



RUBY CANYON ENGINEERING

April 1, 2010 – March 31, 2011 Reporting Period
Verification Report for the Gaston County Landfill Gas Destruction
Project

Prepared for:
EcoSecurities International Limited

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Ruby Canyon Engineering
743 Horizon Ct. Suite 385
Grand Junction, Colorado 81506
(970) 241-9298

Table of Contents

1.0 Introduction	1
1.1 Project Background & Site Description	1
1.2 Responsible Party	1
1.3 Verification Team.....	1
1.4 Objectives	2
1.5 Scope	2
1.6 Verification Criteria.....	2
2.0 Verification Activities Summary.....	2
3.0 Verification Findings.....	3
3.1 Assessment of the GHG Reduction Project Operations	3
3.2 GHG Project Boundary (sources, sinks and/or reservoirs).....	3
3.3 Project Eligibility Criteria	4
3.4 GHG Monitoring and Management Systems	6
3.5 Assessment of GHG Emissions Reductions Calculations	7
4.0 Verification Results	8
4.1 Findings Overview	9
5.0 Verification Opinion.....	10

1.0 Introduction

Ruby Canyon Engineering (RCE) was contracted by EcoSecurities International Limited (EcoSecurities, “Project Developer”) to perform the periodic verification of the Gaston County Landfill Gas Destruction Project (“Project”) for the reporting period April 1, 2010 through March 31, 2011 to the Climate Action Reserve (CAR) Landfill Project Protocol 3.0. The Project involves GHG emission reductions from the capture and destruction of methane from the municipal solid waste landfill located in the town of Dallas, North Carolina, at the Gaston County Landfill – Hardin Site.

1.1 Project Background & Site Description

The Gaston County Landfill is owned by Gaston County and is operated by the County Public Works department. The Landfill, which opened in 1988, covers 130.5 acres, with the following sections: Area C and Area D – 42.7 acres; Unit I – 38 acres; Unit II cells 1A and 1B – 5.7 acres; Unit II Phase I Cell 1 – 4.4 acres; Unit II Phase I Cell 2 – 12.7 acres; Unit II Phase II – 15 acres; and, Unit III – 12 acres. As of July 1, 2008 the landfill contained a total of 2,229,500 tonnes waste in place. The average annual quantity of waste accepted at the landfill is approximately 108,168 tonnes. The total permitted to construct design capacity of the landfill is 6,129,300 tonnes and the currently constructed and permitted to operate design capacity is 2,380,700 tonnes; the estimated date of landfill closure is 2029. The Gaston County Landfill has an active recycling facility at the site in addition to various administration offices.

A pre-project passive venting system of wells and cut-off trenches was installed in 1995 – 1996 to control migratory and explosive gas. This consisted of nine wells along the northeastern side of the Areas C and D, which closed in 1998. The passive system remained in operation until 2008 when the current landfill gas capture and destruction system was designed and installed. The current Gaston County Project consists of seventy-two LFG capture wells, piping and manifolds for transporting the captured gas, and an open candlestick flare to combust the LFG. The seventy-two wells include the original nine passive wells, forty-six new LFG wells installed in Areas C and D, and seventeen LFG wells installed in the Unit I area. Additional equipment for the project includes a blower, a condensate knockout pot, LFG flow and gas content analysis equipment, a flame arrestor, and an 8” Perennial Stand Alone Flare Stack for LFG destruction. The Project became operational on November 18, 2008.

1.2 Responsible Party

EcoSecurities International Limited
40 Dawson Street
Dublin 2, Ireland

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: Nina Pinette
Senior Reviewer: Bonny Crews

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 is 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 Monitoring Manual
- Review the Project Data Acquisition & Quality Control Procedures
- Conduct a site visit to the Gaston County Landfill
- 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 to ensure the project is additional
- Review the Project's emission reduction calculations
- Review of the Project documents and data against the requirements of the CAR Landfill Project Protocol 3.0, Errata and Clarifications to Landfill Project Protocol Version 3.0 (January 4, 2011), the CAR Program Manual (March 16, 2010), and the CAR Verification Program Manual (December 20, 2010).
- Issue requests for clarifications and corrective actions as necessary
- Issue a verification report, list of findings and opinion to EcoSecurities and CAR

