

**Verification Report for
Black Warrior Solid Waste Disposal Authority
Black Warrior Solid Waste Facility—CAR 403
Coker, Alabama**

Climate Action Reserve

December 2013

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1. Introduction

This report is provided to Black Warrior Solid Waste Disposal Authority (BWSWA) as a deliverable of the Climate Action Reserve (CAR) project verification process. This report covers the verification of the Black Warrior Solid Waste Facility – CAR403 (the Project) for the period from January 1 through December 31, 2012. First Environment, Inc. (First Environment) conducted the verification from November 2012 through December 2013.

2. Objectives

The purpose of this verification was, through review of appropriate evidence, to establish that:

- the Project conforms to the requirements of the verification criteria, including all eligibility requirements, discussed in Section 4 of this report; and
- the data reported are accurate, complete, consistent, transparent, and free of material error or omission.

3. Verification Scope

Specific scope metrics for the verification are outlined in the table below:

Geographic Boundaries	Black Warrior Solid Waste Facility, Coker, AL
Emission Reduction Sources, Project Emissions, and Greenhouse Gases	Emissions reductions (expressed in units of Carbon Dioxide equivalents (CO ₂ e)) resulting from methane destruction. Project emissions of CO ₂ from fossil fuel combustion and purchased electricity.
Reporting Period	January 1 through December 31, 2012
Data Sources	Metered Data and Emissions Reduction Calculations

4. Standards Used to Verify Emissions (Criteria)

The following table outlines the guidance and protocols used to conduct this verification:

Standard of Verification	• Climate Action Reserve Landfill Project Reporting Protocol, Version 2.0, November 18, 2008 (CAR Protocol) • Climate Action Reserve Landfill Project Protocol Version 2.0 Errata & Clarification, October 8, 2013 (Errata and Clarification) • Climate Action Reserve Program Manual, October 26, 2011
Verification Process	• Climate Action Reserve Landfill Verification Protocol, Version 2.0, November 18, 2008 • Errata & Clarification • Climate Action Reserve Verification Program Manual, December 20, 2010 • ISO 14064-3: Specification with guidance for the validation and verification of greenhouse gas assertions, 2006

Level of Assurance	• Reasonable assurance
Materiality	• Misstatements greater than three percent of the Project's emission reductions assertion are considered material • Qualitative non-conformities with the CAR Protocol are also considered material

5. Overview of the Verification Process

The verification process was utilized to gain an understanding of the Project's emission sources and reductions, to evaluate and verify the collection and handling of data, the calculations that lead to the results, and the means for reporting the associated data and results.

The following verification process was used:

- conflict of interest review;
- selection of Verification Team;
- initial interaction and kickoff meeting with BWSWA;
- development of the verification and sampling plan;
- review of management and data collection system;
- site visit;
- assessment of raw data and calculations for period under review;
- follow-up interaction with BWSWA for corrective action, clarification, or supplemental data as needed; and
- final statement and report submittal.

5.1 Conflict of Interest Review

Prior to beginning any verification project, First Environment conducts an evaluation to identify any potential conflicts of interest associated with the Project. No potential conflicts were found for this Project. First Environment also received authorization to proceed with verification activities for BWSWA from the Reserve in a notification dated November 28, 2012.

5.2 Verification Team

First Environment's Verification Team consisted of the following individuals who were selected based on their verification experience, as well as familiarity with landfill operations.

Lead Verifier – Jeff Daley
Verifier – Ellen Reid, Natali Ganfer
Senior Internal Reviewer – Jay Wintergreen

5.3 Verification Kick-off

The verification was initiated with a kick-off meeting on December 10, 2012 with BWSWA. The meeting focused on confirming the scope, schedule, and data required for verification.

5.4 Development of the Verification Plan

The team formally documented its verification plan as well as determined the data-sampling plan. The verification plan was developed based on the discussion of key elements of the project verification process during the kick-off meeting. BWSWA was afforded the opportunity to comment on the key elements of the plan for verification. Based on items discussed and agreed upon with BWSWA, the plan identified the First Environment project team members, project level of assurance, materiality threshold, and standards of evaluation and reporting for the verification. It also provided an outline of the verification process and established project deliverables. A separate data-sampling plan was designed to review all project elements in areas of potentially high risk of inaccuracy or non-conformance.

