



RUBY CANYON ENGINEERING

Verification Report for CAR 502 – Central Sanitary Landfill Project September 1, 2010 – August 31, 2011 Reporting Period

Prepared for:
Central Sanitary Landfill, Inc.

January 10, 2012

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1.0 Introduction

Ruby Canyon Engineering (RCE) was contracted by Element Markets, LLC (Element Markets) to perform the repeat verification of the Central Sanitary Landfill (CAR502) project (“Project”) for the reporting period September 1, 2010 through August 31, 2011 to the Climate Action Reserve (CAR) Landfill Project Reporting Protocol Version 2.1 (Protocol 2.1). The Project involves GHG emission reductions from the capture and destruction of methane from the municipal solid waste landfill located in Pierson Township, Montcalm County, Michigan.

1.1 Project Background & Site Description

The Central Sanitary Landfill (CSL) is owned and operated by the Central Sanitary Landfill, Inc. (CSLF), a subsidiary of Republic Services, Inc. CSL is an active solid waste municipal sanitary landfill that began operation in 1970, CSL consists of 306.9 acres with a total permitted footprint of 115.9 acres, and it has a maximum design capacity of 10.075 million tonnes. The landfill is made up of a number of different disposal areas that consist of several closed cells, active phases and other unconstructed phases.

The Project was voluntarily implemented on October 6, 2006 and consists of one landfill gas collection system (LFGCCS) and one open utility flare that combusts the collected gas. The CSLF Landfill Manager is responsible for the Project’s day-to-day operations and maintenance while the Environmental Manager with Republic Services ensures CSL is in environmental compliance. The quarterly monitoring equipment field calibration checks, inspections and cleaning is performed by a third party technician with Systems Service, Inc. Element Markets, LLC (Element Markets) was hired by CSLF as a third party technical consultant that is responsible for the data management, GHG calculations and the Project’s compliance to CAR’s requirements and the Protocol 2.1.

1.2 Responsible Party

Central Sanitary Landfill, Inc.
21156 West Cannonsville Road
Pierson, MI 49339-9741

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: Sally Phipps
Team Member: Bonny Crews
Senior Reviewer: Michael Côté

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 CAR project additionality, monitoring and reporting requirements. Furthermore, the verification activities ensure that the data provided to RCE are well documented and free of any material errors or omissions.

1.5 Scope

The scope of the periodic verification consists of the following independent and objective activities:

- Review the reporting period's Project Design Document/Project Monitoring Plan
- Review the Project Data Acquisition & Quality Control Procedures
- Conduct a site visit to CSL to view the Project equipment
- Review evidence of the Project start date
- Review the Project's baseline emission reductions and check that the baseline and Project boundaries have not changed
- Review the Project's evidence of environmental and regulatory requirements
- Review evidence that the Project passes the legal requirements test and ensure the Project is additional
- Review the Project's emission reduction calculations
- Review the Project documents and data against the requirements of the verification criteria listed in Table 1.
- Issue requests for clarifications and corrective actions as necessary
- Issue a verification report, list of findings and verification statement to Element Markets and CAR

1.6 Verification Criteria

Table 1 – Summary of Verification Criteria

Standard of Verification	• Landfill Project Reporting Protocol Version 2.1 (October 14, 2009) • Landfill Project Verification Protocol Version 2.0 (November 18, 2008) • Errata & Clarifications to Landfill Project Protocol, Version 2.1 (November 28, 2011) • Verification Program Manual (December 20, 2010) • Program Manual (October 26, 2011) and the • International Standards Organization (ISO) 14064-3 Specification with guidance for the validation and verification of greenhouse gas assertions
Verification Process	CAR and ISO 14064-3
Level of Assurance	Reasonable assurance
Materiality	A +/-3 percent materiality threshold

2.0 Verification Activities Summary

The Project was listed with CAR and the previous reporting period was verified by DNV. The verification of the September 1, 2010 through August 31, 2011 Project reporting period began with Element Markets selecting RCE as the verification body. Element Markets provided the Project data and verification support on behalf of the project developer CSLF.

