



RUBY CANYON ENGINEERING

Verification Report

CAR545 City of Garland Landfill Carbon Project

Reporting Period: June 10, 2014 – June 9, 2015

Prepared for:

Garland Power & Light

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1.0 Introduction

Garland Power & Light (GPL) contracted Ruby Canyon Engineering, Inc. (RCE) to perform the verification of the CAR545 City of Garland Landfill Carbon Project (Project) for the reporting period June 10, 2014 through June 9, 2015 to the Climate Action Reserve (Reserve) Landfill Project Protocol Version 2.1 (Protocol). The Project consists of the collection of landfill gas (LFG) from the C.M. Hinton Jr. Regional Landfill (Landfill) and its subsequent destruction by combustion in an open flare at the site. The Project is located near the City of Rowlett in Dallas County, Texas.

1.1 Project Background & Site Description

The Landfill has accepted municipal solid waste, residential construction and demolition waste since 2002. A LFG collection system was completed in June 2009. Currently two alternating blowers pull LFG through 31 vertical wells and 4 horizontal wells to an onsite flare skid where moisture is removed from the LFG and combusted via an open flare. The City of Garland owns both GPL and the C.M. Hinton Jr. Regional Landfill.

1.2 Responsible Party

Project Developer: Garland Power & Light (owned by the City of Garland)

Landfill Owner: City of Garland

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: Samantha Phillips

Team Member: Jessica Stavole

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;
- 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 GPL and the Reserve.

1.6 Verification Criteria

Table 1 – Summary of Verification Criteria

Criteria	Details
Standard of Verification	• The Reserve Landfill Project Protocol Version 2.1 (October 14, 2009) • Errata and Clarifications to Landfill Project Protocol Version 2.1 (June 18, 2015) • The Reserve Landfill Project Verification Protocol Versions 2.0 (November 18, 2008) • The Reserve Program Manual (September 1, 2015) • The Reserve Verification Program Manual (December 20, 2010)
Verification Process	The Reserve Verification Program Manual and ISO 14064-3 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 greater than 25,000 tCO ₂ e and less than 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 GPL. 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 July 23, 2015.
- RCE held a verification kick-off meeting with GPL on July 29, 2015. 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 August 20, 2015. 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 requests for corrective actions, additional documentation, and clarifications to GPL 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 GPL on January 5, 2016.

3.0 Verification Findings

3.1 Assessment of the GHG Emission Reductions Project Operations

The Project currently collects LFG from the Landfill and destroys it via combustion through an open flare mounted on a flare skid adjacent to the Landfill. The LFG is pulled from 31 vertical and 4 horizontal extraction wells at the landfill. Prior to the installation of the project, there were no destruction devices in use at the Landfill. RCE confirmed that the project is not a bioreactor and does not add any liquid, including leachate, in a controlled manner to the landfill.

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

The 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 methane generated from biodegradation of the landfill waste vented to the atmosphere, methane consumed by soil bacteria through natural oxidation, methane destroyed in the Project destruction devices, fossil fuel use, and electricity use. The sources of GHG emissions reviewed during the verification of the 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 incomplete combustion of LFG sent to the open 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 near the City of Rowlett in Dallas County, TX USA. The Project therefore meets this eligibility requirement.

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

The Project began gas destruction by flaring on June 10th, 2009. The Project submittal form was submitted to the Reserve on November 4th, 2009. RCE reviewed the flare commissioning report and raw data from the chart recorder in support of this start date.

- **Eligibility Rule 3: Additionality**

Performance Standard Test

Prior to the Project activity, the Landfill never collected or destroyed any LFG at the site. RCE confirmed this through visual inspection at the site, interviews with site personnel and through a review of images from Google Earth that were taken before and after the Project commenced. 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

RCE examined the procedures outlined in the Project Monitoring Plan that the Project Developer will follow to ascertain and demonstrate that the Project at all times passes the Legal Requirement Test. These procedures include Garland reviewing Landfill permits as well as state and federal regulatory changes to ensure that the Project activity is not required by law. RCE confirmed that there are currently no laws or ordinances requiring the Landfill to collect and destroy LFG. RCE also reviewed the Attestation of Voluntary Implementation form signed after the end of the reporting period and uploaded to the CAR website which states that the project was implemented and established voluntarily.

