

AMEC Environment & Infrastructure  
 1308 Patton Avenue  
 Asheville, North Carolina 28806  
 Phone: (828) 252-8130 Fax: (828) 251-9690



## LETTER OF TRANSMITTAL

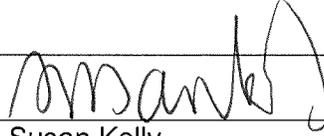
<b>TO:</b> Ms. Jaclyne Drummond NCDENR DWM 1646 Mail Service Center Raleigh, North Carolina 27699-1646	<b>DATE:</b> October 19, 2011 <b>PROJECT NO.:</b> 6252-11-1937 <b>PROJ. NAME:</b> Western Carolina University Closed MSWLF <b>SUBJECT:</b> Landfill Gas Investigation Work Plan
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WE TRANSMIT TO YOU:       HEREWITH       UNDER SEPARATE COVER

<b>SUBJECT:</b> <input type="checkbox"/> DRAWINGS <input type="checkbox"/> SPECIFICATIONS <input type="checkbox"/> CALCULATIONS <input type="checkbox"/> REPORT <input type="checkbox"/> COST ESTIMATE <input checked="" type="checkbox"/> AS NOTED	<b>ACTION:</b> <input checked="" type="checkbox"/> FOR YOUR INFORMATION <input type="checkbox"/> FOR YOUR COMMENT OR APPROVAL <input type="checkbox"/> RETURNED FOR CORRECTION: RESUBMIT <input type="checkbox"/> APPROVED AS NOTED <input type="checkbox"/> AS REQUESTED	<b>SENT BY:</b> <input checked="" type="checkbox"/> MAIL <input type="checkbox"/> CERTIFIED MAIL <input type="checkbox"/> EXPRESS FedEx Overnight and e-mail <input type="checkbox"/> COURIER <input type="checkbox"/> HAND DELIVERED <input type="checkbox"/> FACSIMILE: pages (including transmittal sheet)
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COPIES	DATE	DESCRIPTION
1	10/19/2011	Western Carolina University Closed MSWLF – Landfill Gas Investigation Work Plan

**REMARKS:**  
 Ms. Drummond,  
 Attached is the Landfill Gas Investigation Work Plan for Western Carolina University's closed MSWLF in Cullowhee. Please feel free to contact me if you have any questions. Thanks, Susan

**CC:** Mr. Troy Harrison – NCDENR, Asheville Regional Office      **By:**   
Mr. Roger Turk – Western Carolina University      Susan Kelly  
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 \_\_\_\_\_  
 Phone: 828-252-8130  
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 File (1)

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Fac/Perm/Co ID #	Date	Doc ID#
50-01	11/21/11	DIN 15621



October 19, 2011

Ms. Jaclynne Drummond  
NCDENR – DWM  
Solid Waste Section  
401 Oberlin Road, Suite 150  
Raleigh, North Carolina 27605

**Subject: Landfill Gas Investigation Work Plan  
Western Carolina University Closed MSWLF (Permit 50-01)  
Cullowhee, Jackson County, North Carolina  
AMEC Project 6252-11-1937**

Dear Ms. Drummond:

AMEC Environment & Infrastructure (AMEC), on behalf of Western Carolina University (WCU), is pleased to submit this Landfill Gas Investigation Work Plan for WCU's closed municipal solid waste landfill (MSWLF) located on Monteith Gap Road in Cullowhee, North Carolina (Site).

### **BACKGROUND INFORMATION**

Western Carolina University operated a municipal solid waste landfill from approximately the 1960s until October 1993. Jackson County also disposed of municipal solid waste at the landfill from approximately the early 1970s to the early 1980s. The landfill property is approximately 31.5 acres, approximately four acres of which contains the former landfill (Figure 1). The landfill was closed in accordance with the then applicable North Carolina Department of Environment and Natural Resources (NCDENR) closure standards (15A NCAC 13B 0.0510) and WCU received a closure permit approval letter from NCDENR on September 5, 1995. The post-closure conditions stated in the letter included requirements for landfill gas management and water quality monitoring.

