

Validation Report for the Greater New Bedford LFG Utilization Project Dartmouth, Massachusetts

Voluntary Carbon Standard 2007.1

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1. Introduction

This report is provided to Commonwealth New Bedford Energy LLC (CNBE), a wholly owned subsidiary of Commonwealth Resource Management Corporation (CRMC), as a deliverable of the Voluntary Carbon Standard 2007.1 (VCS 2007.1) project validation process for the Greater New Bedford Landfill Gas Utilization Project (“the Project”) at the Crapo Hill Landfill located in Dartmouth, Massachusetts, U.S.A. This report provides a description of the steps involved in conducting the validation and the findings of the validation performed on the basis of the VCS 2007.1, as well as criteria given to provide for consistent project operations, monitoring and reporting. This validation report summarizes the findings of the validation.

In 2005, CRMC commissioned Environmental Resources Trust, Inc. (ERT) to prepare a Monitoring, Reporting, and Verification Protocol (MRV) to provide transparency and credibility in the quantification of the greenhouse gas emission reductions associated with the Project. In December 2007, a supplement to the MRV was developed to expand upon the information in the MRV and satisfy the requirements of the GE-AES Greenhouse Gas Services (GHGS) “Standard of Practice for the Production, Management and Marketing of Greenhouse Gas Credits” and “Methodology for Landfill Gas Methane Capture and Destruction Projects.”

As such, the initial documentation provided to the Audit Team consisted of:

- The Monitoring, Reporting And Verification Protocol For The Greater New Bedford LFG Utilization Project Crapo Hill Landfill, Dartmouth Massachusetts, (MRV CNBE 2005 12), December 2005; and
- Supplement To The Monitoring, Reporting And Verification Protocol For The Greater New Bedford LFG Utilization Project Crapo Hill Landfill, Dartmouth Massachusetts, (MRV CNBE 2005 12), December 2007.

Based on this initial documentation, a document review took place that resulted in Corrective Action Requests (discussed later in this report) and two supplements to the initial documentation mentioned above. The final VCS Project Design Document (PDD), comprised of these supplements and the initial documentation mentioned above, serves as the basis of the final conclusions presented herewith. As outlined in the PDD, the VCS methodology applied to the Project was UNFCCC’s ACM0001 methodology (Version 9.1) - *Consolidated baseline and monitoring methodology for landfill gas project activities*.

2. Objectives

The purpose of a validation is to have an independent third party assess the project design. In particular, the Project’s baseline, monitoring plan, and the Project’s compliance with the VCS 2007.1 are validated. This is to ensure that the PDD, as documented, is sound and reasonable and meets the identified criteria. Validation objectives also include an assessment of the likelihood that the project activity will achieve the emission reductions asserted by the project proponent. Validation is a requirement for all VCS projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of emission

reductions. Validation is part of the VCS project cycle and will result in a conclusion by the validator as to whether a project is valid and should be submitted for registration to the VCS board.

3. Scope and Criteria

The validation scope is defined as an independent and objective review of the PDD. The PDD is reviewed against the criteria stated in the VCS 2007.1 and the approved CDM baseline and monitoring methodology ACM0001 methodology (Version 9.1). The Audit Team employed a risk-based approach, focusing on the identification of significant risks for implementation of the project activity and the generation of emission reductions.

4. Level of Assurance

First Environment, Inc. (First Environment) and CRMC have agreed that a reasonable level of assurance be applied for the Project.

5. Overview of the Validation Process

The following validation process was used:

- conflict of interest review;
- selection of validation team;
- kickoff conference call with CRMC contacts;
- development of the validation plan;
- desktop review of the project design and the baseline and monitoring methodology and other relevant project documentation;
- follow-up interaction with CRMC for supplemental information as needed; and
- report development and issuance final validation statement.

The validation process was utilized to evaluate whether the Project's approach, as outlined in the project design document, is consistent with VCS and the methodology provided above.

Conflict of Interest Review

Prior to beginning any validation 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 validation experience and familiarity with the Project.

B. Tod Delaney, Ph.D., P.E., BCEE - Independent Internal Reviewer

Christina M. Magerkurth, P.E. – Project Director
Greg Kozak – Lead Auditor

Audit Kick-off

The validation process was initiated with a conference call between First Environment and the primary CRMC contacts, Thomas Yeransian and Anton Finelli. The communication focused on confirming the scope and schedule, the information required for the validation, and discussing the changes that occurred in operations at the Site since First Environment's initial visit in 2006.

