

VERIFICATION REPORT FOR THE GREATER NEW BEDFORD LFG UTILIZATION PROJECT



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Summary:

The Greater New Bedford LFG Utilization Project (Project) consists of the collection and destruction of landfill gas that would otherwise have been released to the atmosphere. Through an active landfill gas collection system coupled with a backup open flare and four Caterpillar 3516 engines, capable of producing up to 3.6 MW of electricity, the Project results in the reduction of greenhouse gases through avoided emissions of methane (CH₄).

In April of 2017, Commonwealth Resource Management Corporation (CRMC) contracted with Ruby Canyon Engineering (RCE) to perform the verification of the monitoring period 1 July 2016 – 30 April 2017. RCE did not conduct a site visit for the verification of this monitoring period but performed one for a previous monitoring period in November 2015. RCE completed a detailed data and document review of relevant Project information.

The purpose of the verification is to ensure that the project activity was implemented according to the monitoring plan and that the emission reduction assertion submitted by CRMC is materially correct and free of errors and omissions, and that the Project meets all criteria requirements. Specifically, RCE assessed the Project against the requirements of the Clean Development Mechanism methodology ACM0001 (version 16.0). RCE assessed the Project's Monitoring Report—which also includes the Project's monitoring plan, based on the above criteria as well as relevant criteria and VCS guidance documents.

During the verification process, RCE completed a desk review of the Monitoring Report and associated documents to confirm that the project activity was implemented as stated in the VCS Project Description including a review of data and information control systems. During the course of verification activities, RCE issued requests for three corrective actions, two additional documentations, and four clarifications. CRMC provided adequate responses to RCE's requests.

RCE concludes, to a reasonable level of assurance, that the Project's GHG assertion of 73,496 metric tonnes of CO₂ equivalent emissions for the period of 1 July 2016 – 30 April 2017 is fairly stated.

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1 INTRODUCTION

CommonWealth Resource Management Corporation (CRMC) contracted RCE to perform a third-party verification of the Project. The Project consists of the collection and destruction of landfill gas (LFG) that would otherwise have been released to the atmosphere. The Project activity results in the reduction of greenhouse gases through avoided emissions of methane. This report covers the monitoring period 1 July 2016 – 30 April 2017.

1.1 Objective

The objective of the verification is to ensure that the GHG emission reduction assertion made by CRMC is materially correct and that the data provided are accurate, complete, and transparent. Additionally, RCE ensured that the Project is in conformance with the criteria as stated in Section 1.2.

1.2 Scope and Criteria

The scope of the Project includes the organizational boundaries of the Crapo Hill Landfill and all components of the gas collection and control system. The GHG included in the scope of the project is CH₄.

RCE conducted the verification based upon the following criteria:

- Verified Carbon Standard version 3.6 (19 October 2016);
- VCS Program Guide Version 3.6 (19 October 2016);
- Clean Development Mechanism methodology ACM0001, Consolidated baseline and monitoring methodology for landfill gas project activities, Version 16.0;
- Validated VCS Project Description, 12 May 2016;
- VCS Validation and Verification Manual, Version 3.2 (19 October 2016); and
- ISO 14064-3 “Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions”.

Additionally, RCE reviewed the Project’s monitoring period-specific Monitoring Report #2017 v3 dated 26 May 2017 (Monitoring Report), including the monitoring plan, during verification activities.

1.3 Level of Assurance

RCE conducted the verification to a reasonable level of assurance.

The VCS Standard defines materiality as errors, omissions, or discrepancies resulting in misstatement of greater than five percent of the Project’s GHG assertion. Additionally, RCE considered qualitative non-conformances with criteria requirements as material during the verification process.

1.4 Summary Description of the Project

The Project activity consists of the collection and destruction of landfill gas from Crapo Hill Landfill in Dartmouth, Massachusetts. The Project is located at latitude: 41° 43'28.12"N and longitude: 70° 59'04.82"W. The Project includes a landfill gas collection system which conveys landfill gas to four 0.9 MW Caterpillar 3516 engines or to a backup open flare. Prior to destruction, the LFG is mixed with biogas being generated at an onsite digester. The biogas is not considered eligible according to the

methodology. RCE confirmed the project proponent correctly accounted for LFG separate from the digester biogas to ensure that only LFG is counted toward the emission reductions. The flare did not operate most of the time during the monitoring period. Zero emission reductions are claimed from gas flaring.

