



Verification Report for

Origin Climate Inc.
Hancock County Landfill Gas Collection
Project
Findlay, Ohio
USA

CAR635, Climate Action Reserve

Landfill Project Protocol Version 3.0

September 25, 2014

Report Prepared for

Origin Climate Inc.
4 Embarcadero Center,
Suite 1400
San Francisco, CA 94111
USA

Report Prepared by

NSF International
789 N. Dixboro Road
Ann Arbor, MI 48105
USA

Project Verification Report

Summary

NSF International (NSF) was commissioned by Origin Climate Inc. (Origin Climate), the project developer, to verify methane emission reductions from the Hancock County Landfill Gas Collection Project (CAR635) reported to the Climate Action Reserve. The “Hancock County Landfill Gas Collection Project” (the Project), consisted of the collection of landfill gas (LFG) from the Hancock County Sanitary Landfill located in Hancock County, Ohio and subsequent destruction through combustion in an open candlestick flare. This report covers the verification period of July 1, 2013 to June 30, 2014 as a project deliverable into the Climate Action Reserve.

The Project reduced emissions into the atmosphere by 99,709 metric tons CO₂-e for the verification period.

1. Introduction

1.1 Objective

The objective of this verification audit was to determine, with reasonable assurance, that the Project had quantified, monitored, and fairly reported to the Climate Action Reserve its landfill gas emission reductions at the Hancock County Landfill in accordance with all applicable requirements of the Climate Action Reserve Landfill Project Protocol Version 3.0, including eligibility.

1.2 Scope

The scope of the engagement included project eligibility, quantification, monitoring and reporting of greenhouse gas project emissions reductions associated with the operation of an open flare at the Hancock County Sanitary Landfill from July 1, 2013 to June 30, 2014.

1.3 Criteria

Origin Climate implemented its methane emission reduction project in accordance with the requirements of the following:

- Climate Action Reserve’s Landfill Project Protocol Version 3.0 (December 2, 2009),
- Climate Action Reserve’s Landfill Project Protocol Version 3.0 Errata and Clarifications (January 21, 2014), and
- Climate Action Reserve Program Manual (October 26, 2011).

NSF conducted its verification of the reported emission reductions in accordance with the

- Climate Action Reserve Verification Program Manual (December 20, 2010), and
- ISO 14064:2006 Part 3, *Greenhouse gases – Specification with guidance for the validation and verification of greenhouse gas assertions*.

1.4 Materiality

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In accordance with the Verification Program Manual, emission reduction reports are considered fairly stated if Projects registering more than 25,000 but less than 100,000 CRTs (expressed in terms of CO₂e) annually achieve greater than +97% accuracy level (less than 3% error) relative to the verification body's calculated emission reductions. The verification body applied this quantitative threshold of materiality to the entire reporting period.

1.5 Level of Assurance

This engagement was performed at the reasonable level of assurance.

2. Verification Approach

2.1 Team Appointment and COI Review

This verification was performed by Tina Sentner, NSF Lead Verifier. Conflict of Interest inquiries were completed for NSF, for the verification team, and for Mike DeBusschere, NSF's internal reviewer. A finding of low COI risk was confirmed by the Climate Action Reserve.

2.2 Document Review

The verification team conducted a document review to inform the planning process in advance of performing verification activities. Documents reviewed included project documentation submitted to the Climate Action Reserve, project reports, gas flow meter and methane analyzer data, calibration documentation, a project monitoring plan, regulatory compliance attestations and supporting documents, and equipment information related to monitoring equipment.

2.3 Planning

NSF's verification approach is risk-based. It draws upon our understanding of risks to fair statement of reported emissions and the operation of controls to reduce such risks. As a result of the document review and preliminary conversations with Origin Climate personnel based in San Francisco, California, a verification plan and a sampling plan were developed for this engagement.