1.6 Verification Criteria

Table 1 – Summary of Verification Criteria

Standard of Verification	• Climate Action Reserve Landfill Project Protocol 3.0 • Errata and Clarifications to Landfill Project Protocol Version 3.0 (January 4, 2011) • CAR Program Manual (March 16, 2010) • CAR Verification Program Manual (December 20, 2010) • 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	97% accuracy level (less than 3% error)

2.0 Verification Activities Summary

The verification of the April 1, 2010 through March 31, 2011 emission reductions is a periodic verification of the Project. The Project was listed on the CAR website on July 23, 2009 and RCE had previously verified the August 1, 2009 through March 31, 2010 reporting

period. The verification process began with EcoSecurities selecting RCE as the verification body.

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) renewal form by RCE to identify any potential conflict of interest with the Project or Project Developer. The COI/NOVA renewal form was submitted to CAR's online website and the COI assessment revealed no conflicts of interest and was approved by CAR on 2/28/2011.
- A teleconference verification kick-off meeting was held between EcoSecurities and RCE on 3/2/2011. 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 by email from EcoSecurities on 3/6/2011.
- 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 was developed based upon the strategic review and risk assessment. The verification plan, site-visit 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 3/8/2011. During the site visit RCE performed key personnel interviews, inspected the Project equipment, reviewed the source documents 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 regulatory compliance, continued additionality and record retention practices.
- Requests for Clarifications & Corrective Actions were submitted to EcoSecurities throughout the verification.
- A senior review of the verification sampling, report and opinion was conducted.
- A final verification report, verification opinion and list of findings were developed.
- An exit meeting was held with EcoSecurities on 7/1/2011.

3.0 Verification Findings

3.1 Assessment of the GHG Reduction Project Operations

The Gaston County Landfill Gas Destruction Project currently collects landfill gas (LFG) from the Gaston County Landfill and destroys it via combustion through an open candlestick flare. The landfill gas is pulled by a blower located at the flare skid through a gas collection system that consists of 72 wellheads connected by lateral piping to the main header pipe.

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

The CAR 3.0 Landfill Project Protocol designates that CO₂ and CH₄ are the only GHGs included from the baseline and Project activities. The GHG emission sources resulting from the Project activity must be deducted from the Project baseline in order to calculate GHG emission reductions. These GHGs include CO₂ emitted from methane oxidized in the soil of an uncapped landfill, methane vented to the atmosphere, methane destroyed in the Project

destruction device, fossil fuel use and electricity use. The sources of GHG emissions reviewed during the verification of the Gaston County Landfill Project are listed in **Table 2**.

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 combustion of LFG in the flare. • CO₂ from the combustion of fossil fuels used during operation and maintenance activities for the Project activity. • CO₂ resulting from the consumption of imported electricity.

3.3 Project Eligibility Criteria

The CAR Landfill Project Protocol 3.0 specifies four eligibility rules that a GHG Project Developer must meet in order to register reductions with CAR: Location, Project Start Date, Additionality, and Regulatory Compliance. During the first verification cycle the Project's location, the Project start date, Additionality and the Regulatory compliance were verified. RCE re-verified the project Additionality and Regulatory Compliance, and observed no changes in these from the last verification cycle.

RCE performed a complete additionality assessment to ensure that the Project met the Performance Standard Test and Legal Requirements Test. RCE reviewed evidence that the Project is in compliance with all applicable local, state and Federal requirements. Evidence reviewed included the Attestation of Regulatory Compliance, environmental and operating permits and regulatory documents to determine that the project was in compliance with all applicable environmental regulations. For evidence that the project is still additional and voluntary RCE reviewed the Attestation of Voluntary Implementation, the New Source Performance Standard (NSPS) Tier II Non-Methane Organic Compound (NMOC) estimates test results and current local, state and Federal regulations.

