Monitoring report form for CDM project activity
(Version 07.0)

Complete this form in accordance with the instructions attached at the end of this form.

MONITORING REPORT		
Title of the project activity	Manaus Landfill Gas Project	
UNFCCC reference number of the project activity	4211	
Version number of the PDD applicable to this monitoring report	03.1	
Version number of this monitoring report	1	
Completion date of this monitoring report	09/10/2019	
Monitoring period number	Second monitoring period	
Duration of this monitoring period	From 01/02/2019 to 30/09/2019 (both days included)	
Monitoring report number for this monitoring period	1	
Project participants	Conestoga Rovers e Associados Engenharia Ltda. (Brazil) Nordic Environment Finance Corporation (Norway)	
Host Party	Brazil	
Applied methodologies and standardized baselines	ACM0001: Flaring or use of landfill gas (version 18.0)	
Sectoral scopes	1 - Energy industries (renewable / non renewable sources) 13 - Waste handling and disposal	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	0	215,651 tCO_2e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	380,905 tCO_2e	

SECTION A. Description of project activity

A.1. General description of project activity

The Manaus Landfill Gas Project has been developed at the Manaus Landfill (Site), originally called the Aterro Municipal de Manaus. The Site has received non-hazardous solid municipal, industrial, commercial, institutional, and some agricultural wastes for approximately 20 years. Landfills normally emit carbon dioxide (CO_2) and methane (CH_4) into the atmosphere, with these compounds being generated by the anaerobic decomposition of the above-noted wastes placed at the project site. Prior to the implementation of the Project, the Manaus landfill was basically a landfill with has minimal control of surface water and leachate and no control of landfill gas (LFG).

Purpose of the Project Activity

The purpose of the project activity is to collect landfill gas (LFG) at the Manaus Landfill and combust the extracted LFG over a seven year-period, using a high efficiency enclosed flare, thereby reducing greenhouse gas emissions (GHG) and generating Certified Emission Reductions (CERs).

Installed Technology and Equipment

The project involved the construction of a LFG collection system consisting of horizontal trenches and vertical LFG extraction wells, centrifugal blower(s), and all other supporting mechanical and electrical subsystems and appurtenances necessary to collect the LFG.

The LFG collected from the Site is combusted in an enclosed LFG flare with full process controls and instrumentation installed and operating. The state-of-the-art flare is capable of providing sufficient temperature and retention time of the extracted LFG for complete destruction of hydrocarbons.

Relevant dates for the project activity

Conestoga-Rovers & Associates (CRA) started design activities in late 2005 and construction works started in October 2008. The project was ready for commissioning in July 2009.

The project activity was renewal on October 04, 2018. Thus, the second crediting period is from July 08, 2018 to July 07, 2025. ‘

Total GHG emission reductions achieved in this monitoring report

The Certified Emission Reductions (CERs) volume claimed for the monitoring period extending from February 01, 2019 to September 30, 2019[1] is 215,651tCO_2e.

A.2. Location of project activity

The project activity takes places in Manaus Landfill, located in the city of Manaus, capital of Amazonas state, at the geographical coordinates 2º57'29.92''S and 60º00'54.74''W. The project site is located at Km 19 of Highway AM-010. The Manaus Landfill covers 60 hectares (ha) area and the current waste filling area has 41 ha, with available space for continued filling.

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (Host Party)	Conestoga Rovers e Associados Engenharia Ltda. (Private Entity)	No
Norway	Nordic Environment Finance Corporation (Private Entity)	No

A.4. References to applied methodologies and standardized baselines

The approved baseline and monitoring methodology applied to this project is the approved ACM0001 version 18 – Flaring or use of landfill gas[2].

This methodology also refers to the following tools:

- TOOL02 - Combined tool to identify the baseline scenario and demonstrate additionality (version 07.0)[3];
- TOOL03 - Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (version 03)[4].
- TOOL04 - Emissions from solid waste disposal sites (version 08.0)[5];
- TOOL05 - Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (version 03.0)[6];
- TOOL06 - Project emissions from flaring (version 02.0.0)[7];

[1] Both days included.

[2] Available at: <https://cdm.unfccc.int/methodologies/DB/Y88077XT5O83TZ2PYEZ36LFIAMAODR>.

[3] Available at: <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v7.0.pdf>.

[4] Available at: <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v3.pdf>.

[5] Available at: <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-04-v8.0.pdf>.

[6] Available at: <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf>.

[7] Available at: <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v2.0.pdf>.

- TOOL08 - Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0)[8];
- TOOL09 - Determine the baseline efficiency of thermal or electricity energy generation systems (version 02.0)[9];
- TOOL10 - Tool to determine the remaining lifetime of equipment (version 01)[10];
- TOOL11 - Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period (version 03.0.1)[11];
- TOOL12 - Project and leakage emissions from transportation of freight (version 01.1.0)[12].

While applying the methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”, the “Tool to calculate the emission factor for an electricity system” (Version 06.0)[13] was also considered to the project activity.

Since this PDD refers to the second crediting period of Manaus project, the “Tool for the demonstration and assessment of additionality” and the “Combined tool to identify the baseline scenario and demonstrate additionality” are not applicable.

The tool “Project and leakage emissions from transportation of freight” is also not applied to Manaus project, since there are no GHG emissions from transportation of freight in the project boundary.

A.5. Crediting period type and duration

The second crediting period for this project is from 08/07/2018 to 07/07/ 2025 (7 years renewable). This is the 02nd monitoring period corresponding to 01/02/2019 to 30/09/2019[1].

SECTION B. Implementation of project activity

Description of implemented project activity

The Project consists of two phases: (1) the construction of a LFG collection and flaring system and (2) the construction of a LFG-fired power.

The technology used to gather the LFG is a grid of horizontal gas extraction wells within the landfill, connected to a centralized blower system used to induce vacuum. Upon collection of the LFG, the methane component of the LFG is combusted in a state-of-the-art high-efficiency enclosed flare.

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[8] Available at: <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-08-v3.0.pdf>.

[9] Available at: <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-09-v2.0.pdf>.

[10] Available at: <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf>.

[11] Available at: <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf>.

[12] Available at: <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-12-v1.1.0.pdf>.

[13] Available at: <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v6.pdf>.

The Global Warming Potential (GWP) of the LFG is reduced by the destruction of the methane portion of the LFG.

The LFG management system is comprised of the following three major components:

1. LFG management facility - houses mechanical and electrical components required for the extraction and delivery of LFG for disposal by flaring
2. LFG collection field - removes LFG from the wastes within the limit of waste and includes trenches and collection piping to convey LFG from the field to the LFG management facility
3. Condensate management system - removes liquid condensate from the LFG collection system and directs the condensate to the leachate collection system.

There are two blowers working in the system, they are responsible to give negative pressure to the landfill. Each blower has maximum capacity to 4,800 SCFM.

The destruction of methane content in the LFG is made via enclosed flare, in order to assure a higher methane destruction. The flare used is manufactured by John Zink (imported from USA). The capacity is 4,800 SCFM.

The power generation facility will be comprised of LFG engine generator sets of high performance standards. The engine-generator sets will be the primary equipment to combust the collected LFG once they are installed. A fraction of the collected LFG will be diverted to flares, which will be used to combust any gas in excess of the fuel demand for the engines, as well as a contingency backup.

The design for the overall landfill gas (LFG) management system for the Site was completed by Conestoga-Rovers & Associates (CRA) from late 2005 to mid-2006. Construction of the LFG management system commenced in early 2008, and the facility was commissioned in 2009.

Accordingly, to the completeness check, the official registration date was on July 8, 2011. Since the project registration date, efforts have been made to establish a formal power purchase agreement suitable for long term electrical utilization of the LFG. However, the Brazilian energy scenario has changed in recent years, with the final price of energy sales dropping a lot. Consequently, the interested investors declined. But, CRA continues to seek interested parties to concretize Phase 2 of the project.

To date there has been ten issuances of CERs, as follows:

Verification N	Monitoring Period	CERs	Date of Issuance
First	July 8, 2011 to October 31, 2011	53,283 tCO_2e	Oct 30, 2012
Second	November 1, 2011 to January 31, 2013	398,522 tCO_2e	Aug 12, 2013
Third	February 1,2013 to December	374,294 tCO_2e	June 20, 2014

	31, 2013		
Fourth	January 1,2014 to June 30, 2014	208,853 tCO_2e	November 13, 2014
Fifth	July 1,2014 to December 31, 2014	274,491 tCO_2e	May 29, 2015
Sixth	January 1,2015 to June 30, 2015	270,484 tCO_2e	December 11, 2015
Seventh	July 1, 2015 to December 31, 2015	233,240 tCO_2e	June 01, 2016
Eighth	January 1,2016 to June 30, 2016	231,011 tCO_2e	November 04, 2016
Ninth	July 1, 2016 to December 31, 2016	232,698 tCO_2e	July 05, 2017
Tenth	January 1, 2017 to June 30, 2017	257,866 tCO_2e	December 12, 2017
Eleventh	July 1, 2017 to December 31, 2017	275,145 tCO_2e	June 07, 2018
Twelfth	January 1, 2018 to July 07, 2018	262,875 tCO_2e	March 28, 2019
TOTAL CERs ISSUED		**3,073,358 tCO_2e**	

During the current monitoring period February 01, 2019 to September 30, 2019[1], there have been the following major maintenance activities:

Description	**Date of maintenance activity/ interruption**	**Period**	**Description**
Blower Maintenance	February 22, 2019	7:40 am to 5:00 pm	The system was not operating
FAU TDL installation	March 19, 2019 to March 21, 2019	7:00 am to 5:00 pm	The system was not operating
Biogas generator installation	May 26, 2019	3:00 pm to 5:00 pm	The system was not operating

During the current monitored period the system went down a few times. Reports describing actions taken by the project operator to solve the issues are available with Project Participants and were provided to the DOE. It is also worth mentioning that no CERs are being claimed for emissions reductions occurring under the circumstances like high electrical discharge in the system.

There were no events or situations occurred during the monitoring period that may impact the applicability of the applied methodology.

B.1. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents

Temporary deviation from the registered monitoring plan, and well the applied methodology, has been requested in the previous monitoring period (July 08, 2018 to January 31, 2019) and applied from February 01, 2019 to March 20, 2019. The deviation is necessary since the system, which measures parameters such as methane (CH_4) concentration, flare temperature, flame detection ($Flame_m$) and landfill gas flow on a continuous-basis of the residual gas, is not operational with data every minute yet due financials difficult.

The equipment (FAU-TDL) took place in March 19th, 2019. In addition, the system has been adapted to read the parameters every minute since March 21, 2019.

According to the guidance of the "CDM project standard for project activities" version 02.0:

If the project participants are temporarily unable to monitor the registered CDM project activity in accordance with the monitoring plan in the registered PDD (hereinafter referred to as the registered monitoring plan), the applied methodologies, the applied standardized baselines or the other applied methodological regulatory documents, the project participants shall describe the nature, extent and duration of the non-conforming monitoring period in the monitoring report, and:

(a) Propose alternative monitoring arrangements for the non-conforming monitoring period. In this case, the project participants shall apply conservative assumptions or discount factors to the calculations to the extent required to ensure that GHG emission reductions or net anthropogenic GHG removals will not be overestimated as a result of the deviation; or

(b) Apply the following most conservative values approach when alternative monitoring arrangements are not proposed. This does not require approval by the Board:

(i) Apply zero for baseline GHG emissions for the entire non-conforming monitoring period; and/or

(ii) Apply the values assuming that the source of GHG emissions is operated at the maximum capacity for the entire non-conforming monitoring period. In the case of project GHG emissions related to the consumption of electricity, add 10 percent to account for transmission and distribution losses.

From February 01, 2019 to March 20, 2019 of this monitoring period, the parameters temperature of the flare ($T_{EG.m}$), flow rate of the residual gas to the flare ($F_{RG,m}$) and Flame detection were

registered every two minutes instead on a minute basis as required by Methodological tool Project emissions from flaring (Version 02.0.0).

