



PLAN

# LANDFILL GAS REMEDIATION PLAN – PHASE 1

Closed Henderson County Municipal Solid Waste  
Landfill, Permit No. 45-01

Henderson County, North Carolina

Submitted To:



Henderson County Solid Waste Division  
191 Transfer Station Drive  
Hendersonville, NC 28791

Submitted By: Golder Associates NC, Inc.  
5B Oak Branch Drive  
Greensboro, NC 27407

September 2013

0839-650613.700



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September 26, 2013

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Ms. Jackie Drummond  
Department of Environment and Natural Resources  
Division of Waste Management  
Solid Waste Section  
1646 Mail Service Center  
Raleigh, North Carolina 27699  
919-707-8294

**RE: LANDFILL GAS REMEDIATION PLAN – PHASE 1  
CLOSED HENDERSON COUNTY MUNICIPAL SOLID WASTE LANDFILL, PERMIT NO. 45-01  
HENDERSON COUNTY, NORTH CAROLINA**

Dear Jackie:

On behalf of Henderson County, Golder Associates NC, Inc. (Golder) is submitting the enclosed Landfill (LFG) Remediation Plan – Phase 1 in response to detections of methane above the lower explosive limit (LEL) in compliance monitoring points MW-5 and TR-3 during the second quarterly methane monitoring event of 2013. The attached LFG Remediation Plan is submitted to comply with the requirements of Title 15A of the North Carolina Administrative Code (NCAC) Subchapter 13B.1626 (4)(c).

Upon completion of the field investigation and evaluation described within, Phase 2 of the LFG Remediation Plan will be prepared, which will recommend long-term controls for methane migration. If you have any questions regarding the LFG Remediation Plan – Phase 1, please contact the undersigned at (336) 852-4903.

Sincerely,  
**GOLDER ASSOCIATES NC, INC.**

A handwritten signature in blue ink, appearing to read "Dusty Reedy II".

David "Dusty" Y. Reedy II, P.G.  
Senior Project Hydrogeologist

A handwritten signature in blue ink, appearing to read "Rachel P. Kirkman".

Rachel P. Kirkman, P.G.  
Associate and Senior Geologist

C: Marcus Jones, P.E., Director of Engineering, Henderson County, 1 Historic Courthouse Square, Suite 6, Hendersonville, NC 28792. 828-694-6560. [majones@hendersoncountync.org](mailto:majones@hendersoncountync.org) (electronic copy)

Natalie Berry, P.E., Assistant County Engineer, Henderson County Landfill, 100 North King Street, Hendersonville, NC 28792. 828-694-6523. [nberry@hendersoncountync.org](mailto:nberry@hendersoncountync.org)

Greg Wiggins, Manager, Solid Waste Department, 191 Transfer Station Drive, Hendersonville, NC 28791. 828-694-7982 [gwiggins@hendersoncountync.org](mailto:gwiggins@hendersoncountync.org)

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Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

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Drawing 1      Closed MSW Landfill Gas Extraction System

## 1.0 INTRODUCTION

This Landfill Gas (LFG) Remediation Plan – Phase 1 has been prepared by Golder Associates NC, Inc. (Golder) for the closed Henderson County Municipal Solid Waste (MSW) Landfill in Henderson County, North Carolina in accordance with Title 15A of the North Carolina Administrative Code (NCAC) Subchapter 13B.1626 (4)(c). The Henderson County Landfill, which consists of a closed municipal solid waste (MSW) and a closed construction and demolition (C&D) landfill, is maintained by the County under Permit No. 45-01 issued by the North Carolina Department of Environment and Natural Resources (NC DENR).

This LFG Remediation Plan – Phase 1 has been prepared in response to detections of methane above the lower explosive limit (LEL) in compliance monitoring points MW-5 and TR-3 during the second quarterly methane monitoring event of 2013, performed on June 26, 2013. NC DENR was notified of the exceedences by letter, dated July 2, 2013. This LFG Remediation Plan describes the first steps of a phased approach to reduce LFG migration and to protect human health and the environment, while additional investigation is performed for a long-term solution.

## 2.0 SITE INTRODUCTION AND BACKGROUND

The location of the facility is shown on the inlay on Drawing 1. As presented, the closed Henderson County Landfill is located approximately 3 miles northwest of the city of Hendersonville, off Stoney Mountain Road. The County maintains an approximately 120-acre landfill facility that consists of a closed, unlined C&D over MSW facility; a closed, unlined C&D facility; a closed, unlined facility formerly operated by the Tennessee Valley Authority (TVA); and an active transfer station. A white goods area, a yard waste disposal area, and a beneficial reuse area are also present on the property.

The facility has been in operation since the 1940s, beginning with the TVA landfill. The MSW landfill opened in 1960. In January 1998, the MSW facility ceased accepting MSW waste and began placing C&D waste over the MSW waste. After closure of the C&D-over-MSW area in 2001, a new C&D landfill began operation on the southeastern portion of the facility property. The C&D-over-MSW area was capped with a modified clay cap. The County ceased accepting waste at the stand-alone C&D landfill on June 30, 2008, and completed closure activities on June 30, 2009.

