



Permit No.	Date	DIN
4501	December 22, 2010	12557

December 20, 2010

RECEIVED
December 20, 2010
 Solid Waste Section
 Asheville Regional Office

Mr. Larry Frost
 North Carolina Department of Environment and Natural Resources
 Division of Waste Management
 2090 US Highway 70
 Swannanoa, North Carolina 28778

RE: Landfill Gas Monitoring Plan Update
 Stoney Mountain Road Landfill
 Permit No. 45-01
 Henderson County, North Carolina

Dear Mr. Frost:

As part of the compliance audit report, dated April 28, 2010, by Ms. Andrea Keller of the North Carolina Department of Environment and Natural Resources, Henderson County was requested to update their Landfill Gas (LFG) Monitoring Plan for the Stoney Mountain Road Landfill (Permit No. 45-01) in conjunction with the submittal for the Permit Renewal for the Stoney Mountain Road Solid Waste Transfer Station (Permit No. 45-04T). This updated LFG Monitoring Plan includes all of the LFG monitoring points on the property, including the LFG monitoring wells and the location of the required LFG monitoring in all on-site structures. The Plan summarizes the procedures and locations of all of the LFG monitoring at the existing locations, as well as future LFG monitoring for the proposed structures included in the Capital Improvements Project. The Permit Renewal for the Transfer Station has been sent to your office under separate cover.

We appreciate your assistance with this project. Please find enclosed 1 digital copy and 1 hard copy of the updated LFG Monitoring Plan for the Stoney Mountain Road Landfill. Please feel free to contact me or Mark Cathey if you have any questions regarding this submittal.

Sincerely,
 MCGILL ASSOCIATES, P.A.

DAVE PASKO
 Senior Engineering Technician

Enclosures

cc: Ms. Andrea Keller, NCDENR, Compliance Branch, w/enc (hard copy)
 Mr. Marcus Jones, PE, Henderson County Engineer, w/enc (via email)
 Ms. Natalie Berry, PE, Henderson County Solid Waste Department, w/enc (via email)
 Mr. Steve Allman, Enerdyne Power Systems, Inc., w/enc (via email)

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**LANDFILL GAS MONITORING PLAN
STONEY MOUNTAIN ROAD LANDFILL**

PERMIT NO. 45-01

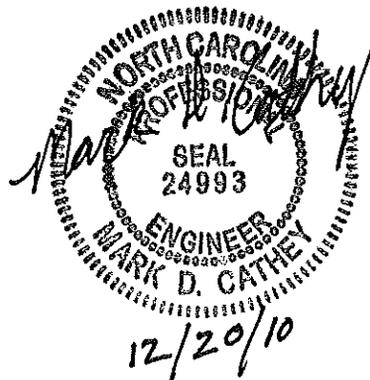
HENDERSON COUNTY, NORTH CAROLINA

MARK D. CATHEY, PE

 **McGill**
ASSOCIATES
Engineering • Planning • Finance
Asheville, North Carolina

December 2010

10.00727



Landfill Gas Monitoring Plan
Stoney Mountain Road Landfill

Permit No. 45-01

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1.0 Introduction

The Stoney Mountain Road Landfill, Permit No. 45-01, is owned and operated by Henderson County and is located at 802 Stoney Mountain Road, in Hendersonville, North Carolina. The North Carolina Department of Environment and Natural Resources (NCDENR) - Division of Waste Management (DWM), in a compliance audit report dated April 28, 2010, has requested that the County update their Landfill Gas (LFG) Monitoring Plan to include all of the LFG monitoring points on the property, including the LFG monitoring wells and the location of required LFG monitoring in all on-site structures. This document summarizes the location of LFG monitoring points and the procedures used to monitor LFG at the Stoney Mountain Road Landfill. This plan addresses LFG monitoring based on current conditions at the Landfill, as well as conditions anticipated at the time of the proposed final build-out of the Capital Improvements Project, in early 2012.

