Monitoring report form

(Version 05.1)

MONITORING REPORT		
Title of the project activity	Landfill Gas Recovery and Flaring Project in the El Verde Landfill, León.	
UNFCCC reference number of the project activity	CDM Project 3378	
Version number of the monitoring report	Version 1	
Completion date of the monitoring report	03/08/2016	
Monitoring period number and duration of this monitoring period	Fourth Monitoring Period, from 01/01/2014 to 31/07/2016 (both days included)	
Project participant(s)	Promotora Ambiental S.A.B. de C.V Gazprom Marketing & Trading Limited C-Quest Capital LLC	
Host Party	Mexico (Host)	
Sectoral scope(s)	Sectoral scope 13 : Waste handling and disposal	
Selected methodology(ies)	ACM0001 ver. 10 - Consolidated baseline and monitoring methodology for landfill gas project activities	
Selected standardized baseline(s)	n/a	
Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD	545,352[1] tCO_2e	
Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	0 tCO_2e	149,000 tCO_2e

[1] The values in the ex-ante calculation of the updated CDM-PDD approved on 02/12/2013 after the request for post-registration changes are 204,270 tCO_2e for 2014 (365 days), 212,537 tCO_2e for 2015 (365 days), and 220,889 tCO_2e for 2016 (366 days). The daily average for 2014, 2015 and 2016 equate to 560, 582 and 604 tCO_2e/day, respectively. The ex-ante estimation is calculated by multiplying each of the daily average for 2014, 2015 and 2016 by the days per year of the current monitored period (365, 365 and 213 days, respectively).

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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a) Purpose of the project activity and the measures taken for GHG emission reductions or net anthropogenic GHG removals by sinks;

The objective of El Verde Landfill Gas Project is to capture the landfill gas (LFG) and to flare and/or utilize it leading to GHG emissions reductions. The principal components of landfill gas are methane (CH_4) and carbon dioxide (CO_2), both of which are greenhouse gases (GHG) listed as such in the Kyoto Protocol.

b) Brief description of the installed technology and equipment;

The installed equipment of the project activity is composed by a LFG Collection System and a LFG Flare System. The LFG Collection System is composed by deep and shallow vertical wells installed in intermediate or closed areas of the El Verde Landfill site and interconnected by a piping network for serving the blower station with a specific diameter piping, suitable for the anticipated flow rates. A leachate pumping system and a condensate management system has also been installed. The LFG Flare System is composed by an enclosed ZTOF Biogas Flare which is equipped with all the monitoring equipment as per the methodology requirements including continuous exhaust gas monitoring, ensuring a minimum destruction efficiency of 98%.

The LFG has been only flared during the monitoring period. Eventually, it is expected to install LFG Power Generation equipment. From then on, LFG would be used to generate electricity and only send the excess LFG to the flare. Thus all LFG will be combusted in one of these two ways and methane contained in LFG would be destroyed.

c) Relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.);

- 01/01/2010: Commissioning of the LFG Flare System of el Verde Landfill Gas Project;
- 27/02/2010: Commissioning of the LFG Collection System and the Leachate Evaporator System of el Verde Landfill Gas Project;
- 27/10/2010: Project registration date with Executive Board of United Nation Framework for Climate Change Convention (UNFCCC)
- 27/10/2010: Start date (day included) of the 1st Monitoring period.
- 30/06/2011: End date (day included) of the 1st Monitoring period.
- 01/07/2011: Start date (day included) of the 2nd Monitoring period.
- 01/11/2011 Permanent cease of the use of the of the Leachate Evaporator System and start of the use of the and Phytoremediation System.
- 31/07/2012: End date (day included) of the 2nd Monitoring period.
- 01/08/2012: Start date (day included) of the 3rd Monitoring period.
- 31/12/2013: End date (day included) of the 3rd Monitoring period.

d) Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period.

The total emission reductions achieved during the fourth monitoring period from 01/01/2014 to 31/07/2016 (both days included) are 149,000 tCO_2e.

