

# **Verification Report for Sioux Falls Regional Sanitary Landfill—CAR462 Sioux Falls, South Dakota**

**Climate Action Reserve**

**Verification Period: January to June 2010**

**October 2010**

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## 1. Introduction

This report is provided to TerraPass Inc. (TerraPass) as a deliverable of the Climate Action Reserve (CAR) project verification process. This report covers the verification of the Sioux Falls Regional Sanitary Landfill – CAR462 (the Project) for the period from January 1 through June 30, 2010. First Environment, Inc. (First Environment) conducted the verification from September to October 2010.

## 2. Objectives

The purpose of this verification was, through review of appropriate evidence, to establish that:

- the Project conforms to the requirements of the verification criteria, including all eligibility requirements, discussed in Section 4 of this report; and
- the data reported are accurate, complete, consistent, transparent, and free of material error or omission.

## 3. Verification Scope

Specific scope metrics for the verification are outlined in the table below:

|                                  |                                                                                                                                                                                                                            |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Geographic Boundaries</b>     | Sioux Falls Regional Sanitary Landfill in Hartford, South Dakota                                                                                                                                                           |
| <b>Greenhouse Gases Verified</b> | Emissions reductions (expressed in units of Carbon Dioxide equivalents (CO <sub>2</sub> -e) resulting from methane destruction; Project emissions of CO <sub>2</sub> from purchased electricity and fossil fuel combustion |
| <b>Reporting Period</b>          | January 1, 2010 - June 30, 2010                                                                                                                                                                                            |
| <b>Data Sources</b>              | Metered Data and Emissions Reduction Calculations                                                                                                                                                                          |

## 4. Standards Used to Verify Emissions (Criteria)

The following table outlines the guidance and protocols used to conduct this verification:

|                          |                                                                                                                                                                                                                        |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standard of Verification | Climate Action Reserve Landfill Project Protocol, Version 3.0, December 2009 (CAR Protocol); Climate Action Reserve Landfill 3.0 Errata & Clarifications, June 2010; Climate Action Reserve Program Manual, March 2010 |
| Verification Process     | Climate Action Reserve Landfill Project Protocol, Version 3.0, December 2009, <i>Section 8</i> ; Climate Action Reserve Verification Program Manual, June 2009                                                         |
| Level of Assurance       | Reasonable assurance                                                                                                                                                                                                   |
| Materiality              | Misstatements greater than five percent of the Project's emission reductions assertion are considered material; Qualitative non-conformities with the verification criteria are also considered material               |

## 5. Overview of the Verification Process

To review the Project's GHG information, the following verification process was used:

- conflict of interest review;
- selection of Audit Team;
- initial interaction and kickoff meeting with primary TerraPass contact;
- development of the verification plan;
- site visit;
- review and evaluation of raw data and calculations for period under review;
- follow-up interaction with TerraPass contact for corrective action or supplemental data as needed; and
- final statement and report development.

The verification process was utilized to gain an understanding of the Project's emission sources and reductions, to evaluate and verify the collection and handling of data, the calculations that lead to the results, and the means for reporting the associated data and results.

### ***Conflict of Interest Review***

Prior to beginning any verification project, First Environment conducts an evaluation to identify any potential conflicts of interest associated with the Project. No potential conflicts were found for this Project. First Environment also received determination of a low risk of conflict of interest from CAR in a notification dated September 7, 2010.

### ***Audit Team***

First Environment's Audit Team consisted of the following individuals who were selected based on their verification experience, as well as familiarity with landfill operations.

Lead Verifier – Heather Moore  
Verifiers – Ross MacWhinney; Iris Caldwell  
Internal Reviewer – Michael Carim

### ***Audit Kick-off***

The verification audit was initiated with a kick-off meeting on September 10, 2010 with the primary TerraPass contact. The meeting focused on confirming the scope, schedule, and data required for verification.

### ***Development of the Verification Plan***

The team formally documented its verification plan as well as determined the data-sampling plan. The verification plan was developed based on the discussion of key elements of the project verification process during the kick-off meeting. TerraPass was afforded the opportunity to comment on the key elements of the plan for verification. Based on items discussed and agreed upon with TerraPass, the plan identified the First Environment project team members,

project level of assurance, materiality threshold, and standards of evaluation and reporting for the verification. It also provided an outline of the verification process, established project deliverables, and presented a data-sampling plan designed to review all project elements in areas of potentially high risk of inaccuracy or non-conformance.