According to CDM Project Standard for Project Activities version 02.0, paragraph 231 and in order to apply conservative assumptions or discount factors to the calculations to the extent required to ensure that emission reductions will not be overestimated as a result of the temporary deviation for the monitoring period between 01/02/2019 and 20/03/2019, the conservative procedure will be elaborated as follows:

- The deviation will use the default value for the flare efficiency, considering option A of the tool “Project emissions from flaring”;
- In order to apply conservative assumptions to ensure that the emission reductions not increase, the efficiency of the flare cannot exceed 90% (default value, as described in the PDD); if higher, the value adopted is 90%;
- Also, in a conservative way, for the flow rate of the residual gas to the flare ($F_{RG,m}$) the value applied considered two situations:
    - If the flow rate of the residual gas to the flare monitored by the PP is below of the value determined by the manufacturer’s specification (maximum flow 5,150 Nm^3/h), then the monitored value will be considered;
    - If the flow rate of the residual gas to the flare monitored by the PP is above of the value determined by the manufacturer’s specification (maximum flow 5,150 Nm^3/h), then the value of 5,150 Nm^3/h will be considered.

B.2.2. Corrections

No corrections were made during this crediting period.

B.2.3. Changes to the start date of the crediting period

There are no changes to the start date of the crediting period that have been approved during this period or submitted with this monitoring report.

B.2.4. Inclusion of monitoring plan

There is no inclusion of a monitoring plan to the registered PDD that was not included at registration.

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

There are no changes from registered monitoring plan, applied methodology or applied standardized baseline that have been approved during this monitoring period or submitted with this monitoring report.

B.2.6. Changes to project design

There are no changes to the project design of the project activity that have been approved during this monitoring period or submitted with this monitoring report.

B.2.7. Changes specific to afforestation or reforestation project activity

Not applicable

SECTION C. Description of monitoring system

The approved monitoring methodology applied to this project activity is the ACM0001 version 18 – Flaring or use of landfill gas, the applicable tools, as well as per the CDM Project Standard for Project Activity[14].

All continuously measured parameters (LFG flow, CH4 concentration, flare temperature, flare operating hours, engine operating hours, and engine electrical output) are recorded electronically via a datalogger, located within the site boundary which have the capability to aggregate and print the collected data at the frequencies as specified above. It is the responsibility of the Site Operator to provide all requested data logs which is stored over the duration of the reporting period at the Site office. The data logs are summarized into emission reduction calculation summaries prior to each verification. This task is completed by CRA and reported directly to the DOE. These logs are available as required by the DOE in order to prove the operational integrity of the Project.

The LFG monitoring program is designed to collect system operating data required to safely and effectively operate the system as required for the verification of CERs. This data is collected in real time, and provides a continuous record that is easy to monitor, review, and verify.

The monitoring methodology is based on the direct measurement of the quantity of LFG captured and destroyed by the LFG management system. The actual tonnage of methane emissions reduced by the project is calculated based on the flow rate of the LFG, methane concentration, and destruction efficiency of the combustion equipment. The monitoring plan provides for the continuous measurement of LFG quantity and quality using a continuous flow meter, an online LFG and a flare emissions analyser.

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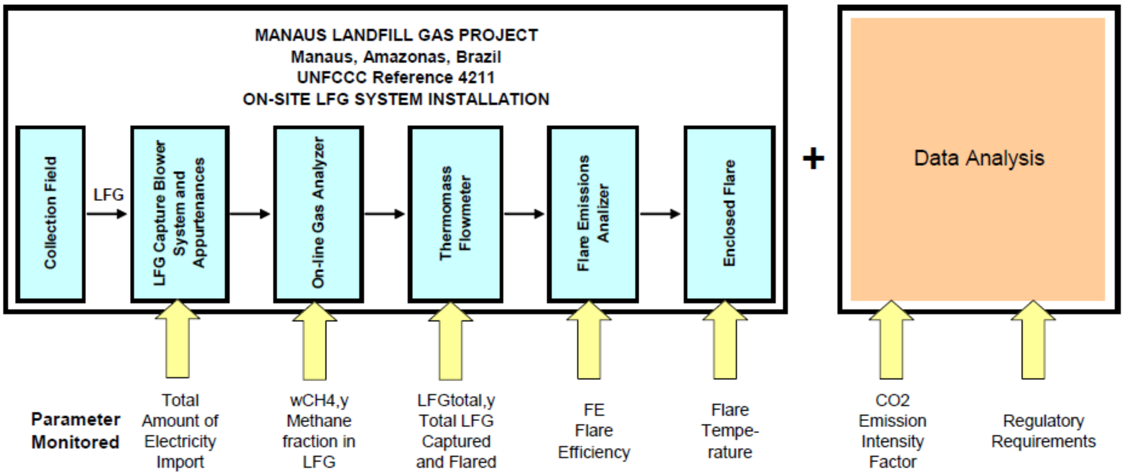
[14] It’s important to mention that during the monitoring period there was no monitoring per minute.



Flow measurement

Following ACM0001, one flow meter was installed during Phase 1 (flaring) on the piping, straight before the flares. The flow of LFG collected by the system and subsequently utilized or flared are measured via individual flow measuring devices suitable for measuring the velocity and volumetric flow of a gas. One common example is an annubar. The flow measurements are taken within the piping itself, and the flow sensors are connected to transmitters that are capable of collecting and sending continuous data to a recording device such as a datalogger.

The flow sensors are calibrated according to a specified temperature and composition of the gas, thus the flow actually measured must be corrected to according to actual temperature, pressure, and composition, thus density, of the gas measured. The equipment selected allows dynamic compensation for these parameters, normalized to a standard temperature, pressure, and gas composition. For reporting purposes, the flows are generally required to be normalized to 0°C and 1.01325 bar at standard gas composition of 50% methane and carbon dioxide each by volume. The accuracy of a flow meter is dependent on the design of the equipment, and the specific type of sensor used, however equipment is available that will provide a minimum accuracy of +/- 2% by volume. The equipment selected for the site utilizes a continuous monitoring system as defined in ACM0001, which measures once every minute and aggregates flow data approximately once every hour.

All data that is collected is recorded for the permanent record. Both electronic and hard copies of the data are maintained for auditing purposes and for use in the calculation of CERs.

Gas quality

The two parameters that are most pertinent to the validation of CERs, as well as the safe and efficient operation of the system are the concentration of methane and oxygen in the gas stream delivered for utilization or diverted to flaring. These two parameters are measured via a common sample line that is run to the main collection system piping, and measured in real time by two

separate sensors, one each for methane and oxygen, installed as per ACM0001. Regular calibration of the equipment is especially important, as the accuracy of the methane and oxygen sensors is greatest within the expected range of the gas stream to be measured. Equipment is readily available that will provide an accuracy of at least +/- 1% by volume. The equipment selected for the site aggregates gas compositions approximately once every 1 minute as per the definition of a continuous monitoring system in ACM0001.

Emission reduction calculations

Guidelines and directives in order to standardize the data acquisition and handling processes are in place for calculating the generation of Certified Emission Reductions (CERs) for the project. The Site uses a Landtec™ data acquisition device [Field Analytical Unit – (FAU)], which measures parameters such as methane (CH_4) concentration, flare temperature, and landfill gas flow on a continuous-basis of the residual gas. A Flare Emission Analyzer (FEA) monitors the CH_4 and O_2 content in the Flare gas exhausted. The data is collected and stored on-site using a Field Server Unit (FSU), which also sends the data to a Landtec server in California (USA) for off-site storage and back-up. Through the EnviroComp Report Service (ECRS), the data is viewed and downloaded to a spreadsheet file for further analysis.

A series of procedures are in place to retrieve and store the data, and set up tables and reports for the verification events. Based on operational data and the applicable monitoring methodology, the emission reductions are calculated on a monthly basis and compiled in a monitoring report during a verification exercise.

Data collection and record keeping

The monitoring methodology requires the continuous measurement of the quantity and quality of the LFG being flared and the quality of exhaust gas from the flare. Data collected from each of the parameter sensors is transmitted directly to an electronic database from which the CER volume calculations may be carried out. A hard copy backup or reports of the data may be printed as required or recorded in Portable Document Format (PDF). Backup of the electronic data is conducted on a 1 minute intervals.

A summary of all data collection and reporting requirements, as listed in the UNFCCC ACM0001 (version 18) monitoring methodology, and a summary of on-site monitoring responsibilities and frequencies are provided below.

SUMMARY OF SITE MONITORING RESPONSIBILITIES
Landfill Gas Development Project
Manaus Landfill
Manaus, Amazonas, Brazil

Project Activity	*Equipment*	*Personnel*	*Responsibilities*	*Frequency*
Quantity of LFG Captured	Flow Meter	Site Operator	* Verify the flow meter and FSU are operating correctly and collecting gas flow rate data continuously	Daily
Methane Fraction in LFG	Gas Analyser	Site Operator	* Verify the FAU and FSU are operating correctly and collecting gas composition data continuously	Daily
Flare Efficiency	Emissions Gas Analyser	Site Operator	* Verify the FEA and FSU are operating correctly and collecting exhausted gas composition data continuously	Daily
Flare Operation Time	Flare Stack	Site Operator	* Verify the FSU is recording the flare temperature on a continual basis	Daily
			* Follow operation and maintenance requirements as outlined in the Operation and Maintenance Report	Daily
Amount of Electricity Used	n/a	Site Operator	* Collect all Electricity bills and file on-Site and to office.	Monthly

Emergency procedures

As a precautionary measure, the Landtec system is plugged to a battery-based uninterruptible power supply (UPS) to avoid data loss due to power failures. As a backup is produced and stored off-site from the main recording system, no more than 1 minute of data at a time would ever be lost due to a system malfunction.

All data is collected through a Landtec Field Analytical Unit (FAU) and will be transmitted to a Landtec Field Server Unit (FSU), which records the data on-site and automatically sends it via an "always-on" Internet connection to an off-site server for storage and off-site back-up. All collected data is available for viewing, report generation, and retrieval through a Web interface, the EnviroComp™ Reporting System (ECRS), which can be accessed from anywhere an Internet connection is available. The plant Manager checks daily the records. In addition, was developed an Emergency Plan including others types of emergencies such as fire and work accidents.
In addition to the previous monitoring practices, the Project Participant keeps records of sustainable development parameters to monitor benefits the project activity is having in the area. Amongst these monitored parameters are:

- record keeping of job creation: includes number of employees hired and definition of responsibilities of employees working at the LFG collection system plant;
- tracking of odour complaints (dealt with by landfill operator): for this monitoring period there were no complaints during February 01 to September 30, 2019;
- subsurface migration of LFG is monitored on a monthly basis through monitoring rounds of the applied vacuum on the collection field. Negative pressure readings indicate the gas is being collected by the combustion system avoiding LFG migrating to the surroundings;
- training records of personnel: meetings are performed on site for training and communication purposes, attendees include field, administrative and technical personnel from CRA;

Income generation: as part of the agreement with the landfill operator (City of Manaus agency), a portion of CERs generated each verification period is transferred to them as royalties.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

ACM0001: Flaring or use of landfill gas

Data/Parameter	OX_{top_layer}
Unit	Dimensionless
Description	Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline
Source of data	Consistent with how oxidation is accounted for in the methodological tool “Emissions from solid waste disposal sites”
Value(s) applied	0.1
Choice of data or measurement methods and procedures	Default value used, according to ACM0001
Purpose of data/parameter	Baseline emission calculations
Additional comments	-

Data/Parameter	η_{PJ}
Unit	Dimensionless
Description	Efficiency of the LFG capture system that is be installed in the project activity
Source of data	Flare manufacturer and company which has been responsible for assembly and testing of the equipment at the landfill site
Value(s) applied	80%
Choice of data or measurement methods and procedures	Based on the active LFG capture system installed in the project activity
Purpose of data/parameter	Calculation of baseline emission
Additional comments	-