The landfill is bounded to the north and east by residential and undeveloped wooded properties, to the south by Stoney Mountain Road and residential and wooded properties, and to the west by a tributary of Mill Pond Creek, a NC Department of Transportation maintenance yard, and a Henderson County School bus maintenance facility. Topographic relief at the landfill ranges from approximately 2170 to 2590 feet above mean sea level. Surface drainage from the facility is predominantly to the southwest toward several streams along the western and southern portions of the property. These features drain into Mill Pond Creek located southwest of the landfill.

Henderson County (The County) monitors methane at eight methane monitoring wells (MP-1, MP-3, MP-4, MP-5, MP-6, TR-1, TR-2, and TR-3) located around the MSW landfill on a quarterly schedule. Additionally, the County monitors three methane monitoring probes (LFG-1, LFG-2, and LFG-3) around the closed C&D landfill. The County currently monitors nine structures (activity building, animal shelter, break house, bus garage, convenience center building, maintenance shop, scalehouse, Revis house, and the Trace barn) on County property in close proximity to the MSW or C&D landfill.

Methane monitoring probe MP-2 was removed from the compliance network during the construction of the new landfill entrance and scalehouse. Probe TR-2 has not been monitored during recent events after being damaged, but has recently been located and repaired.

An active LFG extraction system had been operated by a third party (NC Municipal Gas Partners, LP/Enerdyne Power Systems) from 1998 to April 2013. NC Municipal Gas Partners, LP terminated their contract with the County on April 1, 2013, and shut down and removed the system.

### **3.0 PHASE 1 REMEDIATION STRATEGY**

The Phase 1 remedial activities consist of the following activities:

- Vent LFG extraction wells in the area of the exceedences
- Field investigation to acquire data from the LFG wells and monitoring probes
- Create LFG generation model

Each of the activities are described in the sections below.

#### **3.1 Venting LFG Extraction Wells**

In order to reduce LFG migration until a permanent remedial strategy can be devised and implemented, the County will disconnect 14 LFG extraction wells in the area of recent exceedences from the active LFG extraction header pipe and install turbine vents to each. This will allow each LFG extraction well to passively vent and prevent the buildup of LFG in the waste unit, which could increase the migration of LFG. The location of the converted gas wells is shown on Drawing 1.

#### **3.2 LFG Field Measurement and Evaluation**

An experienced LFG technician from Golder will visit the site to collect data from LFG extraction wells and LFG monitoring probes. The data will be used to evaluate the extent of LFG migration and assess the condition of the remaining components of the LFG extraction system. Golder will use this data to make recommendations to the County for a long-term strategy to control LFG migration, which will be presented as Phase 2 of the LFG Remediation Plan.

#### **3.3 LFG Generation Model**

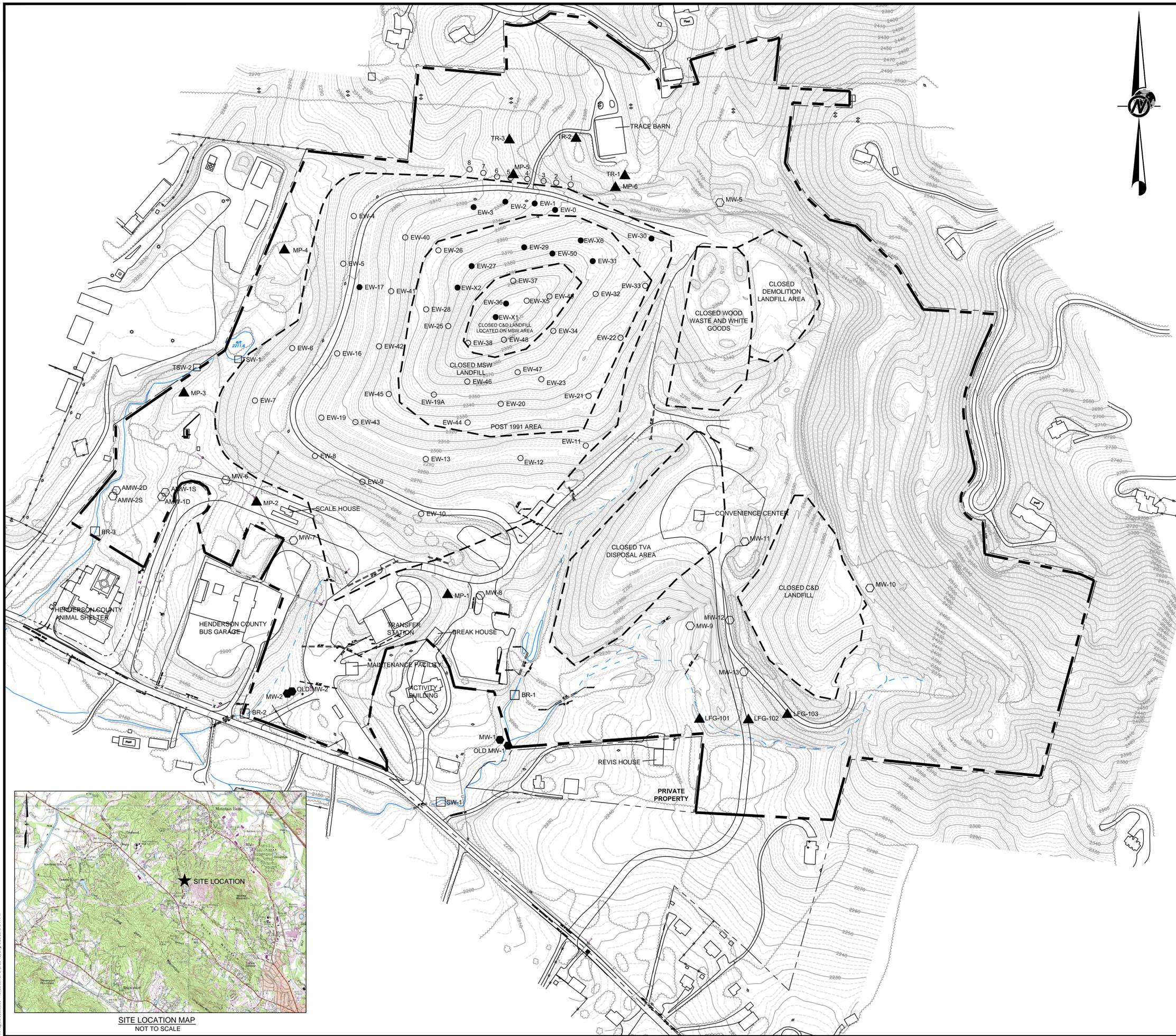
Golder will prepare a LFG generation model to evaluate current and potential LFG production. The model will incorporate available waste data; including mass, type, and age. The model will be calibrated using

