

VERIFICATION REPORT FOR THE CLINTON LANDFILL NO. 2 GAS COLLECTION AND COMBUSTION PROJECT



Document Prepared By First Environment, Inc.

Project Title	Clinton Landfill No. 2 Gas Collection and Combustion Project
Version	1.0

Report Title	Verification Report for the Clinton Landfill No. 2 Gas Collection and Combustion Project
Client	TerraPass Inc.
Pages	10
Date of Issue	1 June 2012
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Summary:

The Clinton Landfill No. 2 Gas Collection and Combustion Project (The Project) consists of the expansion of an active landfill gas collection system that captures methane and destroys it in flares and in engines located on site. These activities result in a net reduction of greenhouse gas (GHG) emissions. This report covers the verification of GHG emission reductions from the destruction of landfill gas during the period from January 1 through December 31, 2011. First Environment, Inc. (First Environment) conducted the verification from March to May 2012.

The Project's monitoring plan, as defined in the validated VCS Project Description (VCS PD), served as the basis of verification activities. The verification scope covered the implementation of the monitoring plan and assessment of conformance with relevant requirements from the VCS PD.

During the verification process, First Environment issued several corrective action and clarification requests – all of which were addressed sufficiently by TerraPass. First Environment is reasonably assured that the Clinton Landfill No. 2 Gas Collection and Combustion Project meets all relevant VCS requirements and has correctly implemented the monitoring plan in the validated VCS PD, with minor deviations as described below.

TABLE OF CONTENTS

1	Introduction	1
1.1	Objective	1
1.2	Scope and Criteria	1
1.3	Level of Assurance	2
1.4	Summary Description of the Project.....	2
2	Validation Process, Findings, and Conclusion	2
2.1	Validation Process	2
2.2	Validation Findings	2
2.3	Gap Validation	2
2.4	Methodology Deviations	2
2.5	New Project Activity Instances	2
2.6	Validation Conclusion	2
3	Verification Process	2
3.1	Method and Criteria	2
3.2	Document Review.....	4
3.3	Interviews.....	4
3.4	Site Inspections	4
3.5	Resolution of Any Material Discrepancy.....	4
4	Verification Findings	6
4.1	Project Implementation Status.....	6
4.2	Accuracy of GHG Emission Reduction or Removal Calculations	8
4.3	Quality of Evidence to Determine GHG Emission Reductions or Removals	8
4.4	Management and Operational System.....	9
5	Verification Conclusion	9
6	Lead Auditor Signature	10
7	Internal Reviewer Signature	10

1 INTRODUCTION

This report is provided to TerraPass, Inc. (TerraPass) as a deliverable of the Verified Carbon Standard (VCS) project verification process for the Clinton Landfill No. 2 Gas Collection and Combustion Project (the Project). First Environment, Inc. (First Environment) conducted the verification from March to May 2012.

1.1 Objective

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

- the Project conforms to the requirements of the verification criteria discussed in Section 1.2; and
- the data reported are accurate, complete, consistent, transparent, and free of material error or omission.

1.2 Scope and Criteria

DeWitt Energy Associates owns and operates the Project located at the Clinton Landfill No. 2 in DeWitt County, Illinois. Emission reductions, expressed in metric tons of carbon dioxide equivalents (CO₂e), resulting from the destruction of landfill gas (LFG) methane are submitted for verification as part of the VCS Version 3 project registration process.

The specific scope metrics for the verification are outlined in the table below:

Reporting Period	January 1 – December 31, 2011
Emission Sources Verified	• CH₄ emission reductions expressed as CO₂e; and • CO₂ emissions from operation of project equipment.
Definition of Materiality	• Misstatements of greater than five percent of the Project's GHG assertion; and • Qualitative non-conformities with Standards of Verification described below.

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

Standards of Verification	• VCS Standard 3: VCS Version 3.2, 1 February 2012 • Validated VCS PD, Version 1.51, November 12, 2009 • Approved CDM methodology ACM0001, "Consolidated baseline and monitoring methodology for landfill gas project activities", Version 10 (ACM0001)
Verification Process	• VCS Standard 3: VCS Version 3.2, 1 February 2012 • VCS Program Guide, Version 3, 1 May 2012, v3.3 • ISO 14064-3: Specification with guidance for the validation and verification of greenhouse gas assertions, 2006

1.3 Level of assurance

First Environment and TerraPass have agreed that a reasonable level of assurance be applied for the Project.