The Landfill has a design capacity greater than 2.5 million megagrams (MG) or 2.5 million cubic meters. Due to its design capacity, the Landfill is subject to the emission reporting requirements under the New Source Performance Standards (NSPS) / Emission Guidelines for Municipal Solid Waste Landfills. RCE reviewed the Landfill’s NSPS Tier 2 non-methane organic compound (NMOC) emissions rate report dated March 22, 2012 and confirmed that the NMOC emission rate for 2014 and 2015 was 17.9 and 22.4 Mg respectively. This is below the 50 Mg/year threshold and therefore the Landfill is not required to install a gas collection and control system.

During the review of the supporting evidence, RCE did not observe any indication that the Landfill was mandated to collect and combust LFG. Additionally, there are no local, state or federal requirements for the installation of a gas collection and combustion system. Therefore RCE has concluded that GPL is following its Monitoring Plan procedures to ensure passage of the Legal Requirement Test.

- **Eligibility Rule 4: Regulatory Compliance**

RCE reviewed the procedures described in the Monitoring Plan to ensure that the Project remains in compliance with all applicable local, state and federal requirements. RCE reviewed the Landfill’s leachate permits, air permits and solid waste permits for evidence that the project was in compliance with all environmental and regulatory requirements. RCE also utilized the Texas Commission on Environmental Quality (TCEQ) and the Environmental Protection Agency’s Enforcement & Compliance History Online (ECHO) databases to determine whether any notice of violations had been issued to the Landfill. No evidence was found of the Landfill being out of compliance during the reporting period.

During RCE’s review there was no evidence of non-compliance 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 GPL owns the emission reduction credits generated by the Project. The C.M. Hinton Jr. Regional Landfill and GPL are both entities within the City of Garland. RCE reviewed several of the Landfill's permits that listed the City of Garland as the permit holder. The city's fiscal report also includes the Landfill as an owned asset and the City of Garland's website states that GPL is owned by the City. RCE reviewed a letter from the City Manager stating that GPL is considered by the city to be the owner of all carbon credits. The presented evidence clearly demonstrated that GPL holds the legal title and exclusive ownership rights of the emission reductions associated with the Project.

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 GLP and Landfill personnel. 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; and equipment maintenance practices. 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, temperature of the flare and methane content of the LFG. The LFG flow is measured by a Fluid Components International (FCI) flow meter, with reference conditions of 70 °F and 1 atm. RCE confirmed that the LFG flow was corrected to the Protocol required temperature and pressure of 60 °F and 1 atm in the emission reduction calculation spreadsheet through the application of Protocol equation 5.2.

During the site visit, RCE observed that the flow meter is installed correctly to allow for laminar flow of LFG. GPL utilizes two FCI flow meters which are rotated quarterly throughout the reporting period. The flare temperature is measured by a thermocouple installed in the flare housing and is used to monitor the operation of the flare. The methane content of the landfill gas was measured continuously using a Siemens Ultramat 23 gas analyzer. All data is measured continuously and recorded every two minutes using a Yokogawa FX106 data recorder.

During the site visit RCE reviewed GPL's data storage and retention policies and verified they were in conformance with the Protocol requirements and followed the Project monitoring plan.

3.6 Variance

GPL submitted a variance request to the Reserve regarding Protocol project monitoring requirements. Section 6.1 of the Protocol requires that:

- the flow of landfill gas delivered to each destruction device, measured continuously and recorded every 15 minutes or totalized and recorded at least daily, adjusted for temperature and pressure;
- the fraction of methane in the landfill gas delivered to the destruction device, measured continuously and recorded every 15 minutes and averaged at least daily (weekly measurements may be used with application of a 10% discount);
- the operational activity of the landfill gas collection system and the destruction devices shall be monitored and documented at least hourly to ensure actual landfill gas destruction.