the data acquired during the field investigation. The LFG generation model will be used to evaluate long-term LFG control.

#### **4.0 CONCLUSIONS**

This LFG Remediation Plan – Phase 1 has been prepared in response to detections of methane above the LEL in compliance monitoring points MW-5 and TR-3 during the second quarterly methane monitoring event of 2013. The Phase 1 remedial activities consist of three activities: to vent gas wells in the area of the exceedences, acquiring current data from the LFG wells and monitoring probes, and create a LFG generation model in order to determine and design the best remedial option for the landfill for Phase 2. Phase 2 of the LFG Remediation Plan will be prepared once sufficient data has been obtained to determine the best long-term method of controlling LFG migration.

**DRAWING**



**LEGEND**

- EXISTING 10 FT. CONTOUR
- EXISTING 2 FT. CONTOUR
- PROPERTY LINE
- - - LIMITS OF WASTE
- STREAM
- BUFFER
- TREE LINE
- EXISTING ROAD
- FENCE
- - - LFG COLLECTION PIPING
- MW-8 2210.79 COMPLIANCE MONITORING WELL AND IDENTIFICATION
- MW-1 NON COMPLIANCE MONITORING WELL AND IDENTIFICATION
- ▲ MP-6 METHANE MONITORING PROBE AND IDENTIFICATION
- BR-1 SURFACE WATER MONITORING POINT AND IDENTIFICATION
- EW-4 LFG EXTRACTION WELL
- EW-29 LFG EXTRACTION WELL CONVERTED TO PASSIVE VENTING WITH TURBINE

**NOTES**

1. TOPOGRAPHIC CONTOUR INTERVAL = 2 FEET
2. COORDINATE SYSTEM IS N.C. STATE PLANE GRID.
3. TOPOGRAPHIC DIVIDING LINE DIVIDES THE BASE MAP TOPOGRAPHIC CONTOURS FROM LANDSAT TOPOGRAPHIC CONTOURS. LANDSAT TOPOGRAPHIC CONTOURS HAVE A 5-CONTOUR INTERVAL.
4. RECORDS WERE UNABLE TO BE LOCATED FOR LFG EXTRACTION WELLS EW-X1 THROUGH EW-X7 AND WERE GIVEN IDENTIFICATION NAMES UNTIL SUCH TIME THAT RECORDS ARE FOUND.

**REFERENCES**

1. BASE MAP PROVIDED BY CAMP DRESSER & MCKEE FROM PREVIOUS WATER QUALITY MONITORING REPORTS.



SITE LOCATION MAP  
NOT TO SCALE

04/12/13	DAC	REVISED GW CONTOURS	BSD		
11/21/12	DYR	REVISED GW CONTOURS	LKB	DYR	RPK
	DES	REVISION DESCRIPTION	CADD	CHK	RW

PROJECT  
**HENDERSON COUNTY CLOSED MSW AND C&D LANDFILL PERMIT # 45-01**

TITLE  
**LANDFILL GAS EXTRACTION SYSTEM LAYOUT**

<p><b>Golder Associates</b> GOLDER ASSOCIATES, INC.</p>	PROJECT No.	D83-9650612	FILE No.	LFG 96-15	
	DESIGN	JAD	04/28/09	SCALE	AS SHOWN
	CADD	LKB	04/28/09	REV.	-
	CHECK	DYR	06/30/09		
	REVIEW	RPK	06/30/09		

DWG. 1

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At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

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