1.4 Summary Description of the Project

The Project is located at the Clinton Landfill No. 2, 9560 Heritage Road in Clinton, Illinois, DeWitt County (latitude and longitude are 40° 6' 51.411" and -88° 57' 28.7994", respectively). The project activity consists of the voluntary capture of LFG through an expanded active collection system and destruction of this LFG in two 1.6- megawatt (MW) Caterpillar 3520C engine generator sets and two open flares. The Project achieves emission reductions through the destruction of methane that would have otherwise been released directly to the atmosphere.

The VCS PD provides additional details regarding the project activity.

2 VALIDATION PROCESS, FINDINGS, AND CONCLUSION

2.1 Validation Process

The validation process consisted of an assessment of the project design as specified in the validated PD against the validation criteria. The Audit team identified a methodology deviation which underwent a validation approval during the current verification period. The validation criteria identified for assessment of the methodology deviation included the approved CDM methodology, "*Consolidated baseline and monitoring methodology for landfill gas project activities*," Version 10, all referenced methodological tools, and the VCS Standard, 1 February 2012, v3.2.

2.2 Validation Findings

Not Applicable

2.3 Gap Validation

Not Applicable

2.4 Methodology Deviations

The following methodology deviation was identified and approved during verification:

The default flare efficiency of the open flare was assigned a value of 96 percent as opposed to the 50 percent default efficiency for open flare as found in the "*Tool to determine project emissions from flaring gases containing methane*", Version 1.0.

2.5 New Project Activity Instances

Not Applicable

2.6 Validation Conclusion

First Environment approved the methodology deviation because the 96 percent flare efficiency is representative of the typical flare efficiency for an open flare operated under United States (US) Environmental Protection Agency (EPA) 40CFR60.18 as is the case for the project flare. Furthermore, the applied flare efficiency yields a more accurate representation of emission reductions.

3 VERIFICATION PROCESS

3.1 Method and Criteria

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

- conflict of interest review;
- selection of Audit Team;
- kick-off meeting with TerraPass;
- review of the validated VCS PD;
- development of the verification plan and sampling plan;
- site visit;
- desktop review and evaluation of raw data, calculations, and supporting documentation for the period under review;
- follow-up interaction with TerraPass 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 GHG 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.

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:

Jeff Daley – Lead Verifier
 Howard Kanter – Verifier
 Michael Carim – Technical Resource
 Iris Caldwell – Internal Reviewer

Audit Kick-off

The verification audit was initiated with a kick-off conference call on March 22, 2012 between First Environment and the primary TerraPass contact, Nick Facciola. The communication focused on confirming the verification scope, objectives, criteria, schedule, and the data required for the verification.

Project Description Review

The Audit Team reviewed the VCS PD as a basis for developing the verification plan.

Development of the Verification Plan

The Audit Team formally documented its verification plan as well as determined the data-sampling plan. The verification plan was developed based on discussion of key elements of the verification process during the kick-off meeting. TerraPass was afforded the opportunity to comment on key elements of the plan for verification. Based on items discussed and agreed upon with TerraPass, the plan identified the First Environment 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 and established project deliverables. A separate sampling plan was designed to review all project elements in

areas of high risk of inaccuracy or non-conformance. The verification and sampling plans were provided to TerraPass on March 26, 2012.

Site Visit

First Environment performed a site visit on May 16, 2011 as part of the verification process for the previous verification period. The site visit included review of site operations, data collection processes, and information management systems, as well as interviews with key project personnel. During the kick-off meeting, TerraPass confirmed that no significant operational or data management changes had occurred since the site visit; therefore, a repeat site visit for this verification period was deemed unnecessary.

Desktop Review

The Audit Team performed a desktop review of the Monitoring Report, GHG emission reduction assertion, and supporting documentation, as further described in Section 3.2 below.

Corrective Actions and Supplemental Information

The Audit Team issued requests for supplemental information, clarification, and corrective action during the verification process. The clarification and corrective action requests and the responses provided by TerraPass are summarized in Section 3.5.

Verification Reporting

Verification reporting documents the verification process and identifies its findings and results. Verification reporting consists of this report and a separate Deed of Representation to be submitted to the VCS Association.

3.2 Document Review

During the verification process, First Environment reviewed the Project's Monitoring Report, GHG emission reduction assertion, and supporting documentation for the current verification period to ensure consistency with the validated VCS PD and ACM0001. Discrepancies between project documentation and the verification criteria were considered material and identified for corrective action. Monitoring deviations required appropriate justification from TerraPass and are described in further detail in Section 4.1 below. Additionally, First Environment assessed the GHG emission reduction assertion and underlying monitoring data to determine if either contained material or immaterial misstatements. The results of these reviews are discussed in greater detail below.