Prior to starting the verification, RCE developed a verification plan that was followed throughout the verification. The verification plan consisted of the following activities:

- Completion of a Project Conflict of Interest/Notification of Verification Activities (COI/NOVA) form by RCE to identify any potential conflict of interest with the Project or Project developer. The COI/NOVA form was submitted to CAR's online website and the COI assessment revealed no conflicts of interest and was approved by CAR on 11/01/2011.
- A teleconference verification kick-off meeting was held with Element Markets on 11/14/2011. During the kick-off meeting RCE was introduced to the key personnel, reviewed the verification objectives and process, reviewed the verification schedule and requested the verification background documents.
- RCE began receiving the background verification documents from Element Markets via email and an ftp site data room on 11/14/2011.
- 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.
- A risk-based site visit sampling plan and desktop sampling plan were developed based upon the strategic review and risk assessment. The verification plan, sampling plan and desktop sampling plan were used throughout the verification and were revised as needed based upon additional risk assessments.
- A site visit was conducted on 12/07/2011. During the site visit RCE performed key personnel interviews, inspected the Project equipment, reviewed the source documents, Project data and calculations, and observed the onsite GHG management systems, and data gathering, monitoring and handling practices.
- A risk-based desktop review of the submitted verification documents was performed. The desktop review included an assessment of the GHG calculation methods and inputs, source data completeness, GHG management and monitoring systems, evidence of Project start date, regulatory and legal compliance and record retention practices.
- Requests for Clarifications, Corrective Actions, and Additional Documentation were submitted to Element Markets throughout the verification.
- A senior review of the verification sampling, report and opinion was conducted.
- A final verification report, verification opinion and listing of findings were developed.
- An exit meeting was held with the client on 1/10/2012.

3.0 Verification Findings

3.1 *Assessment of the GHG Reduction Project Operations*

The Project currently collects landfill gas (LFG) and destroys it via combustion in an open utility flare. Prior to combustion, the LFG passes through condensate knockout tanks and is measured for flow, temperature, pressure and methane content. The LFG is pulled through a LFG collection system by one of two electrically driven centrifugal blower located at the flare skid.

The active LFGCCS was constructed between July 7, 2006 and September 9, 2006 and became operational on October 6, 2006. The LFGCCS was expanded in the fall of 2009 and included the installation of 9 new vertical gas extraction wells, abandonment of 1 gas extraction well and installation of associated piping. Three additional horizontal wells were constructed and tied into the system in 2011. The individual LFG wells are joined by lateral piping that is connected to a common header pipe that is routed to the blower and flare skid.

The LFG flow rate is measured with a Fluid Components International (FCI) thermal mass flow meter, which automatically adjusts for temperature and pressure. Methane content is currently measured with a Siemens Ultramat 23 Non-dispersive Infrared (NDIR) continuous gas analyzer

that was installed in April 2010. A thermocouple measures the combustion temperature of the flare.

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

According to the Protocol 2.1 only CO₂ and CH₄ GHGs are included from the baseline and Project activities. The GHG emission sources resulting from the Project baseline and the Project activity must be deducted from the Project GHG emission reductions. GHGs are emitted from methane vented to the atmosphere, methane destroyed in the Project destruction devices, fossil fuel use, and electricity use.

Table 2 lists the sources and sinks of GHG emissions reviewed during the verification of the Project.

Table 2 Project GHG Sources, Sinks, and Reservoirs

Activity	GHG Sources, Sinks & Reservoirs
Baseline	• CH₄ vented to the atmosphere. • CH₄ oxidized by soil bacteria. As the landfill is not covered with a synthetic liner, a 10 percent oxidation factor resulting from natural oxidation by soil bacteria was applied to the baseline emissions and the pre-project methane destruction.
Project	• CH₄ from the incomplete combustion of LFG in the open utility flare. • CO₂ resulting from the consumption of imported electricity. • CO₂ resulting from the consumption of purchased propane.