Project emissions from flaring

Data/Parameter	GWP_{CH4}
Unit	tCO_2e/tCH_4
Description	Global warming Potential of CH_4
Source of data	IPCC
Value(s) applied	25. Updated for the 2nd commitment period according to COP/MOP decisions
Choice of data or measurement methods and procedures	Default value used, according to IPCC Fourth Assessment Report: Climate Change 2007, item 2.10.2: Direct Global Warming Potentials, Table 2.14
Purpose of data/parameter	Calculation of baseline emission
Additional comments	-

Data/Parameter	$SPEC_{flare}$
Unit	Temperature - ºC Flow rate – Nm^3/h Maintenance schedule – number of days
Description	Manufacturer's flare specifications for temperature, flow rate and maintenance schedule
Source of data	Flare manufacturer
Value(s) applied	-
Choice of data or measurement methods and procedures	<table><tr><td>Flare model</td><td>ZTOF® Enclosed – John Zink</td></tr><tr><td>Minimum flare temperature</td><td>760 ºC</td></tr><tr><td>Maximum flare temperature</td><td>982 ºC</td></tr><tr><td>Minimum and maximum inlet flow rate</td><td>Minimum flow: 858 Nm³/h Maximum flow: 5,150 Nm³/h</td></tr><tr><td>Maximum duration in days between maintenance events</td><td>N/A</td></tr></table>
Purpose of data/parameter	Calculation of project emission
Additional comments	-

Tool to determine the mass flow of greenhouse gas in a gaseous stream

Data/Parameter	R_U
Unit	$Pa.m^3/kmol.K$
Description	Universal ideal gas constant
Source of data	Methodological "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" version 03.0
Value(s) applied	8,314
Choice of data or measurement methods and procedures	Default value used, according to methodological tool "Project emissions from flaring" version 02.0.0, table 1: Constants used in equations
Purpose of data/parameter	Baseline emission calculations
Additional comments	-

Data/Parameter	MM_i
Unit	kg/kmol
Description	Molecular mass of greenhouse gas i
Source of data	"Tool to determine the mass flow of a greenhouse gas in a gaseous stream"

Value(s) applied	Compound / Structure / Molecular mass (kg/kmol) Methane / CH_4 / 16.04
Choice of data or measurement methods and procedures	According to “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”
Purpose of data/parameter	Baseline emission calculations
Additional comments	-

Data/Parameter	MM_k
Unit	kg/kmol
Description	Molecular mass of gas k
Source of data	“Tool to determine the mass flow of a greenhouse gas in a gaseous stream”
Value(s) applied	Compound / Structure / Molecular mass (kg/kmol) Nitrogen / N_2 / 28.01
Choice of data or measurement methods and procedures	According to “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”
Purpose of data/parameter	Baseline emission calculations
Additional comments	-

Data/Parameter	MM_{H20}
Unit	kg/kmol
Description	Molecular mass of water
Source of data	“Tool to determine the mass flow of a greenhouse gas in a gaseous stream”
Value(s) applied	18.0152
Choice of data or measurement methods and procedures	According to “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”
Purpose of data/parameter	Baseline emission calculations
Additional comments	-

Data/Parameter	P_{ref}
Unit	Pa
Description	Atmospheric pressure at reference conditions
Source of data	“Tool to determine the mass flow of a greenhouse gas in a gaseous stream”
Value(s) applied	101,325
Choice of data or measurement methods and procedures	Default value extracted from “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”
Purpose of data/parameter	Project emission calculations
Additional comments	-

Data/Parameter	T_{ref}
Unit	K
Description	Temperature at reference conditions

Source of data	“Tool to determine the mass flow of a greenhouse gas in a gaseous stream”
Value(s) applied	273.15
Choice of data or measurement methods and procedures	Default value extracted from “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”
Purpose of data/parameter	Project emission calculations
Additional comments	-

Emissions from solid waste disposal sites

Data/Parameter	$\varphi_{default}$
Unit	-
Description	Default value for the model correction factor to account for model uncertainties
Source of data	Tool “Emissions from solid waste disposal sites”
Value(s) applied	0.75
Choice of data or measurement methods and procedures	According to “Emissions from solid waste disposal sites”, the Application A was used because the landfill is an existing solid waste disposal site and in the project activity the methane emissions are being mitigated by capturing and flaring the methane (ACM0001)
Purpose of data/parameter	Baseline emission calculations
Additional comments	-

Data/Parameter	**OX**
Unit	-
Description	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data	Based on an extensive review of published literature on this subject, including the IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.1
Choice of data or measurement methods and procedures	Default value used according to Tool “Emissions from solid waste disposal sites”
Purpose of data/parameter	Baseline emission calculations
Additional comments	When methane passes through the top-layer, part of it is oxidized by methanotrophic bacteria to produce CO2. The oxidation factor represents the proportion of methane that is oxidized to CO2.This should be distinguished from the methane correction factor (MCF) which is to account for the situation that ambient air might intrude into the SWDS and prevent methane from being formed in the upper layer of SWDS

Data/Parameter	**F**
Unit	-
Description	Fraction of methane in the SWDS gas (volume fraction)
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.5
Choice of data or measurement methods and procedures	Default value used according to Tool “Emissions from solid waste disposal sites”

Purpose of data/parameter	Baseline emission calculations
Additional comments	Upon biodegradation, organic material is converted to a mixture of methane and carbon dioxide

Data/Parameter	**$DOC_{f,\ default}$**
Unit	Weight fraction
Description	Default value for the fraction of degradable organic carbon (DOC) in MSW that decomposes in the SWDS
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.5
Choice of data or measurement methods and procedures	The default value was used for type Application A). according to Tool “Emissions from solid waste disposal sites”
Purpose of data/parameter	Baseline emission calculations
Additional comments	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, in the SWDS. This default value can be used for Application A

Data/Parameter	**$MCF_{default}$**
Unit	-
Description	Methane correction factor
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value(s) applied	1.0
Choice of data or measurement methods and procedures	The project activity is an anaerobic managed solid waste disposal site with controlled placement of waste (i.e. waste directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and is include: (i) cover material; (ii) mechanical compacting and (iii) levelling of the waste
Purpose of data/parameter	Baseline emission calculations
Additional comments	-

Data/Parameter	**DOC_j**	
Unit	-	
Description	Fraction of degradable organic carbon in the waste type j (weight fraction)	
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)	
Value(s) applied	**Waste type j**	**DOCj (% wet waste)**
	Wood and wood products	43%
	Pulp, paper and carboard (other than sludge)	40%
	Food, food waste, beverages and tobacco (other than sludge)	15%
	Textiles	24%
	Garden, yard and park waste	20%
	Glass, plastic, metal, other inert waste	0%

Choice of data or measurement methods and procedures	IPCC default value for municipal solid waste (MSW) disposal site is applied
Purpose of data/parameter	Baseline emission calculations
Additional comments	-

Data/Parameter	**k_j**
Unit	1/yr
Description	Decay rate for waste type j
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	see table below
Choice of data or measurement methods and procedures	IPCC default value for anaerobic managed solid waste disposal site is applied.
Purpose of data/parameter	Baseline emission calculations
Additional comments	Used for projection of methane avoidance. The Brazil's climate database was provided by EMBRAPA, and historical data from 1961 to 1990 for the municipality of Manaus was used

Waste type j		**Tropical (MAT > 20º C)**
		Wet (MAP > 1,000mm)
Slowly degrading	Pulp, paper, cardboard (other than sludge), textiles	0.07
Slowly degrading	Wood, wood products and straw	0.035
Moderately degrading	Other (non-food) organic putrescible garden and park waste	0.17
Rapidly degrading	Food, food waste, sewage sludge, beverages and tobacco	0.40

Data/Parameter	**Waste composition**
Unit	%
Description	Waste composition
Source of data	Landfill internal data
Value(s) applied	see table below

Composition of waste	
A) Wood and wood products	6.31%
B) Pulp, paper and carboard (other than sludge)	23.47%
C) Food, food waste, beverages and tobacco (other than sludge)	35.84%
D) Textiles	0.00%
E) Garden, yard and park waste	0.00%
F) Glass, plastic, metal, other inert waste	34.39%

Choice of data or measurement methods and procedures	Internal report
Purpose of data/parameter	Baseline emission calculations
Additional comments	Used for projection of methane avoidance

Tool to calculate the emission factor for an electricity system

Data/Parameter	**$EF_{grid,BM,2016}$**
Unit	tCO_2/MWh
Description	Build margin emission factor for the grid in year y
Source of data	Brazilian DNA. Available at: <http://www.mctic.gov.br/mctic/opencms/textogeral/emissao_despacho.html>
Value(s) applied	0.1581 (*ex ante* estimate for year 2016)
Choice of data or measurement methods and procedures	The ex-ante calculation vintage of this parameter was chosen as per the procedures of the “Tool to calculate the emission factor for an electricity system”
Purpose of data/parameter	Project emission calculations
Additional comments	For methodological choices details, please refer to Appendix 4 of the registered PDD

Data/Parameter	**$EF_{grid,OM-adj,y}$**
Unit	tCO_2/MWh
Description	Simple adjusted operating margin CO_2 emission factor in year y
Source of data	Brazilian DNA. Available at: <http://www.mctic.gov.br/mctic/opencms/textogeral/emissao_ajustado.html>
Value(s) applied	0.4979
Choice of data or measurement methods and procedures	The ex-ante calculation vintage of this parameter was chosen as per the procedures of the “Tool to calculate the emission factor for an electricity system”
Purpose of data/parameter	Project emission calculations
Additional comments	For methodological choices details, please refer to Appendix 4 of the registered PDD

D.2. Data and parameters monitored

Baseline, project and/or leakage emission from electricity consumption and monitoring of electricity generation

Data/Parameter	**TDL_y**
Unit	-
Description	Average technical transmission and distribution losses in the grid in year *y* for the voltage level at which electricity is obtained from the grid at the project site
Measured/calculated/ default	Default
Source of data	Brazilian Energy Balance 2019 - Síntese do Relatório Final (base year 2018)

Value(s) of monitored parameter	15.9% http://www.epe.gov.br/sites-pt/publicacoes-dados-abertos/publicacoes/PublicacoesArquivos/publicacao-377/topico-470/Relat%C3%B3rio%20S%C3%ADntese%20BEN%202019%20Ano%20Base%202018.pdf
Monitoring equipment	Not applicable
Measuring/reading/recording frequency	-
Calculation method (if applicable)	The value was based on Brazilian Energy Balance 2018 (base year 2017)
QA/QC procedures	Project emission calculations
Purpose of data/parameter	-
Additional comments	The value was based on Brazilian Energy Balance 2018 - Síntese do Relatório Final (base year 2017), page 30

Data/Parameter	$EC_{PJ1,y} = EG_{EC1,y}$
Unit	MWh/y
Description	Quantity of electricity consumed from the grid by the project activity during the year y
Measured/calculated/ default	Measured
Source of data	Measurement from Project Participants through electric meter
Value(s) of monitored parameter	(see table below) *the quantity of electricity consumed was not yet available.
Monitoring equipment	Energy measurement meters. These meters are installed by the local electric provider Amazonas Energia S.A., are sealed and tamper proof. Calibration of the electricity meters is responsibility of Amazonas Energia as well as their frequency, according to INMETRO (National Institute of Metrology, Quality and Technology) and the Grid Procedures established by the Electric System National Operator (from the Portuguese Operador Nacional do Sistema Elétrico – ONS)[15]. The report of conformity was issued by the meter manufacturer (Landis+Gyr), and in accordance with INMETRO directives.
Measuring/reading/recording frequency	Continuously. Monthly meter reading by the electricity distribution company (Amazonas Energia) representative and billing to the company
Calculation method (if applicable)	Not applicable

Period	**Quantity of electricity consumed from the grid by the project activity (MWh)**
February	20.44
March	26.76
April	27.02
May	27.35
June	27.64
July	27.90
August	28.16
September	28.16*
From February 01, 2019 to September 30, 2019	**213.43**

*the quantity of electricity consumed was not yet available.