In addition, the Project Developer must provide evidence of exclusive ownership rights to the generated GHG emission reductions. RCE reviewed both the completed Attestation of Title and the redacted contract agreement between EcoSecurities Group, PLC and Gaston County, North Carolina for evidence of ownership of the generated emission reductions. The presented evidence clearly demonstrated that EcoSecurities holds the legal title and exclusive ownership rights of the emission reductions associated with the Project. All rights, interests, title and benefits of the agreement have been assigned by EcoSecurities Group, PLC to EcoSecurities International Limited under a corporate restructuring, which is acceptable under the terms of the agreement with Gaston County.

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 the town of Dallas in Gaston County, North Carolina, USA and therefore meets this eligibility requirement.
- **Eligibility Rule 2: Project Start Date:**
The Landfill Project Protocol 3.0 states that pre-existing projects must have a start date on or after January 1, 2001. The start date is defined as the date on which a qualifying destruction device becomes operational. According to the Gaston County Landfill Gas Destruction Project Submittal form, the Gaston County Project began flaring gas on November 18, 2008. RCE confirmed this start date through review of email communications between the Project startup technicians and the design engineering firm.
- **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 activity, the Gaston County Landfill did not combust any landfill gas and only collected and passively vented the gas through the nine passive vents. The current Project involved the installation of a new qualifying destruction device, which satisfies the requirement for the Performance Standard Test.

Legal Requirement Test

A project passes the Legal Requirement Test when there are no laws, statutes, regulations, court orders, environmental mitigation agreements, permitting conditions or other legally binding mandates requiring the destruction of landfill gas methane at the project site. The Gaston County landfill satisfies the Legal Requirement Test through the Attestation of Voluntary Implementation form signed by the Director of EcoSecurities on April 27, 2011 on file with CAR. This document states that the project was implemented and established voluntarily.

RCE examined the procedures, outlined in the Gaston County Monitoring Manual, that the Project Developer will follow to ascertain and demonstrate that the project at all times passes the Legal Requirement Test. These procedures include having an administrator maintain compliance and knowledge of any changes in regulatory requirements.

The Gaston County Landfill expanded its operations in 2010 and is now constructed and permitted to operate at a design capacity of 5,748,470Mg of municipal solid waste. The new design capacity triggered the NSPS Tier II NMOC emissions estimates reporting requirement. According to the Design Capacity and Emissions Projection Report from March 3, 2011, the NMOC emission rate for 2010 and 2011 are 34 Mg/yr and 36 Mg/yr respectively and are below the requirements of the NSPS 50 Mg/yr NMOC threshold.

During the review of the supporting evidence RCE did not observe any indication that the Gaston County Landfill was mandated to collect and combust their LFG. Additionally, there are no local, state or Federal mandatory requirements for the installation of a gas collection and combustion system. Therefore the results of the regulatory review indicated that Gaston County is following their Monitoring Manual procedures to assure they pass the legal requirements test and the Project is in compliance with all Federal, State and Local regulations.

Eligibility 4: Regulatory Compliance: RCE reviewed the procedures described in the Gaston County Monitoring Manual, the submitted Attestation of Regulatory Compliance, North Carolina Department of Environment and Natural Resources (NCDENR) Division of Air Quality air permit, NCDENR Municipal Solid Waste Landfill Facility permit to operate for evidence that the project was in compliance with all environmental and regulatory requirements. During RCE's review there was no evidence of non-compliance found, and the procedures for ensuring regulatory compliance in the Monitoring Manual were being properly followed.

3.4 GHG Monitoring and Management Systems

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 Gaston County Landfill Gas Destruction Project personnel. 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 include the total landfill gas flow, the landfill gas flow to the flare, methane content, oxygen content, pressure and flare temperature. A Yokogawa Model EJX910A flow meter that automatically adjusts the temperature and pressure measures to 59 °F and 1 atm continuously monitors the gas flow after the blower and knockout prior to combustion in the candlestick flare. The position of the flow meter is adequate to ensure laminar flow.