2.4 Verification Activities

NSF conducted a site visit of the Hancock County Landfill Gas Collection Project operation in Hancock County, OH, on September 11, 2014. The purpose of the site visit was to verify the project equipment, location and eligibility, to review and evaluate the project GHG management systems, data collection and handling, emission reduction calculations, and to finalize the risk assessment and sampling plan. Verification activities were also conducted via phone interviews. The nature of verification activities conducted included:

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- Verification of the continued eligibility of the Project to report emission reductions in accordance with the Climate Action Reserve Landfill Project Protocol Version 3.0;
- Verification of evidence presented by Origin Climate to demonstrate its knowledge of and assertion of compliance with applicable air and water regulations;
- Verification of applicable methane and carbon dioxide emission sources within the project boundary and their quantification as defined by the Climate Action Reserve Landfill Project Protocol Version 3.0;
- Verification of the Project's monitoring of key operational parameters of its landfill gas collection and destruction project;
- Determination of the Project's conformity in all material respects with the requirements of the Climate Action Reserve Landfill Project Protocol Version 3.0;
- Selecting locations and processes within the scope of the Project to visit based upon an assessment of risks to fair reporting; and
- Reviewing the basis for and results achieved from the calculated methane emission reductions from its landfill gas collection and destruction project.

3. Verification Findings

3.1 Project Description

The Project collected landfill gas (LFG) from the Hancock County Sanitary Landfill and destroyed it via combustion through an open candlestick flare. The Project is located in Hancock County, Ohio. The landfill is an active solid waste sanitary landfill owned and operated by Hancock County. The landfill began accepting wastes in 1969 and consists of approximately 52 acres. Final closure of the landfill is estimated to take place in 2036. The landfill does not re-circulate leachate back into the landfill and is not considered a Bioreactor as defined by U.S. EPA.

The Gas Collection and Conveyance System consists of approximately 89 wellheads with 76 wells active. The gas from the wellheads was routed via a main header line into the flare skid. The landfill gas was pulled by a blower and passed through a knockout vessel to remove moisture prior to passing through the flow meter in route to the candlestick flare. A small low NO_x enclosed flare (350 scfm capacity) was installed onsite in January 2012 for research/experimental purposes. This enclosed flare was permitted for experimental operation and was intermittently operational during the verification period; however, no emission reductions were claimed from this destruction device.

3.2 Eligibility

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NSF reconsidered evidence to establish the eligibility of the Project under the Landfill Project Protocol Version 3.0 and found the following:

Location. The Project is a US based landfill located in Hancock County, Ohio, USA. NSF confirmed the location through a site visit conducted on September 11, 2014.

Project Start Date. The project start date was verified as June 29, 2010, the day the open flare became operational. Origin Climate Inc. provided various documents to support the evidence of construction of the landfill gas project such as the invoice for the flare purchase, third party construction reports for the installation of the well field, initial data logger reports and a start up service order from SHAW LFG Specialties for the installation of the flare skid. NSF concluded from these documents the project start date of June 29, 2010.

Crediting Period. The crediting period for landfill projects is 10 years from the project start date. The crediting period for the Project extends to June 28, 2020. NSF has concluded that the reporting period verified in this report is within the first crediting period of the Project.

3.3 Additionality

Legal Requirement Test. NSF reviewed the Attestation of Voluntary Implementation, signed on July 23, 2014 by an eligible signatory to attest for the project. Origin Climate Inc. has affirmed that the Project was established and implemented voluntarily and continues to operate as such. NSF reviewed the Solid Waste Permit, Title V Permit and Flare Permit letter from the Ohio Environmental Protection Agency dated November 9, 2009, which confirmed the gas collection system, was voluntary. NSF also reviewed local and state laws to determine if there were any requirements for the destruction of landfill gas for Hancock County Landfill and found no legal requirement to do so. Based on our review, NSF found no evidence of legal requirements to collect and destroy methane at the Hancock County Sanitary Landfill.

The Hancock County Sanitary Landfill is subject to NSPS regulation requiring the facility to conduct Non-Methane Organic Compound (NMOC) emission rate testing. The most recent Tier II NMOC Emission Rate Report for the landfill was conducted on October 5, 2012 with a result of 7.42 Mg/yr NMOC for 2013 and 7.83 MG/yr NMOC for 2014. The test results indicate that the Landfill is not expected to reach an NMOC level of 50 MG/year until beyond the project crediting period.

Lastly, NSF verified the Project had developed a procedure in the monitoring plan to ascertain and demonstrate that the project passes the legal requirements test at all times. Based on the evidence provided above, NSF concluded that the project passed the Legal Requirement Test for the report period.