Henderson County Solid Waste Department records show quarterly monitoring of on-site LFG monitoring wells since the early 1990's. Landfill gas migration was observed at the Stoney Mountain Road Landfill in the early 1990's, and the County worked with the then North Carolina Department of Environment, Health and Natural Resources to develop a plan to address LFG migration issues. The result of that plan was to install an active gas collection system, which has been in place from the mid 1990's. The gas collection system is operated by a private developer. As part of the contract to operate the gas collection system, the developer performs the quarterly monitoring of LFG monitoring wells and structures, and reports to the County the findings of the quarterly monitoring.

The MSWLF facility, with C&DLF constructed over the MSWLF, received the final Letter of Closure from the NCDENR-DWM on April 11, 2006. The entire landfill property encompasses approximately 145 acres, as shown on the Landfill Gas Monitoring Plan (Figure 1), included as Appendix 1. The Facility Boundary includes approximately 126 acres (Figure 1). There are several closed landfill units within the Facility Boundary, as well as existing operations: a mulching & grinding operation, a citizen's convenience center, recycling, a proposed composting operation, scale house, and employee break room. Located on the property, but outside of the Facility Boundary, is the Humane Society Facility of Henderson County, and a community activity center and playground. Located just outside of the property limits, the Henderson County Schools operates a school bus maintenance facility. Future monitoring locations for the proposed scale house and attendant building at the citizen's convenience center are included in this LFG Monitoring Plan. The proposed scale house will be equipped with a continuous methane gas monitoring system and a passive gas ventilation system constructed below the concrete building slab. The monitoring system will be operated and calibrated in accordance with the manufacturer's requirements. The monitoring system sounds an alert horn if the methane gas readings are detected above 25 percent of the lower explosive limit of methane gas. The below-slab ventilation system will be installed as part of the original construction of the building.

The Facility Boundary is bounded by private property utilized for residential use on the north and east sides, Stoney Mountain Road to the south, and the NCDOT operates a facility

along the western margin of the landfill property. Adjoining properties are illustrated on Figure 1 in Appendix 1.

2.0 Regulatory Compliance

The Stoney Mountain Road Landfill (Permit No. 45-01) operates under the Permit for Closure. This Landfill Gas Monitoring Plan was updated to comply with the following "Methane Gas Remediation Conditions" section of the Permit for Closure. This section has been included below.

- (8) The owner or operator shall maintain and operate the gas monitoring system to ensure that:
 - (a) The concentration of methane gas generated by the facility does not exceed 25 percent of the lower explosive limit for methane in facility structures (excluding gas control or recovery system components); and
 - (b) The concentration of methane gas does not exceed 100% of the lower explosive limit for methane at the facility property boundary.

- (9) If methane gas levels exceeding these limits are detected, the owner or operator must take all steps necessary to meet the standards established in condition 8. Methane gas remediation plans approved by the Division are described in the List of Approved Documents, Attachment 1, Part C of the Permit for Closure.

"Lower Explosive Limit" (LEL) is defined as the lowest percent by volume of a mixture of explosive gases which will propagate a flame in air at 25° C and atmospheric pressure.

3.0 Landfill Gas Monitoring Plan

The Landfill Gas Monitoring Plan has been developed to detect the migration of landfill gas to Facility /Property Boundary and/or on-site facility structures. The Stoney Mountain Road Landfill was not constructed with an impermeable base liner system and cap system. There may be a chance for landfill gas migration through the permeable *in situ* soils. The migration of landfill gas is induced by pressure gradients. The landfill gas will move from areas of high pressure to those of low pressure following the path of least resistance. The landfill gas generally migrates vertically until it reaches the landfill cap, where it may begin to flow horizontally. This occurs until it finds a pathway out through the permeable *in situ* soils. Henderson County has had an active gas collection system in operation in the closed MSWLF since the mid 1990's. A vacuum system aids the movement of landfill gas to the collection system, where it is removed from the landfill through a piping network instead of into the atmosphere. The landfill gas is then utilized by private industry as a fuel source. The landfill gas monitoring wells are in place to detect any landfill gas not collected in the active collection system.