Emission reductions are achieved by the Project through the collection and combustion of methane in the Caterpillar engines. The Project reduces the quantity of methane released to the atmosphere from the decomposition of waste in the landfill. In the absence of the Project, the majority of methane collected would have been vented to the atmosphere. Note that pre-Project, an active landfill gas collection and combustion system destroyed landfill gas from a small portion of the landfill in a flare. This initial system covered only a small extent of the landfill and methane that would have been collected in the initial system is deducted from final emission reduction calculations.

2 VERIFICATION PROCESS

2.1 Method and Criteria

The verification process involved the following independent and objective activities:

- Select a Verification Team;
- Perform a Conflict of Interest Review;
- Conduct a kickoff meeting with CRMC;
- Review the validated Project Description;
- Review the Validation Report;
- Review the previous Verification Report;
- Review the current Monitoring Report #2017 v3 dated 26 May 2017;
- Develop a verification plan and risk-based sampling plan;
- Review the Project information control systems and quality control procedures;
- Review the Project's emission reduction calculations;
- Issue corrective action, additional documentation, and clarification requests as necessary;
- Issue a verification report and verification representation; and
- Conduct an exit meeting with CRMC.

RCE selected the verification team according to its GHG Verification Policies & Procedures to ensure team members are qualified to perform verification activities pertaining to the Project. The Verification team consisted of the following individuals:

Lead Verifier: Samantha Phillips
Team Member: Nina Pinette
Internal Reviewer: Bonny Crews

Prior to verification activities, RCE performed a Conflict of Interest Assessment to determine whether any potential conflicts exist with the project developer. No issues were discovered that would affect the impartiality or independence of the verification team.

RCE held a kickoff call with CRMC on 2 May 2017. The purpose of the kickoff call was to introduce the CRMC personnel and the RCE verification team, review the verification objectives and process, review the VCS requirements, and to confirm the verification schedule.

RCE developed a verification plan and sampling plan that were used throughout the verification of the Project. The plan was created after reviewing the Project Monitoring Report, validated Project Description, and the VCS Standard (Version 3.6). RCE performed a risk assessment based upon the criteria listed above and evidence provided to RCE by CRMC for the current monitoring period.

RCE used the verification plan throughout the monitoring period as a basis for assessing the completeness, consistency, accuracy, and transparency of the Project's GHG emission reductions. RCE conducted a site visit on 11 November 2015 at the Project location in Dartmouth, Massachusetts for the verification of a previous monitoring period as described in Section 2.4.

2.2 Document Review

RCE performed a risk-based analysis of the Project and document sampling in order to verify that the Project is in conformance with all criteria requirements and that the stated emission reductions are materially correct. RCE reviewed the following documents:

- Validated Project Description,
- Validation Report,
- Previous verification report,
- Assertion spreadsheets,
- Monitoring Report #2017 v3 dated 26 May 2017,
- Site Lease Agreement which defines ownership of the emission reductions,
- Air Quality Operating Permit,
- Consent order,
- Calibration records,
- Daily reports,
- Hourly reports,
- Electric invoices,
- Emergency generator logs.

2.3 Interviews

RCE held discussions with the following personnel during the verification process including discussions during the site visit for the verification of the previous monitoring period:

Thomas Yeransian, Principal, CRMC: Thomas is responsible for development and maintenance of the Project Monitoring Report and emission reductions calculations. He was the primary contact during the verification and addressed the corrective action requests (CARs), additional documentation requests (ADRs), and clarification requests (CRs). He also provided a tour of Project equipment and described the processes for maintaining the Project including data collection, equipment calibration checks, and other quality assurance/quality control procedures during the site inspection conducted for the verification of a previous monitoring period.

2.4 Site Inspections

As part of RCE's preliminary risk assessment, RCE determined that a site visit was not required to provide a reasonable level of assurance for the verification of the emission reductions during this

monitoring period as none of the Project equipment had changed since the previous monitoring period. RCE conducted a site visit at the Project location in Dartmouth, Massachusetts for the verification of a previous monitoring period (1 January 2015 – 30 September 2015) on 11 November 2015. The site visit activities included a physical inspection of the Project operations and a review of the Project's information control systems, data handling, QA/QC activities, and equipment calibration schedules. RCE viewed the Project landfill gas (LFG) destruction devices operating during this monitoring period—the four engines—and viewed the monitoring and metering equipment including the new instruments installed to quantify the volume of biogas combusted, as discussed in more detail in Section 3.3 below. During the site visit, RCE discussed the day-to-day operation of equipment, data aggregation and compilation, environmental and regulatory compliance, and emission reduction quantification. RCE confirmed that the day-to-day operations have not changed, but the collection of data for calculating project emissions and initial gas collection system deductions have changed with the new crediting period.