### ***Site Visit***

A site visit by Iris Caldwell was performed on January 12, 2010 to assess the Project's data management systems and interview personnel relevant to the project during the verification of the previous reporting period. TerraPass confirmed that no changes to the project's operations or data management systems and processes have occurred since the project's previous reporting period covering January 1 through December 31, 2009. Therefore, a site visit for the current reporting period was deemed unnecessary because the site visit had occurred within the current year.

### ***Emissions Reduction Data and Calculation Assessment***

This assessment used information and insights gained during the previous steps to evaluate the collected data and the reported emissions reduction quantities, and identify if either contained material or immaterial misstatements.

### ***Corrective Actions and Supplemental Information***

The team made requests for clarification during the verification process. TerraPass provided sufficient responses to all clarification requests. No requests for supplemental information were necessary.

### ***Verification Reporting***

Verification reporting, represented by this report, documents the verification process and identifies its findings and results. Verification reporting consists of this report for TerraPass, a verification opinion, and a list of findings to be submitted to the Climate Action Reserve.

## **6. Project Conformance with Verification Criteria**

### ***6.1 Project Description***

The Sioux Falls Regional Sanitary Landfill is located at 26727 464<sup>th</sup> Avenue in Hartford, South Dakota and is owned and operated by the City of Sioux Falls. The City of Sioux Falls began operating a landfill methane destruction project in April 2006 where the landfill gas was directed to an open flare. A pipeline conveying landfill gas to a nearby ethanol plant became operational in February 2009. The project consists of approximately 90 gas extraction wells, lateral and header piping, condensate removal equipment, blowers, an open flare, and a pipeline which conveys the landfill gas to an off-site ethanol plant. Prior to this system, landfill gas was passively vented to the atmosphere.

### ***6.2 Eligibility***

The Sioux Falls Regional Sanitary Landfill meets the eligibility requirements set forth in the CAR Protocol. The project is located within the United States and has a project start date after

January 1, 2001. The start date of the project was April 7, 2006. The project's start date was confirmed during the verification of the project's initial reporting period.

Ownership of the verification emission reductions was demonstrated through a Verified Emission Reduction Purchase and Sale Agreement (VERPA) with the City of Sioux Falls and TerraPass Inc., establishing TerraPass' exclusive ownership rights to Environmental Attributes of any sort arising from the landfill gas combusted by the Project over the given reporting period, including any CRTs generated. A second contract between the City of Sioux Falls and Great Plains Ethanol, LLC, d/b/a POET Biorefining-Chancellor (POET) gives the City of Sioux Falls the rights to the emission reduction associated with the landfill gas combusted at the ethanol plant. First Environment's review of both contracts indicated TerraPass' ownership. Additionally, the CAR Project Developer's Attestation of Title has been completed by TerraPass and is on file with CAR. First Environment reviewed the Attestation of Title during the verification process and confirmed that it was completed correctly.

Additionally, First Environment reviewed the facility's operating permit, general stormwater discharge permit, Title V air quality operating permit, most current Tier II report to inform the assessment of regulatory compliance, and the Environmental Protection Agency's Enforcement and Compliance History Online (ECHO) database. The cursory review of permits indicated that the site was in compliance and no violations of permits occurred during the reporting period. First Environment also relied in part on the Attestation of Regulatory Compliance, on file with CAR and completed by TerraPass for the current reporting period, to indicate regulatory compliance.

### **6.3    *Additionality***

The project consists of a voluntarily installed landfill gas collection and combustion system with no pre-existing system; therefore, the Project is consistent with activity No. 1 as described in Section 3.4.1 of the performance standard test in the CAR protocol.

The landfill's design capacity of approximately 22 million megagrams exceeds 2.5 million megagrams and therefore falls under the NSPS regulations. The most current Tier II test, completed in July of 2008, revealed a site-specific NMOC emissions rate in calendar year 2010 of 23 Mg/yr, which is below the NSPS regulatory threshold of 50 Mg/yr. First Environment also reviewed the landfill's state permits, including its permit to operate and stormwater permits, and state and local laws, which indicated that the project is voluntarily implemented.