3.3 Project Eligibility Criteria

The CAR Protocol 2.1 specifies four eligibility rules that a GHG Project developer must meet in order to register reductions with the CAR. The four eligibility rules in the Protocol 2.1 are location, Project operation start date, additionally requirements, and regulatory compliance. The additionally requirements consist of meeting the performance standard and exceeding any legal requirements. As this was the first verification RCE performed of the Project, RCE performed a complete assessment of the each eligibility rule.

Below is a summary of the CAR eligibility requirements and the Project's compliance to each requirement.

- **Eligibility Rule 1: Location:**
The Project is a US-based landfill located in Pierson Township, Montcalm County, Michigan USA and therefore meets this eligibility requirement.
- **Eligibility Rule 2: Project Start Date:**
The Protocol 2.1 states that to be eligible, the project must be submitted to the Reserve no more than six months after the project start date, unless the project is submitted during the first 12 months following the date of adoption of Version 2.0 of the Landfill Project Protocol by the Reserve board (the Effective Date, or November 17, 2008). For a period of 12 months from the Effective Date, projects with start dates as early as January 1, 2001 are eligible to register. The start date is defined as the date on which a

qualifying destruction device becomes operational. According to the Project Design Document/Monitoring Plan the Project became operational on October 6, 2006.

To confirm the Project start date RCE examined the Field Monitoring Report dated October 6, 2006 showing that the flare was started and LFGCCS monitoring began. The American Environmental Group Ltd. Certificate of Completion report dated October 2, 2006 indicates that the wells of the LFG collection were completed. Finally RCE reviewed the Shaw LFG Specialties, LLC utility flare purchase agreement that was signed on October 6, 2006. The reviewed evidence in combination with interviews with the landfill personnel concerning the Project start date was sufficient evidence to affirm that the Project began flaring gas on October 6, 2006 and therefore meets the Project start date requirements.

- **Eligibility 3: Additionality**

According to the CAR additionality requirements Project developers must pass a Performance Standard Test and a Legal Requirement Test in order to show that the Project reductions are above and beyond business as usual.

Performance Standard Test

Prior to the Project implementation, CSLF did not collect or combust the LFG. Therefore, the Project proponent meets the performance standard threshold under Option 1 of the performance standard test. Option 1 states “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.”

To ensure that the Project met Option 1 RCE examined the February 2, 2009 Renewable Operating Permit, which expires February 2, 2014. The Permit contained a history of all emission sources at the landfill and no LFGCCS or combustion systems were installed prior to the Project.

Legal Requirement Test

For the Legal Requirement Test, Project proponents must ensure that emission reductions achieved by the Project would not have occurred in the baseline case due to federal, state, or local regulations. During the site visit RCE interviewed the Landfill Manager and Environmental Manager about the environmental compliance and legal requirements procedures. The Environmental Manager regularly reviews federal, state and local regulations and permitting requirements to ensure CSLF is environmental compliance and not mandated to collect and combust its LFG. In particular, the Environmental Manager closely monitors the NSPS Tier II report testing requirements.

CSLF has a design capacity above 2.5 million megagrams (Mg) and 2.5 million cubic meters of municipal solid waste. Consequently, the facility is required by the New Source Performance Standard (NSPS) regulation to conduct Non-Methane Organic Compound (NMOC) emission rate testing. Cornerstone Environmental Group, LLC, performed the most recent Tier II test on April 11, 2011. The test results from the Tier II NMOC emission rate for 2011 was 40.53 Mg/year; the report also included the 2010 estimate of 39.97 Mg/year. RCE reviewed the NMOC test results that indicated that

CSLF is below the 50 Mg/year regulatory threshold and should not have to recalculate its NMOC emissions until 2015.

RCE reviewed the Legal Requirements procedures detailed in the Project Design Document/Monitoring Plan and confirmed that the Monitoring Plan contains a clear and rigorous method to ensure the Project passes the CAR Legal Requirements Test. An Attestation of Voluntary Implementation was signed by CSLF on November 3, 2011 and is on file with CAR.