2.5 Resolution of Findings

During the verification process, RCE issued three CARs, three ADRs and four CRs. These requests were documented through RCE's list of findings. CRMC sufficiently addressed all requests as documented in Appendix A.

2.5.1 Forward Action Requests

There are no forward action requests.

2.6 Eligibility for Validation Activities

RCE did not perform validation activities as part of the verification process.

3 VALIDATION FINDINGS

No validation activities took place during the verification of this monitoring period.

3.1 Participation under Other GHG Programs

The Project is registered at the American Carbon Registry (Project ID ACR113). CRMC is not claiming the emission reductions verified for this monitoring period under the ACR or any other registry.

3.2 Methodology Deviations

During the validation of the initial crediting period the following methodology deviations were approved and still apply for the new crediting period:

- The SCADA system was programmed to calculate the methane gas flow in units of million British thermal units (MMBtu) using standardized gas flow (at 68°F and one atmosphere of pressure), methane concentration, the gross heat content (higher heating value) of methane, and the actual temperature and pressure. CNBE determined the volume of methane destroyed by converting the MMBtu values to total methane gas flow in standard cubic feet.
- The Project reference conditions are 20 degrees Centigrade and 1 atmosphere rather than ACM0001 reference conditions of 0 degrees Centigrade and 1 atmosphere.

During the validation of the second crediting period the following methodology deviations were approved and validated. RCE reviewed each methodology deviation and confirmed that the following deviations pertain to the criteria and procedures relating to monitoring and measurement:

- LFG flow is not monitored for each individual destruction device. One flow meter monitors the flare while another single flow meter monitors all the gas going to four engines. Flow controls ensure no LFG is sent to engines that are not operational. This deviation does not impact the conservativeness of the emission reductions.
- The method for calculating ex-ante emission reductions does not use the required CDM estimation tools, but uses historic Project specific data for projecting future emissions. This deviation does not impact the emission reduction calculations.
- Instead of continuously monitoring the gas from the initial gas collection system, a percentage of flow from the initial gas collection system was calculated based on handheld measurements of flow at each wellhead every two weeks. The percentage is then applied to the total LFG for the monitoring period and deducted from claimed emission reductions. This deviation decreases the conservativeness but increases the accuracy of the reductions claimed.
- The Project did not use the CDM default electricity emission factor, but did use the site specific eGRID regional emission factor. This deviation decreased the conservativeness but increases the accuracy of the reductions claimed.

The above deviations applied to the project are valid.

3.3 Project Description Deviations

No project description deviations occurred this monitoring period.

3.4 Grouped Project

The Project is not a grouped project.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

The Project start date is 1 January 2002 and the initial crediting period was from 29 March 2006 to 28 March 2016. The newly validated second crediting period is from 29 March 2016 to 28 March 2026, totaling 10 years. RCE found that the Project was implemented in conformance with the validated Project Description. RCE confirmed that the Project continues to meet the requirements of the VCS Standard version 3.6.

RCE confirmed that there were no changes to the project proponents or other entities involved in the project for this monitoring period. CRMC is identified as the Project Proponent in the Monitoring Report. During verification activities, RCE confirmed that ownership of all emission reduction credits generated by the Project is transferred to Commonwealth New Bedford Energy LLC (CNBE - a wholly owned subsidiary of CRMC). As owner of the associated emission reduction credits and consistent with VCS policy, CNBE/CRMC provided an attestation to RCE stating that the emission reduction credits associated with the Project are only registered with the VCS program.

The data parameters that are recorded in order to calculate emission reductions are included and described in the Monitoring Report and monitoring plan. Flow of landfill gas and ineligible biogas conveyed to the engines is monitored continuously and is recorded on hourly and daily intervals by a custom-built supervisory control and data acquisition system (SCADA). Field checks for flow meter accuracy are conducted on a monthly basis. All field checks during the monitoring period were conducted on the appropriate interval and demonstrated that flow readings were accurate.