Performance Standard Test. NSF re-confirmed during the site visit that the Hancock County Sanitary Landfill had not collected and destroyed any landfill gas prior to the implementation of the Project. Interviews with the site environmental manager confirmed there were no solar flares devices connected to the leachate riser system or previous qualifying destruction devices installed onsite. NSF did not observe evidence of a solar flare or pre-existing destruction devices

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or identify pre-existing destruction devices on historical project drawings. In addition, NSF reviewed the Solid Waste Permit and the Title V Permit for the landfill and no evidence of a pre-existing destruction device was observed or required of the site. Therefore NSF concludes the project proponent meets the performance standard threshold under option 1: “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.”

Regulatory Compliance. NSF reviewed the Attestation of Regulatory Compliance signed by the CEO of Origin Climate Inc. dated July 23, 2014 affirming the project’s compliance status throughout the project reporting period. A regulatory review of the Hancock County Sanitary Landfill was conducted by the project proponent. The results of the regulatory review indicated the landfill was in compliance with Federal, State and Local regulations and that there are no laws, statutes, regulations, court orders, environmental mitigation agreements, permitting conditions, or other legally binding mandates requiring the destruction of landfill gas. During the site visit and desk review activities, NSF reviewed the regulatory review of the Hancock County Sanitary Landfill conducted by the project proponent and found that it was accurate. In addition, NSF interviewed the landfill and project managers regarding legal and regulatory compliance tracking systems and reviewed recent inspections for the landfill. From a sample of inspections reports reviewed over the reporting period of the project, there was no notices of violations observed. In addition, the Project’s monitoring plan was observed to contain procedures for maintaining and monitoring ongoing legal and regulatory compliance. From this evidence, NSF concluded that the Project and the Hancock County Sanitary Landfill were in material compliance with applicable laws and regulations during the reporting period.

3.4 Ownership

Hancock County owns Hancock County Sanitary Landfill. Evidence of ownership was observed through various regulatory permits issued by the Ohio Environmental Protection Agency. Hancock County assigned the title of the emission reduction credits to Granger Electric who is the owner of the project equipment. Granger Electric sold the rights to the emission reduction credits for the project to Origin Climate Inc., previously known as TerraPass Inc. NSF reviewed the agreement between Hancock County Landfill and Granger Electric for the assignment of emission reduction credits, and further the sales contract between Granger Electric and Origin Climate Inc. for the rights to the emission reduction credits. NSF reviewed the legal name change from TerraPass Inc. to Origin Climate Inc by review of corporate documentation. NSF also reviewed the Attestation of Title dated July 23, 2014 concerning ownership of landfill gas emission reduction credits for the period July 1 2013 to June 30, 2014. This document asserts that the project developer had legal rights to any emission reduction credits to be issued by the Climate Action Reserve. From this evidence, NSF has concluded that the project developer, Origin Climate Inc. is entitled to receive the emission reduction credits that may be issued by the Climate Action Reserve for methane destroyed during the project period for the Hancock County Landfill Gas Collection Project.

3.5 Project Boundaries and Emission Sources

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The project includes all emission sources from the operation of the landfill gas collection system to the ultimate destruction of the landfill gas. The sources of GHG emissions reviewed include:

The GHG sources, sinks, and reservoirs associated with the baseline scenario are:

- CH₄ vented to the atmosphere.
- CO₂ from the oxidation of CH₄ by soil bacteria. As the landfill is not covered with a synthetic liner, the CAR Landfill Project Reporting Protocol assumption that 10 percent of the methane produced would be naturally oxidized by soil bacteria has been applied.

The GHG sources, sinks, and reservoirs associated with the project are:

- CH₄ from incomplete combustion of Landfill gas 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.

The gases reviewed include CO₂, CH₄. All gases are converted to CO₂ equivalents.

3.6 Performance Against Project Protocol/Methodology

The Project was implemented in conformity with the Climate Action Reserve Landfill Project Protocol Version 3.0.

Conditions Affecting Landfill Gas Collection. There were no construction activities, well-field expansions or destruction device issues for the reporting period. The emission reductions were relatively in-line with the previous reporting period. A temporary enclosed Low NO_x flare was installed onsite in January 2012 for testing and research purposes with a separate flow meter; however, no emission reductions were claimed from this device, as it was not monitored in accordance with the protocol requirements.

