



Verification Report for
South Kent Landfill Gas to Energy Project

Kent County Michigan
Department of Public Works
Grand Rapids, Michigan
USA

Climate Action Reserve
CAR443

Landfill Project Protocol Version 2.0

25 March 2013

Report Prepared for

Kent County Michigan
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Report Prepared by

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Summary

The Kent County Department of Public Works engaged NSF International Strategic Registrations Ltd. (NSF-ISR) to verify its methane emission reductions from a landfill gas project reported to the Climate Action Reserve for the reporting period 1 January 2012 – 31 December 2012. The Kent County Department of Public Works, the project developer, is the operator of a municipal landfill as described by NAICS code 562212. The “South Kent Landfill Gas to Energy Project” is listed in the Reserve’s database with the identification number CAR443.

The Kent County Department of Public Works’ methane emission reductions during the cited period resulted from the collection of landfill gas and its destruction in two electricity generator sets at the South Kent solid waste disposal facility located at 300 100th St. S.W. Byron Center, Kent County, MI 49315.

A zero-credit reporting period for the Project for the second half of 2011 was approved by the Climate Action Reserve. The Project reduced emissions into the atmosphere by 79,370 metric tons CO₂e for the year 2012.

1. Introduction

1.1 Objective

The objective of this verification audit was to determine, with reasonable assurance, that the Kent County Department of Public Works had quantified, monitored, and fairly reported to the Climate Action Reserve its landfill gas emission reductions at the South Kent Landfill in accordance with all applicable requirements of the Climate Action Reserve Landfill Project Verification Protocol version 2.0, and to confirm the project’s continuing eligibility.

1.2 Scope

The scope of the engagement included project eligibility, quantification, monitoring and reporting of greenhouse gas project emission reductions associated with the operation of a flare and electricity generator sets at the South Kent Landfill during the twelve months of 2012.

The scope also included a determination of whether the project emissions were less than the baseline emissions during the zero-credit reporting period comprising the last six months of 2011.

1.3 Criteria

The Kent County Department of Public Works implemented its methane emission reduction project in accordance with the requirements of the Climate Action Reserve’s Landfill Project Reporting Protocol version 2.0, the Landfill Project Protocol 2.0 Errata and Clarifications (October 26, 2011), and the Climate Action Reserve Program Manual (October 26, 2011). NSF-ISR conducted its verification of the reported emission reductions in accordance with the Climate Action Reserve Landfill Project Verification Protocol 2.0, the Climate Action Reserve Verification Program Manual version 2.0 (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

In accordance with the Climate Action Reserve Verification Program Manual version 2.0 (December 20, 2010), projects asserting emission reductions between 25,000 and 100,000 metric tons per year were subject to a quantitative materiality threshold of 3%. Assertions were considered fairly stated if they

overstated emission reductions by no more than 3%. The Climate Action Reserve also has defined a qualitative materiality threshold which considers any nonconformance with a prescriptive requirement in the project protocol to be material.

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 Janette Lutz, NSF-ISR Lead Verifier. Conflict of Interest inquiries were completed for NSF-ISR, for the verification team, and for John Shideler, NSF-ISR's Senior 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 the Kent County Department of Public Work's project documentation submitted to the Climate Action Reserve, project reports, gas flow meter and methane analyzer data, calibration documentation, data logging records, a project monitoring plan, regulatory compliance attestations and supporting documents, and site and equipment drawings.

2.3 Planning

NSF-ISR'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, preliminary conversations with the Director of Engineering/Utility Services at the Kent County Department of Public Works, a verification plan and a sampling plan were developed for this engagement.