3.3 Interviews

Through the course of verification activities, First Environment conducted phone interviews with the following project personnel to inform the verification process:

- Nick Facciola – TerraPass, Inc.

3.4 Site Inspections

No site inspections were performed during the verification process as identified in Section 3.1 above.

3.5 Resolution of Any Material Discrepancy

The Audit Team issued requests for clarification and corrective action during the verification process. TerraPass' responses were sufficient to resolve all clarification and corrective action requests. The clarification and corrective action requests and the responses provided are summarized in the tables below:

Corrective Action Request	Summary of Participant Response	Verification Conclusion
The VCS Monitoring Report does not identify MD _{project,y} as being the lesser of either the sum of the LFG destroyed or the total quantity of methane generated annually.	Section 4.1 of the VCS Monitoring Report was revised to indicate how MD _{project,y} was determined.	Response is acceptable
The parameters MD _{flare 1, 2011} and MD _{electricity, 2011} are not quantified using the density of methane at the flow meter reference temperature and pressure.	The emission reduction calculations were revised to quantify MD _{flare 1, 2011} and MD _{electricity, 2011} with the appropriate methane density.	Response is acceptable
December 2010 engine flow data is incorrectly accounted for in the current verification period.	The emission reduction calculations were revised to exclude flow data from December 2010.	Response is acceptable
The following project verification information was excluded from the VCS Monitoring Report: - The flare efficiency and methane density deviations are not referenced and justified in Section 2.2. - Equipment calibration requirements, specifically for the Siemens continuous gas analyzers, are not consistently referenced.	The flare efficiency and methane density monitoring plan deviations have been addressed in the revised Monitoring Report. The Siemens gas analyzer calibration requirements have been consistently referenced throughout the revised Monitoring Report.	Response is acceptable
The Siemens gas analyzer field calibration record for Flare No. 2, dated October 13, 2011, indicates as-found and as-left methane concentration readings outside the five percent accuracy threshold.	Landfill personnel confirmed that a transcription error was present on the "as left" methane composition reading documented on the Siemens Flare No. 2 calibration sheet. A revised copy signed by the landfill technician was provided reflecting the correct calibration reading. The "as found" calibration reading indicated the meter was underreporting methane data; therefore emission reductions quantified prior to this calibration event are a conservative estimate.	Response is acceptable

Clarification Request	Summary of Participant Response	Verification Conclusion
The November 29, 2011 Landtec GEM2000 factory calibration indicated as found conditions outside of the accuracy threshold, please clarify if any action was taken as a result.	Since the GEM2000 was not used for project data during the reporting period, no adjustments were made to the calculations. The device is used as a backup to the continuous gas analyzers in case they should fail to record the methane fraction. The Monitoring Report has been revised to clarify that data from the GEM2000 were not used for quantification of emission reductions during the verification period.	Response is acceptable
Please clarify why methane concentration readings at the engine skid inlet sample port were significantly lower on April 6, April 27, and May 15, 2011 when compared to the remainder of the methane readings during the verification period.	Cell 2 was being capped during these days, allowing air to enter the system. The air entering the system resulted in low methane concentrations at the skid inlet. However, the skid inlet readings are not used for the purposes of emission reduction quantification.	Response is acceptable
Please clarify why the flow totalizer readings contain a data gap from January 7, 2011 to January 10, 2011.	The data gap is due to the recorder having stopped working, as confirmed via field report. The data gap does not have a material impact on the emission reduction assertion.	Response is acceptable

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

The Project is implemented according to the description provided in the validated VCS PD, except where noted below. The Project became operational on January 27, 2007. The nine-year Project crediting period began on July 1, 2009 and ends on June 30, 2018. The Project's start date and crediting period were previously confirmed during validation. Emission reductions are claimed for LFG destroyed on site in the two engine/generator sets and in the two open flares.

TerraPass provided an attestation, dated March 26, 2011, indicating that GHG emission reduction credits for the verification period will be registered only with VCS and not under any other GHG program. Additionally, the approved validation body confirmed during the validation process that GHG emission reduction credits had not been registered under another GHG program.

First Environment confirmed through interviews with project personnel that no operational or management changes had occurred since the previous verification site visit. The following topics were discussed with project personnel during the site visit and re-confirmed during the current verification process:

- the data collection process used to generate reports, and
- internal documents and protocols that set guidelines for the data collection process.

The information gathered during these discussions and review was used to assess the Project's data management systems and its controls for sources of potential errors and omissions. The primary aspects of the Project's monitoring plan are described below.

