



Verification Report

CAR403 Black Warrior Solid Waste Facility

Reporting Periods: January 1, 2020 – December 31, 2020

Prepared for:

Element Market Emissions, LLC

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1.0 Introduction

Ruby Canyon Environmental, Inc. (RCE) was contracted to perform the verification of the Black Warrior Solid Waste Facility (Project) for the reporting periods January 1, 2020 – December 31, 2020 to the Climate Action Reserve (Reserve) Landfill Project Protocol 5.0 (Protocol). The Project is located in the town of Coker, Alabama at the Black Warrior Landfill (Landfill).

1.1 Project Background & Site Description

The Landfill was opened in 1978 by the City of Tuscaloosa and was transferred ownership to Black Warrior Solid Waste Authority (BWSWA) in 1994. The landfill consists of 8 cells. Cells 2 through 8 send gas to the flare and the landfill is currently building a tenth cell. BWSWA owns and operates the gas collection and control system. The Project consists of the collection of landfill gas (LFG) from the landfill and its subsequent destruction by combustion in one open flare.

1.2 Responsible Party

Project Developer: Element Markets Emissions, LLC (EM)

Landfill Owner: Black Warrior Solid Waste Authority

Gas Collection and Control System Owner: Black Warrior Solid Waste Authority

1.3 Verification Team

The RCE verification team consisted of the following individuals who were selected based upon verification experience and knowledge of the landfill methane sector.

Lead Verifier: Garrett Heidrick

Team Member: Masury Lynch

Senior Internal Reviewer: Zach Eyler

1.4 Objectives

The goal of the verification activities was to ensure that the claimed GHG emission reductions were complete, consistent, accurate, transparent, and permanent and that the Project was in compliance with the Reserve's project additionality, monitoring, and reporting requirements. Furthermore, the verification activities ensure that the data provided to RCE is well documented and free of any material errors or omissions.

1.5 Scope

The scope of the verification consisted of the following independent and objective activities:

- Review the reporting period's Project Monitoring Plan;
- Conduct a site visit to the Project location;
- Review the Project data acquisition and quality control procedures;
- Review the Project's baseline emissions and confirm the baseline and Project boundaries;
- Review the Project's evidence of environmental and regulatory requirements to ensure that the Project is additional;
- Review the Project's emission reduction calculations;
- Review the Project documents and data against the criteria listed in Table 1;
- Issue requests for additional documentation, clarifications, and corrective actions as necessary; and
- Issue a verification report, verification statement, and list of findings to EM and the Reserve.

1.6 Verification Criteria

Table 1 – Summary of Verification Criteria

Criteria	Details
Standard of Verification	- CAR Landfill Project Protocol, Version 5.0 (April 24, 2019) - CAR Offset Program Manual (March 12, 2021) - The Reserve Verification Program Manual (February 3, 2021)
Verification Process	The Reserve Verification Program Manual and ISO 14064-3:2006 Specification with guidance for the validation and verification of greenhouse gas assertions
Level of Assurance	Reasonable assurance
Materiality	97% accuracy level (less than 3% error) because total annual emission reductions are between 25,000 and 100,000 tCO ₂ e.

2.0 Verification Activities Summary

The Verification process consisted of the following activities as outlined in the verification plan:

- RCE completed a NOVA/COI form to identify any potential conflict of interest with the Project or technical consultants. The NOVA/COI form was submitted to the Reserve and the COI assessment revealed no conflicts of interest and was approved by the Reserve on November 23, 2021.
- RCE held a verification kick-off meeting with EM on December 2, 2021. During the kick-off meeting RCE reviewed the verification objectives and process, reviewed the verification schedule, and requested the verification background documents.
- RCE performed a strategic review and risk assessment of the received data and support documents in order to understand the scope and areas of potential risk in the GHG emissions reductions.
- RCE developed a risk-based sampling plan based upon the strategic review and risk assessment. The verification plan and sampling plan were used throughout the verification and were revised as needed based upon additional risk assessments.
- RCE conducted a site visit on February 2, 2022. During the site visit RCE performed key personnel interviews; inspected the Project equipment; and observed the onsite GHG management systems and data gathering, monitoring, and handling practices.
- RCE performed a risk-based desktop review of the submitted verification documents. The desktop review included an assessment of the GHG calculation methods and inputs, source data completeness, GHG management and monitoring systems, evidence of regulatory compliance, and record retention practices.
- RCE submitted material findings, non-material findings, additional documentation requests, and clarifications, as necessary, to EM throughout the verification.
- RCE's senior internal reviewer conducted a review of the verification sampling, report, and statement.
- RCE issued a final verification report, verification statement, and list of findings.
- RCE held an exit meeting with EM.