Monitoring and Measurement Equipment. The primary data gathered for the project was landfill gas flow, pressure, temperature and methane content of the landfill gas. During the reporting period of the project, a Fluid Components Intl (FCI) thermal mass flow meter was used in to continuously monitor flow after the blower and a knockout prior to combustion in to the open flare. The FCI Thermal Instrument measurement device automatically adjusts to compensate for the temperature and pressure of the gas stream and was configured to measure flow at 60 deg F and 1 ATM. The position of the flow meter was observed adequate to ensure laminar flow. The flow meter was field calibrated by a FCI factory representative on 1/11/2012. FCI recommends the calibration of the output be verified at a minimum every 18 months. The project met this requirement as the flow meter instrument was field checked and calibrated by a certified third party on 9/6/2013, 12/26/2013 (though no calibration was conducted due to weather), 02/14/2014, and 6/02/2014 within two months of the end of the reporting period. The instrument was also observed to be quarterly cleaned and inspected in the field with the activities performed and as found/as left condition of the equipment documented on the same schedule as the quarterly field checks. All calibrations and field checks confirmed that the flow meter was operating within a $\pm 5\%$ margin of error.

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Methane concentration was measured continuously with a Siemens Ultramat 23 methane concentration analyzer. Evidence of the Siemens Ultramat 23 instrument factory calibration was observed prior to installation. The Ultramat 23 was weekly inspected, cleaned, and field checked by a certified third party. There were three instances the weekly field check indicated the instrument had drifted outside protocol tolerances. The emission reduction calculations were adjusted to account for the instrument drift when the weekly field check indicated over-reporting back to the last successful field check (one week). These weekly calibration checks, which occasionally indicated the instrument to be outside of the $\pm 5\%$ threshold, were all followed by a manual calibration to a known calibration gas (60% Methane) by the same certified third party. The instrument was last field calibrated on June 9, 2014 (within 2 months of the end of the reporting period) by the certified service provider and found to be operating within protocol tolerances. A portable gas analyzer (Envision) used to field check the Siemens Ultramat was observed to be calibrated annually as required by the manufacture and found within protocol tolerances.

Temperature and hours of operation were continuously monitored via two thermocouples mounted within the shroud of the candlestick flare; one for the pilot and one for the flare temperature. The flare operations are monitored by a UV sensor, which will automatically alert three separate individuals via phone if the flare system goes down. It will automatically initiate a re-start of the system three times and if unsuccessful, the system will shutdown automatically eliminating flow to the flare if the flame is extinguished.

Raw data from the FCI Thermal Mass flow meter instrument, temperature thermocouples and gas analyzer were continuously collected every 4 minutes automatically onsite by a Yokogawa data acquisition device. Once a month, raw data is downloaded from the Yokogawa recorder by a third party consultant. The raw data is sent to the Origin Climate Inc. and Granger Electric for recordkeeping retention and emission reduction calculations. Both companies generally store data indefinitely; however at a minimum the data is stored for a period of 10 years after the information is generated or 7 years after the last verification.

Based on the calibration, inspection and cleaning results for this verification period, NSF concludes the project was monitored according to the Protocol requirements and reported accurate data.

3.7 Project Management System

NSF verified the Project's management system during the site visit conducted on September 11, 2014. In particular, the verification looked to confirm continued adequacy of the following elements:

- Definition and maintenance of an appropriate control environment by Origin Climate management and personnel;
- Training and competence of landfill project managers and operating/data management personnel;

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- Identification and management of legal requirements related to landfill operations;
- Identification and maintenance of records required by the landfill project;
- Landfill site and gas collection and combustion equipment specifications;
- Quantification methods and calculations of project emissions; and
- Checking and corrective action mechanisms.

Based on this review, NSF found a continued adequate control environment existed for the project

3.8 Calculation of GHG Emission Reductions

NSF verified the calculated project emission reductions on a sampling basis from information derived from the Yokogawa data acquisition device for the reporting period. The verification team reviewed a sample of data downloaded and compared it to data supplied in excel spreadsheets for the two vintage years. NSF verified data for completeness, scanned the data for data gaps and for out-of-range values, reviewed spreadsheet formulas for consistency with protocol equations, and recalculated emission reductions. The verification team also verified the correct calculation of project emissions based upon evidence of fossil fuel consumption, and indirect CO₂ emissions from the use of electricity from the grid. The Project emission reductions were calculated per the formula defined in the Climate Action Reserve Landfill Gas Protocol. The main parameters of formula 5.2 were verified as follows