Based upon the personnel interviews and the documentation reviewed RCE did not find any indication that CSLF was mandated to collect and combust its LFG. Additionally, there are no local, Michigan or Federal requirements mandating the installation of a LFGCCS at CSLF. Therefore the results of the regulatory review indicated that the Project developer is following its Project Design Document/Monitoring Plan procedures to assure they pass the legal requirements test and the Project is in compliance with all Federal, State and local regulations.

- **Regulatory Compliance**

RCE reviewed the environmental compliance procedures described in the Project Description/Monitoring Plan, the Environmental Compliance Plan Outline, the Attestation of Regulatory Compliance signed by CSLF on November 3, 2011, the Renewable Operating Permit, the Operating License, and the Leachate Recycling Permit for evidence that the Project was in compliance with all environmental and regulatory requirements. During RCE's review no evidence of non-compliance found, and the procedures for ensuring regulatory compliance in the Project Design Document/Monitoring Plan were followed.

3.4 Ownership of GHG reductions

RCE reviewed two contract agreements submitted by Element Markets and the Attestation of Title signed by CSLF on November 3, 2011 for evidence of ownership of the generated emission reductions.

The Designation of Authority contract specifies that Element Markets will maintain the CAR account on behalf of CSLF. The contract agreement titled "Carbon Credit Development and Management Agreement" demonstrates the role of Element Markets as the project technical consultant and the agreement explicitly states that CSLF has the rights to all generated emission reductions. The presented evidence clearly demonstrates CSLF as the sole owner of the emission reductions associated with the Project.

3.5 Assessment of Information System Controls

The GHG management systems were reviewed during both the site visit and the desktop review. During the site visit the majority of the GHG management systems review took place and was achieved through observing the onsite procedures and interviewing the Landfill Manager, the LFG Technician and the Environmental Manager. The onsite review included an assessment of the Project data collection, processing and handling procedures, recordkeeping and data storage, the quality control and assurance procedures, Project maintenance procedures, and a field tour of the Project.

The primary Project data included the LFG flow, methane content, pressure and temperature of the LFG. One FCI Thermal Mass flow meter continuously monitors the LFG. The flow meter standard conditions were 70°F and 1 atmosphere until March 9, 2011 when the flow meter standard conditions were set by the manufacture to 60°F and one atmosphere. A Siemens Ultramat 23 gas analyzer continuously records the gas quality after the blower and condensate knockout tank. The flow meter is located after the blower and a condensate knockout tank and the position of the flow meter is adequate to ensure laminar flow.

The LFG flow, gas analysis and thermocouple data is recorded every 4 minutes via a Yokogawa digital chart recorder to a compact 512 MB flash drive. For emission reductions calculation purposes, data is aggregated by 8 minute intervals. The Yokogawa is directly connected via a phone line to the Element Markets Houston office. The Houston office will export daily DDS files directly from the Yokogawa using a software system called the DAQ Explorer. The DDS files are converted into text files that are stored in the Element Markets database system. The raw data from the text files are then put into an Excel file. The data from the Excel file are then transferred into the CSL Emission Reductions spreadsheet.

The flare operation is monitored continuously by a thermocouple located in the utility flare shroud and the temperature and operating hours are recorded every 4 minutes by the Yokogawa digital chart recorder. For emission reductions calculation purposes, data is aggregated by 8 minute intervals. A Pilot Timer is used to indicate pilot system malfunction or failure. If the pilot temperature does not reach the Pilot-Off set point before the Pilot Timer times out, a pilot fault will occur, and the flare system automatically shuts down and starts the process over again. After the combustion of LFG has begun, low temperature detection is enabled, and the thermocouple on the flare stack begins monitoring for low temperature conditions to ensure that proper combustion temperatures are maintained. If the temperature drops below the Pilot-Off set point, a low temperature fault will occur, and the flare system automatically shuts down and automatically attempts to start the ignition cycle over again.