LFG flow to the engines and to the two open flares was monitored continuously using three separate Rosemount 3095 Multivariable Mass Flow Transmitters. Flow data were recorded continuously on a Yokogawa data recorder. The engine flow meter was factory calibrated on April 21, 2010. The flow meters for flares one and two were factory calibrated on December 17, 2010 and April 20, 2010, respectively. All three calibrations meet the manufacturer's requirements of a factory calibration every five years. First Environment confirmed that this frequency is consistent with ACM0001 and the validated VCS PD. First Environment reviewed the calibration records which indicated that the meters were operating accurately.

Methane concentration of LFG destroyed in the engines was monitored using an Elkins Earthworks Envision portable methane analyzer. The methane readings were manually recorded on an approximately weekly basis. The Envision gas analyzer was factory calibrated on March 30, 2010 and March 17, 2011. The Envision analyzer was also field calibrated prior to each use. First Environment reviewed the factory calibration records which indicated the analyzer was operating accurately. A Landtec GEM2000 portable methane analyzer was used solely for quality assurance purposes and data recorded by the GEM2000 were not used to quantify emission reductions during the verification period.

Methane concentration of LFG destroyed in the flares was monitored using two Siemens Ultramat 23 continuous gas analyzers. The analyzers for flares one and two were factory calibrated on March 15, 2010 and February 11, 2010, respectively. The flare one analyzer was field calibrated to span gas on August 17, 2011 and October 28, 2011. The flare two analyzer was field calibrated to span gas on October 13, 2011. These field calibrations meet the manufacturer's requirements of an annual field calibration to a span gas. There is no manufacturer requirement for factory calibration. First Environment reviewed these calibration records which indicated that both meters were operating accurately.

Electricity consumption is determined using utility invoices from the electricity supplier. The quantity of propane combusted is also determined based on supplier's invoices.

The operation hours of the engines are monitored to ensure that methane is only flowing to the engines when they are operating. The operation of both flares was monitored through the flare's thermocouple temperature readings.

There are no remaining issues from the previous validation. Further, the validation process for the Project did not identify any deviations from the ACM0001 methodology, except where noted above in Section 2.

The data collection and recordkeeping procedures were found to be consistent with those outlined in the monitoring plan described by the VCS PD and meet the requirements of the ACM0001, with the exception of the following monitoring deviations as identified in the Monitoring Report:

Parameter	Monitoring Requirement	Deviation	Verification Conclusion
$W_{CH_4, power\ plant}$	Measured continuously	Monitored daily using a portable methane analyzer	Deviation is acceptable
$EC_{PJ, 2011}$	Monitored continuously	Data are sourced from monthly utility invoices	Deviation is acceptable
Engine operating hours	Monitored hourly	Operating hours are monitored daily	Deviation is acceptable
D_{CH_4}	Default value of 0.0416 lb CH_4 /scf based on reference temperature and pressure of 68°F and 14.696 psia	Adjusted defaults are applied consistent with the flow meter reference temperatures and pressures	Deviation is acceptable

No additional deviations from the monitoring plan or VCS PD were identified in the verification process.

4.2 Accuracy of GHG Emission Reduction or Removal Calculations

Emission reductions are calculated ex-post using the approach indicated in ACM0001. First Environment reviewed the emission reduction calculations for the verification period to ensure accuracy in the formulas applied and the raw data and default factors used as inputs. First Environment's review assessed whether emission reductions were free of material misstatement. The formulas were tested and found to be consistent with the calculations described in ACM0001.

Project monitoring data for methane fraction ($W_{CH_4, power\ plant}$) and LFG collected and destroyed ($LFG_{electricity, 2011}$) are used to calculate the amount of methane destroyed by the project engines ($MD_{electricity}$). The total monthly quantities of LFG are determined by taking the difference in the continuous flow totalizer readings and summing them over each month of the reporting period. The flow meter automatically corrects flow data to the standard conditions of 60°F and 14.696 psia. Since methane readings were not recorded continuously, a 95 percent lower confidence interval is taken over the entire reporting period to find the annual average methane content of the LFG sent to the engines. Total methane destroyed is converted from a volumetric to a mass flow using a methane density of 0.04226 lb CH_4 /scf.