[15] Sub-módulo 12.3. Metering System Maintenance for Invoicing, in a free translation from the Portuguese *Manutenção do Sistema de Medição para Faturamento*. Available at: <http://extranet.ons.org.br/operacao/prdocme.nsf/videntificadorlogico/5DA0C134065FB70F83257945005B1BDF/$file/Submodulo%2012.3_Rev_2.0.pdf?openelement>.

QA/QC procedures	The energy meters are installed at the site by Amazonas Energia. The meters are sealed and tempering with the meter is a criminal offence.
Purpose of data/parameter	b) Calculation of project emissions or actual net GHG removals by sinks
Additional comments	The data will be archived throughout the crediting period and two years thereafter

Data/Parameter	$EC_{PJ2,y} = EG_{EC2,y}$
Unit	MWh/y
Description	Quantity of electricity consumed from diesel generator by the project activity during the year y
Measured/calculated/ default	Measured
Source of data	Measurement from Project participants
Value(s) of monitored parameter	See table below
Monitoring equipment	Continuously measured by electricity meters for the diesel generators as per "*Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation*" and ACM0001 methodology
Measuring/reading/recording frequency	Continuously
Calculation method (if applicable)	Not applicable
QA/QC procedures	As per the "*Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation*"
Purpose of data/parameter	(b) Calculation of project emissions or actual net GHG removals by sinks
Additional comments	The data will be archived throughout the crediting period and two years thereafter

Period	**Quantity of electricity consumed from diesel generator by the project activity (MWh)**
February	0.012550278
March	0.008887778
April	0.008953889
May	0.008801389
June	0.000000000
July	0.000000000
August	0.000000000
September	0.000000000
From February 01, 2019 to September 30, 2019	0.039193333

ACM0001: Flaring or use of landfill gas --- Version 18.0

Data/Parameter	Management of SWDS
Unit	-
Description	Management of SWDS
Measured/calculated/ default	The company monitors the entire system and its equipment according to manufacturers' standards, periodically checking equipment with nationally accredited entities.
Source of data	Use different sources of data: - Technical specifications - Local or national regulations.
Value(s) of monitored parameter	-

Monitoring equipment	Verification of all equipment according to the manufacturer.
Measuring/reading/recording frequency	Annually
Calculation method (if applicable)	Not applicable
QA/QC procedures	-
Purpose of data/parameter	(a) Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	-

Data/Parameter	$EG_{PJ,y} = EC_{BL,k,y}$
Unit	MWh
Description	Amount of electricity generated using LFG by the project activity in year y
Measured/calculated/ default	Measured
Source of data	Electricity meter
Value(s) of monitored parameter	Not applicable yet since there is no electricity generation at the project activity.
Monitoring equipment	Monitor net electricity generation by the project activity using LFG
Measuring/reading/recording frequency	Continuous
Calculation method (if applicable)	Not applicable
QA/QC procedures	Electricity meter will be subject to regular (in accordance with stipulation of the meter supplier) maintenance and testing to ensure accuracy. The readings will be double checked by the electricity distribution company.
Purpose of data/parameter	b) Calculation of project emissions or actual net GHG removals by sinks
Additional comments	This parameter is required for calculating baseline emissions associated with electricity generation ($BE_{EC,y}$) using the "*Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation*"

Data/Parameter	$O_{pj,h}$
Unit	-
Description	Operation of the equipment that consumes the LFG

Measured/calculated/ default	For each equipment unit j using the LFG monitor that the plant is operating in hour h by the monitoring any one or more of the following three parameters: (a) Temperature. Determine the location for temperature measurements and minimum operational temperature based on manufacturer's specifications of the burning equipment. Document and justify the location and minimum threshold in the PDD; (b) Flame. Flame detection system is used to ensure that the equipment is in operation; (c) Products generated. Monitor the generation of steam for the case of boilers and air-heaters and glass for the case of glass melting furnaces. This option is not applicable to brick kilns. $O_{pj,h}$ = 0 when: (a) One of more temperature measurements are missing or below the minimum threshold in hour h (instantaneous measurements are made at least every minute); (b) Flame is not detected continuously in hour h (instantaneous measurements are made at least every minute); (c) No products are generated in the hour h. Otherwise, $O_{pj,h}$ = 1
Source of data	Measurements by Project participant using a device integrated with the operational software at the landfill gas plant.
Value(s) of monitored parameter	0
Monitoring equipment	Measurements by project participants using a continuous Ultra Violet flame detector./ Flares temperature meters
Measuring/reading/recording frequency	Continuous Landtec System, available at: http://df3.datafield.com/DF32online/(S(1r10oi55wgae0wvr3ncwc2fk))/Login.aspx and Flame detection system_AEMSHistoricalData
Calculation method (if applicable)	Not applicable
QA/QC procedures	The calibration of this equipment is not applicable since it is a device integrated with the operational software at the landfill gas plant.
Purpose of data/parameter	(a) Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	-

Tool to determine the mass flow of a greenhouse gas in a gaseous stream

Data/Parameter	$V_{t,db}$
Unit	m^3/h
Description	Volumetric flow of the gaseous stream in time interval t on a dry basis
Measured/calculated/ default	Measured
Source of data	Measurements by Project participants using a flow meter(s)
Value(s) of monitored parameter	The CERs calculation spreadsheet includes all records of measurement data of this parameter during the considered monitoring period

Monitoring equipment	Thermal Instrument Co Model 62-9/9500 thermal flowmeter serial #2012382 Flowrate Readout Accuracy: ± 1 % Full Scale Calibration frequency: 18 months Date of last calibration: February 01, 2018 Validity: July 31, 2019 Thermal Instrument Co Model 62-9/9500 thermal flowmeter serial #1808000061 Flowrate Readout Accuracy: ± 1 % Full Scale Calibration frequency: 18 months Date of last calibration: September 13, 2019 Validity: March 12, 2020 The flowmeter serial #2012382 was replaced by flowmeter serial #1808000061 on February 28, 2019
Measuring/reading/recording frequency	Continuous recorded and hourly aggregated
Calculation method (if applicable)	Not applicable
QA/QC procedures	Landtec Field Analytical Unit (FAU), calibration automatically checked each three hour, using standard gas from cylinder. Type: Gas Cylinder Serial Number: 40324 Composition: CH4 50%; CO2 35% Date of last calibration: March 01, 2017 Validity: February 28, 2022 Type: Gas Cylinder Serial Number: 4147430 Composition: O2- 4% Date of last calibration: June16, 2016 Validity: June 15, 2021 Type: Gas Cylinder Serial Number: 410011 Composition: CH4 50%; CO2 35% Date of last calibration: March 03, 2017 Validity: February 25, 2022 The gas cylinder serial number #40324 was replaced by #410011 on March, 22,2019.
Purpose of data/parameter	(a) Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	This parameter will be monitored only in case Option A of the "*Tool to determine the mass flow of a greenhouse gas in a gaseous stream*" is applied for the determination of $F_{CH4,flared,y}$ and $F_{CH4,EL,y}$. Considering that the Option A is applied to the project activity, then this parameter was monitored during the monitored period. The monitoring is made on dry basis according to the applicable tool, thus the gas temperature is not greater than 60ºC (333.15 K). The gas temperature is monitored by FAU- Field Analytical Unit and reported to Landtec System, available at: http://df3.datafield.com/DF32online/(S(1r10oi55wgae0wvr3ncwc2fk))/Login.aspx and Automated Extraction and Monitoring System Report. PDF If the temperature is higher than 60ºC (333.15 K), the system can notice that.

Data/Parameter	$v_{i,t,db}$
Unit	m³ gas i/m^3 dry gas
Description	Volumetric fraction of greenhouse gas *i* in a time interval t on a dry basis
Measured/calculated/ default	Measured
Source of data	Measurements by Project Participants using gas analyser (onsite measurements)
Value(s) of monitored parameter	The CERs calculation spreadsheet includes all records of measurement data of this parameter during the considered monitoring period
Monitoring equipment	Landtec Field Analytical Unit (FAU), calibration automatically checked each three hours. Type: FAU Serial Number: 14046 Calibration Frequency: 12 months Accuracy: +/-1% Date of last calibration: February 01,2018 Validity: January 31, 2019 Type: FAU TDL Serial Number: 1117 Calibration Frequency: 12 months Accuracy: +/-1% Date of last calibration: March 11, 2019 Validity: March 10, 2019 The FAU serial number #14046 was replaced by FAU TDL serial number #1117 on March 19, 2019
Measuring/reading/recording frequency	Continuous recorded and hourly aggregated
Calculation method (if applicable)	Not applicable
QA/QC procedures	Landtec Field Analytical Unit (FAU), calibration automatically checked each three hour, using standard gas from cylinder. Type: Gas Cylinder Serial Number: 40324 Composition: CH4 50%; CO2 35% Date of last calibration: March 01, 2017 Validity: February 28, 2022 Type: Gas Cylinder Serial Number: 4147430 Composition: O2- 4% Date of last calibration: June16, 2016 Validity: June 15, 2021 Type: Gas Cylinder Serial Number: 410011 Composition: CH4 50%; CO2 35% Date of last calibration: March 03, 2017 Validity: February 25, 2022 The gas cylinder serial number #40324 was replaced by #410011 on March, 22,2019.

Purpose of data/parameter	(a) Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	This parameter will be monitored only in case Option A of the tool "*Tool to determine the mass flow of a greenhouse gas in a gaseous stream*" is applied for the determination of $F_{CH4,flared,y}$ and $F_{CH4,EL,y}$. Considering that the Option A is applied to the project activity, then this parameter was monitored during the monitored period.

Data/Parameter	T_t
Unit	K
Description	Temperature of the gaseous stream in time interval t
Measured/calculated/ default	Measured
Source of data	Measurements by Project Participants using a flow meter
Value(s) of monitored parameter	The CERs calculation spreadsheet includes all records of measurement data of this parameter during the considered monitoring period
Monitoring equipment	Thermal Instrument Co Model 62-9/9500 thermal flowmeter serial #2012382 Flowrate Readout Accuracy: ± 1 % Full Scale Calibration frequency: 18 months Date of last calibration: February 01, 2018 Validity: July 31, 2019 Thermal Instrument Co Model 62-9/9500 thermal flowmeter serial #1808000061 Flowrate Readout Accuracy: ± 1 % Full Scale Calibration frequency: 18 months Date of last calibration: September 13, 2019 Validity: March 12, 2020 The flowmeter serial #2012382 was replaced by flowmeter serial #1808000061 on February 28, 2019
Measuring/reading/recording frequency	Continuous
Calculation method (if applicable)	Not applicable
QA/QC procedures	Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. The calibration frequency of this monitoring equipment should be in accordance with manufacturer's specifications.
Purpose of data/parameter	(a) Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	Provided all parameters are converted to normal conditions during the monitoring process, this parameter may not be needed except for moisture content determination and therefore it should be metered only when performing such measurements (with same frequency). However, if the applicability condition related to the gaseous stream flow temperature being below 60ºC is adopted, this parameter must be monitored continuously to assure the applicability condition is met.