3.0 Verification Findings

3.1 Assessment of the GHG Emission Reductions Project Operations

The Project currently collects landfill gas from the Landfill and destroys it via one open flare. The LFG is pulled from 8 cells at the landfill and passes through a clean-out that removes condensate which is transferred to

the landfill's condensate collection system. RCE confirmed that the open flare can combust all landfill gas produced.

RCE confirmed that the landfill is not a bioreactor and does not re-circulate leachate nor add any liquid other than leachate in a controlled fashion to accelerate or enhance the anaerobic biodegradation of the waste.

3.2 GHG Project Boundary (sources, sinks and/or reservoirs)

According to the Protocol, carbon dioxide and methane are the only GHGs included in the Project boundary from both the baseline and Project activities. The emissions resulting from the Project activity must be deducted from the Project baseline emissions in order to calculate total emission reductions. These Project emissions include the carbon dioxide resulting from the consumption of electricity from the grid and consumption of propane related to Project activities. Baseline emissions are the total methane vented to the atmosphere less the oxidation of methane by soil bacteria. Table 2 lists the sources of GHG emissions reviewed during the verification of the Project.

Table 2 – Summary of the Project GHG Sources, Sinks and Reservoirs

Activity	GHG Sources, Sinks & Reservoirs
Baseline	• CH₄ vented to the atmosphere. • Percent methane oxidized by soil bacteria. As the landfill is not covered with a synthetic liner, a 10% oxidation factor resulting from natural oxidation by soil bacteria was applied to the baseline emissions.
Project	• CH₄ from the incomplete combustion of LFG sent to the flare. • CO₂ from the combustion of fossil fuels used during operation and maintenance of the Project activity. • CO₂ resulting from the consumption of imported electricity.

3.3 Project Eligibility Criteria

The Protocol specifies four eligibility rules that a project must meet in order to register emission reductions with the Reserve: Location, Project Start Date, Additionality, and Regulatory Compliance. Below is a summary of the Reserve eligibility requirements and the Project's compliance to each requirement.

- **Eligibility Rule 1: Location**

The Project is a US-based landfill located in the town of Coker, AL. The Project therefore meets this eligibility requirement. RCE confirmed this information with a site visit.

- **Eligibility Rule 2: Project Start Date**

The Landfill Project Protocol states a project start date is the date when methane was first continuously destroyed in a qualifying destruction device at the site. RCE reviewed the initial calibration date and Project Submittal form to confirm that the Project first began continuous methane destruction on January 16, 2009. The Project submittal form was completed and submitted to the Reserve on September 19, 2008.

Eligibility Rule 3: Additionality

Performance Standard Test

Prior to the Project activity, the Landfill was neither collecting nor destroying gas. RCE confirmed this through time-stamped satellite imagery prior to the project start date and with landfill staff during the site visit. RCE also observed no evidence of a previous landfill gas collection system while on site.

Thus, the Project passes the Performance Standard Test number 1 since it involves:

“Installation of a landfill gas collection system and a new qualifying destruction device at an eligible landfill where landfill gas has never been collected and destroyed prior to the project start date.”

Legal Requirement Test

During the site visit, RCE interviewed BWSWA about the procedures to ensure that the Project meets environmental compliance requirements and the Legal Requirement Test. BWSWA and EM monitor federal, local, and state regulations to ensure that the Project is in environmental compliance and that there is no mandate to collect and combust LFG. RCE confirmed that there are currently no laws or ordinances requiring the Landfill to collect and destroy LFG.

The Landfill is a municipal solid waste (MSW) landfill that exceeds the design capacity of 2.5 million megagrams (Mg) or 2.5 million cubic meters as specified in the New Source Performance Standards (NSPS) codified in Title 40 of the Code of Federal Regulations (CFR) Part 60, Subpart WWW. The landfill is therefore subject to the requirements of the NSPS for MSW landfills. The Landfill is currently building a new cell, but it is not subject to NSPS XXX Regulations as of this verification.

RCE examined the NMOC modeling results for the landfill and found that the calculated NMOC emission rate for 2020 to be 17.57 Mg/year, which is below the 34 Mg/year threshold for a required gas collection and combustion system.

RCE also reviewed the Project’s Monitoring Plan which defines how the Project continues to exceed the Legal Requirement Test. Landfill personnel review local, state, and federal regulations prior to each verification period in order to confirm that there are no new requirements or laws that mandate the GCCS to be in place. The Attestation of Voluntary Implementation form was also signed after the end of the reporting period and uploaded to the Reserve registry which states that the project was implemented and established voluntarily.