3.1 Landfill Gas Compliance Monitoring Locations

The landfill gas monitoring wells have been strategically located around the perimeter of the closed MSWLF as shown on Figure 1 in Appendix 1. The locations were chosen based on the relationship of solid waste disposal areas to property lines and adjacent landfill structures. The existing gas monitoring system includes the original six (6) LFG monitoring wells spaced along the southern, western, and northern margins of the closed MSWLF. Additional LFG monitoring wells were installed on the former Trace Property, located to the north of the closed MSWLF, in the early 1990's. There are three (3) LFG monitoring wells located on the former Trace Property. The original six wells consist of 1-1/4 inch PVC capped pipe. The three Trace Property wells consist of 1-inch PVC capped pipe. The PVC pipe is equipped with a port and valve for use with the landfill gas analyzer. The actual construction details for the LFG wells are not available. MP2 was accidentally destroyed in late Winter of 2010, and will be replaced as MP2 REV, as part of the Capital Improvements Project. See the detail in Figure 2 in Appendix 2 pertaining to the construction of proposed MP2 REV.

Table 1 lists the existing and proposed landfill gas compliance monitoring locations for the Stoney Mountain Road Landfill.

Table 1 –Landfill Gas Compliance Monitoring Locations

Compliance Point	Description
MP1	Monitoring well south of closed MSWLF, near Transfer Station
MP2 Rev (formerly MP2)	Monitoring well along southern property line, near the cemetery and School Bus Maintenance Facility, to be installed as part of Capital Improvements Project
MP3	Monitoring well along western property line, near LFG processing facility
MP4	Monitoring well along western property line
MP5	Monitoring well north of closed MSWLF
MP6	Monitoring well north of closed MSWLF
TR1 (formerly Trace 6)	Monitoring well on former Trace Property, north of closed MSWLF
TR2 (formerly Trace 4)	Monitoring well on former Trace Property, north of closed MSWLF
TR3 (formerly Trace 3)	Monitoring well on former Trace Property, north of closed MSWLF
SM1	Monitoring point in Landfill Break Room
SM2	Monitoring point in Activity Center
SM3	Monitoring point in Maintenance Building
SM4	Monitoring point in existing Scale House
SM5	Monitoring point in School Bus Garage Building
SM6A	Monitoring point in Transfer Station (western building)
SM6B	Monitoring point in Transfer Station (eastern building)

SM7	Monitoring point in proposed scale house
SM8	Monitoring point in Trace barn
SM9	Monitoring point in storage shed south of Trace barn
SM10	Monitoring point in proposed Convenience Center attendant building
SM11	Monitoring point in proposed household hazardous waste facility

MP: LFG monitoring well.

TR: LFG monitoring well located on the former Trace Property.

SM: location of LFG monitoring point within an existing or proposed structure.

3.2 Monitoring Frequency

Henderson County performs LFG monitoring on a quarterly basis (4 times per year) at all of the compliance LFG monitoring well locations (MP's and TR's) noted in Table 1 (except MP2 REV). The County recently began monitoring the existing on-site and adjacent structures SM1-SM5. The County will begin monitoring SM6 A&B, SM8, and SM9 at the next quarterly event. The County will begin monitoring SM7, SM10, and SM11 upon completion of these facilities. All collected data is documented on the Landfill Gas Measurement Field Worksheet, included as Appendix 3, and inserted into the permanent Landfill Operating Record. The Operating Record is located at the office of the Solid Waste Director. Prior to the sampling event, the person performing sampling will review the complete Landfill Gas Monitoring Plan to become familiar with the locations of the compliance points and the requirements of the plan.