Data/Parameter	P_t
Unit	Pa
Description	Pressure of the gaseous stream in time interval t
Measured/calculated/ default	Measured
Source of data	Measurements by Project participant using a flow meter

Value(s) of monitored parameter	The CERs calculation spreadsheet includes all records of measurement data of this parameter during the considered monitoring period
Monitoring equipment	Thermal Instrument Co Model 62-9/9500 thermal flowmeter serial #2012382 Flowrate Readout Accuracy: ± 1 % Full Scale Calibration frequency: 18 months Date of last calibration: February 01, 2018 Validity: July 31, 2019 Thermal Instrument Co Model 62-9/9500 thermal flowmeter serial #1808000061 Flowrate Readout Accuracy: ± 1 % Full Scale Calibration frequency: 18 months Date of last calibration: September 13, 2019 Validity: March 12, 2020 The flowmeter serial #2012382 was replaced by flowmeter serial #1808000061 on February 28, 2019
Measuring/reading/recording frequency	Continuous
Calculation method (if applicable)	Not applicable
QA/QC procedures	Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. The calibration frequency of this monitoring equipment should be in accordance with manufacturer's specifications.
Purpose of data/parameter	(a) Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	Provided all parameters are converted to normal conditions during the monitoring process, this parameter may not be needed except for moisture content determination and therefore it should be metered only when performing such measurements (with same frequency)

Data/Parameter	Status of biogas destruction device
Unit	-
Description	Operational status of biogas destruction devices
Measured/calculated/ default	Measured
Source of data	Provided by project participants
Value(s) of monitored parameter	-
Monitoring equipment	Measurements by project participants using a continuous Ultra Violet flame detector.
Measuring/reading/recording frequency	Continuous Landtec System, available at: http://df3.datafield.com/DF32online/(S(1r10oi55wgae0wvr3ncwc2fk))/Login.aspx and Flame detection system_AEMSHistoricalData
Calculation method (if applicable)	Not applicable
QA/QC procedures	-
Purpose of data/parameter	(a) Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	For flame detector devices refer to the methodological tool "*Project emissions from flaring*"

Data/Parameter	$P_{H2O,t,Sat}$
Unit	Pa
Description	Saturation pressure of H_2O at temperature T_t in time interval t
Measured/calculated/ default	Measured
Source of data	Provided by project participants
Value(s) of monitored parameter	The CERs calculation spreadsheet includes all records of measurement data of this parameter during the considered monitoring period
Monitoring equipment	This parameter is solely a function of the gaseous stream temperature Tt and can be found at reference [1] for a total pressure equal to 101,325 Pa
Measuring/reading/recording frequency	-
Calculation method (if applicable)	Not applicable
QA/QC procedures	-
Purpose of data/parameter	(a) Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	[1] Fundamentals of Classical Thermodynamics; Gordon J. Van Wylen, Richard E. Sonntag and Borgnakke; 4º Edition 1994, John Wiley & Sons, Inc.

Methodological tool "*Project emissions from flaring*"

Data/Parameter	$V_{i,RG,m}$
Unit	-
Description	Volumetric fraction of component i in the residual gas on a dry basis in the minute m where i = CH4, CO, CO2, O2, H2, H2S, NH4, N2
Measured/calculated/ default	Measured
Source of data	Measurements by project participants using a continuous gas analyser
Value(s) of monitored parameter	The CERs calculation spreadsheet includes all records of measurement data of this parameter during the considered monitoring period
Monitoring equipment	Landtec Field Analytical Unit (FAU), calibration automatically checked each three hours. Type: FAU Serial Number: 14046 Calibration Frequency: 12 months Accuracy: +/-1% Date of last calibration: February 01,2018 Validity: January 31, 2019 Type: FAU TDL Serial Number: 1117 Calibration Frequency: 12 months Accuracy: +/-1% Date of last calibration: March 11, 2019 Validity: March 10, 2019 The FAU serial number #14046 was replaced by FAU TDL serial number #1117 on March 19, 2019
Measuring/reading/recording frequency	Continuously. Values to be averaged on a minute basis
Calculation method (if applicable)	Not applicable

QA/QC procedures	Landtec Field Analytical Unit (FAU), calibration automatically checked each three hour, using standard gas from cylinder. Type: Gas Cylinder Serial Number: 40324 Composition: CH_4 50%; CO_2 35% Date of last calibration: March 01, 2017 Validity: February 28, 2022 Type: Gas Cylinder Serial Number: 4147430 Composition: O_2- 4% Date of last calibration: June16, 2016 Validity: June 15, 2021 Type: Gas Cylinder Serial Number: 410011 Composition: CH_4 50%; CO_2 35% Date of last calibration: March 03, 2017 Validity: February 25, 2022 The gas cylinder serial number #40324 was replaced by #410011 on March, 22,2019.
Purpose of data/parameter	Determination of the flare efficiency
Additional comments	As a simplified approach, project participants may only measure the content CH_4, CO and CO_2 of the residual gas and consider the remaining part as N_2. Monitoring of this parameter is only applicable in case of enclosed flares and continuous monitoring of the flare efficiency (as the case of the purpose project activity)

Data/Parameter	$V_{RG,m}$
Unit	m^3
Description	Volumetric flow of the residual gas on a dry basis at reference conditions in the minute *m*
Measured/calculated/ default	Measured
Source of data	Measurements by project participants using a flow meter
Value(s) of monitored parameter	The CERs calculation spreadsheet includes all records of measurement data of this parameter during the considered monitoring period

Monitoring equipment	Landtec Field Analytical Unit (FAU), calibration automatically checked each three hours. Type: FAU Serial Number: 14046 Calibration Frequency: 12 months Accuracy: +/-1% Date of last calibration: February 01,2018 Validity: January 31, 2019 Type: FAU TDL Serial Number: 1117 Calibration Frequency: 12 months Accuracy: +/-1% Date of last calibration: March 11, 2019 Validity: March 10, 2019 The FAU serial number #14046 was replaced by FAU TDL serial number #1117 on March 19, 2019
Measuring/reading/recording frequency	Continuously. Values to' be averaged on a minute basis
Calculation method (if applicable)	Not applicable
QA/QC procedures	Landtec Field Analytical Unit (FAU), calibration automatically checked each three hour, using standard gas from cylinder. Type: Gas Cylinder Serial Number: 40324 Composition: CH4 50%; CO2 35% Date of last calibration: March 01, 2017 Validity: February 28, 2022 Type: Gas Cylinder Serial Number: 4147430 Composition: O2- 4% Date of last calibration: June16, 2016 Validity: June 15, 2021 Type: Gas Cylinder Serial Number: 410011 Composition: CH4 50%; CO2 35% Date of last calibration: March 03, 2017 Validity: February 25, 2022 The gas cylinder serial number #40324 was replaced by #410011 on March, 22,2019.
Purpose of data/parameter	Determination of the flare efficiency
Additional comments	-

Data/Parameter	$M_{RG,m}$
Unit	kg
Description	Mass flow of the residual gas on a dry basis at reference conditions in the minute m
Measured/calculated/ default	Measured
Source of data	-

Value(s) of monitored parameter	The CERs calculation spreadsheet includes all records of measurement data of this parameter during the considered monitoring period
Monitoring equipment	Thermal Instrument Co Model 62-9/9500 thermal flowmeter serial #2012382 Flowrate Readout Accuracy: ± 1 % Full Scale Calibration frequency: 18 months Date of last calibration: February 01, 2018 Validity: July 31, 2019 Thermal Instrument Co Model 62-9/9500 thermal flowmeter serial #1808000061 Flowrate Readout Accuracy: ± 1 % Full Scale Calibration frequency: 18 months Date of last calibration: September 13, 2019 Validity: March 12, 2020 The flowmeter serial #2012382 was replaced by flowmeter serial #1808000061 on February 28, 2019
Measuring/reading/recording frequency	Continuous, values to be averaged on a minute basis
Calculation method (if applicable)	Not applicable
QA/QC procedures	Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. The calibration frequency of this monitoring equipment should be in accordance with manufacturer's specifications.
Purpose of data/parameter	Determination of the flare efficiency
Additional comments	-

Data/Parameter	$v_{O2,EG,m}$
Unit	-
Description	Volumetric fraction of O_2 in the exhaust gas on a dry basis at reference conditions in the minute *m*
Measured/calculated/ default	Measured
Source of data	Measurements by project participants using a continuous gas analyser (Flare Emissions Analyser – FEA)
Value(s) of monitored parameter	The CERs calculation spreadsheet includes all records of measurement data of this parameter during the considered monitoring period
Monitoring equipment	Landtec Flare Emission Analyzer – FEA Accuracy: +/- 0.1% O2 Serial number: 4722 Calibration frequency: 12 months Last calibration: January 29, 2019 Validity: January 28, 2020 Next calibration: January 29, 2020
Measuring/reading/recording frequency	Continuously. Values to be averaged on a minute basis
Calculation method (if applicable)	Not applicable

QA/QC procedures	Zero check and spam check performance once a day using standard gas. Calibration of equipment as per manufacturer specifications to ensure validity of data measured Type: Gas Cylinder Serial Number: 288855 Composition: CH_4 50Micromol/mol; O2 15% Date of last calibration: June 16, 2016 Validity: June 15, 2021
Purpose of data/parameter	Determination of the flare efficiency
Additional comments	-

Data/Parameter	$fc_{CH4,EG,m}$
Unit	mg/m^3
Description	Concentration of methane in the exhaust gas of the flare on a dry basis at reference conditions in the minute *m*
Measured/calculated/ default	Measured
Source of data	Measurements by project participants using a continuous gas analyser (Flare Emissions Analyser – FEA)
Value(s) of monitored parameter	The CERs calculation spreadsheet includes all records of measurement data of this parameter during the considered monitoring period
Monitoring equipment	Landtec Flare Emission Analyzer – FEA Accuracy: +/- 0.1% O2 Serial number: 4722 Calibration frequency: 12 months Last calibration: January 29, 2019 Validity: January 28, 2020 Next calibration: January 29, 2020
Measuring/reading/recording frequency	Continuously. Values to be averaged on a minute basis
Calculation method (if applicable)	Not applicable
QA/QC procedures	Zero check and spam check performance once a day using standard gas. Calibration of equipment as per manufacturer specifications to ensure validity of data measured Type: Gas Cylinder Serial Number: 288855 Composition: CH_4 50Micromol/mol; O2 15% Date of last calibration: June 16, 2016 Validity: June 15, 2021
Purpose of data/parameter	Determination of the flare efficiency
Additional comments	Measurement instruments may read ppmv or % values. To convert from ppmv to mg/m3 simply multiply by 0.716. 1% equals 10 000 ppmv

Data/Parameter	$Flame_m$
Unit	Flame on or Flame off
Description	Flame detection of flare in the minute m
Measured/calculated/ default	Measured
Source of data	Project Participant
Value(s) of monitored parameter	The CERs calculation spreadsheet includes all records of measurement data of this parameter during the considered monitoring period

Monitoring equipment	Measurements by project participants using a continuous Ultra Violet flame detector.
Measuring/reading/recording frequency	Continuous Landtec System, available at: http://df3.datafield.com/DF32online/(S(1r10oi55wgae0wvr3ncwc2fk))/Login.aspx and Flame detection system_AEMSHistoricalData
Calculation method (if applicable)	Not applicable
QA/QC procedures	Equipment shall be maintained and calibrated in accordance with manufacturer's recommendations
Purpose of data/parameter	Calculation of baseline and project emissions when the flame is on[16]
Additional comments	-

Data/Parameter	$Maintenance_y$
Unit	Calendar dates
Description	Maintenance events completed in year y
Measured/calculated/ default	-
Source of data	Project participants
Value(s) of monitored parameter	As per the applied maintenance practice for the project activity, general inspection services on the flare are performed daily. Performed maintenance and overhauling services in the flare are perfomed under by specialized technical service team under conformance with maintenance requirements for the flare (as established by equipment manufacturer) and as required by the ex-ante determined parameter SPECflare. Further details about the parameter SPECflare are included in Section D.1.
Monitoring equipment	Record the date that maintenance events were completed in year y. Records of maintenance logs include all aspects of the maintenance including the details of the person(s) undertaking the work, parts replaced, or needing to be replaced, source of replacement parts, serial numbers and calibration certificates
Measuring/reading/recording frequency	Daily
Calculation method (if applicable)	Not applicable
QA/QC procedures	Records must be kept in a maintenance log for two years beyond the life of the flare
Purpose of data/parameter	Calculation of baseline and project emissions when the flame is on[17]
Additional comments	Monitoring of this parameter is required for the case of enclosed flares and the project participant selects Option B to determine flare efficiency. These dates are required so that they can be compared to the maintenance schedule to check that maintenance events were completed within the minimum time between maintenance events specified by the manufacturer ($S_{PEC,flare}$). In this monitoring period was used the default option.