NCDENR Solid Waste Section staff conducted a facility compliance audit at the facility on March 16, 2011. The audit report indicated that WCU was not in compliance with the landfill gas management requirements of the post-closure conditions. This Landfill Gas Investigation Work Plan presents our proposed investigation procedures and evaluation methods for determining the potential presence of landfill gas at the Site.

**Correspondence:**

AMEC Environment & Infrastructure  
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Asheville, North Carolina 28806  
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Fax 828.251.9690  
License Number: NC Corporate Engineering F-0653

## PROPOSED WORK PLAN

The following sections describe the proposed work plan to evaluate the potential presence of landfill gas at the Site. A preliminary investigation of landfill gas will be conducted using the existing monitoring wells at the landfill. As funding becomes available to WCU from the State of North Carolina, permanent landfill gas wells will be installed and the landfill gas investigation will be continued, as described below.

### Pre-Mobilization Activities

A Health and Safety Plan (HASP) will be prepared in accordance with OSHA 1910.120 requirements. The HASP will identify general and known/suspected Site-specific health and safety hazards, and will describe procedures for addressing health and safety hazards potentially associated with the Site.

### Preliminary Landfill Gas Investigation

Landfill gas will be measured at the four existing monitoring wells at the site (Figure 2) during low/decreasing barometric pressure conditions. The wells will be fitted with a temporary slip cap equipped with a quick-connect fitting to allow for measurement of landfill gas. A calibrated landfill gas monitoring instrument will be used to measure the following landfill gas parameters:

- Barometric pressure
- Methane (percent by volume)
- Oxygen (percent by volume)
- Carbon dioxide (percent by volume)

The initial and stabilized lower explosive limit will also be determined and recorded. The Solid Waste Section's "Landfill Gas Monitoring Data Form" will be used to record measurements and other relevant information.

The results of this preliminary investigation will be incorporated into a Preliminary Investigation of Landfill Gas Report. The report will include text, tables, figures, and other documents as necessary to present the methods of investigation, findings, and conclusions and recommendations.

### Landfill Gas Investigation

Prior to intrusive activities, North Carolina One Call will be contacted to have the location of underground public utilities marked at the Site. WCU personnel will also assist in identifying private underground utilities at the Site..

Landfill gas wells will be installed at the locations depicted in Figure 2. At each location, a soil boring will be advanced using nominal 4.25-inch diameter hollow stem augers, creating an approximate 8-inch diameter borehole. At locations where the depth of the water table can be approximated using historical data, the soil borings will be advanced to within five feet of the water table. At locations where the depth of the water table cannot reasonably be approximated, the soil borings will be advanced until the apparent water table is encountered and the borings will then be backfilled five feet with hydrated bentonite prior to well installation. At locations where the depth to the water table is

greater than approximately 45 feet below ground surface, two landfill gas wells will be installed in a single boring – one well screened in the upper portion of the unsaturated zone and the second in the lower portion of the unsaturated zone. Standard penetration tests (SPT) will be performed at 5-foot intervals to a depth of 20 feet, and then at 10-foot intervals thereafter.

Upon completion of the soil borings that are less than 45 feet deep, a 2-inch diameter Schedule 40 PVC riser pipe and 0.010-inch slotted screen will be installed. The length of the screen will be dependent upon the thickness of the unsaturated zone at each location, and will extend up to approximately five feet below ground surface. The borehole annulus of the well will be filled with filter sand to at least one foot above the well screen. Hydrated bentonite chips will be placed above the filter sand and the borehole annulus will be filled to the ground surface with a cement grout.

Upon completion of the soil borings that are greater than 45 feet deep, two, 1-inch diameter Schedule 40 PVC riser pipes and 0.010-inch slotted screens will be installed. The length of the screens will be dependent upon the thickness of the unsaturated zone at each location and the upper screen will extend up to approximately five feet below ground surface. The borehole annulus around and at least one foot above each well screen will be filled with filter sand. Approximately five feet of hydrated bentonite will be placed above the top of the lower screen and the bottom of the upper screen. Hydrated bentonite will be placed to at least one foot above the upper filter sand and the borehole annulus will be filled to the ground surface with a cement grout.