Development of the Validation Plan

Based on the information discussed during the kickoff conference call, the team formally documented its validation plan.

Corrective Actions and Supplemental Information

The team requested clarification and supplemental information as well as five corrective actions during the validation. The corrective action requests (CARs) and the responses provided are summarized in Section 7.

Validation Reporting

Validation reporting, represented by this report for CRMC, documents the validation process and identifies its findings and results.

6. VCS Project Description

The Crapo Hill landfill is owned and operated by the Greater New Bedford Regional Refuse Management District (the District) and, as permitted by the Massachusetts Department of Environmental Protection (MDEP), consists of 69.8 acres of a 152-acre parcel of land located in the Town of Dartmouth, Massachusetts. The landfill began receiving municipal solid waste and construction and demolition debris in 1995 and currently encompasses approximately 30 acres of the 69.8 permitted acres. The landfill does not fall under the Federal New Source Performance Standards (NSPS) regulation or other local, state, or federal regulations requiring the collection of the landfill gas.

The MDEP permit governing the Site requires passive venting of landfill gas to the atmosphere. The District voluntarily installed an active landfill gas collection system consisting of lateral and vertical landfill gas extraction wells, header pipes connecting the wells, and a flare to combust the landfill gas in order to prevent odor issues and to provide a means for productive use of the landfill gas in the future. Two vacuum blowers were installed to pull the landfill gas to the flare. This initial system was completed and became operational in early 2000 (the District Initial System). The audit team has reviewed evidence confirming the start date of the District Initial System.

After the District Initial System was installed, the LFG collection system was subsequently expanded aggressively in anticipation of the development of an electric

generating facility, which became operational in October 2005. Landfill gas collected/destroyed under the pre-existing system is not included within the scope of the project activity. The Project (or Project Activity) consists of the expansion of the initial active collection system after January 1, 2002 and the installation and operation of the electric generating facility. Emission reductions are only claimed for landfill gas collected by the system installed from 2002 onwards and destructed in the four engines and flare.

The PDD provides additional details regarding the site and the gas collection system.

7. Validation Findings

Project Design

The Project Activity began in January 2002 when the LFG collection system was aggressively expanded in anticipation of the development of an electric generating facility, which became operational in October 2005. The current LFG management system consists of a network of gas extraction wells, laterals, and header pipes to extract the LFG, four Caterpillar engine generator sets and associated electric generation equipment, and a flare to combust any LFG not consumed in the engines. Two vacuum blowers pull LFG under pressure from the Landfill through the wells and pipes and through the main header to the engines or flare where the LFG is destroyed by combustion.

CNBE wholly owns all environmental attributes associated with landfill gas destruction associated with the Project Activity.

The crediting period is proposed for 10 years starting on March 28, 2006, which is the earliest credit start date under the VCS. However, credits for methane destruction from 2003 through 2008 have been registered with the American Carbon Registry (formerly ERT). As such, no credit is sought for emission reductions generated between 2003 and 2008 (except for vintage 2008 credits registered and subsequently cancelled/unregistered from the American Carbon Registry) and emission reductions are only forecasted from 2009 forward. The forecasted emission reductions from the Project Activity are 1,098,058 tCO₂e during the first crediting period (see Appendix A), which started March 28, 2006 and is for a period of 10 years.

The Project Activity qualifies in all aspects to be considered as a VCS project. The table below lists the VCS 2007.1 eligibility requirements and identifies how the Project Activity meets them.

VCS 2007.1 Eligibility Conformance Checklist

Requirement	Project Conformance	Comments/Findings
Project began after January 1, 2002	Yes	In 2002, the existing LFG collection and control system was expanded voluntarily in anticipation of the development of an electric generating facility, which became operational in October 2005. Project Activity start documents were verified.

Eligible emissions reductions are those after March 28, 2006	Yes	Emission reductions from the Project Activity are only claimed for after March 28, 2006.
A VCS PDD is developed in accordance with the requirements of the protocol and ISO 14064-2:2006 clause 5.2	Yes	Documentation equivalent to a final VCS PDD was provided. Validation findings included in validation report.
Clear demonstration of GHG credit ownership	Yes	CNBE has clear ownership of credits generated from the destruction of LFG by the Project Activity. Evidence of credit ownership provided and verified.
VCS program approved methodology is applied	Yes	The VCS program approved methodology applied to the Project Activity is UNFCCC's ACM0001 methodology (Version 9.1)

Baseline and Additionality

The Project has adopted the approved methodology ACM0001 (Version 9.1) "Consolidated baseline and monitoring methodology for landfill gas project activities" which is relevant and applicable to the Project because the baseline scenario is the partial or total atmospheric release of the gas and the project activity involves the destruction of LFG in a flare as well as used to produce electricity.