[16] When the flame is off, neither baseline nor project emissions occurs since the LFG is not combusted and instead released to the atmosphere.

[17] When the maintenance is being carried out, neither baseline nor project emissions occurs since the LFG is not combusted and released to the atmosphere.

Data/Parameter	$T_{EG,m}$
Unit	ºC
Description	Temperature in the exhaust gas of the enclosed flare in minute *m*
Measured/calculated/ default	Measured
Source of data	Measurements by project participants
Value(s) of monitored parameter	The CERs calculation spreadsheet includes all records of measurement data of this parameter during the considered monitoring period

Monitoring equipment	Thermocouples Type N. Pakari Industria e Serviços: Serial Number: 3881 Accuracy:+/- 2.2°C Date of last calibration: September 26, 2018 Frequency calibration: 1 year Validity: September 25, 2019 Serial Number: 3882 Accuracy:+/- 2.2°C Date of last calibration: September 26, 2018 Frequency calibration: 1 year Validity: September 25, 2019 Serial Number: 3883 Accuracy:+/- 2.2°C Date of last calibration: September 26, 2018 Frequency calibration: 1 year Validity: September 25, 2019 Serial Number: 3884 Accuracy:+/- 2.2°C Date of last calibration: September 26, 2018 Frequency calibration: 1 year Validity: September 25, 2019 Serial Number:7526 Accuracy:+/- 2.2°C Date of last calibration: September 16, 2019 Frequency calibration: 1 year Validity: September 15, 2020 Serial Number:7527 Accuracy:+/- 2.2°C Date of last calibration: September 16, 2019 Frequency calibration: 1 year Validity: September 15, 2020 Serial Number:7528 Accuracy:+/- 2.2°C Date of last calibration: September 16, 2019 Frequency calibration: 1 year Validity: September 15, 2020 Serial Number:7529 Accuracy:+/- 2.2°C Date of last calibration: September 16, 2019 Frequency calibration: 1 year Validity: September 15, 2020 The thermocouples # 3881,3882, 3883, 3884 was replaced by 7526, 7527,7528,7529 on September 23, 2019
Measuring/reading/recording frequency	Once per minute
Calculation method (if applicable)	Not applicable
QA/QC procedures	Thermocouples will be replaced or calibrated every year.

Purpose of data/parameter	(b) Calculation of project emissions or actual net GHG removals by sinks
Additional comments	-

Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion

Data/Parameter	**$FC_{i,j,y}$**
Unit	kg/yr
Description	Quantity of fuel type *i* combusted in process *j* during the year *y*
Measured/calculated/ default	Measured
Source of data	Sales of receipt
Value(s) of monitored parameter	<table><tr><th>Period</th><th>Quantity of LPG consumed by the project activity (kg)</th></tr><tr><td>February</td><td>0.0</td></tr><tr><td>March</td><td>13.0</td></tr><tr><td>April</td><td>0.0</td></tr><tr><td>May</td><td>13.0</td></tr><tr><td>June</td><td>0.0</td></tr><tr><td>July</td><td>0.0</td></tr><tr><td>August</td><td>0.0</td></tr><tr><td>September</td><td>0.0</td></tr><tr><td>From February 01, 2019 to September 30, 2019</td><td>26.0</td></tr></table>
Monitoring equipment	Not applicable
Measuring/reading/recording frequency	Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated at least once a year and have a book of control for recording the measurements (on a daily basis or per shift); • Accessories such as transducers, sonar and piezoelectronic devices are accepted if they are properly calibrated with the ruler gauge and receiving a reasonable maintenance; • In case of daily tanks with pre-heaters for heavy oil, the calibration will be made with the system at typical operational conditions.
Calculation method (if applicable)	-
QA/QC procedures	The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records.
Purpose of data/parameter	Calculation of project emissions from fossil fuel combustion in process
Additional comments	-

Data/Parameter	$NCV_{i,y}$
Unit	GJ/kg
Description	Weighted average net calorific value of fuel type i in year y (i = LPG)
Measured/calculated/ default	Default
Source of data	National Energy Balance 2018 - Base year 2017
Value(s) of monitored parameter	0.0491

Monitoring equipment	-
Measuring/reading/recording frequency	Review appropriateness of values annually
Calculation method (if applicable)	Not applicable
QA/QC procedures	Verify if the value is within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in a), b) or c) should have SO17025 accreditation or justify that they can comply with similar quality standards.
Purpose of data/parameter	Calculation of project emissions from fossil fuel consumption for the flare ignition.
Additional comments	Option c) is used since a liquid fuel is considered and is based on well documented reliable sources (i.e. Brazilian Energy Balance). Information used with the purpose of calculating expected emission reductions is in accordance with the values provided in 2006 IPCC Guidelines.

Data/Parameter	**$EF_{CO_2,i,y}$**
Unit	tCO_2/GJ
Description	Weighted average CO_2 emission factor of fuel type i in year y (i = LPG)
Measured/calculated/ default	Default
Source of data	d) IPCC default values at the upper limit of the uncertainty at 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value(s) of monitored parameter	0.0656
Monitoring equipment	Not applicable since IPCC default value is used
Measuring/reading/recording frequency	Any future revisions of the IPCC Guidelines should be taken into account
Calculation method (if applicable)	Not applicable
QA/QC procedures	Not applicable since IPCC default value is used.
Purpose of data/parameter	Calculation of project emissions from fossil fuel consumption for the flare ignition
Additional comments	-

The following monitoring parameters (which are also included in the monitoring plan of the PDD) were not monitored as the methodological options for which they are applicable were not selected as the monitoring or calculation approaches for the determination of baseline emissions and/or project emissions achieved by the project activity during the considered monitoring period:

- Volumetric flow of the gaseous stream in time interval t on a wet basis ($V_{t,wb}$);
- Volumetric fraction of greenhouse gas i in a time interval t on a wet basis ($V_{i,t,wb}$).

D.3. Implementation of sampling plan

Not applicable.

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

Monitoring Period	*Baseline emissions (tCO_2e/month)*
	BE_y
feb/19	21,867
mar/19	24,909
apr/19	25,999
may/19	26,413
jun/19	26,630
jul/19	27,333
ago/19	27,410
Sept/19	24,519
February 01, 2019 to September 30, 2019	**205,081**

Baseline emissions for the proposed project activity are determined according to the following equation:

$$BE_y = BE_{CH4,y} + BE_{EC,y} + BE_{HG,y} + BE_{NG,y}$$ **Equation 1**

Where:

BE_y = Baseline emissions in year y (tCO_2e/yr)

$BE_{CH4,y}$ = Baseline emissions of methane from the SWDS in year y (tCO_2e/yr)

$BE_{EC,y}$ = Baseline emissions associated with electricity generation in year y (tCO_2e/yr)

$BE_{HG,y}$ = Baseline emissions associated with heat generation in year y (tCO_2e/yr)

$BE_{NG,y}$ = Baseline emissions associated with natural gas use in year y (tCO_2e/yr)

Baseline emissions associated with heat generation in year *y* ($BE_{HG,y}$) and natural gas use in year *y* ($BE_{NG,y}$) are not applicable to the proposed project activity.

$$BE_y = BE_{CH4,y}$$

Baseline emissions of methane from the SWDS ($BE_{CH4,y}$)

Baseline emissions of methane from the SWDS are determined based on the amount of methane that is captured under the project activity and the amount that would be captured and destroyed in

the baseline (such as due to regulations). In addition, the effect of methane oxidation that is present in the baseline and absent in the project is taken into account[18].

$$BE_{CH4} = \left(\left(1 - OX_{top\_layer}\right) \times F_{CH4,PJ,y} - F_{CH,BL,y} \right) \times GWP_{CH4}$$ **Equation 2**

Where:

BE_{CH4y}	=	Baseline emissions of LFG from the SWDS in year y (tCO_2e/yr)
OX_{top_layer}	=	Fraction of methane in the LFG that would be oxidized in the top layer of the SWDS in the baseline (dimensionless)
$F_{CH4,PJ,y}$	=	Amount of methane in the LFG which is flared and/or used in the project activity in year y (tCH_4/yr)
$F_{CH4,BJ,y}$	=	Amount of methane in the LFG that would be flared in the baseline in year y (tCH_4/yr)
GWP_{CH4}	=	Global warming potential of CH_4 (tCO_2e/tCH_4)

Example:

February , 2019:

*$BE_{CH4,y=}$ ((1- 0.1)) x 971.87 – 0)*25*

$BE_{CH4,y=}$ 21,870

$BE_{y\,=}\,BE_{CH4,y}$

$BE_{y=}$*21,867*

Ex post determination of $F_{CH4,PJ,y}$

During the crediting period, $F_{CH4,PJ,y}$ is to be determined as the sum of the quantities of methane flared and forwarded to electricity generation, considering the following equation:

[18] $OX_{top\text{-}layer}$ is the fraction of the methane in the LFG that would oxidize in the top layer of the SWDS in the absence of the project activity. Under the project activity, this effect is reduced as a part of the LFG is captured and does not pass through the top layer of the SWDS. This oxidation effect is also accounted for in the methodological tool "*Emissions from solid waste disposal sites*". In addition to this effect, the installation of a LFG capture system under the project activity may result in the suction of additional air into the SWDS. In some cases, such as with a high suction pressure, the air may decrease the amount of methane that is generated under the project activity. However, in most circumstances where the LFG is captured and used this effect was considered to be very small, as the operators of the SWDS have in most cases an incentive to main a high methane concentration in the LFG. For this reason, this effect is neglected as a conservative assumption.

$$F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,HG,y} + F_{CH4,NG,y}$$ **Equation 3**

Where:

$F_{CH4,PJ,y}$	=	Amount of methane in the LFG which is flared and/or used in the project activity in year y (tCH_4/yr)
$F_{CH4,flared,y}$	=	Amount of methane in the LFG which is destroyed by flaring in year y (tCH_4/yr)
$F_{CH4,EL,y}$	=	Amount of methane in the LFG which is used for electricity generation in year y (tCH_4/yr)
$F_{CH4,HG,y}$	=	Amount of methane in the LFG which is used for heat generation in year y (tCH_4/yr)
$F_{CH4,NG,y}$	=	Amount of methane in the LFG which is sent to the natural gas distribution network in year y (tCH_4/yr)

Example

February

$F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,HG,y} + F_{CH4,NG,y}$

$F_{CH4,PJ,y} = F_{CH4,flared,\ y} + 0 + 0 + 0$

$F_{CH4,PJ,y} = F_{CH4,flared,\ y}$

As the project only flares LFG and generates electricity, then $F_{CH4,HG,y}$ and $F_{CH4,NG,y}$ equals to 0 (zero).

$F_{CH4,EL,y}$ is determined using the "*Tool to determine the mass flow of a greenhouse gas in a gaseous stream*" and monitoring the working hours of the power plant(s), boiler(s), air heater(s), glass melting furnace(s) and kiln(s), so that no emission reduction are claimed for methane destruction during non-working hours. This is taken into account by monitoring the hours that the equipment utilizing the LFG is operating in year y ($Op_{j,h,y}$).

The following requirements apply:

a) As per the gaseous stream tool, if the LFG is used for multiple purposes (e.g. flaring or energy generation), and all methane destruction devices are verified to be operational (e.g. by means of flame detectors records, energy generated), a single flow meter may be used to record the flow into multiple destruction devices. The destruction efficiency of the least efficient among the destruction devices shall be used as the destruction efficiency for all destruction devices monitored by this flow meter. If there are any periods for which one or more destruction devices are not operational, paragraph 5 (a)

and (b) of the Appendix of the "*Tool to determine the mass flow of a greenhouse gas in a gaseous stream*" tool shall be followed;

b) CH_4 is the greenhouse gas for which the mass flow should be determined;

c) The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations (3) or (17) in the tool);

d) The mass flow should be calculated on an hourly basis for each hour *h* in year *y*;

e) The mass flow calculated for hour *h* is 0 if the equipment is not working in hour *h* ($Op_{j,h}$ = not working), the hourly values are then summed to a yearly unit basis.