The gas flow data and thermocouple temperature is recorded continuously via an electronic chart data recorder located at the blower and flare station. The landfill gas methane content is measured continuously with a Siemens Ultramat 23 gas analyzer. The site operator uses a handheld Landtec GEM 2000 analyzer for twice daily manual readings of landfill gas methane concentration. The readings are recorded twice daily on the project log book, along with manual readings of the LFG flow, methane concentration, oxygen, pressure and temperature. The Environmental Analyst notes any downtime, system alarms, etc. in the weekly project logbook. The daily logs are compiled into spreadsheets and sent to EcoSecurities once per month.

The continuous data from the electronic chart recorder are exported in 10-minute intervals to *.DAT file format on a weekly basis. The Environmental Analyst conducts quality checks and transfers data files to EcoSecurities bi-weekly. During the first verification RCE verified the data transfer procedures by requesting the Environmental Analyst to perform this procedure on a randomly selected *.DAT file from the rotating 2-week archive of raw files. The procedure was transparent, complete, consistent, and was accurate when compared to

the raw data in the workbook. During the current site visit RCE interviewed the site key personnel and the technical consultant with EcoSecurities and confirmed that the procedures were transparent, complete and had not changed from the last reporting period.

The review of the logs and reports consisted of an assessment of their completeness, consistency, accuracy and compliance. In addition, RCE also compared the project data from the logs and reports to the data used in the GHG reduction calculations. RCE selected risk based samples of the daily logs and compared the daily logs to the spreadsheets that are sent to EcoSecurities. RCE examined instances of downtime and the noted causes for significant downtime or instrumentation error.

From September 27 to October 11, 2010 the continuous methane analyzer O₂ sensor was malfunctioning. During this time the methane analyzer would output methane readings less than 1% off and on throughout the time period. Each instance of discontinuous data between September 27 and October 11 was less than 24 hours. RCE cross-compared the accurate methane readings greater than 1% from between September 27 to October 11 to methane readings from the months of July, August, November and December and determined that the readings appeared consistent and representative of the typical methane readings from the other months.

RCE reviewed the submitted calibration reports for the flow meter and continuous methane analyzer unit and verified that they were calibrated, cleaned and inspected on a quarterly basis, which satisfies the requirements of the CAR Landfill Protocol 3.0. Table 1 of the Gaston County Monitoring Manual provides specific information on the details of the monitoring equipment to include model and serial numbers, calibration and maintenance procedures, and procedure in event of failure that are in compliance with the CAR Landfill Protocol 3.0 and are being followed on site. Also, the operational procedures and responsibilities as outlined in Table 2 of the Monitoring Manual were observed by RCE to be accurately portrayed.

During the site visit RCE reviewed the data storage and retention policies of the Gaston County Landfill and verified they were in conformance with the protocol requirements and followed the Monitoring Manual.

3.5 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 is transferred to the calculation spreadsheet. Next the formulas and raw data inputs were reviewed for accuracy and compliance with the Landfill Project Protocol 3.0. Lastly, RCE recalculated the GHG emissions and reductions and compared the results to the Project Developer's calculations to determine if the GHG emissions were materially correct.

The Project GHG emission and GHG reduction calculations were reviewed for compliance to the CAR Landfill Project Protocol 3.0 calculation methodologies demonstrated in equations 5.1, 5.2, 5.3 and 5.4 of the protocol. Since the project did not destroy landfill gas prior to the Project implementation equation 5.5 was not included. A 96 percent destruction efficiency was assigned to the Project's combustion device and applied accordingly in emission reduction calculations. Because the landfill does not have a synthetic cover, a 10 percent

discount is applied to the baseline scenario for bacterial oxidation of methane under the cap. RCE examined 100 percent the Project calculation methods in the Gaston County Workbooks, and compared them to the protocol.

The project electricity use from the invoices was compared to the numbers used in the GHG emission reductions calculations. The method of estimating the propane usage was to calculate a monthly average from the tank purchased in 2008 which is still in use. RCE sampled approximately 40 percent of the raw Project data within the calculation spreadsheets, and the selected samples review consisted of data transcription tests, data completeness and accuracy.