Biogas flow is monitored continuously and totalized readings are recorded by CRMC personnel in a spreadsheet at least twice each month. The Flow Sensor was checked monthly per the QA/QC procedures listed in the Monitoring Plan, and all checks indicated that the instrument was reading accurately.

Methane concentration of the LFG and ineligible digester biogas conveyed to the engines is measured continuously using a California Analytical NDIR gas analyzer. Values are recorded in the SCADA system and calculated on hourly and daily intervals. The analyzer is field calibrated using calibration gas on a weekly basis. All field checks during the monitoring period were conducted on the appropriate interval and demonstrated that concentration readings were accurate.

Biogas methane concentration is measured continuously using a Hitech Model IR600 Infrared Gas Analyzer. Average methane readings are recorded by CRMC personnel in a spreadsheet at least twice each month. The analyzer was checked monthly, exceeding the QA/QC procedures listed in the Monitoring Plan as “field calibrated periodically”, and all checks indicated that the instrument was reading accurately.

The wellfield is balanced twice a month, at which time the flow measurements of each individual well is recorded using a handheld GEM2000. The recorded flows are used to calculate the percent contribution of LFG from the initial system. RCE reviewed the most recent calibration certificates, which indicated the instrument was reading accurately during use.

Operating hours for the engines are tracked via the SCADA system. Engine run hours are tracked for each engine separately.

The landfill is not subject to the New Source Performance Standards/Emissions Guidelines as it does not meet the relevant size requirements. Therefore, NMOC emission rate testing is not required for the landfill. Additionally, RCE reviewed the Project's air permit and the EPA ECHO database and found no instances of non-compliance.

4.2 Accuracy of GHG Emission Reduction and Removal Calculations

CRMC calculates the Project's emission reductions in accordance with the equations described in ACM0001. RCE sampled the Project's raw data collected via the SCADA system during the reporting period to ensure the accuracy of reported data and to ensure that there were no transcription errors between data sets. RCE reviewed the CRMC GHG assertion spreadsheet to ensure the accuracy of the formulas, emission factors applied, and functionality of the spreadsheet.

The primary Project data includes the LFG flow to the engines and to the flare (which was not used during this monitoring period), the methane content of the LFG, and temperature of the LFG. CRMC uses these parameters to calculate the amount of methane destroyed by the Project. Flow volume and methane content are based on reference conditions of 68°F and 1atm. RCE verified that the validated oxidation efficiency of the engines was applied in the calculation of emission reductions for this monitoring period.

As described above, the determination of the quantity of eligible LFG destroyed by the project includes an additional step to subtract the ineligible biogas destroyed. CRMC monitors biogas flow and methane content to determine the quantity of ineligible methane destroyed by the Project. Biogas flow volume and methane content are based on reference conditions of 68°F and 1atm, equal to the LFG flow.

Methane destruction in the baseline is calculated by applying the percent contribution of the initial system to the methane destroyed during the monitoring period. This value is subtracted from the quantity of methane destroyed by the project activity.

A 10 percent deduction was applied to the total emission reductions to account for the soil oxidation potential.

Project emissions from the flare were not deducted because the flare did not operate this monitoring period. There were no project emissions from electricity and fossil fuel consumption.

RCE recalculated the emission reductions for the entire monitoring period and found the GHG emission reduction calculations to be in conformance with ACM0001 and the validated Project Description as well as free of material misstatement.

4.3 Quality of Evidence to Determine GHG Emission Reductions and Removals

CRMC provided adequate documentation for the emission reduction calculations as well as its information control systems and data management processes. RCE reviewed the Project's Monitoring Report, instrumentation calibration documentation, raw data, and all emission reduction calculations. Additionally, RCE interviewed Project personnel during the site visit for the verification of a previous monitoring period and over the phone for this monitoring period to assess their understanding of the

Project equipment and data outputs including data management. Metered data is collected and recorded by the SCADA system which creates a Microsoft Excel file that contains the hourly and daily totals of LFG flow, heat value, methane content, engine operating hours, engine gross power output, and engine net power output. The file is automatically saved on the system computer and can be accessed remotely or at the Project. RCE reviewed samples of these daily files as well as monthly summaries.

RCE found the information provided to be transparently documented and in accordance with the validated Project Description and requirements of ACM0001 with the exceptions of the deviations noted in Section 4.1 above.

4.4 Non-Permanence Risk Analysis

Not applicable.