Total annual methane emissions destroyed by the project landfill gas collection and destruction system (CH₄ Dest_{PR})

The amount of methane destroyed is calculated from the continuously metered landfill gas flow and methane concentration data. For the verification period, data was aggregated on intervals of 4 minutes and totalized on a daily basis for the purpose of the calculations of emissions reductions. The main monitored parameters needed to calculate the amount of methane destroyed are:

LFG_{I,t} = total quantity of landfill gas fed to the destruction device and
PR_{CH₄ i,t} = the average methane fraction of the landfill gas in time interval t as measured

Landfill gas flow destroyed in the Low NO_x temporary flare was measured separately and deducted from the flare flow. Incremental flare flow was also voided if for any given 4 minute period the flare temperature is below the threshold temperature of 500 deg F. Total destroyed methane was carried forward into further calculations for the flare to determine emission reductions for the project. Destruction data was calculated on time interval t=daily.

Adjustment for landfill gas flow metering equipment for temperature and pressure
The project FCI flow meter installed corrected flow to 60 degrees and 1 atmosphere.

Default methane destruction efficiency for device (DE_i)

The value applied was 0.960 for Open flares, as prescribed by the protocol.

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Factor for the oxidation of methane by soil bacteria (OX)

The project does not incorporate a synthetic liner in its cover system; therefore a 10% methane soil oxidation factor was applied to the baseline scenario.

Discount factor to account for uncertainties associated with the project monitoring equipment (DF)

There was no discount factor applied to the total quantity of methane collected and destroyed for the period as there were no uncertainties associated with the project monitoring equipment.

Adjustment to account for pre-project LFG destruction device ($PRE_{discount}$)

There were no pre-project destruction devices installed prior to the project; therefore, no adjustment to the project baseline was necessary.

Total annual indirect carbon dioxide emissions from the consumption of electricity from the grid (EL_{CO_2}) and total annual carbon dioxide emissions from the destruction of fossil fuel (FF_{CO_2})
CO₂ emissions resulting from consumption of electricity to power project equipment and activity data for this source was tracked by reviewing utility invoices from the power supplier. Direct CO₂ emissions resulted from propane used to assist the ignition of the flare. This activity data was taken from purchase invoices and estimates from propane used. The Emission Factors for electricity and propane were verified.

Missing Data Procedures

There were no missing data events applied in this report period.

3.9 Corrective Action Requests

All requests for corrective action raised by NSF during this reporting period were addressed to NSF's satisfaction and closed. These findings are detailed in our List of Findings, a private document.

3.10 Approved Variances or Deviations

No variances were requested or deviations approved for the Project.

4. Verification Results

4.1 Verification Team Recommendation

Based on the verification activities described above, the verification team has concluded that the project has achieved the following emission reductions:

Reductions/Removals during the current reporting period in Metric tons CO ₂ -e	July 1, 2013 to December 31, 2013	January 1, 2014 to June 30, 2014
Landfill gas destroyed	54,798	45,042

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- Project emissions	69	62
= Net project emission reductions/removals	54,729	44,980

4.2 Verification Audit Summary

Project Developer	Origin Climate Inc. 4 Embarcadero Center, Suite 1400 San Francisco, CA 94111
Project Location	Hancock County Sanitary Landfill 10400 Township Road 107, Findlay, Hancock County, OH 45840 USA
Project Type	Landfill gas collection and destruction
Project Period	July 1, 2013 – June 30, 2014
Protocol/Methodology	Climate Action Reserve Landfill Project Protocol Version 3.0
Emissions/Removals Verified	Vintage 2013: 54,729 metric tons Vintage 2014: 44,980 metric tons
Verification Conclusion	Based upon the verification activities described above, NSF has concluded that Origin Climate Inc. reported methane emission reductions of 99,709 metric tons reported to the Climate Action Reserve for the period of July 1, 2013 through June 30, 2014 are, in all material respects, fairly stated.
Lead Verifier	 Tina Sentner, September 25, 2014
Internal Reviewer	 Mike DeBusschere, September 27, 2014
<i>This verification statement is valid when signed and dated by an NSF internal reviewer.</i>	