Risk-based samples from the months of May, September, October, November and December of 2010 and February of 2011 were selected to recalculate the monthly CH₄ destroyed by the Project. The months of September and October were chosen to examine the instances of data substitution while the remaining months were selected due to percent contribution. The samples chosen were 10-minute readings that were checked against the Gaston County calculations. Data substitutions were applied for the less than 24 hour instances of discontinuous methane readings that occurred off and on between September 27 and October 11, 2010. RCE verified that the data substitution methods applied were accurate and conservative.

Since the volume of gas flow metered by the Yokogawa flow meter is recorded at a temperature of 59 °F and 1 atm, the flow readings were appropriately adjusted to a standard temperature and pressure of 60 °F and 1 atm per the Protocol's requirement using Equation 5.2. The gas flows for each 10-minute reading are totalized using the difference in recorded time per interval to determine the gas flow during that interval. The total volume of gas flow is converted to a mass flow using the density of methane at 60 °F and 1 atm of pressure.

As there is continuous methane monitoring and all calibration tests were verified to be within a five percent margin of error no discount factor was applied to account for uncertainties. The net amount of methane destroyed by the Project was calculated per month, then summed for the reporting period total and converted into CO₂ equivalents (CO₂e). Project emissions from the Gaston County Landfill consisted of indirect emissions of CO₂ from electricity consumption and direct emissions of CO₂ from the combustion of propane to ignite 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 found no material misstatements in the final Gaston Landfill GHG reductions calculations and results.

4.0 Verification Results

EcoSecurities provided sufficient evidence and excellent documentation of their emission estimates, data collection procedures and their monitoring and quality control procedures. The verification process focused on verifying the emissions estimates and the source data used by EcoSecurities to quantify the emissions reductions in accordance with the CAR Landfill Project Protocol 3.0. The following is a summary of the verification results.

The Project proponents reported 60,398 metric tons CO₂e in 2010 and 17,423 metric tons of CO₂e in 2011 as per the information provided in the Gaston County calculation spreadsheets dated May 3, 2011. During final review, RCE identified no material misstatements in the data or emissions calculations. The amount of emission reductions verified resulted as follows:

Table 3 - Emission Reductions - April 1 through December 31, 2010

Emissions Verified	CO₂e (metric tons)
Baseline Emissions	60,400
Project Emissions	2
Emission Reductions	60,398

Table 4 - Emission Reductions -January 1 through March 31, 2011

Emissions Verified	CO₂e (metric tons)
Baseline Emissions	17,424
Project Emissions	1
Emission Reductions	17,423

Table 5 -Total Emission Reductions - April 1, 2010 through March 31, 2011

Emissions Verified	CO₂e (metric tons)
Total Emission Reductions	77,821

4.1 Findings Overview

During the verification process, RCE made several requests for Clarifications, Corrective Actions and supplemental documentation to complete the verification. According to RCE's verification procedures all material Corrective Actions must be addressed by EcoSecurities before a positive verification opinion will be submitted. The details of the requests for corrective actions and clarifications are documented in the RCE List of Findings provided to CAR and the Project Developer.

5.0 Verification Opinion

RCE conducted a risk-based analysis of the Gaston County Landfill Gas Destruction Project 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 emission reductions at the Project resulting from the capture and destruction of landfill gas during the reporting period April 1, 2010 through March 31, 2011 can be considered:

- in conformance with the CAR Landfill Project Protocol 3.0 standards,
- without material discrepancy, and
- verified to a reasonable level of assurance

The verified Emission reduction CRT(s) are listed in the **Table 6** and **Table 7**.

Table 6 -Emission Reductions Verified for April 1 through December 31, 2010

Emissions Verified	CO ₂ e (metric tons)
Emission Reductions	60,398

Table 7 - Emission Reductions Verified for January 1 through March 31, 2011

Emissions Verified	CO ₂ e (metric tons)
Emission Reductions	17,423

Lead Verifier Signature



Sally Phipps

Independent Internal Reviewer Signature



Bonny Crews