In accordance with ACM0001 (Version 9.1), the selected baseline scenario was appropriately determined and additionality demonstrated using the CDM's *Tool for the Demonstration and Assessment of Additionality, Version 05.2* (the "Additionality Tool").

Step 1 of the *Additionality Tool* was satisfied as follows:

The PDD identified several alternatives to the Project including:

- 1) Continued operation of the pre-existing landfill gas collection system (i.e., the District's initial system).
- 2) The project undertaken without being registered as a VCS project activity.
- 3) The District installs and operates passive vents in new areas of waste to passively vent untreated methane to the atmosphere.
- 4) The District installs and operates (a) passive point flares to passively vent and destroy potentially odor-causing compounds in new areas of waste that provided evidence of potential odor problems, and (b) passive vents to relieve pressure from the landfill but in areas that would not cause detectable odors offsite.
- 5) The District installs and operates a new but separate active gas collection system in new areas of waste for the purpose of treating or otherwise removing potentially odorous compounds from the collected landfill gas using several commercially available technologies in order to prevent detectable odors offsite.
- 6) The District installs and operates additional active gas collection wells in new areas of waste and connected those new wells to the District Initial System to relieve pressure from the landfill and destroy potential odor-causing compounds.

All six baseline alternatives are in compliance with applicable laws and regulations.

Step 2 (Investment Analysis) of the *Additionality Tool* was not selected.

Step 3 (Barrier Analysis) of the *Additionality Tool* requires identifying barriers that would prevent the implementation of the proposed project activity and showing that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity) from Step 1 above.

Baseline Alternative 2 (i.e., the project undertaken without being registered as a VCS project activity) faces a technological barrier to implementation in the form of stringent air emission limits for nitrogen oxides (NOx) produced by the combustion of LFG in internal combustion engines, which limits are significantly below (i) those normally required for LFG-fueled electric power generating projects in the US, and (ii) the limits guaranteed by vendors of the relevant available internal combustion engine-generator systems. The barrier has had the effect of imposing significant technical performance risk and higher costs on the project when compared to projects of similar scale employing conventional internal combustion engine technology available for LFG. To meet this technical challenge, the electric generating facility component of the Project Activity has utilized a recently developed, and still-evolving advanced fuel management system to monitor and adjust the required parameters on each engine to stay within the narrow operating window, while producing the output that the engine is designed for. Because of the complexity and sensitivity of the advanced fuel management system, it has proven to be highly susceptible to damage from the contaminants found in landfill gas. Revenues from the sale of carbon credits have helped to alleviate the additional costs to CNBE of installing and maintaining the fuel management system. In addition, carbon revenues have enabled CNBE to commission independent development of a new fuel management system that is expected to perform more reliably than the current system while providing the advanced fuel controls required to operate within the strict emissions limits that have been imposed on the Project.

As between the project activity and the alternatives identified above, the aforementioned technological barrier is only applicable to implementing the project activity. The alternatives would not be subject to the stringent NOx emissions requirement which creates the barrier, because the alternatives either do not involve combustion of LFG, or only limited combustion of LFG.

Alternative 1 can be eliminated because good engineering practice is to install passive vents in closed and capped areas of the landfill to vent untreated methane to the atmosphere. This passive venting relieves gas pressure underneath the cap that could otherwise be disruptive to the cap and/or result in gas migration through undesirable pathways. This good engineering practice has been adopted into the Massachusetts State Solid Waste Regulations at 310 CMR 19.117. This regulation requires at a minimum, passive gas vents in all areas of the landfill that final cover has been applied to in order to prevent the buildup of explosive concentration of gas and prevent the lateral migration of gases beyond the boundaries of a landfill.

Additionally, Alternative 4 can be eliminated. While this alternative has the advantage of a relatively low cost versus active gas collection, and is also less obtrusive and disruptive to landfill operations in active areas of waste deposition than an active LFG

collection system, when compared to passive vents, passive point flares are more expensive to install and maintain. Point flares are also more disruptive to landfill operations than passive vents because of their propagation of high-temperature (1800 degrees F) low-base (approximately eight feet above grade), unenclosed flames, that are difficult to approach and work around. Therefore, the District would likely install and operate passive vents over passive point flares.