In addition, First Environment relied in part on the Attestation of Voluntary Implementation completed by TerraPass for the current reporting period. First Environment confirmed that the form is on file with CAR and was completed correctly.

### **6.4    *Project Performance Against Protocol/Methodology and Project Management System***

The project was implemented in conformity with the CAR Landfill Project Reporting Protocol, Version 3.0.

Landfill gas collected by the active landfill gas collection and control system is either destroyed by the open flare or conveyed off site through a pipeline to a nearby ethanol plant. The landfill gas destroyed in the open flare is continuously measured using a FCI ST98 Thermal Mass Flow

Meter and recorded in 10-second intervals. The ST98 flow meter corrects the flow rates from ambient conditions to a standard temperature and pressure of 70°F and one atmosphere of pressure. The landfill gas sent off site is continuously measured by a Veris Verabar V100 Pitot Differential Pressure Sensor and recorded in 10-second intervals. Totalizer readings are recorded daily. The Veris Verabar flow meter corrects the totalizer readings from ambient conditions to a standard temperature and pressure of 59°F and one atmosphere of pressure. Data from both flow meters are connected to a supervisory control and data acquisition (SCADA) system. The methane concentration of the landfill gas routed to the flare is measured at least weekly using a Landtec GEM-2000 portable gas analyzer. The methane concentration of the landfill gas conveyed through the pipeline is continuously measured by a CAI L Series gas analyzer.

TerraPass provided evidence of inspections and cleaning, field checks, and factory calibrations of all applicable project monitoring equipment during the reporting period. Table 1 shows each measurement device and its respective monitoring program. First Environment reviewed documentation, including equipment calibration records; field check records; quarterly inspection/cleaning records; equipment manuals and manufacturers requirements; to support the adequacy of the monitoring program and its compliance with the CAR Protocol. All field checks showed the measurement equipment to have under-reported within the required 5 percent accuracy, requiring no adjustment to the reported data.

Table 1: Monitoring Program

| <b>Equipment Name</b>               | <b>Quarterly Inspection/Cleaning</b>                | <b>Field Check</b>                                  | <b>Factory Calibration</b>                                                                                       |
|-------------------------------------|-----------------------------------------------------|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Veris Verabar Flow Meter (Pipeline) | February 17, 2010 and June 29, 2010                 | June 29, 2010                                       | No manufacturer calibration requirement; previous calibration occurred when installed in February 2009.          |
| ST98 Flow Meter (Flare)             | March 24, 2010 and June 20, 2010                    | June 30, 2010                                       | Accuracy check performed every 18 months, recalibrate if necessary; previous factory calibration in August 2006. |
| CAI Gas Analyzer                    | February 17, 2010 and June 29, 2010                 | Auto-calibrates daily                               | No manufacturer calibration requirement; previous calibration occurred when installed in February 2009.          |
| Landtec GEM-2000                    | Weekly during reporting period; before each reading | Weekly during reporting period; before each reading | January 14, 2010                                                                                                 |

Hourly operation of the open flare is monitored by the flare's thermocouple. If the temperature drops below 400°F, the blower and valves will shut down. Shut down periods are noted in the SCADA system. The delivery of landfill gas through the pipeline is confirmed from sale invoices from the landfill to the ethanol plant.

First Environment determined the monitoring system to meet the protocol requirements based upon observations made during the January 2010 site visit and review of relevant project documentation.

There are two sources of project emissions identified within the project boundaries. Indirect emissions of CO<sub>2</sub> occur from purchased electricity used to power project equipment and propane used to assist in reigniting the flare should it become extinguished. Activity data is obtained from monthly utility invoices and the capacity of the propane tank. No propane was purchased during this reporting period, so TerraPass conservatively assumed that the entire tank capacity was consumed.

TerraPass developed and implemented a monitoring plan to track relevant project parameters and data sources. The Monitoring Plan was reviewed to determine compliance with the protocol requirements. First Environment found the monitoring plan to meet the requirements set forth by the CAR Protocol.