3.3 Landfill Gas Analyzer

The contractor that performs the LFG monitoring for Henderson County utilizes a LandTec Gem 500 or 2000 Gas Analyzer to perform the landfill gas sampling. The landfill gas analyzer equipment must be periodically calibrated by the manufacturer. The user shall verify that factory calibration has been completed in accordance with manufacturer's recommendations. In addition, the analyzer must be field calibrated prior to each sampling event. Users shall become familiar with the operation and maintenance of the analyzer prior to use.

Prior to the sampling event, the following preliminary checks of the analyzer should be performed:

- (1) Water trap has a clean and dry filter.
- (2) Inlet port particulate filter is clean and dry.
- (3) Battery is fully charged.
- (4) Field calibration is performed.

3.4 Field Monitoring Protocol

- (1) Record date and weather information including weather conditions, temperature, and atmospheric pressure on Landfill Gas Measurement Field Worksheet.
- (2) Field calibrate gas analyzer in accordance with manufacturer's procedure.
- (3) Proceed to first sample point.

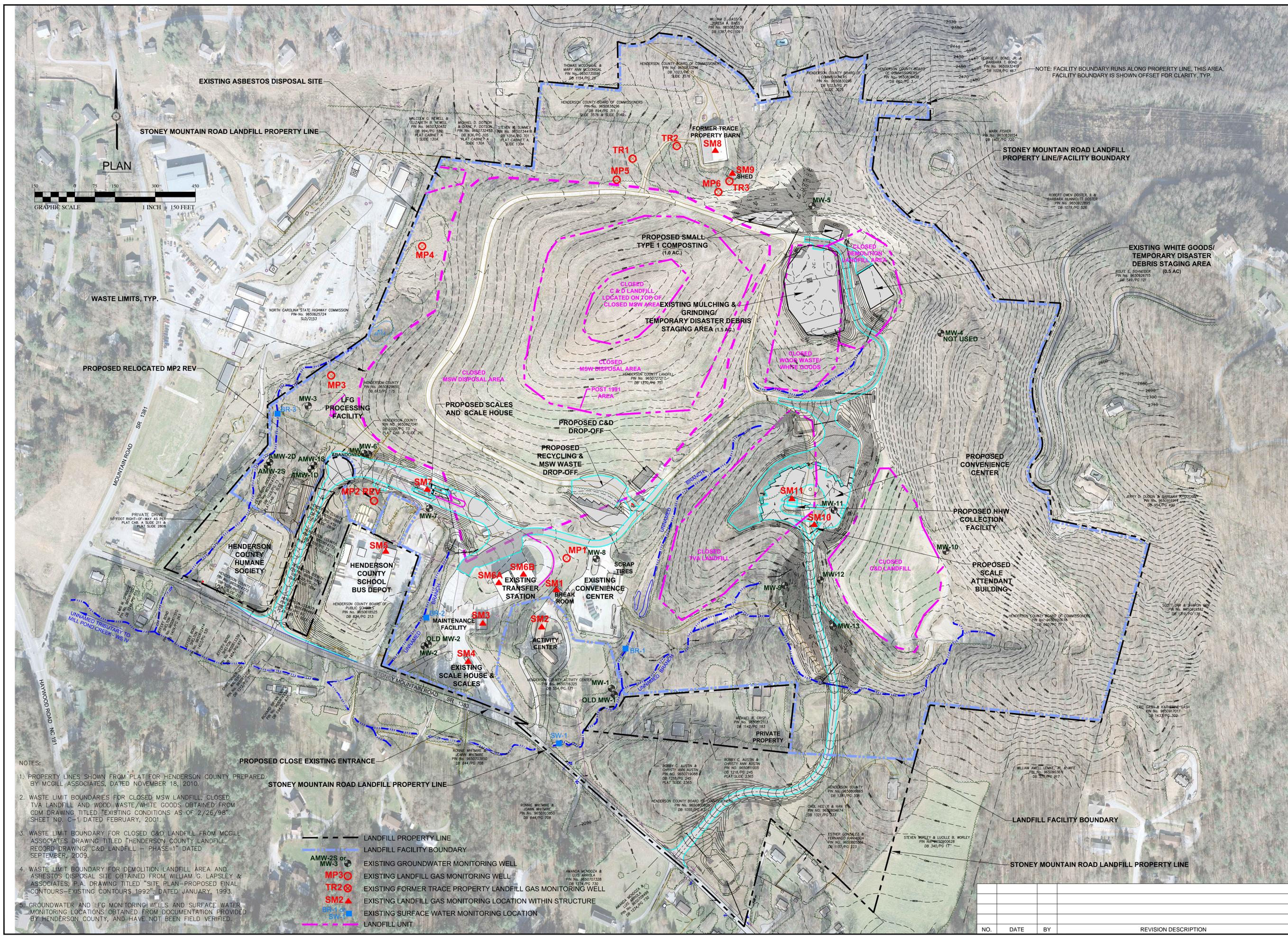
- (4) Prior to connection to the port on the monitoring well, turn on analyzer and pump for minimum of 30 seconds to purge any remaining potential contaminants from the equipment.
- (5) Check well or point for condition and suitability for monitoring. Record any problems with location on the Landfill Gas Measurement Field Worksheet.
- (6) Connect sample tube from the inlet port of the analyzer to the port on the monitoring well and open the port valve. For on-site buildings, place sample tube near the designated sample point, located in the center of the structure.
- (7) Turn on analyzer air pump to take sample.
- (8) For wells less than 20 feet deep, continue to sample until there is a steady reading of gases for a minimum of 30 seconds.
- (9) Record the gas levels for % methane, % LEL, % carbon dioxide, % oxygen, and time of sampling onto the Landfill Gas Measurement Field Worksheet.
- (10) Turn-off air pump, close valve, and disconnect sample tube from the port.
- (11) If gas readings exceed 25 percent of the lower explosive limit in buildings or 100 percent of the lower explosive limit in the monitoring wells, resample the point. If readings still exceed the limits, notify the Henderson County Solid Waste Director as outlined in the Landfill Gas Measurement Field Worksheet included in Appendix 2.
- (12) Proceed to next sample point.