2.4 Verification Activities

As a result of its planning process, on 9 November 2012 NSF-ISR conducted an on-site planning audit and initiated the verification audit. Site visits included the South Kent Landfill methane gas and collection and destruction project operations in Byron Center, MI; and the management offices of the Kent County Department of Public Works in Grand Rapids, MI. The nature of the verification activities conducted for this reporting period included:

- Verification of the continuing eligibility of the Kent County Department of Public Works' landfill gas project to report emission reductions in accordance with the Climate Action Reserve Landfill Project Reporting Protocol 2.0;
- Verification of evidence presented by Kent County Department of Public Works to demonstrate its knowledge of and 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 Reporting Protocol 2.0;

- Verification of Kent County Department of Public Works' monitoring of key operational parameters of its landfill gas collection and destruction project;
- Assessment of the capability of Kent County Department of Public Works' management system and procedures to produce accurate, reliable and reproducible data and information;
- Determination of Kent County Department of Public Works' conformity in all material respects with the requirements of the Climate Action Reserve Landfill Project Reporting Protocol 2.0;
- Selecting locations, processes and information within the scope of Kent County Department of Public Works' landfill gas project to review based upon an assessment of risks to fair reporting;
- 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 South Kent Landfill is a municipal solid waste facility operated by the Kent County Department of Public Works. During the project reporting period covered by this report, landfill gas was collected and routed to two internal combustion engine electricity generator sets installed in the month of April 2009. Although a single open flare serves as a backup combustion device and was operated briefly throughout the project reporting period, no reduction credits related to the flare are claimed for this reporting period. Methane emission reductions related to the operation of the generator sets were reviewed during this verification.

The landfill gas collection system consisted of 32 wells and five horizontal collectors. The project was initiated with 24 wells and two horizontal collectors completed in July 2008. Three horizontal collectors were added in September 2009, and eight additional wells were added in October 2011. The landfill does not re-circulate leachate back into the landfill and is not considered a Bioreactor as defined by U.S. EPA.

3.2 Eligibility and Title

NSF-ISR considered evidence to establish the eligibility of the South Kent Landfill Gas to Energy Project under the Landfill Gas Reporting Protocol version 2.0.

Location. The project is located within the United States of America in Byron Center, Michigan. NSF-ISR confirmed the location through annual site visits in 2009, 2010, 2011, and 2012.

Project Start Date. The project was listed with the Climate Action Reserve on May 1, 2009. The project start date was July 10, 2008, the day the open flare became operational. The July 10, 2008, date was within 12 months of listing with the Reserve. NSF-ISR had confirmed the start date of the Project from records during our initial verification of the project in June 2009.

Crediting Period. The crediting period for landfill projects is 10 years from the project start date. The crediting period for the South Kent Landfill Gas to Energy Project extends to July 9, 2018. NSF-ISR has concluded that the reporting period verified in this report is within the first crediting period of the Project.

Zero-Credit Reporting Period. The previous verifying cycle included the reporting period of 1 January 2011 to 30 June 2011. A zero-credit period was reported for 1 July 2011 to 31 December 2011. NSF-ISR reviewed the Zero-Credit Reporting Period Acknowledgment and Election form dated 18 January 2013, and confirmed the operational conditions and monitoring plan in place during that period were maintained. NSF-ISR also confirmed with reasonable assurance, through the review of monitoring data and project and emission reduction calculations, that project emissions were less than baseline emissions during the zero-credit reporting period.

Ownership. The County of Kent is the owner and Kent County Department of Public Works is the operator of the landfill and related facilities. Granger Electric of Byron Center, LLC, is contracted to provide operation and maintenance of the electricity generation units and the gas well field.

NSF-ISR reviewed the attestation of title dated 18 January 2013 concerning ownership of landfill gas emission reduction credits. This document asserts that the project applicant had legal right to any emission reduction credits to be issued by the Climate Action Reserve. In previous project reporting periods, NSF-ISR has confirmed the information in attestation of title documents by reviewing correspondence from Kent County Department of Public Works' legal counsel describing the relationship with the County of Kent and the beneficial rights held by the Kent County Department of Public Works; the Climate Action Reserve's previous acceptance of this evidence of title (e-mail dated 6/17/2009); and contractual documentation between the Kent County Department of Public Works and Granger Electric (Landfill Gas and Collection System Lease, dated 6/26/2008). In this project reporting period, NSF-ISR received information from the project developer that no modifications or amendments to those agreements had been made since dates of execution. From this evidence, NSF-ISR concludes that the project developer, the Kent County Department of Public Works, is entitled to receive the emission reduction credits that may be issued by the Climate Action Reserve for methane destroyed during this project reporting period.