RCE reviewed the field calibration reports titled "Systems Service, Inc. Inspection Report" for the flow meter and gas analyzer and confirmed that each quarter a successful field calibration was conducted. During the quarterly checks the LFG Technician also checks the Yokogawa milliamp (mA) output and signal from the unit to ensure it is communicating properly with the monitoring equipment. The LFG Technician records the total LFG flow, temperature, pressure, and site inspection notes onto the quarterly Systems Service, Inc. Inspection Report. In addition, the Landfill Manager inspects the flare skid weekly and performs regularly scheduled field inspections, maintenance and cleaning. The activities are recorded into the Weekly Operation and Maintenance Record documents; RCE reviewed samples of these documents during the verification. Section 3.6 of this report details the field calibration and factory calibration documentation review.

During the site visit the field calibration check procedures and the flare skid data gathering and documenting procedures were discussed in detail. RCE also observed the LFG Technician perform a calibration check of the flow meter and the gas analyzer.

The Project Design Document/Monitoring Plan was reviewed and RCE determined that Project Design Document/Monitoring Plan clearly and thoroughly described the Project monitoring,

data recording and data management activities and included all requirements of the Protocol 2.1. All Project records kept by CSLF and Element Markets are kept a minimum of ten years from when the information is first generated or seven years after the last verification.

3.6 Quarterly Cleaning, Inspections, & Calibration Checks & Factory Calibrations

While at the Project site RCE interviewed the Landfill Manager and the third party LFG Technician from Systems Service, Inc. about the quarterly cleaning, inspection and calibration check procedures and equipment maintenance. The project monitoring equipment is cleaned, inspected and calibrated quarterly by the LFG Technician with Systems Service, Inc. The Landfill Manager also regularly inspects and maintains the Project equipment and monitoring devices.

The dates for the quarterly cleaning, inspections and calibrations for each piece of monitoring equipment are listed in Table 3.

Table 3 Project Quarterly Cleaning, Inspection and Field Calibration Checks

Monitoring Equipment	Dates of Calibration Checks			
Flare Flow Meter (FCI Thermal Mass Flowmeter)	November 15, 2010	March 21, 2011	June 6, 2011	August 30, 2011
Ultramat Siemens Gas Analyzer (Ultramat 23)				

CSL's procedures also require that the flow meter be factory calibrated annually and the methane analyzer calibrated as needed. While the Project flow meter was factory calibrated a temporary factory calibrated flow meter was installed. The factory calibration dates for each piece of monitoring equipment are listed in Table 4.

Table 4 Factory Calibrations

Monitoring Equipment	Dates of Factory Calibrations		
Flare Flow Meter (FCI Thermal Mass Flowmeter)	September 8, 2006		March 9, 2011
Temporary Flare Flow Meter (FCI Thermal Mass Flowmeter)		February 4, 2011	

RCE examined the quarterly cleaning, calibration, and inspection reports and found that according to the field check results, all monitoring equipment was in calibration within the +/- 5% accuracy threshold. The factory calibrations in combination with the field checks satisfy the Protocol 2.1 requirement that all monitoring equipment must at a minimum be field checked for calibration accuracy quarterly and calibrated within two months prior to the end of the reporting period.

3.7 Assessment of GHG Emissions Reductions Calculations

The emission reduction calculation assessment included the review of Project assumptions, raw data inputs, and accuracy of calculations. RCE first assessed the completeness of the raw data and how the data are transferred to the calculation spreadsheet. Next the formulas and raw data inputs were reviewed for accuracy and compliance with the Protocol 2.1. Lastly, RCE recalculated the GHG emissions and reductions and compared the results to Project calculations to determine if the GHG emissions were materially correct.

During the desktop review the Yokogawa flow data was compared to the LFG flow volumes, gas analysis and temperature readings in the CSL Emission Reductions Spreadsheet. The fossil fuel use and electricity use raw data from the invoices and receipts were also compared to the numbers used in the GHG emissions calculations. RCE's review consisted of data transcription tests, data completeness, spreadsheet functionality and accuracy. No errors were found during the review.

Within the CSL Emission Reductions Spreadsheet data was eliminated when the incremental flare temperature was below the threshold temperature of 500°F or when the data recording was greater than 15 minutes. The remaining data was then considered corrected and the LFG was totaled per day and the methane readings were averaged per day.