3.5 Methane Gas Response Plan

If methane gas levels exceeding the limits specified in Section 2, "Regulatory Compliance" above are detected, the owner or operator will:

- (1) Immediately take all necessary steps to ensure protection of human health, i.e. no smoking, temporarily abandon the structure. The field technician should immediately notify the Henderson County Director of Solid Waste. The Solid Waste Director, or their designee, will immediately notify by telephone the Regulatory Specialist at the Solid Waste Section office in Asheville at 828-296-4500. The Director shall follow-up the telephone call with an electronic mail message detailing the event and the steps taken to protect human life.
- (2) Within seven days of detection, place in the operating record the methane gas levels detected and a description of the steps taken to protect human health.
- (3) Within 60 days of detection, prepare and implement a Remediation Plan for the methane gas releases, place a copy of the Plan in the Operating Record, and notify the DWM that the Plan has been implemented. The Plan will describe the nature and extent of the problem and the proposed remedy.

APPENDICES



PLAN



NOTE: FACILITY BOUNDARY RUNS ALONG PROPERTY LINE. THIS AREA FACILITY BOUNDARY IS SHOWN OFFSET FOR CLARITY, TYP.

- NOTES:
1. PROPERTY LINES SHOWN FROM PLAT FOR HENDERSON COUNTY PREPARED BY MCGILL ASSOCIATES, DATED NOVEMBER 18, 2010.
 2. WASTE LIMIT BOUNDARIES FOR CLOSED MSW LANDFILL, CLOSED TVA LANDFILL AND WOOD WASTE/WHITE GOODS OBTAINED FROM CDM DRAWING TITLED "EXISTING CONDITIONS AS OF 2/26/98", SHEET NO. C-1 DATED FEBRUARY, 2001.
 3. WASTE LIMIT BOUNDARY FOR CLOSED C&D LANDFILL FROM MCGILL ASSOCIATES DRAWING TITLED "HENDERSON COUNTY LANDFILL, RECORD DRAWING C&D LANDFILL - PHASE 1" DATED SEPTEMBER, 2009.
 4. WASTE LIMIT BOUNDARY FOR DEMOLITION LANDFILL AREA AND ASBESTOS DISPOSAL SITE OBTAINED FROM WILLIAM G. LAPSLEY & ASSOCIATES, P.A. DRAWING TITLED "SITE PLAN-PROPOSED FINAL CONTOURS-EXISTING CONTOURS 1992", DATED JANUARY, 1993.
 5. GROUNDWATER AND LFG MONITORING WELLS AND SURFACE WATER MONITORING LOCATIONS OBTAINED FROM DOCUMENTATION PROVIDED BY HENDERSON COUNTY, AND HAVE NOT BEEN FIELD VERIFIED.

- LANDFILL PROPERTY LINE
- LANDFILL FACILITY BOUNDARY
- EXISTING GROUNDWATER MONITORING WELL
- MP3 --- EXISTING LANDFILL GAS MONITORING WELL
- TR2 --- EXISTING FORMER TRACE PROPERTY LANDFILL GAS MONITORING WELL
- SM2 --- EXISTING LANDFILL GAS MONITORING LOCATION WITHIN STRUCTURE
- EXISTING SURFACE WATER MONITORING LOCATION
- LANDFILL UNIT

NO.	DATE	BY	REVISION DESCRIPTION



JOB NO.: 10.00727
 DATE: NOVEMBER 2010
 DESIGNED BY: DP
 CADD BY: DP
 DESIGN REVIEW: ---
 CONST. REVIEW: ---
 FILE NAME: LFG Monitoring Plan - Figure 1.dwg

C:\2010\10.00727\Design\Task\Water\Drawings\LFG Monitoring Plan - Figure 1.dwg 12/20/2010 3:11 PM DATE PASKO