3.3 Additionality

Legal Requirement Test. NSF-ISR previously determined that the South Kent Landfill was subject to New Source Performance Standards (NSPS) regulation, which requires the facility to conduct Non-Methane Organic Compound (NMOC) emission rate testing. A landfill emitting above a 50 Mg/year limit is required to install a gas collection and control system (GCCS) for emission control. NSF-ISR confirmed the most recent Tier 2 NMOC Emission Rate Report for South Kent Landfill, dated October 24, 2011, indicates the annual estimated NMOC emission rate ranges from 7.74 Mg/year in 2011 to 9.19 Mg/year in 2015. This is well below the regulatory threshold requiring the installation of a GCCS; therefore the Michigan Department of Natural Resources and the Environment (MDNRE) has not required the installation of a GCCS for the South Kent Landfill. The Tier 2 NMOC Emission Rate Report indicates the results of the Tier 2 landfill gas test may be considered valid for a total of five years before additional sampling is required. The report states the data used to calculate the NMOC emission rates is valid for the facility through December of 2015.

NSF-ISR reviewed an attestation of voluntary implementation signed by the Kent County Department of Public Works' Director of Engineering on 18 January 2013 for the twelve-month period from 1 January 2012 through 31 December 2012. NSF-ISR verified the implementation of the project developer's monitoring plan with respect to changes in regulations that could affect the continued eligibility of the landfill gas destruction project. NSF-ISR also interviewed the Kent County Department of Public Works' Director of Engineering concerning his knowledge of any changes to regulations that would affect the voluntary nature of the project's implementation. Records of permit documents and permit renewals were also reviewed. From this review NSF-ISR has concluded that the project implementation continues to be voluntary.

Performance Standard Test. NSF-ISR determined during its first verification site visit that the South Kent Landfill had not collected and destroyed any landfill gas prior to the implementation of the Project. The project therefore has met the performance standard test described in the Landfill Project Reporting Protocol Version 2.0. According to the Protocol, a project developer who has once passed the performance standard test remains eligible to register reductions for the lifetime of the project crediting period, as long as the project is not otherwise determined ineligible due to regulatory changes that impact the project's voluntary implementation. NSF-ISR has concluded from these facts that the project has met the performance standard test.

Regulatory Compliance.

The results of NSF-ISR's ongoing regulatory review indicated the landfill was in compliance with Federal, State and Local regulations during the reporting period 1 January through 31 December 2012. As stated above, the South Kent Landfill is not required to install a gas collection and control system. An Attestation of Regulatory Compliance was signed by the Kent County Department of Public Works Director of Engineering on 18 January 2013. This attestation resulted from the implementation of the monitoring of regulations performed by the Kent County Department of Public Works, and the results of reviews and site inspections performed by the MDNRE. For the current reporting period, NSF-ISR reviewed the results of compliance evaluations and inspections available on the MDNRE website, and a certification of compliance letter written by the Kent County Department of Public Works' Director of Engineering (dated November 8, 2012). Review of this evidence indicated that one administrative Notice of Violation had been received by the landfill during the reporting period 1 January through 31 December 2012. From this evidence, NSF-ISR has concluded that the Project and the South Kent Landfill remained in material compliance with applicable laws and regulations during the reporting period 1 January through 31 December 2012.

3.4 Project Boundaries and Emission Sources

The project includes all emission sources from the operation of the landfill gas collection system to the ultimate destruction of the landfill gas at a flare and two internal combustion engine electricity generator sets. The sources of GHG emissions reviewed in the South Kent Landfill Gas Project are as follows.

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

- 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 Landfill Project Reporting Protocol version 2.0 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:

- CH₄ from the incomplete combustion of CH₄ in the electricity generator sets.
- 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 and CH₄.

All gases have been converted to CO₂ equivalents.

3.5 Performance Against Project Protocol/Methodology

The South Kent Landfill Gas Project was implemented in conformity with the Climate Action Reserve Landfill Project Reporting Protocol version 2.0.