A.2. Location of project activity

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El Verde landfill is located in León de Los Aldamas (also called León), about 15 kilometres northwest of the centre of the city. The address is Carretera León, Lagos de Morenos km 18.5, León City, Guanajuato State, Mexico. The geographic coordinates are N 21°10’14”; W 101°46’30”.

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate whether the Party involved wishes to be considered as project participant (yes/no)
Mexico (host)	Promotora Ambiental S.A.B. de C.V	No
Sweden	C-Quest Capital LLC	No

A.4. Reference of applied methodology and standardized baseline

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The baseline and monitoring methodology applied for the proposed project activity is the approved consolidated baseline methodology ACM0001, version 10: *"Consolidated baseline and monitoring methodology for landfill gas project activities"*. Moreover, the following tools have been applied to the project activity for the monitoring period:

- In order to determine the flare efficiency and/or to monitor the flare exhaust gases the version 1 of the *"Tool to determine project emissions from flaring gases containing methane"* is applied. References to this tool in the formulae are marked as T.
- In order to determine emissions associated with electricity consumption in the project scenario, the version 1 of *"Tool to calculate baseline, project and/or leakage emissions from electricity consumption"* is applied. References to this tool in the formulae are marked as TE.
- The version 2 of the *"Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"* is applied in case any fossil fuels are used on site. References to this tool in the formulae are marked as TF.

The registered CDM-PDD also used the following tools, which have not been used to calculate the emission reductions for the monitoring period:

- "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site". Version 4.
- "Combined tool to identify the baseline scenario and demonstrate additionality". Version 2.2
- "Tool to calculate the emission factor for an electricity system". Version 1.1
- "Tool for the demonstration and assessment of additionality". Version 5.2

The methodologies and tools applied to the project activity can be found in the UNFCCC webpage: http://cdm.unfccc.int/methodologies/PAmethodologies/approved

A.5. Crediting period of project activity

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The first crediting period corresponding to this monitoring period commence from the date of registration that is from 27/10/2010 and will last till 26/10/2017 (Renewable).

A.6. Contact information of responsible persons/entities

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Hired by Promotora Ambiental S.A.B. de C.V as CDM Consultant, the entity responsible for completing the monitoring report form (CDM-MR) is ClimaLoop. The responsible person is Sergi Cuadrat, Climate Change Mitigation Consultant of ClimaLoop (www.climaloop.com). His contact details are sergi.cuadrat@climaloop.com

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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a) Description of the installed technology, technical processes and equipments;

The El Verde Landfill was designed for municipal waste treatment with a total area of 60 ha. The landfill is divided in two Macrocells, with a total area of approximately 51 ha planned for waste disposal. The remaining 9 ha include roads, buffer zone, and the administrative area. The proposed project activity covers the entire 60 ha, i.e. including future expansion as more waste is received. The landfill started to receive waste in June 2001 and since then is receiving an average of 442,000 tonnes per year. Before the project implementation, the most likely scenario was the atmospheric release of landfill gas generated at the landfill site with no landfill gas capture and destruction. The project activity was designed in two phases:

- Phase 1: The first phase includes the construction and operation of a landfill gas (LFG) collection and flare system. The purpose of LFG flaring is to safely dispose of the flammable constituents, particularly methane, and to control odour nuisance, health risks and adverse environmental impacts. This phase has involved the investment in a highly efficient landfill gas collection system and the required enclosed flaring equipment.
- Phase 2: Once the LFG flow is proven to be steady (in terms of volume and quality) for the electricity generation, a second project phase would be carried out and a reciprocating engine facility will be installed. This phase would imply the installation of generating equipment that would combust the methane of the LFG in order to produce electricity.