Alternative 5 can be eliminated. Given that the District's Initial System was already a cost expended by the District, funding a separate collection and control system would be less desirable than other plausible alternatives. In addition, installation and operation of an active gas collection system in active areas of landfill operations would have been more disruptive to landfill operations than Alternatives 2 and 3 and therefore less desirable from a landfill operations standpoint.

Alternative 6 can be eliminated as well. Although the District could have installed and operated additional active gas collection wells in new areas of waste and connected those new wells to the District Initial System to relieve pressure from the landfill and destroy potential odor-causing compounds, the new areas of waste are in active areas of the landfill and operators attempt to limit other construction activities within active areas and limit potential obstacles in these areas such as gas wells. Limiting installation of active gas wells in active landfill areas reduces interference with landfill operations. Typically, landfill owners would install active gas wells in landfill areas that no longer are active. Also, damage to one active well results in shutting down the active system until a repair is made. Given the higher level of costs and potential disruption to landfill operations compared to Alternatives 2 and 3, this scenario is less desirable operationally than those alternatives.

Based on the barrier analysis and arguments presented in the PDD, only one alternative scenario (i.e., baseline Alternative 3 from above), is not prevented by any barriers, is the most realistic and economically desirable of the plausible alternatives, and is therefore the baseline scenario. As such, the baseline was determined to be the continued operation of the pre-existing landfill gas collection and flare system with the remainder of landfill gas passively vented to the atmosphere.

Step 4 (Common Practice Analysis) of the *Additionality Tool* requires an analysis of other activities similar to the proposed project activity. According to the USEPA Landfill Methane Outreach Program (LMOP), less than one sixth of non-federally regulated landfills have installed landfill gas capture and flaring projects. These projects are generally implemented to meet federal, local or state requirements to reduce methane emissions, odors or surface migration of emissions from the landfill as there is no economic incentive associated with the implementation of landfill gas collection and flaring projects. The project activity was not required to be implemented as a result of local or state regulations, ordinances or permitting requirements.

In accordance with ACM0001 (Version 9.1), the baseline scenario and additionality of the Project are appropriately demonstrated using ACM0001 (Version 9.1) and the *Additionality Tool*.

Monitoring Plan

The Project applies the approved monitoring methodology ACM0001 (Version 9.1).

The Project includes an extensive monitoring system involving staff training and development/implementation of a monitoring plan to maintain the performance of equipment as well as to ensure the accuracy of measurements and data reported.

The PDD includes all relevant data and parameters required to obtain a reliable result of generated emission reductions and meets the requirements of the ACM0001 Methodology. The PDD includes a complete description of the frequency, responsibility and authority for recording, monitoring, measurement and reporting activities. The monitoring plan described in the PDD ensures the adequate measurement of emissions occurring from GHG sources through the installation of adequate equipment and devices and the consideration of the parameter required for the final balance of emission reductions generated.

All the monitored data will be archived for the lifetime of the Project Activity. Both flow data and gas quality data are collected in real time and recorded automatically in a database on and off site by the supervisory control and data acquisition (SCADA) system. CRMC and landfill staff maintain the collection system with proper equipment calibration and training of site employees. CRMC will be mainly responsible for developing the monitoring reports / calculation workbooks, maintaining the relevant records for verification, and has the responsibility and authority for registration of VCUs generated by this Project.

Calculation of GHG Emissions

Emission reductions are directly monitored and calculated ex-post using the approach indicated in ACM0001 (Version 9.1). The project emissions related to methane destruction in end use applications were based on a destruction efficiency of 50 percent and 100 percent for open flare and electricity generating units, respectively per the PDD. No credits are claimed for the landfill gas used in the pre-project condition. The amount of methane destroyed by the flare in Calendar Year 2001 - with 12.5% declines each subsequent year due to biological decay rate and loss of gas collection system effectiveness - will be used as MD_{BL} and discounted from the total emission reductions achieved by the project activity.

For the *ex-ante* estimation of emission reductions from 2009 to 2016, the expected LFG generation of the landfill is determined using a proprietary model based on the US EPA's first order decay model. This *ex-ante* estimate is for illustrative purposes only, as emission reductions will be monitored *ex-post*, according to the methodology.

The GHG emission calculation has been developed in a correct manner and the justification of the data and assumptions used were provided. The formulas have been correctly applied and the estimation of the emission reductions generated by the project activity is correct (1,098,058 tCO₂e) during the first crediting period, which started March 28, 2006 and is for a period of 10 years.