Conditions Affecting Landfill Gas Collection. There were no construction activities or destruction device issues for the reporting period or the zero-credit reporting period, excepting a well-field expansion consisting of eight additional wells that was completed in October 2011. The emission reductions were relatively in-line with the previous reporting periods on an annualized basis.

Monitoring and Measurement Equipment. The protocol required the development and implementation of project monitoring and quarterly inspection and calibration of landfill gas flow metering devices. NSF-ISR reviewed quarterly (at a minimum) inspection and calibration for the Yokogawa digital YEWFO flow meter and the Siemens Ultra23 gas analyzer used at the generator sets and found them to have as found readings that were within the required $\pm 5\%$ tolerance prescribed by the Landfill Gas Project Protocol. Operation and monitoring logs confirmed that inspection and calibration occurred weekly for the gas analyzer and at least twice per quarter for the flow meter. Cleaning and maintenance of the monitoring equipment occurred as needed during these events, on at least a quarterly basis. From the documentary evidence and monitoring data reviewed in this verification, and on-site confirmation of the installed monitoring equipment and its maintained condition, NSF-ISR concluded that the project continuously monitored landfill gas flow, temperature and pressure, and continuously analyzed the percentage of methane fraction delivered to the combustion device. No exceptions to continuous data recording was noted for the reporting period.

Monitoring Plan and monitoring equipment calculation procedures were reviewed for consistency with the Landfill Project Reporting Protocol v. 2.0 requirements as part of this verification. All monitoring records, including monitoring device calibration records were available and found in order for the project reporting period.

Monitoring Plan worksheets and data were reviewed for consistency with the Landfill Project Reporting Protocol version 2.0 requirements and the applicable Errata and Clarifications document. No discrepancies with requirements were found. During the project reporting period 1 January through 31 December 2012, no instances of missing data substitution was implemented.

The project utilized Yokogawa data recorders to collect flow and methane content data continuously and to aggregate them in 15-minute increments related to the flare and generator sets. NSF-ISR confirmed the generator set flow meter measures temperature and pressure and expresses the volume of landfill gas flow in standard cubic feet per minute; the flow meter is calibrated at standard temperature and pressure; and the methane fraction is determined as a percentage of the standardized landfill gas flow for the purposes of calculating the emission reduction totals.

All raw data as reported in monthly spreadsheets were scanned and reviewed to determine any out-of-normal operating periods, missing data, gas flow and methane concentration trends, and general comparisons of these trends to historical data. Based on the results of this review, a risk-based sample set of approximately 33% (four of twelve monthly spreadsheets) of the generator gas flow and concentration data was selected and reviewed in greater detail in order to identify material misstatements due to transcription mistakes, mathematical errors or malfunction of instruments. NSF-ISR examined the formulae used to generate the various terms in the emission reduction calculation equations, and recalculated a sampling of these terms within the four sampled spreadsheets. Monitored and calculated data were also cross-checked with daily operating and monitoring logs. The calculated project and emission reductions from each monthly summary were also confirmed, as well as the aggregation of these values for the twelve-month reporting period. No material discrepancies were found in the calculation of methane flow and concentrations, and reporting of the data.

The generator equipment layout, serial numbers, operating manuals, and monitoring equipment drawings and specifications were also reviewed for compliance to the Landfill Gas Project Reporting Protocol version 2.0 requirements. The flow meter and gas analyzer are located downstream of a dryer and upstream of two identical, internal combustion engines, and the pressure (vacuum) is continuously monitored. When the vacuum rises above a setpoint (for example, when one or both of the engines

cease operation), the landfill gas flow is diverted to the flare. It was confirmed through generator operation logs and corroborating monitoring data that the flare was only operated for brief, intermittent time periods during the current reporting period. As these amounts were confirmed as immaterial compared to the total emission reductions, and following conservative reporting, the project developer did not report the methane destroyed in the flare as emission reductions. NSF-ISR also confirmed through review of equipment, equipment documentation and communication with operating personnel that the generator and monitoring equipment layout and operation have not materially changed. Observations made during the site visit, review of equipment serial numbers, and review of maintenance records and operation logs also supported this conclusion.