5.5 Site Visit

Ellen Reid conducted a site visit on December 12, 2012 to assess the Project's data management systems and interview personnel relevant to the Project for the verification period.

5.6 Emissions Reduction Data and Calculation Assessment

This assessment used information and insights gained during the previous steps to evaluate the collected data and the reported emissions reduction quantities, and identify if either contained material or immaterial misstatements.

5.7 Corrective Actions and Supplemental Information

The team issued corrective action and clarification requests during the verification process. BWSWA provided sufficient responses to all corrective action and clarification requests.

5.8 Verification Reporting

Verification reporting, represented by this report, documents the verification process and identifies its findings and results. Verification reporting consists of this report for BWSWA, a verification statement, and a list of findings to be submitted to the Climate Action Reserve.

6. Site's Conformance with Verification Criteria

6.1 Project Description

The Black Warrior Solid Waste Facility is an active municipal landfill located at 3301 Landfill Drive in Coker, Alabama. The site originally opened in 1978 and was operated by a solid waste authority chartered by the City of Tuscaloosa. This entity was dissolved in 1994 and the BWSWA was established to upgrade environmental controls and operate the landfill. The site began accepting waste as a Subtitle D landfill in January 1994 and currently consists of Cells 1 thru 8A.

The Project collects and combusts landfill gas in an open flare. No combustion devices existed on site prior to the initiation of the project activity. The baseline scenario, defined as the total release of LFG to the atmosphere, was verified during the Project's initial reporting period.

6.2 Eligibility

BWSWA meets the eligibility requirements set forth in the CAR Protocol, as described below.

6.2.1 Ownership and Title

BWSWA is the owner and developer of the landfill, and as such, holds title to the associated emission reduction credits. First Environment reviewed operating permits held by BWSWA to confirm that BWSWA is the owner of the Project and consequently owns the rights to any emission reduction credits generated by it. The ownership status was also re-confirmed during the site visit.

Additionally, First Environment relied on the Attestation of Title completed by BWSWA for the current reporting period to establish ownership of greenhouse gas (GHG) emission reductions. The Attestation is on file with CAR and was reviewed to confirm that it was completed correctly.

6.2.2 Project Start Date

First Environment confirmed that the Project meets CAR's start date requirements. The project start date is January 14, 2009, which was confirmed during the initial verification.

6.2.3 Additionality

The Project passes both the Performance Standard Test and the Legal Requirements Test, as described below.

6.2.3.1 Performance Standard Test

The Project consists of the installation of a landfill gas collection and control system and therefore exceeds the performance standard defined by the CAR protocol; specifically Scenario 1 from the list provided in Section 3.3.1 of the CAR Protocol because landfill gas had never been collected or destroyed prior to the Project start date. It was also confirmed during the site visit that the landfill is not a bioreactor.

6.2.3.2 Legal Requirements Test

The landfill's Title V Permit, Solid Waste Handling Permit, and Tier 2 test results were reviewed during this verification period to confirm conformance with the Legal Requirement Test. The Black Warrior Solid Waste Facility is subject to NSPS rules requiring the facility to conduct Non-Methane Organic Compound (NMOC) emission rate testing. The most recent Tier II sampling and testing was conducted on March 9, 2011 with the NMOC emission rate results calculated to be 30.99 Mg/yr during 2012, below the 50 Mg/yr threshold that would require the installation of a gas collection and control system. The landfill's next scheduled Tier II testing event will occur in 2016.

To further inform the assessment of regulatory additionality, First Environment performed a cursory review of the landfill's Title V permit from ADEM, dated January 30, 2007, that states the GCCS does not require an Air Permit Amendment in accordance with ADEM Administrative Rule R. 335-3-10-.02(75), and that the landfill is currently not subject to the standards of Subpart WWW. This cursory review of permits, laws, and regulations indicated that the Project is not required by regulation; therefore, the Project passes the CAR Protocol's Legal Requirement Test.

Additionally, First Environment relied on the Attestation of Voluntary Implementation completed by BWSWA for the current reporting period. The Attestation is on file with CAR and was reviewed to confirm that it was completed correctly.

6.2.4 Regulatory Compliance

First Environment reviewed the landfill's Solid Waste Permit, Major Source Operating Permit, National Pollution Discharge and Elimination Permit, the landfill's Environmental Protection Agency's (EPA) Enforcement and Compliance History Online (ECHO) database, and performed an online regulatory review using the Alabama Department of Environmental Management (ADEM) database (e-file) for the Black Warrior Solid Waste Facility to assess compliance with relevant laws and regulations. This cursory review of permits and regulations indicated that the site was in compliance and no violations of permits occurred during the reporting period.