Methane destroyed by the flares ($MD_{flare\ 1}$ and $MD_{flare\ 2}$) is calculated using project monitoring data for LFG collected and destroyed ($LFG_{flare\ 1, 2011}$ and $LFG_{flare\ 2, 2011}$) and methane fraction ($W_{CH_4, flare\ 1}$ and $W_{CH_4, flare\ 2}$). The flow meter for flare one automatically corrects flow data to standard conditions of 60°F and 14.696 psia. The flare two flow meter automatically corrects flow data to the reference conditions of 60°F and 14.73 psia. Flow data for which the recorded flare temperature was below 500°F are excluded from emission reduction calculations. Flow data are aggregated monthly and annually. An annual aggregate of methane content data is used to calculate total methane destroyed in the flares. Total methane destroyed is converted from a volumetric to a mass flow using a methane density of 0.04226 lb CH_4 /scf and 0.04235 lb CH_4 /scf for flares one and two, respectively.

Project emissions from electricity use and propane consumption are deducted from the overall emission reductions created by the Project. Project emissions are quantified by multiplying the activity data by the appropriate emission factor specified in the validated VCS PD. A transmission and distribution loss factor of seven percent is accounted for in the quantification of project emissions from electricity use and is sourced from the 2010 EIA Annual Energy Review report, as per the VCS PD.

As per the validated VCS PD, and consistent with ACM0001, an adjustment factor is calculated and applied to account for methane generated in the baseline that may have been captured and destroyed to comply with regulations or contractual requirements. First Environment confirmed that the adjustment factor is calculated correctly as 25.3 percent, in conformance with the VCS PD, using a baseline efficiency factor of 16.1 percent and calculated project efficiency factor of 63.7 percent.

The verification process focused on the evaluation of quantification spreadsheets to ensure that they were consistent with the formulas and equations described in ACM0001. Copies of the raw data used in the calculations; including methane concentration, LFG flow, and electricity consumption, were compared with the values used in the final calculations and tested for transcription and mathematical errors.

The Audit Team performed an independent recalculation of the emission reductions from the verification period using the available raw flow, methane and electricity consumption data. Material misstatements were identified for correction by TerraPass as described in Section 3.5.

4.3 Quality of Evidence to Determine GHG Emission Reductions or Removals

TerraPass provided adequate documentation for the emissions reduction calculations as well as its management systems around the data collection process. Evidence included flow meter and gas analyzer calibration records, electronic data associated with methane concentration, LFG flow, and electricity consumption invoices. The evidence provided is consistent with the requirements of ACM0001.

and the validated VCS PD and meets generally accepted evidentiary standards for best practice in GHG accounting.

4.4 Management and Operational System

TerraPass and DeWitt Energy Associates had adequate management and operational systems in place with respect to monitoring and reporting during the current verification period as determined through observation during the previous site visit, interviews with project personnel, and review of project documentation. Records of the raw data and equipment calibration checks were adequately documented. TerraPass reviewed these records as part of their quality control process and in order to perform the emission reduction calculations.

5 VERIFICATION CONCLUSION

First Environment was retained to provide verification services for the Project's GHG emission reductions assertion based on the following fundamentals:

- *Level of assurance:* Reasonable assurance.
- *Objectives of verification:* To assure project conformance with the VCS Standard, the CDM Methodology ACM0001, and the validated VCS PD.
- *Verification criteria:* VCS Standard, CDM Methodology ACM0001, and the validated VCS PD.
- *Definition of materiality:* Misstatements of greater than five percent of the GHG assertion and qualitative non-conformities with the validated VCS PD are considered material.
- *Scope, including:*
 - o *Boundaries of the assertion:* Clinton County landfill and DeWitt Energy Associates facility operations;
 - o *The physical infrastructure, facilities, and activities within the assertion:* LFG collection and destruction operations;
 - o *GHG sources, sinks, and reservoirs included within the assertion:* Methane emission reductions expressed as carbon dioxide-equivalents and carbon dioxide emissions from the operation of project equipment; and
 - o *The time period for the assertion:* January 1, 2011 through December 31, 2011.

Based on the assessments performed and the historical evidence collected, First Environment concludes with a reasonable level of assurance that the Project implementation and the emission reductions of the Project resulting from the capture and combustion of methane gas for the period from January 1 through December 31, 2011 are:

- consistent with the validated VCS PD of November 12, 2009;
- in conformance with the VCS Standard, 1 February 2012, v3.2 and the CDM Methodology ACM0001 (Version 10);
- without material discrepancy; and
- meeting the minimum level of accuracy of at least 95 percent.

Verified results show:

Reporting Period: January 1, 2011 through December 31, 2011	GHG Emissions (tCO ₂ e)
Baseline Emissions	123,555
Project Emissions	237
Leakage	0
Net GHG emission reductions or removals	123,318

6 LEAD AUDITOR SIGNATURE



Jeff Daley
Lead Verifier

7 INTERNAL REVIEWER SIGNATURE



Iris Caldwell, P.E.
Senior Engineer