For a span of 55 days data was not being recorded by the Yokogawa while the project was operating normally. Inspections were performed daily without indication of system failure.

GPL has requested a variance for the Project to perform data substitution during a 55 day period in which they experienced a malfunction with their data recorder. The Reserve granted this variance pursuant to the following conditions:

- Data may be substituted during this period, using the more conservative of the 95% lower or upper confidence limit based on data recorded during the 72 hours preceding and following the data gap, in addition to the data collected manually on the 31 available daily logs;
- No data substitution shall be performed during periods in which no flare temperature is recorded on the daily log, a flare temperature lower than 775°F is recorded on the daily log, or during which there was known disruption to flare operation;
- The total emission reductions calculated during these 55 days should be discounted by 15%, or the percentage of flare downtime observed while the data recorder was not functioning, whichever is more conservative;
- The verifier must confirm that consistent power usage/day can be demonstrated during the time period in which data substitution is applied; and
- The verifier must confirm that the landfill staff are qualified and appropriately trained to perform the tasks of recording daily gas flow, methane concentration, and daily flare operational status.

RCE confirmed that the flow and methane concentration values used for substitution during the 55 day gap are the more conservative of the 95% lower or upper confidence limit and were calculated using the 72 hours prior to and following the data gap, in addition to manually collected data. Data substitution only occurred for periods when a flare temperature of greater than 775°F was confirmed. The percentage of flare down time has historically been 2% and it has been demonstrated to be lower during the 55 day gap which is lower than 15% and less conservative, so a 15% discount was applied to the emission reductions claimed during the recorder malfunction. RCE confirmed that consistent power use per day was demonstrated during the data gap. During the site visit on September 16, 2014 (for the 6/10/2013-6/9/2014 reporting period) RCE witnessed the task of recording daily records and confirms that the staff is qualified and trained to obtain accurate information.

3.7 Instrument QA/QC

The Project Monitoring Plan provides specific information on the details of the monitoring equipment, data unit and recording frequency, calibration and maintenance procedures and other relevant documents.

RCE confirmed that the two flow meters used were inspected and cleaned quarterly (July 23, 2014, October 21, 2014, January 21, 2015, April 20, 2015, July 15, 2015) with the as found/as left condition documented per the requirements of the Protocol. Additionally, all flare equipment and monitoring equipment were inspected on a daily basis.

GPL alternated between two different FCI flow meters throughout the reporting period. One flow meter is sent to the manufacturer for calibration on a quarterly basis, where the as found calibration accuracy is documented. Table 3 summarizes the flow meter calibration records below. Prior to the installation of flow meter 432062 on 5/6/14, it was factory calibrated on 3/12/14.

Table 3 – Summary of the Flow Meter Calibration Records

Serial Number	Date Installed	Date Removed	Calibration Date	Largest As Found Drift
432062	05/6/14	07/23/14	9/12/14	-2.68%
437725	07/23/14	10/21/14	12/10/14	-1.19%
432062	10/21/14	01/21/15	03/05/15	-5.64%
437725	01/21/15	04/20/15	05/27/15	-7.25%
432062	04/20/15	07/15/15	09/16/15	-3.33%

Instead of a field check for calibration accuracy at the end of the reporting period, GPL exceeds the protocol requirement by having the flow meters checked for accuracy and calibrated by the manufacturer every three months. Flow meters were found outside 5%, but were under reporting, thus no correction was necessary.

The Siemens Ultramat 23 gas analyzer is cleaned, inspected, checked for accuracy, and calibrated every quarter (July 16, 2014, October 22, 2014, January 28, 2015, April 20, 2014, and June 4, 2015) on-site by a Siemens technician, exceeding the requirements of the Protocol. All accuracy checks on the gas analyzer found the equipment to be within the Protocol stipulated +/- 5% threshold. The June 4, 2015 field check was two months prior to the end of the reporting period.