Additionally, First Environment relied on the Attestation of Regulatory Compliance completed by BWSWA for the current reporting period. The Attestation is on file with CAR and was reviewed to confirm that it was completed correctly.

6.3 Project Performance Against CAR Protocol and Project Management System

The Project was implemented in conformity with the CAR Protocol. BWSWA developed and implemented a Monitoring Plan to track relevant project parameters and data sources. The Monitoring Plan, including the Project Diagram, was reviewed to determine compliance with the protocol requirements. Based on observations made during the site visit and review of relevant Project documentation, First Environment found the Monitoring Plan and Project Diagram to meet the requirements set forth by the CAR Protocol and the Project to be implemented in accordance with the Monitoring Plan.

6.3.1 Project Monitoring

A Thermal Instruments ST-95 mass flow meter continuously measures differential pressure, temperature, and pressure of the gas stream. The meter standardizes flow readings from ambient conditions to a pressure of one atmosphere and a temperature of 60°F. The project utilizes two identical Thermal Instruments ST-95 flow meters to facilitate quarterly factory calibrations.

A CAI continuous gas analyzer measures gas composition for methane, oxygen, and carbon dioxide content. A GEM2000 portable gas analyzer is also used to take periodic methane measurements, although continuously monitored methane data was used for the purposes of emission reduction quantification over this reporting period.

Both gas flow rates and methane concentration are measured on the same relative moisture basis.

The candlestick flare incorporates two thermocouples within the shroud designed to shut down the flare when the flare temperature drops below the set point of 500°F.

A PLC system continuously records gas flow, methane concentration, and flare temperature on a Yokogawa digital chart recorder.

Table 1 summarizes the project monitoring system parameters and monitoring equipment employed by the project.

Table 1: Monitoring Equipment

Parameter	Monitoring Equipment	Frequency of Measurement	Frequency of Recording	Recording Device
Landfill gas flow	Thermal Instruments Mass Flow meter. Model # 65-9/9500 Primary Meter s/n: 2008455 In service: 11/11/11 - 2/23/12; 3/22/2012 - 7/10/2012; 8/21/2012 - 10/22/2012	Continuous	Every 4 minutes	Yokogawa digital chart recorder
Landfill gas flow	Thermal Instruments Mass Flow meter. Model # 65-9/9500 Secondary Meter s/n: L9005 In Service: 2/23/2012 - 3/22/12; 7/10/2012 - 8/21/2012; 10/22/2012 - 12/31/2012	Continuous	Every 4 minutes	Yokogawa digital chart recorder
Methane Concentration	California Analytical Instruments L Series Gas analyzer	Continuous	Every 4 minutes	Yokogawa digital chart recorder
	GEM2000 portable gas analyzer	Periodic	As measured	Field logs
Hourly Operation of Destruction Device	Type K thermocouple	Continuous	Every 4 minutes	Yokogawa digital chart recorder

6.3.2 Instrument Quality Assurance/Quality Control

BWSWA's instrument quality assurance/quality control (QA/QC) plan for the Project's monitoring equipment complies with the requirements of the CAR Protocol.

The Thermal Instruments Mass flow meters were inspected and cleaned on a weekly basis and checked for calibration accuracy using a pitot tube by a third party on a near monthly basis. The flow meters were also factory calibrated on a quarterly basis during the reporting period with the exception of the primary flow meter during the second quarter of 2012. During the second quarter of 2012, third-party accuracy checks were relied upon to confirm calibration accuracy in place of a factory calibration. First Environment reviewed evidence of the flow meter quarterly calibrations and third-party field accuracy checks which all indicated the meters were operating accurately with reported drift within the five percent threshold established by the CAR Protocol.

The California Analytical Instruments gas analyzer was inspected, cleaned, and field calibration checked on a weekly basis. The field calibration checks are performed by a third-party technician, employed by TTL, using a LandTec GEM2000. First Environment reviewed the results of the cleanings/inspections and field calibration checks, all of which indicated that the

analyzer was operating within the allowed five percent accuracy range specified in the CAR Protocol.