The landfill gas wells will be completed with lockable above-ground/stick-up wellheads. A quick-connect fitting will be installed at the top of the PVC well casings to allow for measurement of landfill gas. An approximate four square-foot concrete pad will be placed around each wellhead in a manner that precludes surface runoff towards the well. A permanent well identification label that includes well construction details will be placed on the exterior of the wellheads. The landfill gas wells will be surveyed by a North Carolina Licensed Surveyor.

Drill cuttings will be spread at the drilling locations. Because the proposed drilling locations are outside of the landfill extents and drilling will not extend beyond the water table, drilling equipment will not be decontaminated between drilling locations.

At least one week after the landfill gas wells have been installed, and during low/decreasing barometric pressure conditions, landfill gas measurements will be conducted at the landfill gas wells. A calibrated landfill gas monitoring instrument will be used to measure the following landfill gas parameters:

- Barometric pressure
- Methane (percent by volume)
- Oxygen (percent by volume)
- Carbon dioxide (percent by volume)

The initial and stabilized lower explosive limit will also be determined and recorded. The Solid Waste Section's "Landfill Gas Monitoring Data Form" will be used to record measurements and other relevant information.

The results of landfill gas investigation will be incorporated into a Landfill Gas Investigation Report. The report will include text, tables, figures, and other documents as necessary to present the methods of investigation, findings, and conclusions and recommendations.

### SCHEDULE

Upon NCDENR's approval of this Work Plan, the preliminary investigation should be able to be initiated within one week, and take one day to complete. The Preliminary Investigation of Landfill Gas Report will be submitted to NCDENR within 30 days of completion of the field activities. As funding to WCU becomes available from the State of North Carolina, the landfill gas investigation will be continued.

### CLOSING

Please contact us at (828) 252-8130 if you have questions concerning this Work Plan.