The FCI manual recommends to periodically verify the calibration of the output and recalibrate if necessary every 18 months at a minimum. GPL sends the FCI meters to the manufacture for calibration at least quarterly, exceeding the manufacture's recommendations. Siemens recommends that the Ultramat 23 be calibrated with calibration gas every 12 months. The Project Ultramat 23 is calibrated every quarter, exceeding the manufacturer recommendations.

3.8 Assessment of GHG Emission Reductions Calculations

RCE reviewed the emission reduction calculations, 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 team reviewed the formulas and raw data inputs for accuracy and compliance with the Protocol. RCE sampled selections of data and recalculated the methane destroyed by the Project and compared these values to GPL's values in the assertion spreadsheet.

RCE reviewed checks built into the spreadsheet that accounts for flow only at times when the destruction devices are operational which is defined as thermocouple reading temperatures greater than 500°F for the enclosed flare. The Project also includes additional QA/QC checks in the calculations including eliminating all flow less than 300 scfm and all methane readings less than 10 percent.

RCE confirmed that the default destruction efficiency of 96 percent was applied to the open flare and a 10 percent discount was applied for the oxidation of methane by soil bacteria because the landfill does not incorporate a synthetic liner as part of the final cap system throughout the entire landfill. RCE reviewed source documentation for Project emissions from purchased electricity, meter readings for gasoline consumption, the estimation of propane use, confirmed that appropriate emission and conversion factors were used, and reviewed the use of Protocol equations for Project emissions in the GHG assertion.

During the reporting period one instance of flow and eleven instances of methane data were substituted for unscheduled outages of the monitoring equipment. RCE confirmed that Appendix E and the Reserve's guidelines were used for all data substitution during the reporting period. RCE confirmed that the correct data sampling and statistics were used to calculate the data substitution values.

RCE recalculated LFG total flow, confirmed correct application of percent methane, recalculated project emissions, and confirmed use of appropriate conversion factors. All calculations were checked against the GPL's calculations with percent differences noted. The difference between RCE's and GPL's emission reductions was non-material.

4.0 Verification Results

Garland Power & Light provided sufficient documentation of its emission reductions, data collection procedures, and monitoring and quality control procedures. The verification process focused on verifying the emission reductions claimed and the source data used by GPL to quantify the emission reductions in accordance with the Reserve Landfill Project Protocol Version 2.1. The following is a summary of the verification results.

The Project reported emission reductions of 26,713 metric tons CO₂e in 2014 and 26,120 metric tons CO₂e in 2015. During the final review, RCE identified no material misstatements in the data or emission reduction calculations. The emission reductions verified are listed in Table 4.

During the verification process, RCE made requests for corrective actions and supplemental documentation to complete the verification. GPL sufficiently addressed all requests. The details of these requests are documented in RCE's List of Findings provided to the Reserve and GPL.

5.0 Conclusion

RCE conducted a risk-based analysis of the CAR545 City of Garland Landfill Carbon Project GHG assertion including a strategic review of the Project data and evidence. Based upon the processes and procedures and the evidence collected, RCE concludes that the GHG assertion is a fair representation of the Project emission reductions resulting from the capture and destruction of landfill gas during the reporting period June 10, 2014 through June 9, 2015 and can be considered:

- In conformance with the Reserve Landfill Project Protocol, Version 2.1,
- Without material discrepancy, and
- Verified to a reasonable level of assurance.

The verified emission reductions are listed in Table 4.

Table 4 - Emission Reductions Verified for June 10, 2014 through June 9, 2015

Year	Baseline Emissions CO ₂ e (tonnes)	Project Emissions CO ₂ e (tonnes)	Emission Reductions CO ₂ e (tonnes)
2014	26,739	25	26,713
2015	26,137	17	26,120

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



Samantha Phillips

Senior Internal Reviewer Signature



Zach Eyler