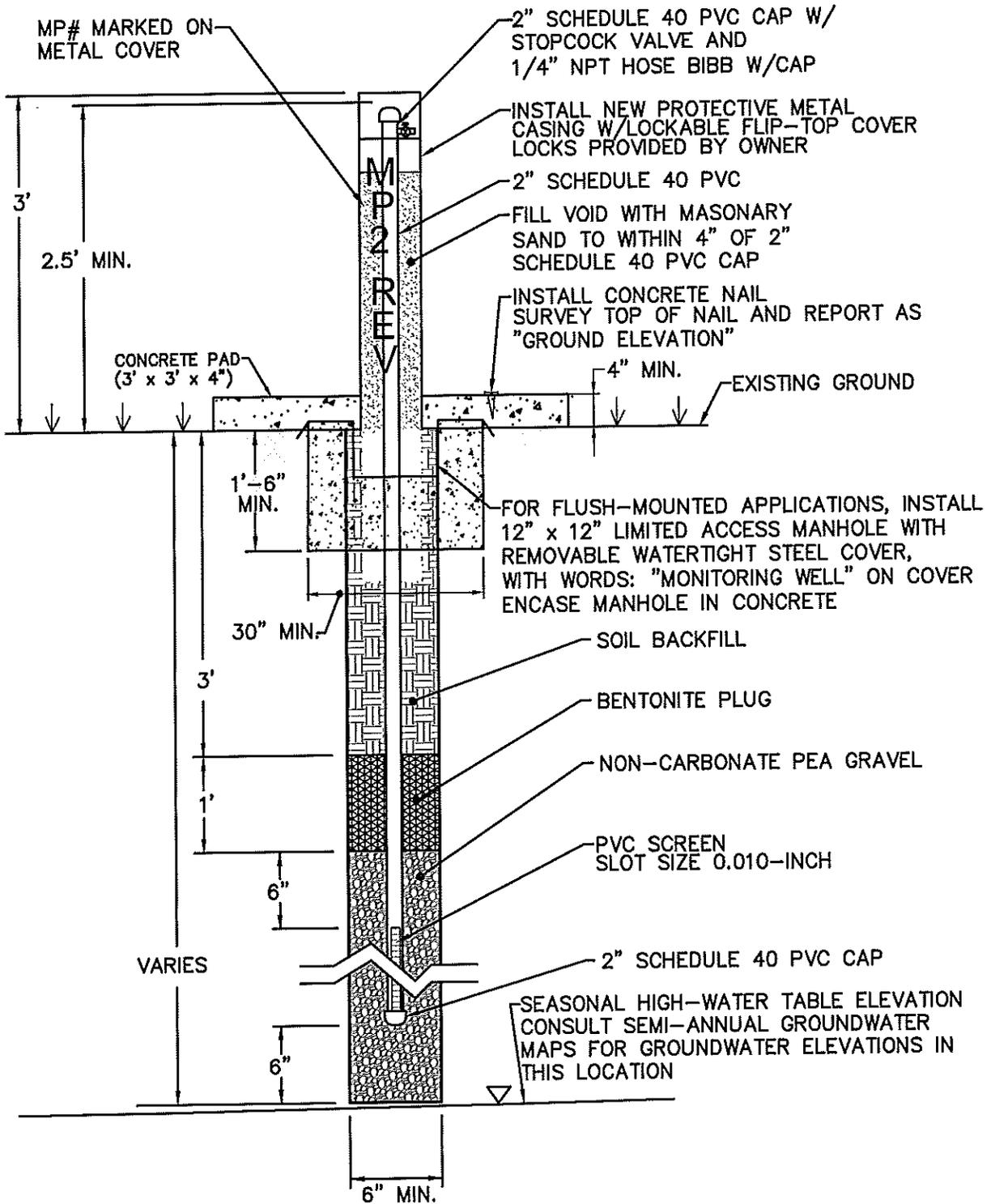
APPENDIX 1

Landfill Gas Monitoring Plan (Figure 1)

APPENDIX 2

Landfill Gas Monitoring Well Detail (Figure 2)

NOTE: USE ABOVE GROUND PROTECTIVE METAL COVER UNLESS A FLUSH-MOUNTED APPLICATION IS REQUIRED, TO BE DETERMINED IN FIELD. BOTH COVERS SHOWN HERE.



LANDFILL GAS MONITORING WELL

NOT TO SCALE

FIGURE 2

APPENDIX 3

Landfill Gas Measurements – Field Worksheet

Landfill Gas Measurements Field Worksheet
Stoney Mountain Road Landfill - Permit #45-01
Henderson County, North Carolina

Name of Person Taking Readings: _____

Date: _____

Weather Conditions: _____

Ambient Temp: _____

Atmospheric Pressure: _____

Gas Monitoring Equipment: Land-Tec GEM Serial #: _____

Factory Calibration Date: _____ Field Calibration Date : _____

Well or Monitoring ID	Stable Reading	Time	%LEL	%CH ₄	%CO ₂	%O ₂	Notes:
MP1							
MP2							
MP3							
MP4							
MP5							
MP6							
TR1							
TR2							
TR3							
SM1							
SM2							
SM3							
SM4							
SM5							
SM6A							
SM6B							
SM7							
SM8							
SM9							
SM10							
SM11							

Note: If methane gas readings exceed 25% of LEL in structures or 100% of LEL in LFG monitoring wells contact Henderson County Solid Waste Director or Henderson County Engineer immediately at: 828-694-6526 or 828-694-6560

Field Observation Notes: