged By	JAD
Date Start/Finish	5/10/11 - 5/12/11	Total Depth	13' bgs

BORING NO. LFG-10

Page 1 of 1

Elev. Ft.	Depth ft.	Sample Type & No.	Sample Blows per 6"	Sample Pen in.	Sample Rec %	Remarks	Graphic Log (USCS)	Soil and Rock Descriptions
		SS	4				ML	0-4' Orange clayey SILT, loose, soft, slightly moist, low plasticity.
	5	4-6'	5 7 9		100%		ML	4-5' Brown to tan clayey SILT, loose, soft, slightly moist
							CL	5-5.5' Orange to red silty CLAY, low plasticity, firm
	10	9-11'	3 6 5 4		100%		ML	5.5-9.5' Brown to red clayey SILT, loose, soft, micaceous
							SM	9.5-11' Tan to beige sandy SILT, loose, dry, soft w/ brownish/orangish layers, micaceous, granitic fabric
	15	12-13'	50/5		10%		PWR	11-12' PWR, white to gray granite, firm to hard w/ quartz, feldspar, muscovite biotite
	20							
	25					Granite →		12-13' Competent granite bedrock w/ quartz, feldspar, muscovite, biotite, amphibole, very hard, dry

Set well @ 13' (at top of bedrock)

Screen 5-13'

Blows per 6 in. - 140lb hammer falling 30 in. to drive a 2.0 in. OD split spoon sampler.
Pen - Penetration Length of Sampler or Core Barrell
Rec - Recovery Length of Sample
RQD - Lenght of Sound Cores >4in./Length Cored %
S - Split Spoon Sample
U - Undisturbed Samples

Notes: (Rig Type, drilling method, bit or auger size, PSI, Equipment Failures, possible contamination, deviations from drilling plan, drilling difficulties, ect.)

4.25" ID HSA, Splitspoons 5' centers

Golder Associates

Golder Associates

MONITORING WELL INSTALLATION SKETCH

Project: WCA. Material Recovery

Drilling Subcontractor: Geologic Exploration

Driller: Brian Thomas

Logged By: JAD

Monitoring Well No.: LFG-10

Date/time of Well Installation: 5/10/11 10:00

Depth to Bottom of Well From Top of Monitoring Well Pipe: 17.90'

(90) (~~screen~~ riser not yet cut down) 5/10/11

Final depth 5/12/11 15.25

Depth or Height (ft) From Ground Surface

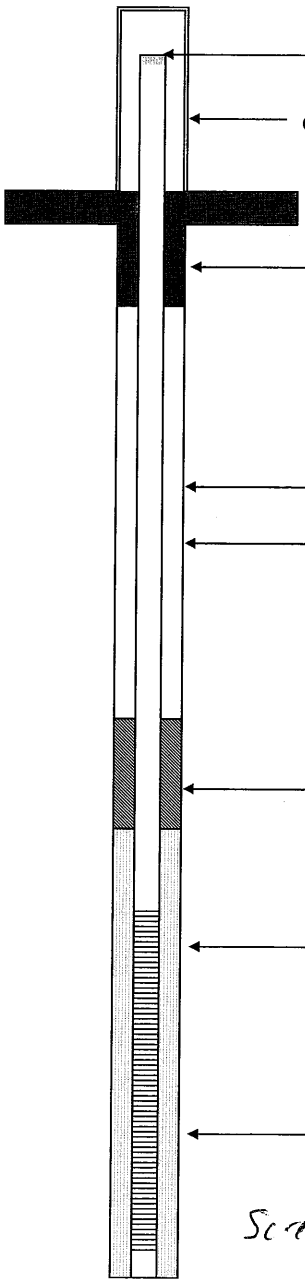
0'

3'

4'

5'

13'



Approx. Stickup 2.2'

O.D. of Outer Protective Casing 4"

Dimensions of Concrete Pad 3'x3'x0.5'

Type of Surface Seal Portland cement

Type of Backfill cement grout

Diameter of Borehole 8"

Type of Seal bentonite holeplug

I.D. of screen 2"

Size of Screen Opening 0.010"

Type of Screen PVC Sch. 40

Size of Filter Sand #2

Screened interval 15.25'-7.25' from TOC

WATER LEVEL MEASUREMENTS

Date	5/10/11	5/12/11					
Depth from TOC	dry	dry					
Time	12:55	8:19					

NON RESIDENTIAL WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR CERTIFICATION # 2581

1. WELL CONTRACTOR:

BRIAN THOMAS
Well Contractor (Individual) Name

GEOLOGIC EXPLORATION, INC
Well Contractor Company Name

176 COMMERCE BLVD
Street Address

STATESVILLE NC 28625
City or Town State Zip Code

(704) 872-7686
Area code Phone number

2. WELL INFORMATION:

WELL CONSTRUCTION PERMIT# N/A

OTHER ASSOCIATED PERMIT#(if applicable)

SITE WELL ID #(if applicable) LFG-8

3. WELL USE (Check One Box) Monitoring ☑ Municipal/Public ☐
Industrial/Commercial ☐ Agricultural ☐ Recovery ☐ Injection ☐
Irrigation☐ Other ☐ (list use)

DATE DRILLED 05/09/11 - 05/17/11

4. WELL LOCATION:

2600 BROWNFIELD ROAD 27610
(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

CITY: RALEIGH COUNTY WAKE

TOPOGRAPHIC / LAND SETTING: (check appropriate box)
☐Slope ☐Valley ☐Flat ☐Ridge ☐Other

LATITUDE ___°___'___" DMS **OR** ___ DD

LONGITUDE ___°___'___" DMS **OR** ___ DD

Latitude/longitude source: ☐GPS ☐Topographic map
(location of well must be shown on a USGS topo map andattached to this form if not using GPS)

5. FACILITY (Name of the business where the well is located.)

WCA - MATERIAL RECOVERY N/A
Facility Name Facility ID# (if applicable)

2600 BROWNFIELD ROAD
Street Address

RALEIGH NC 27610
City or Town State Zip Code

WCA - MATERIAL RECOVERY
Contact Name

2600 BROWNFIELD ROAD
Mailing Address

RALEIGH NC 27610
City or Town State Zip Code

( )
Area code Phone number

6. WELL DETAILS:

a. **TOTAL DEPTH:** 10.0 FEET

b. **DOES WELL REPLACE EXISTING WELL?** YES ☐ NO ☑

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

d. **TOP OF CASING IS** 2.5 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):** N/A **METHOD OF TEST** N/A

f. **DISINFECTION: Type** N/A **Amount** N/A

g. **WATER ZONES** (depth):

Top	Bottom	Top	Bottom
Top	Bottom	Top	Bottom
Top	Bottom	Top	Bottom

7. CASING:

Depth		Diameter	Thickness/ Weight	Material
Top 0.0	Bottom 5.0	Ft. 2 INCH	SCH 40	PVC
Top	Bottom	Ft.		
Top	Bottom	Ft.		

8. GROUT:

Depth		Material	Method
Top 0.0	Bottom 3.0	Ft. PORTLAND BENTONITE	SLURRY
Top	Bottom	Ft.	
Top	Bottom	Ft.	

9. SCREEN:

Depth		Diameter	Slot Size	Material
Top 5.0	Bottom 10.0	Ft. 2.0 in.	.010 in.	PVC
Top	Bottom	Ft. in.	in.	
Top	Bottom	Ft. in.	in.	

10. SAND/GRAVEL PACK:

Depth		Size	Material
Top 4.0	Bottom 10.0	Ft. 20-40	FINE SILICA SAND
Top	Bottom	Ft.	
Top	Bottom	Ft.	

11. DRILLING LOG

Top	Bottom	Formation Description
0.0	5.0	BLACK SAND
5.0	8.0	RED SILTY CLAY
8.0	15.0	TAN SILTY SANDY CLAY

12. REMARKS:

BENTONITE SEAL FROM 3.0 TO 4.0 FEET

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.

Brian Thomas 06/06/11
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

BRIAN THOMAS
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit within 30 days of completion to: Division of Water Quality - Information Processing, 1617 Mail Service Center, Raleigh, NC 27699-161, Phone : (919) 807-6300

Form GW-1b
Rev. 2/09


Brownfield Rd
site
Old Baucom Rd.

NON RESIDENTIAL WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR CERTIFICATION # 2581

1. WELL CONTRACTOR:

BRIAN THOMAS
Well Contractor (Individual) Name

GEOLOGIC EXPLORATION, INC
Well Contractor Company Name

176 COMMERCE BLVD
Street Address

STATESVILLE NC 28625
City or Town State Zip Code

(704) 872-7686
Area code Phone number

2. WELL INFORMATION:

WELL CONSTRUCTION PERMIT# N/A

OTHER ASSOCIATED PERMIT#(if applicable)

SITE WELL ID #(if applicable) LFG-9

3. WELL USE (Check One Box) Monitoring ☑ Municipal/Public ☐
Industrial/Commercial ☐ Agricultural ☐ Recovery ☐ Injection ☐
Irrigation☐ Other ☐ (list use)

DATE DRILLED 05/09/11 - 05/17/11

4. WELL LOCATION:

2600 BROWNFIELD ROAD 27610
(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

CITY: RALEIGH COUNTY WAKE

TOPOGRAPHIC / LAND SETTING: (check appropriate box)
☐Slope ☐Valley ☐Flat ☐Ridge ☐Other

LATITUDE ___°___'___" DMS **OR** ___ DD

LONGITUDE ___°___'___" DMS **OR** ___ DD

Latitude/longitude source: ☐GPS ☐Topographic map
(location of well must be shown on a USGS topo map andattached to this form if not using GPS)

5. FACILITY (Name of the business where the well is located.)

WCA - MATERIAL RECOVERY N/A
Facility Name Facility ID# (if applicable)

2600 BROWNFIELD ROAD
Street Address

RALEIGH NC 27610
City or Town State Zip Code

WCA - MATERIAL RECOVERY
Contact Name

2600 BROWNFIELD ROAD
Mailing Address

RALEIGH NC 27610
City or Town State Zip Code

(_____) _____
Area code Phone number

6. WELL DETAILS:

a. **TOTAL DEPTH:** 18.0 FEET

b. **DOES WELL REPLACE EXISTING WELL?** YES ☐ NO ☑

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

d. **TOP OF CASING IS** 2.5 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):** N/A **METHOD OF TEST** N/A

f. **DISINFECTION: Type** N/A **Amount** N/A

g. **WATER ZONES** (depth):

Top	Bottom	Top	Bottom
Top	Bottom	Top	Bottom
Top	Bottom	Top	Bottom

7. CASING:

Depth		Diameter	Thickness/ Weight	Material
Top 0.0	Bottom 5.0	Ft. 2 INCH	SCH 40	PVC
Top	Bottom	Ft.		
Top	Bottom	Ft.		

8. GROUT:

Depth		Material	Method
Top 0.0	Bottom 3.0	Ft. PORTLAND BENTONITE	SLURRY
Top	Bottom	Ft.	
Top	Bottom	Ft.	

9. SCREEN:

Depth		Diameter	Slot Size	Material
Top 5.0	Bottom 18.0	Ft. 2.0 in.	.010 in.	PVC
Top	Bottom	Ft. in.	in.	
Top	Bottom	Ft. in.	in.	

10. SAND/GRAVEL PACK:

Depth		Size	Material
Top 4.0	Bottom 18.0	Ft. 20-40	FINE SILICA SAND
Top	Bottom	Ft.	
Top	Bottom	Ft.	

11. DRILLING LOG

Top	Bottom	Formation Description
0.0	5.0	BLACK SAND
5.0	20.0	RED SILTY CLAY
20.0	30.0	TAN SILTY SANDY CLAY

12. REMARKS:

BENTONITE SEAL FROM 3.0 TO 4.0 FEET

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.

SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE 06/06/11

BRIAN THOMAS
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit within 30 days of completion to: Division of Water Quality - Information Processing, 1617 Mail Service Center, Raleigh, NC 27699-161, Phone : (919) 807-6300

Form GW-1b
Rev. 2/09


Brownfield Ro
site
Old Baucom Rd.