Source Testing of Internal Combustion Engines. Two annual source testing events were completed and applicable to this reporting period. The destruction efficiencies of the two internal combustion engines were measured by a third-party testing firm on April 28, 2011 and were determined to be 98.1 for engine #1 and 98.2% for engine #2. A second annual test was conducted by the same firm on March 23, 2012, yielding measured efficiencies of 99.8 for engine #1 and 99.7 for engine #2. NSF-ISR reviewed the engineering letter reports, dated May 13, 2011 and April 19, 2012, confirming these measured efficiencies. As the two internal combustion engines are considered identical destruction devices, NSF-ISR confirmed the lower of the two measured emissions factors were applied in the emission reduction calculations for the periods 1 January through March 2012 (98.1%), and April 1 through December 2012 (99.7%).

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

3.6 Project Management System

The verification team reviewed elements of the South Kent Landfill project management system during these and previous verification activities. In particular, it reviewed for adequacy the following elements:

- Definition and maintenance of an appropriate control environment by Kent County Department of Public Works management and personnel; specifically, confirmation of personnel changes, if any;
- Training and competence of landfill project managers and operating personnel, including contractors;
- 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.

3.7 Calculation of GHG Emission Reductions

The South Kent County Landfill project emission reductions were calculated per the formula defined in the Climate Action Reserve Landfill Gas Reporting Protocol version 2.0. The basic formula was

Landfill gas destroyed

- the portion of methane oxidized in the baseline scenario,
 - carbon dioxide emissions from fossil fuel consumption
 - methane emissions from incomplete destruction of natural gas, if applicable,
 - indirect carbon dioxide emissions from the use of electricity from the grid,
 - the pre-project adjustment for destruction in the baseline scenario, if applicable,
 - the discount factor to account for uncertainties associated with the project monitoring equipment
- = Project Emission Reductions.

In the case of the South Kent Landfill, the verification team verified the correct calculation of project emissions based upon evidence of fossil fuel consumption (primarily propane as supplemental fuel for the flare), and the indirect CO₂ emissions from the supplemental use of electricity in the grid. As the significant majority of electricity used in the project is supplied by the generators, the amount of project emissions related to indirect electricity use is minimal.

3.8 Corrective Action Requests/Recommendations

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

3.9 Approved Variances or Deviations

No variances were requested or deviations approved for the Project.

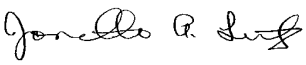
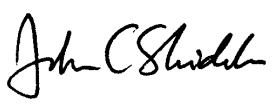
4. Verification Results

4.1 Verification Team Recommendation

Reductions/Removals from [Project Period: 2012-01-01 to 2012-12-31]	Metric tons CO ₂ -e
Project baseline	79,374
- Project emissions	4
- Project adjustments (explain)	0
= Net project emission reductions/removals	79,370

4.2 Verification Audit Summary

Project Developer	Kent County Department of Public Works 1500 Scribner N.W. Grand Rapids, MI 49504
Project Location	South Kent Landfill Gas to Energy Project South Kent Landfill 300 100 th St. S.W. Byron Center Kent County, MI 49315
Project Type	Landfill gas collection and destruction
Project Period	1 January 2012 – 31 December 2012
Protocol/Methodology	Climate Action Reserve Landfill Project Reporting Protocol, version 2.0
Emissions/Removals Verified	Vintage 2012: 79,370 metric tons
Verification Conclusion	Based upon the verification activities described above, NSF-ISR has concluded that the Kent County Department of Public Works' reported 2012 vintage methane emission reductions of 79,370 metric tons reported to the Climate Action Reserve for the period ending 31 December 2012, are, in all material respects, fairly stated.

Lead Verifier	 Janette A. Lutz, 25 March 2013
Internal Reviewer	 John C. Shideler, 26 March 2013
<i>This verification statement is valid when signed and dated by an NSF internal reviewer.</i>	