The amount of methane destroyed by flaring ($F_{CH4,flared,y}$) will be determined as follows:

$$F_{CH4,flared,y} = F_{CH4,sent\_flare,y} - \frac{PE_{flare,y}}{GWP_{CH4}}$$ **Equation 4**

Where:

$F_{CH4,flared,y}$	=	Amount of methane in the LFG which is destroyed by flaring in year y (tCH_4/yr)
$F_{CH4,sent\_flare,y}$	=	Amount of methane in the LFG which is sent to the flare in year y (tCH_4/yr)
$PE_{flare,y}$	=	Project emissions from flaring of the residual gas stream in year y (tCO_2e/yr)
GWP_{CH4}	=	Global warming potential of CH_4 (tCO_2e/tCH_4)

$F_{CH4,sent\_flare,y}$ will be determined directly using the "*Tool to determine the mass flow of a greenhouse gas in a gaseous stream*", applying the requirements described below.

According to "*Tool to determine the mass flow of a greenhouse gas in a gaseous stream*" the following options will be considered for the present project activity:

- Option A (Volume flow in dry basis and volumetric fraction in dry basis) when the temperature of the gaseous stream is less than 60ºC (333.15 K) at the flow measurement point; and
- Option B (Volume flow in wet basis and volumetric fraction in dry basis) when the temperature of the gaseous stream is higher than 60ºC (333.15 K) at the flow measurement point.

The Option A is applicable to the project activity.

Option A

Flow measurement on a dry basis is not doable for a wet gaseous stream. Therefore, it is necessary to demonstrate that the gaseous stream is dry to use this option. There are two ways to do this:

(a) Measure the moisture content of the gaseous stream ($C_{H2O,t,db,n}$) and demonstrate that this is less or equal to 0.05 kg H2O/m3 dry gas; or

(b) Demonstrate that the temperature of the gaseous stream (T_t) is less than 60ºC (333.15 K) at the flow measurement point.

In this case, the mass flow of greenhouse gas *i* ($F_{i,t}$) is determined as follows:

$$F_{i,t} = V_{t,db} * v_{i,t,db} * \rho_{i,t}$$ **Equation 5**

With:

$$\rho_{i,t} = \frac{P_t * MM_i}{R_u * T_t}$$ **Equation 6**

Where:

$F_{i,t}$	=	Mass flow of greenhouse gas *i* in the gaseous stream in time interval *t* (kg gas/h)
$V_{t,db}$	=	Volumetric flow of the gaseous stream in time interval *t* on a dry basis (m³ dry gas/h)
$V_{i,t,db}$	=	Volumetric fraction of greenhouse gas *i* in the gaseous stream in a time interval *t* on a dry basis (m³ gas *i*/m³ dry gas)
$\rho i_{,t}$	=	Density of greenhouse gas i in the gaseous stream in time interval *t* (kg gas *i*/m³ gas *i*)
P_t	=	Absolute pressure of the gaseous stream in time interval *t* (Pa)
MM_i	=	Molecular mass of greenhouse gas *i* (kg/kmol)
R_u	=	Universal ideal gases constant (8,314 Pa.m³/kmol.K)
T_t	=	Temperature of the gaseous stream in time interval *t* (K)

If it cannot be demonstrated that the gaseous stream is dry, then the flow measurement should be assumed to be on a wet basis and the option B should be applied instead.

$F_{i,t=} V_{t,db} * V_{i,t,db} * (P_{t} * MM_i / R_u * T_t)$

Project Emissions from flaring:

$PE_{flare,y}$ shall be determined using the methodological tool "*Project emissions from flaring*". If LFG is flared through more than one flare, then $PE_{flare,y}$ is the sum of the emissions for each flare determined separately.

Enclosed flare has been installed in the project activity to increase the destruction efficiency. Those flares reach 98% (minimum)[19] of methane destruction efficiency.

To determine the project emissions from flaring gases the methodological tool "*Project emissions from flaring*" was used. The project emissions calculation procedure is given in the following steps:

STEP 1: Determination of the methane mass flow of the residual gas;

STEP 2: Determination of the flare efficiency;

STEP 3: Calculation of project emissions from flaring.

Step 1: Determination of the methane mass flow in the residual gas

The "*Tool to determine the mass flow of a greenhouse gas in a gaseous stream*" shall be used to determine the following parameter:

Parameter	**Unit**	**Description**
$F_{CH4,m}$	kg	Mass flow of methane in the residual gaseous stream in the minute *m*

The following requirements apply:

- The gaseous stream tool shall be applied to the residual gas;
- The flow of the gaseous stream shall be measured continuously;
- CH_4 is the greenhouse gas i for which the mass flow should be determined;
- The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations 3 and 17 in the tool); and
- The time interval t for which mass flow should be calculated is every minute m.

$F_{CH4,m}$ which is measured as the mass flow during minute *m*, shall then be used to determine the mass of methane in kilograms fed to the flare in minute m ($F_{CH4,RG,m}$). $F_{CH4,m}$ shall be determined on a dry basis.

The option chosen for the "*Tool to determine the mass flow of a greenhouse gas in a gaseous stream*" by the project participant is option A. However, during the project operational monitoring, if

[19] In accordance with the Manufacturer's specification.

not demonstrated that the temperature of the gaseous stream (T_t) is less than 60ºC (dry basis), then the flow measurement should be assumed to be on a wet basis and the option B should be applied instead.

Step 2: Determination of flare efficiency

Enclosed flare

In the case of enclosed flares, project participants may choose between the following two options to determine the flare efficiency for minute m ($n_{flare,m}$).

Option A: Apply a default value for flare efficiency;

Option B: Measure the flare efficiency.

Option A is applied to the monitoring period. For enclosed flares that are defined as low height flares, which is the case of the project activity, the flare efficiency in the minute m ($n_{flare,m}$) shall be adjusted, as a conservative approach, by subtracting 0.1 from the efficiency as determined in Option A. For example, the default value applied should be 80%, rather than 90%, and if for example the measured value was 99%, then the value to be used shall correspond to 89%. This approach was applied in this monitoring period.

Option A: Default value

The flare efficiency for the minute m ($n_{flare,m}$) is 90% when the following two conditions are met to demonstrate that the flare is operating:

(1) The temperature of the flare ($T_{EG.m}$) and the flow rate of the residual gas to the flare ($F_{RG,m}$) is within the manufacturer's specification for the flare ($SPEC_{flare}$) in minute m; and

(2) The flame is detected in minute m ($Flame_m$).

Otherwise $n_{flare,m}$ is 0%.

Step 3: Calculation of project emissions from flaring

Project emissions from flaring are calculated as the sum of emissions for each minute *m* in year *y,* based on the methane mass flow in the residual gas ($F_{CH4,RG,m}$) and the flare efficiency ($\eta_{flare,m}$), as follows:

$$PE_{flare,y} = GWP_{CH4} \times \sum_{m=1}^{525600} F_{CH4,RG,m} \times \left(1 - \eta_{flare,m}\right) \times 10^{-3}$$

Equation 7

Where:

$PE_{flare,y}$	=	Project emissions from flaring of the residual gas in year *y* (tCO_2e)
GWP_{CH4}	=	Global warming potential of methane valid for the commitment period (tCO_2e/tCH_4)
$F_{CH4,RG,m}$	=	Mass flow of methane in the residual gas in the minute *m* (kg)
$\eta_{flare,m}$	=	Flare efficiency in minute *m*

Example February 01, 12AM

$$PE_{flare,y} = 25 * 2023.801 * (1-(80/100)) /1000$$

$$PE_{flare,y} = 10.12$$

Table 1 – Parameters used in the tool "*Project emissions from flaring*"

Parameter	Description	Value	Unit
MM_{CH4}	Molecular mass of methane	16.04	kg/kmol
MM_{CO}	Molecular mass of carbon monoxide	28.01	kg/kmol
MM_{CO2}	Molecular mass of carbon dioxide	44.01	kg/kmol
MM_{O2}	Molecular mass of oxygen	32.00	kg/kmol
MM_{H2}	Molecular mass of hydrogen	2.02	kg/kmol
MM_{N2}	Molecular mass of nitrogen	28.02	kg/kmol
AM_C	Atomic mass of carbon	12.00	kg/kmol (g/mol)
AM_H	Atomic mass of hydrogen	1.01	kg/kmol (g/mol)
AM_O	Atomic mass of oxygen	16.00	kg/kmol (g/mol)
AM_N	Atomic mass of nitrogen	14.00	kg/kmol (g/mol)
P_{ref}	Atmospheric pressure at reference conditions	101,325	Pa
R_u	Universal ideal gas constant	0.008314472	$Pa.m^3/kmol.K$
T_{ref}	Temperature at references conditions	273.15	K
GWP_{CH4}	Global warming potential of methane valid for the second commitment period	25[20]	tCO_2/tCH_4
$\rho_{CH4,n}$	Density of methane at references conditions	0.716	Kg/m^3

Step A.1.1: Ex-ante estimation of $F_{CH4,PJ,y}$

[20] Value for the 2nd commitment period updated according to COP/MOP decisions.

An *ex ante* estimate of $F_{CH4,PJ,y}$ is required to estimate baseline emission of methane from the SWDS in order to estimate the emission reductions of the proposed project activity in the CDM-PDD.

It is determined as follows:

$$F_{CH4,PJ,y} = \eta_{PJ} \times BE_{CH4,SWDS,y} / GWP_{CH4}$$

Equation 8

Where:

$F_{CH4,PJ,y}$	=	Amount of methane in the LFG which is flared and/or used in the project activity in year *y* (tCH_4/yr)
$BE_{CH4,SWDS,y}$	=	Amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* (tCO_2e/yr)
η_{PJ}	=	Efficiency of the LFG capture system that will be installed in the project activity
GWP_{CH4}	=	Global warming potential of CH_4 (tCO_2e/tCH_4)

February, 01

$F_{CH4,PJ,y=}$ *5,150*(54.9/100) * 0,0007168– (10.12/25)*

$F_{CH4,PJ,y}$ *= (5,150* 0.549)* 0,0007168 -0.4048*

$F_{CH4,PJ,y}$ *=1.62*

$BE_{CH4,SWDS,y}$ is determined using the methodological tool "*Emissions from solid waste disposal sites*". The calculation of $BE_{CH4,SWDS,y}$ according the tool is:

$$BE_{CH4,SWDS,y} = \varphi_y \cdot (1 - f_y) \cdot GWP_{CH4} \cdot (1 - OX) \cdot \frac{16}{12} \cdot F \cdot DOC_{f,y} \cdot MCF_y \cdot \sum_{x=1}^{y} \sum_j W_{j,x} \cdot DOC_j \cdot e^{-k_j \cdot (y-x)} \cdot (1 - e^{-k_j})$$

Equation 9

Where:

$BE_{CH4,SWDS,y}$	=	Baseline, project or leakage methane emissions occurring in year *y* generated from waste disposal at a SWDS during a time period ending in year *y* (tCO_2e/yr)
X	=	Years in the time period in which waste is disposed at the SWDS, extending from the first year in the time period (x = 1) to year y (x = y).