NON RESIDENTIAL WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR CERTIFICATION # 2581

1. WELL CONTRACTOR:

BRIAN THOMAS
Well Contractor (Individual) Name

GEOLOGIC EXPLORATION, INC
Well Contractor Company Name

176 COMMERCE BLVD
Street Address

STATESVILLE NC 28625
City or Town State Zip Code

(704) 872-7686
Area code Phone number

2. WELL INFORMATION:

WELL CONSTRUCTION PERMIT# N/A

OTHER ASSOCIATED PERMIT#(if applicable)

SITE WELL ID #(if applicable) LFG-10

3. WELL USE (Check One Box) Monitoring ☑ Municipal/Public ☐
Industrial/Commercial ☐ Agricultural ☐ Recovery ☐ Injection ☐
Irrigation☐ Other ☐ (list use)

DATE DRILLED 05/09/11 - 05/17/11

4. WELL LOCATION:

2600 BROWNFIELD ROAD 27610
(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

CITY: RALEIGH COUNTY WAKE

TOPOGRAPHIC / LAND SETTING: (check appropriate box)
☐Slope ☐Valley ☐Flat ☐Ridge ☐Other

LATITUDE ___°___'___" DMS **OR** ___ DD

LONGITUDE ___°___'___" DMS **OR** ___ DD

Latitude/longitude source: ☐GPS ☐Topographic map
(location of well must be shown on a USGS topo map andattached to this form if not using GPS)

5. FACILITY (Name of the business where the well is located.)

WCA - MATERIAL RECOVERY N/A
Facility Name Facility ID# (if applicable)

2600 BROWNFIELD ROAD
Street Address

RALEIGH NC 27610
City or Town State Zip Code

WCA - MATERIAL RECOVERY
Contact Name

2600 BROWNFIELD ROAD
Mailing Address

RALEIGH NC 27610
City or Town State Zip Code

(_____) _____
Area code Phone number

6. WELL DETAILS:

a. **TOTAL DEPTH:** 13.0 FEET

b. **DOES WELL REPLACE EXISTING WELL?** YES ☐ NO ☑

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

d. **TOP OF CASING IS** 2.5 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):** N/A **METHOD OF TEST** N/A

f. **DISINFECTION: Type** N/A **Amount** N/A

g. **WATER ZONES** (depth):

Top	Bottom	Top	Bottom
Top	Bottom	Top	Bottom
Top	Bottom	Top	Bottom

7. CASING:

Depth		Diameter	Thickness/ Weight	Material
Top 0.0	Bottom 5.0	Ft. 2 INCH	SCH 40	PVC
Top	Bottom	Ft.		
Top	Bottom	Ft.		

8. GROUT:

Depth		Material	Method
Top 0.0	Bottom 3.0	Ft. PORTLAND BENTONITE	SLURRY
Top	Bottom	Ft.	
Top	Bottom	Ft.	

9. SCREEN:

Depth		Diameter	Slot Size	Material
Top 5.0	Bottom 13.0	Ft. 2.0 in.	.010 in.	PVC
Top	Bottom	Ft. in.	in.	
Top	Bottom	Ft. in.	in.	

10. SAND/GRAVEL PACK:

Depth		Size	Material
Top 4.0	Bottom 13.0	Ft. 20-40	FINE SILICA SAND
Top	Bottom	Ft.	
Top	Bottom	Ft.	

11. DRILLING LOG

Top	Bottom	Formation Description
0.0	3.0	BLACK SAND
3.0	8.0	RED SILTY CLAY
8.0	13.0	TAN SILTY SANDY CLAY

12. REMARKS:

BENTONITE SEAL FROM 3.0 TO 4.0 FEET

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.

Brian Thomas 06/06/11
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

BRIAN THOMAS
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit within 30 days of completion to: Division of Water Quality - Information Processing, 1617 Mail Service Center, Raleigh, NC 27699-161, Phone : (919) 807-6300

Form GW-1b
Rev. 2/09


Brown Field Ro
site
Old Baucom Rd.

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Appendix B

Reporting Forms

Landfill Gas Management Plan
Wake Reclamation, LLC.
Brownfield Road C&D Landfill
Raleigh, North Carolina

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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: _____ Permit Number: _____

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

Name and Position of Sample Collector: _____

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

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 TITLE

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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
☐ 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.

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)

Revised 6/2009

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