Environmental Impact

An Environmental Impact Assessment is not required as per regulation for the implementation of the Project.

Comments by stakeholders

Stakeholder consultation has not been conducted for this project as it is not a requirement under VCS 2007.1.

Corrective Actions and Requests for Clarification

Where First Environment identified issues that needed clarification or represented key elements of the PDD that may prevent the Project from being successfully validated under the VCS 2007.1 protocol, a corrective action or clarification request was issued. First Environment requested corrective actions and requests for clarification that were resolved as follows by CRMC:

Correct Action Request and Requests for Clarification	Participant Response	Validation Conclusion
Projects shall use one of the VCS program approved project methodologies or propose a new methodology. Ensure this is included in the project documentation and that the applicability is provided.	The use of ACM0001 (Version 9.1) was confirmed in the kickoff meeting. The PDD was modified to include a discussion regarding the applicability of ACM0001 (Version 9.1).	Response to CAR is acceptable
ACM0001 (version 9.1) outlines a required procedure for selecting the most plausible baseline scenario. This procedure is not followed in the PDD provided and no justification for its exclusion was included. Provide the justification or include the process.	The PDD was modified to include procedure for selecting the most plausible baseline scenario. The most desirable, realistic, and credible alternative to the Project Activity was determined to be the continued operation of the pre-existing landfill gas collection and flare system with the remainder of landfill gas passively vented to the atmosphere.	Response to CAR is acceptable
The project must demonstrate additionality using the CDM <i>Additionality Tool</i> .	The PDD was modified to include a discussion of how the Project Activity is additional using the CDM <i>Additionality Tool</i> .	Response to CAR is acceptable
Section III of ACM0001 (version 9.1) includes a list of data and parameters to be monitored by the project participant. Ensure that the PDD includes a complete list of monitoring records and parameters as required by ACM0001 (version 9.1).	The PDD was modified to include a discussion of parameters to be monitored and justification for the exclusion of others.	Response to CAR is acceptable
ACM0001 (version 9.1) outlines specific equations to be used to estimate the greenhouse gas emission reductions achieved by the project activity. Ensure that the PDD includes the GHG emission reduction equations that are in accordance with ACM0001 (version 9.1).	The PDD was modified to include reference to the applicable emission reduction equations.	Response to CAR is acceptable

8. Validation Conclusion

First Environment has performed a validation of the Greater New Bedford Landfill Gas Utilization Project in Dartmouth, Massachusetts, USA. The validation was performed on the basis of VCS 2007.1 criteria, as well as criteria given to provide for consistent project operations, monitoring, and reporting.

The Project correctly applies the approved CDM baseline and monitoring methodology ACM0001, version 9.1, "Consolidated baseline and monitoring methodology for landfill

gas project activities". By collecting and destroying landfill gas that would otherwise be released to the atmosphere, the Project Activity results in reductions of greenhouse gas emissions that are real, measurable, and give long-term benefits to the mitigation of climate change. An analysis of the additionality test demonstrates that the proposed Project Activity is not a likely baseline scenario. Emission reductions attributable to the Project Activity are hence additional to any that would occur in the absence of the Project Activity.

The total emission reductions from the Project Activity are estimated to be 1,098,058 tCO₂e over the selected crediting period. The emission reduction forecast has been checked and is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.

Adequate training and monitoring procedures have been implemented.

In summary, it is First Environment's opinion that the Greater New Bedford Landfill Gas Utilization Project in Dartmouth, Massachusetts, USA, as described in the final VCS PDD, meets all relevant VCS 2007.1 requirements and correctly applies the baseline and monitoring methodology ACM0001 (version 9.1). Hence, First Environment recommends the Project for registration by the VCS Board.

The validation of the Project is based on the information made available to us and the engagement conditions detailed in this report. First Environment cannot guarantee the accuracy or correctness of this information. The only purpose of this report is its use during the registration process as part of the VCS project cycle. Hence, First Environment cannot be held liable by any party for decisions made or not made based on the validation opinion, which will go beyond that purpose.

8. Validator Signature



Gregory Kozak

9. Independent Internal Reviewer Signature



B. Tod Delaney, Ph.D., P.E., BCEE

APPENDIX A

EXHIBIT 2

Projections of Emission Reductions from the Greater New Bedford LFG Utilization Project under the VCS Program

[illegible]