During the review of the supporting evidence, RCE did not observe any indication that the Landfill was mandated to destroy LFG. Additionally, there are no local, state, or federal requirements for the installation of a GCCS at the Landfill. Therefore, the results of the review indicated that BWSWA is following its Monitoring Plan procedures to assure that it passes the Legal Requirement Test.

- **Eligibility Rule 4: Regulatory Compliance**

RCE reviewed the procedures described in EM’s monitoring plan to ensure that the Project remains in compliance with all applicable local, state, and federal requirements. RCE searched the Environmental Protection Agency’s Enforcement & Compliance History Online (ECHO) database and found one violation. The violation was a reportable noncompliance, which is administrative in nature and not project related. RCE reviewed environmental and operating permits including the Landfill’s operating permit and the Municipal Solid Waste permit. During RCE’s review there was no evidence of noncompliance found, and the procedures for ensuring regulatory compliance in the Monitoring Plan were being properly followed. Finally, RCE confirmed signature of the Attestation of Regulatory Compliance, after the end of the reporting period, which was uploaded to the Reserve.

3.4 Ownership of Generated Emission Reductions

RCE reviewed the completed Attestation of Title which states that BWSWA owns and operates the flare and EM owns the emission reduction credits generated by the Project. RCE also reviewed the Carbon Credit Purchase and Sale Agreement between the Landfill and EM and the amendments to confirm ownership.

3.5 GHG Monitoring and Management Systems

RCE reviewed the data management systems during the site visit and desktop review. RCE completed the majority of the GHG management systems review during the site visit by observing the onsite procedures and interviewing the personnel responsible for the Project. The onsite review included an assessment of the Project data collection, processing and handling procedures, recordkeeping and data storage, quality control and assurance procedures, record retention systems, and a field tour of the Project equipment. The desktop review included a detailed review of the Project monitoring plan and its conformance to Protocol requirements. RCE also confirmed that the Project was implemented according to the Monitoring Plan.

The primary project data include the LFG flow to the flare and methane content of the LFG. The LFG flow is continuously measured by one Thermal Instrument Company flow meter, serial number 2008455. During the site visit, RCE observed that the position of the flow meter to allowed for laminar flow of landfill gas. The flow meter internally corrects for temperature and pressure at 60°F and 1 atm. All monitored data is recorded continuously by a SCADA PLC system as well as a chart recorder. The methane content of the landfill gas was measured weekly by a Landtec GEM2000 (GEM). RCE confirmed that the project was deducting 10% as required by the Protocol for weekly methane measurements.

During the site visit, RCE reviewed the data storage and retention policies of BWSWA and EM and verified they were in conformance with the Protocol requirements and followed the Monitoring Plan. All data is kept for a period of ten years after the information is generated or seven years after the last verification.

3.6 Instrument QA/QC

RCE reviewed evidence that the flow meters and methane analyzers met instrument QA/QC requirements as outlined in the Protocol for cleaning, inspection, and calibration. The Project Monitoring Plan describes the procedures for instrument field checks and calibrations. These procedures in the Monitoring Plan are in compliance with the Protocol requirements. The Protocol requires all handheld methane analyzers to be calibrated per manufacturer's guidance or annually, whichever is more frequent. The GEM2000 is required to be calibrated every 6 months according to the manufacturer's guidance. The GEM (GM11409) was calibrated by QED on 1/16/2019, 1/14/2020, 3/25/2020, and 5/10/2021 with percent drift documented. All calibration records show the GEM to be within the protocol required 5% drift threshold. The frequency of calibration checks for the GEM did not meet protocol requirements because they fell outside of manufacturer specified guidance, and therefore a variance was needed to satisfy the methane analyzer calibration requirements for this reporting period (see section 3.8 "6/27/2022"). RCE confirmed that the conditions for this variance were met.

Landfill staff performed monthly checks on the entire gas collection system, which includes the flow meter and gas analyzer. These monthly checks ensure that all pieces of equipment are functioning properly and if one is not, that it is fixed or calibrated in a timely manner. The Project was not able to satisfy the protocol required instrument QA/QC as-found field check at the end of the reporting period, and therefore a variance was needed to satisfy the final protocol required field check (see section 3.8 "4/18/2022"). RCE confirmed that the conditions for this variance were met.

3.7 Assessment of GHG Emission Reductions Calculations

The emission reduction calculation assessment included a review of Project assumptions, raw data inputs, and accuracy of calculations. RCE assessed the completeness of the raw data and how the data are

transferred to the calculation spreadsheet. RCE reviewed the formulas and raw data inputs for accuracy and compliance with Protocol requirements.