The GEM2000 portable gas analyzer is calibrated prior to each use with a reference gas of known concentration. The instrument is also calibrated by the manufacturer bi-annually. First Environment reviewed field calibration checks and factory calibration records to confirm that the GEM2000 portable gas analyzer was operating accurately within the five percent threshold established by the CAR Protocol.

Table 2 shows the dates during the current reporting period when instrument QA/QC was performed.

Table 2: Instrument QA/QC

Monitoring Equipment	Calibration Check	Inspected/Cleaned
Thermal Instruments flow meter. Primary (s/n: 2008455)	1/24/2012; 3/15/2012 (factory); 3/28/2012; 4/10/2012; 5/11/2012; 6/25/2012; 8/6/2012 (factory); 9/21/2012; 12/3/2012 (factory)	1/3/2012; 1/17/2012; 1/24/2012; 1/31/2012; 2/7/2012; 2/14/2012; 2/21/2012; 3/27/2012; 4/3/2012; 4/10/2012; 4/17/2012; 4/24/2012; 5/1/2012; 5/8/2012; 5/15/2012; 5/22/2012; 5/29/2012 6/5/2012; 6/12/2012; 6/19/2012; 6/26/2012; 7/3/2012; 8/21/2012; 8/28/2012; 9/5/2012; 9/11/2012; 9/18/2012; 9/25/2012; 10/2/2012; 10/12/2012; 10/16/2012
Thermal Instruments flow meter. Secondary (s/n: L9005)	2/29/2012; 2/3/2012 (factory); 6/28/2012 (factory); 7/13/2012; 8/17/2012; 10/29/2012; 10/15/2012 (factory); 11/12/2012; 12/7/2012	2/28/2012; 3/6/2012; 3/13/2012; 3/20/2012; 7/17/2012; 7/31/2012; 8/7/2012; 8/15/2012; 8/21/2012; 10/22/2012; 10/30/2012; 11/6/2012; 11/13/2012; 11/20/2012; 11/26/2012; 12/4/2012; 12/10/2012; 12/18/2012/ 12/26/2012

Monitoring Equipment	Calibration Check	Inspected/Cleaned
California Analytical Instruments gas analyzer	1/3/2012; 1/10/2012; 1/17/2012; 1/24/2012; 1/31/2012; 2/7/2012/ 2/14/2012; 2/21/2012; 2/28/2012; 3/6/2012; 3/13/2012; 3/20/2012; 3/27/2012; 4/3/2012; 4/10/2012; 4/17/2012; 4/24/2012; 5/1/2012; 5/8/2012; 5/15/2012; 5/22/2012; 5/29/2012; 6/5/2012; 6/12/2012; 6/19/2012; 6/26/2012; 7/3/2012; 7/17/2012; 7/24/2012; 7/31/2012; 8/7/2012; 8/15/2012; 8/21/2012; 8/28/2012; 9/5/2012; 9/11/2012; 9/18/2012; 9/25/2012; 10/2/2012; 10/12/2012; 10/16/2012; 10/22/2012; 10/30/2012; 11/6/2012; 11/13/2012; 11/20/2012; 11/26/2012; 12/4/2012; 12/10/2012; 12/18/2012; 12/26/2012	1/3/2012; 1/10/2012; 1/17/2012; 1/24/2012; 1/31/2012; 2/7/2012/ 2/14/2012; 2/21/2012; 2/28/2012; 3/6/2012; 3/13/2012; 3/20/2012; 3/27/2012; 4/3/2012; 4/10/2012; 4/17/2012; 4/24/2012; 5/1/2012; 5/8/2012; 5/15/2012; 5/22/2012; 5/29/2012; 6/5/2012; 6/12/2012; 6/19/2012; 6/26/2012; 7/3/2012; 7/17/2012; 7/24/2012; 7/31/2012; 8/7/2012; 8/15/2012; 8/21/2012; 8/28/2012; 9/5/2012; 9/11/2012; 9/18/2012; 9/25/2012; 10/2/2012; 10/12/2012; 10/16/2012; 10/22/2012; 10/30/2012; 11/6/2012; 11/13/2012; 11/20/2012; 11/26/2012; 12/4/2012; 12/10/2012; 12/18/2012; 12/26/2012
GEM2000	3/14/2012 (factory calibration) 9/7/2012 (factory calibration)	Prior to each use

6.3.3 Project Emissions

Project emissions sources and the associated monitoring methodology are summarized in Table 3.