Sincerely,

**AMEC Environment & Infrastructure**

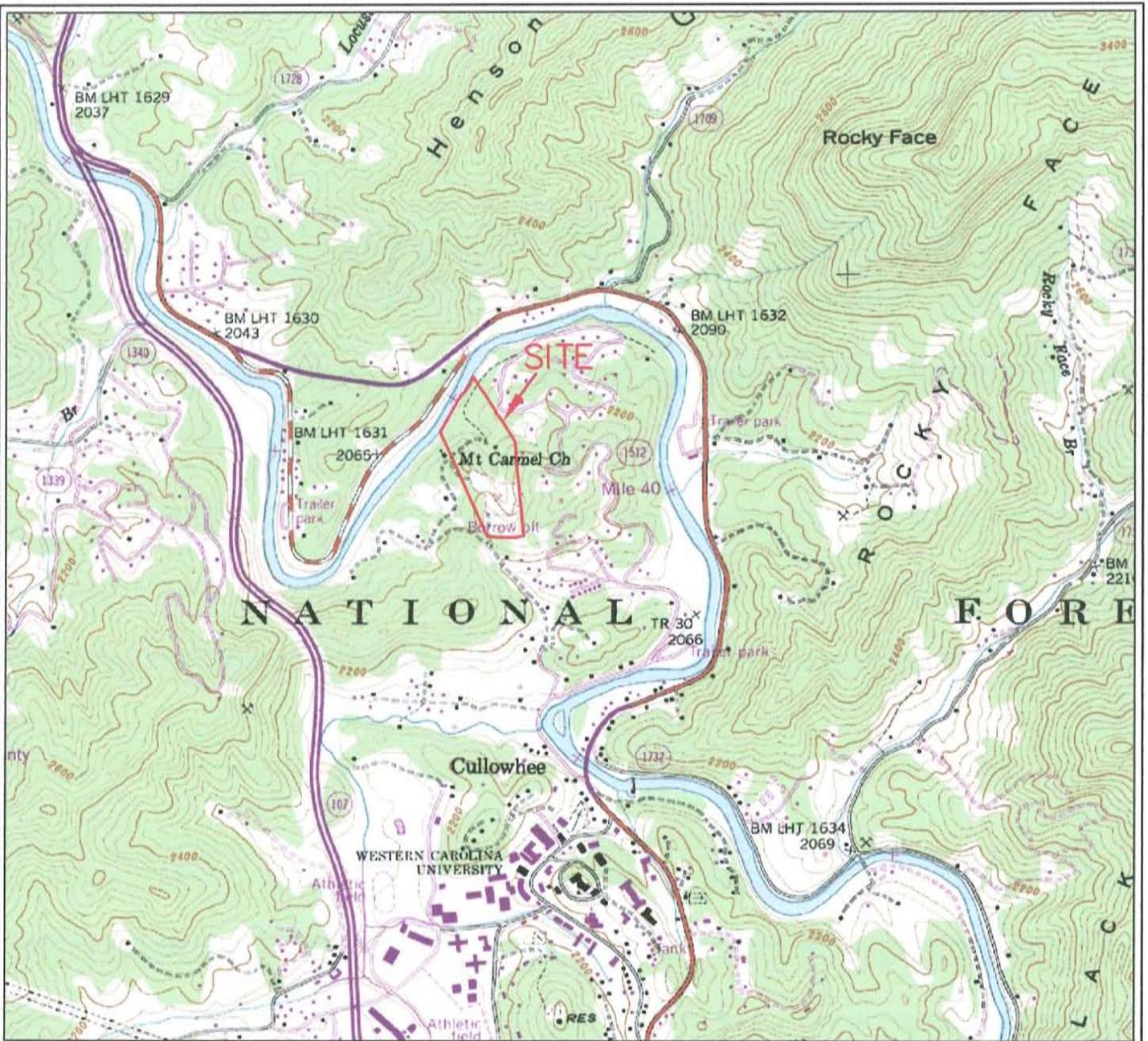
  
Susan E. Kelly, P.E., L.G.  
Senior Engineer

  
Matthew E. Wallace, P.E.  
Principal Engineer

SEK/MEW:sek

cc: Mr. Roger Turk – Western Carolina University  
Mr. Troy Harrison – NCDENR – Solid Waste Section, Asheville Regional Office

attachments: Figure 1 – Site Location Map  
Figure 2 – Proposed Landfill Gas Well Locations



SYLVA SOUTH, N.C. QUADRANGLE  
 35083-C2-TF-024  
 DMA 4354 I SW-SERIES V842  
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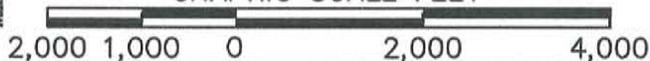


NOTE: SITE BOUNDARY IS APPROXIMATE.



CONTOUR INTERVAL 40 FEET

GRAPHIC SCALE FEET



DRAWN: SEK	DATE: OCT. 2011
DFT CHECK: MEW	SCALE: 1" = 2,000'
ENG CHECK: --	JOB: 6252-11-1937
APPROVAL: MEW	FIG: 1

SITE LOCATION MAP  
 WCU CLOSED MSWLF  
 MONTEITH GAP ROAD  
 CULLOWHEE, NORTH CAROLINA



**LEGEND**

- Property Boundary
- Landfill Extents
- Unnamed Tributary/Stream
- Elevation Contour (10-foot interval)
- 50-foot Property Boundary Buffer
- MW-1 Monitoring Well
- LG-1 Proposed Landfill Gas Well Location

NOTE: Locations of depicted features are approximate.



**PROPOSED LANDFILL GAS WELL LOCATIONS**  
**WCU CLOSED MSWLF**  
**CULLOWHEE, NORTH CAROLINA**



DRAWN: SEK	ENG CHECK: --	DATE: OCTOBER 2011	JOB: 6252-11-1937
DFT CHECK: MEW	APPROVAL: MEW	SCALE: APPROX. 1" = 180'	FIG: 2

REFERENCE: JACKSON COUNTY GIS.