### **6.5 Emissions Reduction Calculation Assessment**

The emission reduction calculations were reviewed to ensure accuracy in the formulas used and the raw data used as inputs. The formulas were tested to ensure they were consistent with the calculation methodology described in the CAR Protocol. Because the landfill is still receiving waste and is not capped, a 10 percent oxidation factor was applied to account for methane oxidation in the cover soil. A 96 percent destruction efficiency is assigned to the project's open flare and a 98 percent destruction efficiency is assigned to the landfill gas conveyed through the pipeline. Both destruction efficiencies are applied accordingly in emission reduction calculations.

Landfill gas flow to the open flare was calculated by taking the 10-second standard cubic feet per minute (SCFM) readings from the ST98 flow meter, removing all readings when either the flow rate was less than zero or the thermocouple temperature was below 500°F indicating inoperativeness of the open flare, converting the SCFM to SCF, and aggregating the flow on a daily basis. The ST98 flow meter corrects gas flow recorded at ambient conditions to one atmosphere of pressure at 70°F, so an adjustment was made within the emission reduction calculations to adjust the flow to 60°F and one atmosphere of pressure. Landfill gas flow to the pipeline was determined from the Veris Verabar 10-second totalizer readings, which were averaged on a daily basis. The Veris Verabar flow meter corrects the flow recorded at ambient conditions to one atmosphere of pressure at 59°F, so an adjustment was made within the emission reduction calculations to adjust flow to 60°F.

Methane concentration measurements for the landfill gas directed to the flare were obtained weekly using a portable gas analyzer. The weekly readings were correctly applied throughout the calculations and a 10 percent discount factor was used to account for the weekly readings. Methane concentration measurements for the landfill gas conveyed through the pipeline were obtained from the CAI gas analyzer. The CAI gas analyzer outputs daily averages used in the emission reduction calculations.

Data substitution methodologies were employed at various times during the project when the continuous methane concentration data were missing. The project developer correctly employed data substitution methodologies according to Appendix E of the CAR Protocol for the length of the period of missing data.

Project emissions were subtracted from total volume of methane destroyed. Project emissions were calculated by multiplying activity data by an appropriate emission factor. Project emission

sources consisted of purchased electricity to power the gas collection system and combustion of propane.

Copies of the raw data used in the calculations including flow data, methane content data, and utility and other fossil fuel invoices, were compared with the data used in the final calculations and tested for transcription or mathematical errors. All raw data sources and calculations over the entire verification period were reviewed. First Environment performed recalculations of emission reductions for the entire reporting period to assess whether they were free of material misstatement.

## **6.6 *Approved Variance or Deviations***

TerraPass did not request any variances or deviations from the CAR protocol for the verification period.

## **6.7 *Changes Due to Errata & Clarification Document***

The issuance of the Landfill 3.0 Errata & Clarification document on June 25, 2010 did not result any changes to the scope of the verification.

## **7. *Audit Results***

TerraPass provided good documentation for its emissions estimates, as well as its procedures surrounding the data collection process. To complete the verification process, First Environment requested additional clarification. The responses given by TerraPass were sufficient to resolve the issue raised by the Audit Team.

Verified results show 74,563 metric tonnes of CO<sub>2</sub>e from Vintage 2010 from the project reporting period of January 1 to June 30, 2010 eligible for registration with the Climate Action Reserve.

## **8. *Verification Conclusion***

Based on the assessments performed and the evidence collected, First Environment concludes that the Project GHG emissions reductions, due to the capture and combustion of methane gas for the period January 1 to June 30, 2010, can be considered with a reasonable level of assurance:

- consistent with the Project Methodology,
- without material discrepancy, and
- meeting the minimum level of accuracy of at least 95 percent.

Verified results show:

| Reporting Period: January 1, 2010<br>to June 30, 2010 | Total  |
|-------------------------------------------------------|--------|
| Baseline Emissions (tCO <sub>2</sub> e)               | 75,681 |
| Project Emissions (tCO <sub>2</sub> e)                | 1,118  |
| Emissions Reductions (tCO <sub>2</sub> e)             | 74,563 |

\*as measured and calculated in accordance with the Project Methodology

## 9. Lead Verifier Signature



Heather I. Moore  
Engineer II

## 10. Independent Internal Review Signature



Michael M. Carim  
Associate