5 SAFEGUARDS

5.1 No Net Harm

Not applicable.

5.2 Local Stakeholder Consultation

Not applicable.

6 VERIFICATION CONCLUSION

RCE conducted a risk-based analysis of the Greater New Bedford LFG Utilization Project including a strategic review of the Project data, documentation, and emission reduction calculations. RCE concludes to a reasonable level of assurance that the GHG assertion is free of material misstatement. The emission reductions resulting from avoided emissions of methane for the monitoring period 1 July 2016 to 30 April 2017 can be considered in conformance with the:

- Verified Carbon Standard version 3.6 (19 October 2016),
- Clean Development Mechanism methodology ACM0001, Consolidated baseline and monitoring methodology for landfill gas project activities, Version 16, and
- Validated VCS Project Description, 12 May 2016.

Verification period: From 1 July 2016 to 30 April 2017
Verified GHG emission reductions and removals in the above verification period:

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
7/1/16 – 12/31/16	45,697	0	0	45,697
1/1/17 – 4/30/17	27,799	0	0	27,299
Total	73,496			73,496

7 LEAD AUDITOR SIGNATURE

Samantha Phillips
Staff Environmental Scientist

8 INTERNAL REVIEWER SIGNATURE

Bonny Crews
Senior Environmental Scientist

APPENDIX A: VERIFICATION FINDINGS

Corrective Action Requests (CAR), Additional Documentation Requests (ADR), and Clarification Requests (CR)		
ID #	Action Item	Resolution
CAR 1	The following errors are in the Monitoring Report: a. Section 1.6 - The end date of the second crediting period does not match the validated PDD b. Section 1.9 - Information about renewable energy credits should be included in this section c. Section 4.1 - Fraction of total LFG collected attributable to District Initial System is not updated for this RP d. Section 4.1 - $EF_{EL,Grid,y}$ is not updated for this RP e. Section 5.4 – The template table is not being used to report the emissions reductions. Note – The sections seemed to get off between 3.1 and 4.1	5/26/17: a. The end date of the crediting period has been corrected. b. Information about renewable energy credits was included. c. The fraction of LFG from the initial system was updated. d. The eGrid emissions factor was updated. e. The template table is being used to report emission reductions. Additionally, the sections were corrected.
CAR 2	The total flow for April is incorrect. The biogas flow for April is not linked to the CRMCB data tab, thus the calculated LFG flow is incorrect.	5/26/17: CRMC corrected the LFG flow for April.
CAR 3	Based on the information provided RCE calculated the fraction of total LFG from the initial system to be 5%.	5/26/17: CRMC updated the fraction of gas from the initial system to be from April to March.
CAR 4	In the Daily Reports spreadsheet, Cell T257 of the CRMCB data tab, the summation formula is including one extra cell (S236).	6/13/17: CRMC has chosen to ignore this finding because it conservatively deducts more biogas from the total LFG reductions and results in <0.003% error in overall emission reductions.
ADR 1	Please provide the final calculation spreadsheet. Based on the spreadsheet you provided last RP, I think it might be call "CNBE VCS calc 1Jul2016-30Apr2017".	5/26/17: The emission reduction calculation spreadsheet called "CNBE VCS calc 01July2016-30April2017" was provided.
ADR 2	Please provide the Landtec calibration certificates for the GEM2000 And GEM5000 that were used to measure the gas from the initial system.	5/26/17: CRMC provided the calibration certification for the GEM2000. The GEM2000 was the only instrument used during the reporting period.

ADR 3	Please provide the Emergency Generator Log Sheet.	5/26/17: CRMC provided the Emergency Generator Log Sheet.
CR 1	Please provide an update on the current status of the consent order ACOP-SE-16-7001.	5/26/17: The facility returned to compliance according the MA DEP letter dated February 6, 2017.
CR 2	Please confirm that the project did not receive any new notices of violation for this reporting period.	5/26/17: CRMC confirmed that the project did not receive and NOVs during the reporting period.
CR 3	Please confirm that there have been no changes to the landfill's design capacity for solid waste disposal and that the landfill is still under the NSPS threshold.	5/26/17: CRMC confirmed there have been no changes to the landfill design capacity and that the landfill is still under the NSPS threshold.
CR 4	Please confirm that the table on the provided electric bill is the KWH usage from 4/16-4/17.	5/26/17: CRM confirmed that the table on the provided electric bill is the KWH usage from 4/16-4/17