The Project GHG emission and GHG reduction calculations were reviewed for compliance to the Protocol 2.1 calculation methodologies demonstrated in equations 5.1, 5.2 and 5.4 of the protocol.

A 96 percent destruction efficiency was assigned to the Project's utility flare and applied accordingly in emission reduction calculations. Because the landfill does not have a synthetic liner, a 10% discount was applied to the baseline scenario for bacterial oxidation of methane under the cap. Since the flow meter's standard conditions were 70°F and one atmosphere prior to March 9, 2011, the LFG readings until March 9, 2011 were adjusted to 60°F and one atmosphere per the Protocol 2.1 requirements.

The net amount of methane destroyed by the Project was calculated per day then summed for the reporting period and converted into CO₂ equivalents (CO₂e). Project emissions from CSL consisted of indirect emissions of CO₂ from electricity consumption and direct emissions of CO₂ from the combustion of propane to assist the flare. The Project emissions were calculated from the product of activity data multiplied by an appropriate emission factor. The total Project GHG reductions in CO₂e were calculated by subtracting the Project emissions from the net amount of methane destroyed by the Project in CO₂e.

RCE examined 100 percent of the Project calculation methods and compared them to the protocol. Daily risk-based samples from each month were selected to recalculate the CH₄ destroyed by the Project. RCE found no material misstatements in the final Project GHG reductions calculations and results.

3.7.1 Data Substitution

The project developer did not apply any data substitutions during the period. RCE verified that there were no instances of missing data where a data substitution was used.

4.0 Verification Results

Element Markets provided excellent documentation of its emission estimates, data collection procedures and monitoring and quality control procedures. The verification process focused on verifying the emissions estimates and the source data used by Element Markets to quantify the emissions reductions in accordance with the Protocol 2.1. The following is a summary of the verification results.

The Project proponents reported 23,500 metric tons CO₂e in 2010 and 44,595 metric tons of CO₂e in 2011 as per the information provided in the final Emission Reductions Spreadsheet.

During the verification, RCE identified no non-material or material misstatements. The verified emission reductions are listed in Tables 5, 6 and 7.

Table 5 - Emission Reductions Verified for September 1, 2010 through December 31, 2010

Emissions Verified	CO₂e (metric tons)
Baseline Emissions	23,581
Project Emissions	81
Emission Reductions	23,500

Table 6 - Emission Reductions Verified for January 1, 2011 through August 31, 2011

Emissions Verified	CO₂e (metric tons)
Baseline Emissions	44,758
Project Emissions	163
Emission Reductions	44,595

Table 7 - Emission Reductions Verified for September 1, 2010 through August 31, 2011

Emissions Verified	CO₂e (metric tons)
Total Emission Reductions	68,095

4.1 Findings Overview

During the verification process, RCE made requests for Clarifications and supplemental documentation to complete the verification. RCE did not identify any non-material or material misstatements during the verification. The details of the requests for corrective actions and clarifications are documented in the RCE List of Findings provided to CAR and Element Markets and CSLF.

5.0 Verification Statement

RCE conducted a risk-based analysis of the Central Sanitary Landfill (CAR502) project ("Project") GHG assertion where RCE performed a strategic review of the Project data and evidence. Based upon the processes and procedures and the evidence collected, RCE concludes with a reasonable level of assurance that the Project emission reductions resulting from the capture and destruction of landfill gas during the reporting period September 1, 2010 through August 31, 2011 can be considered:

- in conformance with the CAR Landfill Project Reporting Protocol 2.1 standards
- without material discrepancy, and
- verified to a reasonable level of assurance.

The verified Emission reduction CRTs are listed in the Table 8 and Table 9.

Table 8 - Emission Reductions Verified for September 1, 2010 through December 31, 2010

Emissions Verified	CO ₂ e (metric tons)
Emission Reductions	23,500

Table 9 - Emission Reductions Verified for January 1, 2011 through August 31, 2011

Emissions Verified	CO ₂ e (metric tons)
Emission Reductions	44,595

Lead Verifier Signature



Sally Phipps

Independent Internal Reviewer Signature



Michael Coté