Table 3: Project Emissions

Project Emissions Source	Monitoring
Purchased Electricity	Monthly utility invoices
Propane consumption	Purchase records

6.4 Emissions Reduction Calculation Assessment

The emission reduction calculations were reviewed to ensure accuracy in the formulas used and raw data used as inputs. The formulas were tested to ensure they were consistent with the calculation methodology described in the CAR Protocol.

Total landfill gas flow is computed by multiplying the average landfill gas flow rate in a given interval by the length of the interval. Flow totals are aggregated on a daily basis. Metered gas flow volumes were automatically corrected to standard conditions at one atmosphere of pressure and a temperature of 60°F by the flow meter. The total volume of methane destroyed by the Project was computed in daily intervals by multiplying the daily gas flow to the flare by the daily average of methane concentration measurements and is converted to a mass flow using the density of methane at 60°F and one atmosphere of pressure. The total quantity of methane destroyed by the Project is aggregated monthly and summed over the reporting period to obtain the total baseline emissions. Project emissions were calculated by multiplying activity data by

an appropriate emission factor. The total emission reductions were determined by subtracting the project emissions from the baseline emissions.

Table 4 summarizes the input parameters used in the emission reduction calculations.

Table 4: Input parameters

Input Parameter	Name	Description/ Value
$LFG_{i,t}$	Total quantity of landfill gas sent to flare	Summed daily from metered data, internally corrected to 60°F and one atmosphere of pressure
$PR_{CH_4,t}$	Methane content	Averaged daily from continuously recorded data
DE_i	Default destruction efficiency	96%
OX	Oxidation Factor	10%
DF	Discount Factor	0
Flare Temperature Cut-off	Metered data below corresponding temperature cut-off are excluded from calculations.	500°F
EF_{FF}	Propane emission factor	5.74 CO ₂ /gallon
EF_{EL}	Purchased electricity emission factor	1,325.68 lb CO ₂ /MWh

Copies of the raw data used in the calculations, including flow data, methane content data, and utility and other fossil fuel invoices, were compared with the data used in the final calculations and tested for transcription or mathematical errors. A representative sample of raw data sources and calculations over the entire verification period were reviewed. First Environment performed recalculations of emission reductions for the entire reporting period to assess whether they were free of material misstatement. First Environment found the emission reduction calculations to be free of material misstatement.

6.5 *Approved Variance or Deviations*

No variances or deviations were obtained for the project in this verification period.

6.6 *Changes Due to Errata & Clarifications Issued by CAR*

The issuance of the Errata and Clarification, dated October 8, 2013, resulted in the following changes:

- Clarification No. 2 resulted in a change to the Attestation forms that the project developer submitted to CAR. Clarification No. 2 further clarifies that the Legal Requirement Test and the Regulatory Compliance require the execution of both attestations of Voluntary Implementation and Regulatory Compliance. First Environment reviewed these two attestation forms and confirmed that these forms were completed correctly and are on file with the CAR.
- Clarification No. 12 requires that any portable instruments used for field checks and calibrations that have the ability to measure the parameter that the meter in question would normally measure must themselves be calibrated annually and maintained per the manufacturer's specifications. A Landtec GEM-2000 was used to field check the flow

meter and methane analyzer. First Environment reviewed calibration records for a Landtec GEM-2000 (s/n 11409) used during the third-party field checks. First Environment concluded that the portable analyzer was successfully factory calibrated on March 14 and September 7, 2012 and maintained as required by the manufacturer.

The Errata and Clarification did not result in any other changes to the verification process.

7. Verification Conclusion

Based on the evidence collected and the assessments performed, First Environment concludes that the Project's GHG emissions reductions achieved through the collection and combustion of landfill gas for the period January 1 through December 31, 2012 can be considered with a reasonable level of assurance:

- in conformance with the verification criteria, and
- without material discrepancy.

Verified results show:

Reporting Period: January 1, 2012 to December 31, 2012	Total
Baseline Emissions (tCO ₂ e)	56,535
Project Emissions (tCO ₂ e)	51
Emissions Reductions (tCO ₂ e)	56,484

8. Lead Verifier Signature



Jeff Daley
Environmental Specialist

9. Senior Internal Reviewer Signature



James T. Wintergreen
Senior Associate