The Project data consisted of raw data in the form of spreadsheets of flare flow, GEM measurements, and the calculation workbooks. RCE compared raw data in the spreadsheets to the respective daily sums, and then compared those data and the methane readings to the calculation workbooks. RCE confirmed operational activity of the flare using temperature data supplied in the raw data. RCE confirmed that a 10 percent discount was applied for weekly methane readings. RCE confirmed that a 96.0 percent destruction efficiency was assigned to the Project's open flare.

RCE reviewed source documentation for Project emissions from purchased electricity and propane, confirmed that appropriate emission and conversion factors were used, and reviewed the use of Protocol equations for Project emissions in EM's calculation workbook.

RCE recalculated the GHG emission reductions and compared the results to EM's calculations to determine if the GHG emission reductions were materially correct. RCE found no material misstatements in the final Project GHG reductions calculations.

3.8 Variance Determination

The Project submitted two variances to the Reserve. The details of these variances are described below.

4/18/2022 Variance

The variance was needed because the Project missed the required field check for calibration accuracy by a third-party technician with the percent drift documented, using a portable instrument or manufacturer specified guidance, at the end of – but no more than two months prior to or after – the end date of the reporting period. EM requested a variance for BWSWF to use a manufacturer calibration conducted in February 2022 in lieu of the field checks for calibration accuracy required for the 2020 and 2021 reporting periods.

A variance determination was issued by the Reserve on 4/18/2022 pursuant to the following condition, the verifier confirms that the project developer has updated their monitoring plan and onsite procedures to ensure that QA/QC requirements are followed for the flow meter for all subsequent reporting periods.

RCE confirmed that the project developer revised their monitoring plan and QA/QC procedures to ensure that all subsequent reporting periods will have accuracy checks completed within two months of the end date of the reporting period.

6/27/2022 Variance

The variance was needed because the Project missed the required calibration frequency specified by the manufacturer of their gas analyzer. Landtec requires their GEM2000 units to be calibrated every six months. The Project's GEM2000 unit was calibrated annually, and therefore, falls outside of the manufacturer recommended calibration frequency. EM requested a variance for BWSWF to allow the GEM2000 calibrations performed by QED in March 2020 and May 2021 to satisfy this requirement.

A variance determination was issued by the Reserve on 6/27/2022 pursuant to the following conditions; the verifier confirms the calibration certificates from March 2020 and May 2021 for the GEM2000 were within the accuracy threshold, and the verifier confirms that the monitoring plan specifies an appropriate methane analyzer calibration schedule to ensure that future reporting periods will meet protocol monitoring requirements.

RCE confirmed that the calibrations of the GEM2000 in March 2020 and May 2021 fell within the accuracy threshold of $\pm 5\%$ and that the monitoring plan specifies an appropriate methane analyzer calibration schedule to ensure that future reporting periods will meet protocol monitoring requirements.

4.0 Verification Results

EM provided sufficient evidence and documentation of its emission reductions, data collection procedures, and monitoring and quality control procedures. The verification process focused on verifying the emission reduction calculations and the source data used to quantify the emission reductions in accordance with the Reserve Landfill Project Protocol 5.0. The following is a summary of the verification results.

The Project reported emission reductions of 49,488 metric tons of CO₂e from January 1, 2020 to December 31, 2020. RCE identified no material misstatements in the data or emission reductions calculations. Table 3 defines the emission reductions verified for the reporting period. During the verification process, RCE made requests for material findings, non-material findings, additional documentation, and clarifications, as necessary, to complete the verification. EM sufficiently addressed all requests. The details of these requests are documented in RCE's List of Findings provided to the Reserve and EM.

5.0 Conclusion

RCE conducted a risk-based analysis of the Project's GHG emission reductions including a strategic review of the Project data and evidence. Based upon the processes and procedures and the evidence collected, RCE concludes that the Project emission reductions resulting from the capture and destruction of LFG during the reporting period January 1, 2020 – December 31, 2020 can be considered:

- In conformance with the Reserve Landfill Project Protocol 5.0,
- Without material discrepancy, and
- Verified to a reasonable level of assurance

Table 3 - Emission Reductions Verified for January 1, 2020 – December 31, 2020

Year	Baseline Emissions CO ₂ e (tonnes)	Project Emissions CO ₂ e (tonnes)	Emission Reductions CO ₂ e (tonnes)
2020	49,525	37	49,488

Note: Due to rounding, individual values might not equal totals and values are not representative of raw data used in the emission reductions calculation.

Lead Verifier Signature



Garrett Heidrick

Senior Internal Reviewer Signature



Zach Eyler