Y	=	Year of the crediting period for which methane emissions are calculated (*y* is a consecutive period of 12 months)
$DOC_{f,y}$	=	Fraction of degradable organic carbon (DOC) that decomposes under the specific conditions occurring in the SWDS for year *y* (weight fraction)
$Wj_{,x}$	=	Amount of solid waste type j disposed or prevented from disposal in the SWDS in the year *x* (t)
φ_y	=	Model correction factor to account for model uncertainties for year *y*
f_y	=	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year *y*
GWP_{CH4}	=	Global Warming Potential of methane
OX	=	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
F	=	Fraction of methane in the SWDS gas (volume fraction)
MCF_y	=	Methane correction factor for year *y*
DOC_j	=	Fraction of degradable organic carbon in the waste type *j* (weight fraction)
k_j	=	Decay rate for the waste type *j* (1 / yr)
j	=	Type of residual waste or types of waste in the MSW

According to ACM0001 methodology, the parameter f_y in the methodological tool "*Emissions from solid waste disposal sites*" shall be assigned a value of 0 (zero) because the amount of LFG that would have been captured and destroyed is already accounted for in Equation 2 of this methodology. Also, according to ACM0001 methodology, the parameter *X* begins with the year that the SWDS started receiving wastes (1986). For this reason, the parameter f_y and *X* will not be monitored.

Step A.2: Determination of $F_{CH4,BL,Y}$

No LFG capture and destruction system would be implemented in the absence of the project (baseline scenario) at the Manaus landfill.

Thus, as per ACM0001 in this situation:

$F_{CH4,BL,y} = 0$

Baseline emissions associated with electricity generation ($BE_{EC,y}$)

The project activity do not generates electricity during the monitoring period. Thus, $BE_{EC,y}$ = 0.

Step C: Baseline emissions associated with heat generation ($BE_{HG,y}$)

As the project design does not encompass utilization of collected LFG for heat generation, (in boiler, air heater, glass melting furnace(s) and/or kiln), baseline emissions associated with heat generation in year *y* ($BE_{HG,y}$) are not considered. Thus, this step is not applicable.

Step D: Baseline emissions associated with natural gas use ($BE_{NG,y}$)

As the project design does not encompass use of collected LFG displacing the use of natural gas or injection of collected LFG into a natural gas distribution network, baseline emissions associated with natural gas use in year y ($BE_{NG,y}$) are not considered. Thus, this step is not applicable.

Finally:

$$BE_y = (1 - OX_{top\_layer}) * (\eta_{PJ} * BE_{CH4,SWDS,y} / GWP_{CH4} - 0) * GWP_{CH4} + \sum_j EC_{BL,j,y} * EF_{EL,j,y} * (1 + TDL_{j,y})$$

Equation 10

E.2. Calculation of project emissions or actual net removals

The values of project emissions during the monitoring period are presented below:

Monitoring Period	***Emissions from consumption of electricity (tCO_2e/ month)***	***Emissions from fossil fuel combustion in process (tCO_2e/ month)***	***Emission from Consumption of LPG by the project activity (tCO_2e/ month)***
	$PE_{EC1,y}$	$PE_{EC2,y}$	$PE_{FC,y}$
february/2019	5.76	0.276	0.00
march/2019	7.54	0.195	0.05
april/2019	7.61	0.197	0.00
may/2019	7.70	0.193	0.05
june/2019	7.78	0.000	0.00
july/2019	7.86	0.000	0.00
august/2019	7.93	0.000	0.00
september/2019	7.93	0.000	0.00
February 01, 2019 to September 30, 2019[1]	**60.11**	0.861	**0.09**

Project emissions:

Project emissions are calculated as follows:

$$PE_y = PE_{EC,y} + PE_{FC,y} + PE_{DT,y} + PE_{SP,y}$$ **Equation 11**

Where:

PE_y	=	Project emissions in year *y* (in tCO_2/yr)
$PE_{EC,y}$	=	Emissions from consumption of electricity due to the project activity in year *y* (in tCO_2/yr)
$PE_{FC,y}$	=	Emissions from consumption of fossil fuels due to the project activity, for purpose other than electricity generation, in year *y* (in tCO_2/yr)
$PE_{DT,y}$	=	Emissions from the distribution of compressed/liquefied LFG using trucks, in year y (tCO_2/yr)
$PE_{SP,y}$	=	Emissions from the supply of LFG to consumers through a dedicated pipeline, in year *y* (tCO_2/yr)

Example

February

$PE_{y=}$ *5.76 +0.459+0.00*

PEy= 6.22

The parameters $PE_{DT,y}$ and $PE_{SP,y}$ are not used in the calculation of project emissions since there is no distribution of compressed/liquefied LFG using trucks and supply of LFG to consumers through a dedicated pipeline in the project activity.

According to methodological tool "*Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation*", the project emission from consumption of electricity will be from three sources:

- *Scenario A:* $PE_{EC1,y}$ – Electricity consumption from the grid;
- *Scenario B:* $PE_{EC2,y}$ – Electricity consumption from an off-grid captive power plant;
- *Scenario C*: $PE_{EC2,y}$ – Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s).

In the case of the project activity, electricity consumption from the grid and diesel generators are used in the project. Since the captive power plant (diesel generator) is not connected to the electricity grid, scenarios A and B apply.

Thus,

$$PE_{EC,y} = PE_{EC1,y} + PE_{EC2,y}$$ **Equation 12**

$PE_{EC1,y}$ - Project emission from electricity consumption from the grid

As electricity is consumed from the grid, the option A1 of the scenario A was chosen, as follows:

> *Option A1: Calculate the combined margin emission factor of the applicable electricity system, using the procedures in the latest approved version of the "Tool to calculate the emission factor for an electricity system" ($EF_{EL,j/k/l,y} = EF_{grid,CM,y}$).*

Thus, the project emission is calculated as following:

$$PE_{EC1,y} = EC_{PJ1,y} \times EF_{grid,CM,y} \times (1 + TDL_y)$$ **Equation 13**

Where:

$EC_{PJ1,y}$	=	Quantity of electricity consumed from the grid by the project activity during the year *y* (MWh)
$EF_{grid,CM,y}$	=	The emission factor for the grid in year *y* (tCO_2/MWh)
TDL_y	=	Average technical transmission and distribution losses in the grid in year *y* for the voltage level at which electricity is obtained from the grid at the project site

Example

February

$PE_{EC1,y}$ = *20.44*0.243* (1+15.90/100)*

$PE_{EC1,y}$ =*5.76*

$PE_{EC2,y}$ - Project emission from electricity consumption from an off-grid captive power plant (diesel generator(s))

As electricity is consumed from diesel generators (off-grid captive power plant), a conservative approach was adopted and the option B2 of the scenario B was chosen since "*electricity consumption source is a project or leakage electricity consumption source*". Therefore, the value used will be 1.3 tCO_2/MWh for project emission from diesel generator(s).

$$PE_{EC2,y} = EC_{PJ2,y} \times EF_{diesel\_generator,y} \times (1 + TDL_y)$$ **Equation 14**

Where:

$EC_{PJ2,y}$	=	Quantity of electricity consumed from diesel generator by the project activity during the year *y* (MWh)
$EF_{diesel\_generator,y}$	=	The emission factor for the diesel generator in year *y* (tCO_2/MWh)
TDL_y	=	Average technical transmission and distribution losses in the grid in year *y* for the voltage level at which electricity is obtained from the grid at the project site

Example

February

$PE_{EC2,y=}$ (0,012*1.3)* (1+15.9)

$PE_{EC2,y=}$ 0.019

<u>$PE_{FC,y}$ - Emissions from consumption of fossil fuels due to the project activity, for purpose other than electricity generation</u>

Considering that Manaus project activity have a consumption of fossil fuels due to the project activity, for purpose other than electricity generation, such as LPG to flare ignition, the project emissions has to be accounted and monitored.

According to the *"Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"*, CO_2 emissions from fossil fuel combustion in process *j* are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y}$$ **Equation 15**

Where:

$PE_{FC,j,y}$	=	Are the CO_2 emissions from fossil fuel combustion in process *j* during the year *y* (tCO_2/yr)
$FC_{i,j,y}$	=	Is the quantity of fuel type *i* combusted in process *j* during the year y (mass or volume unit/yr)
$COEF_{i,y}$	=	Is the CO_2 emission coefficient of fuel type *i* in year *y* (tCO_2/mass or volume unit)
i	=	Are the fuel types combusted in process *j* during the year *y*

Example

July

$PE_{FC,y} = 0.00 * 0.004$

$PE_{FC,y} = 0$

For the project activity, the CO_2 emission coefficient $COEF_{i,y}$ can be calculated using the Option B, as follows:

Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type *i*, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$ **Equation 16**

Where:

$COEF_{i,y}$	=	Is the CO_2 emission coefficient of fuel type *i* in year *y* (tCO_2/mass or volume unit)
$NCV_{i,y}$	=	Is the weighted average net calorific value of the fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{co2,i,y}$	=	Is the weighted average CO_2 emission factor of fuel type *i* in year *y* (tCO_2/GJ)
i	=	Are the fuel types combusted in process *j* during the year *y*

E.3. Calculation of leakage emissions

No leakage effects need to be accounted under methodology ACM0001 ver. 18 (LE = 0).

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals ($t CO_2e$)	Project GHG emissions or actual net GHG removals ($t CO_2e$)	Leakage GHG emissions ($t CO_2e$)	GHG emission reductions or net anthropogenic GHG removals ($t CO_2e$)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	215,717	61.06	0	0	215,651	215,651

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period ($t CO_2e$)	Amount estimated ex ante for this monitoring period in the PDD ($t CO_2e$)
215,651	380,905[21]

E.5.1. Explanation of calculation of "amount estimated ex ante for this monitoring period in the PDD"

According to the registered PDD, the amount estimated ex ante for this monitoring report considered the total amount of waste of 630,727, the composition of waste is presented below:

Composition of the waste estimated in the registered PDD	
A) Wood and wood products	6.31%
B) Pulp, paper and carboard (other than sludge)	23.47%
C) Food, food waste, beverages and tobacco (other than sludge)	35.84%
D) Textiles	0.00%
E) Garden, yard and park waste	0.00%
F) Glass, plastic, metal, other inert waste	34.39%
TOTAL	**100%**

Considering the total amount of waste disposal in the Manaus Landfill, the baseline emissions estimated 380,905 tCO_2 of emissions reductions.

The ex-ante emission factor for the second crediting period was calculated based on 2014, 2015 and 2016 years and equals to 0.2430 tCO_2/MWh ($EF_{OM,simple,2014-2016}$ = 0.4979 tCO_2/MWh and $EF_{BM,2016}$ = 0.1581 tCO_2/MWh). This parameter was fixed during the second crediting period and, thus, the same value applicable to this monitoring period.

E.6. Remarks on increase in achieved emission reductions

A total difference of 43%[22] is noted when comparing the total emission reductions claimed during the monitored period (215,651 tCO_2e) against the total emission reductions estimated in the registered PDD (380,905 tCO_2e). As per information presented above, there is no increase in the actual emission reductions achieved during the current monitoring period when the comparison is done considering an equivalent period (from 01/02/2019 to 30/09/2019).

[21] The amount estimated of this period is inserted in the Appendix 3 of PDD process: https://cdm.unfccc.int/Projects/DB/SGS-UKL1291802325.34/history. It is calculated on a pro-rata basis of 242 days of monitoring in the period (between 01/Feb2019 to 30/Sept/2019)

[22] Due to economic difficulties, were not made enough investments in the purchase of pipelines so the flow was smaller than the one estimated in the PDD, adding to this the application of the deviation error

According to the registered PDD and landfill operator data, during the monitoring period was estimated a total amount of waste of 630,727. Until the end of this monitoring report the real data of the waste disposal was not yet available.

Also, to ensure that emission reductions will not be overestimated as a result of the temporary deviation for the monitoring period between 01/02/2019 and 20/03/2019, was apply conservative assumptions or discount factors to the project calculations to the extent required.

E.7. Remarks on scale of small-scale project activity

Not applicable

Document information

Version	*Date*	*Description*
07.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Add a section on remarks on the observance of the scale limit of small-scale project activity during the crediting period; • Add "changes specific to afforestation or reforestation project activity" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R project activities between two commitment periods; • Make editorial improvements.
06.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).

Version	*Date*	*Description*
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

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