The El Verde Landfill Gas Project León is currently operating in its first phase. The installed equipment of El Verde Landfill Gas Project is composed by a LFG Collection System and a LFG Flare System. In order to maximize LFG recovery rates, and thus GHG emission reductions, an active LFG Collection System has been installed covering 60% of the area of Macrocell 1. The system consists of a series of vertical extraction wells interconnected by header piping. The LFG is extracted from the landfill by a set of blowers to be initially flared in the LFG Flare System. Once LFG gas recovery is considered to be stationary and proper dimensioning can be conducted, project proponent would install a LFG power generation equipment. During the current monitored period, LFG has been only flared. It is expected that in future monitoring periods LFG would be used mainly for power generation, with any excess of LFG being flared. The following diagram represents the technology applied in the El Verde Landfill Gas Project:

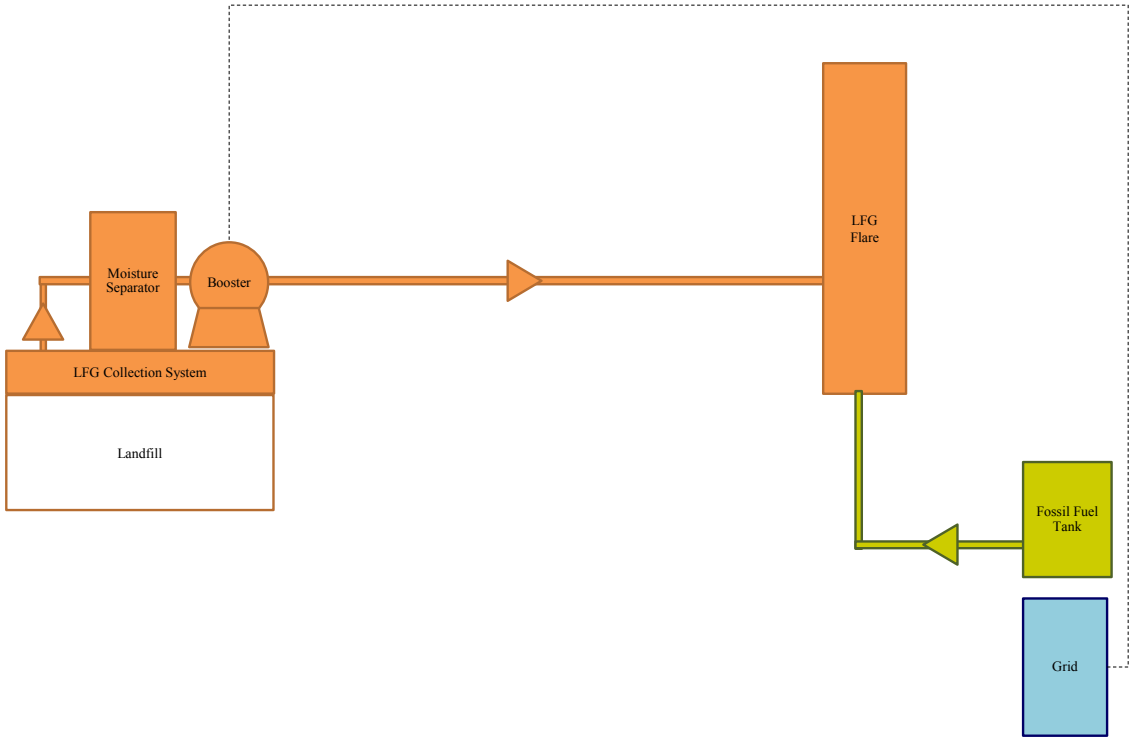

Figure 1. Diagram of the technology applied in the El Verde Landfill Gas Project.

The essential characteristics of the technology applied during the monitoring period[2] for the LFG collection and flaring systems are:

1. **LFG Collection System:** The LFG collection system is composed by:
    - Deep and shallow vertical wells in intermediate or closed areas have been installed, trying not to interfere with landfill operation. Depending on future development plans, some horizontal wells might be installed to capture the gas in areas that continue to be filled;
    - A piping network has been installed to include connection to extraction wells for serving the blower station[3] with a specific diameter piping, suitable for the anticipated flow rates. Connection has been made to those extraction wells that have been constructed to final or intermediate grade, and to which the piping connection have a minimal impact on current filling operations.
    - A leachate pumping system and a condensate management system has also been installed. The LFG collection system has been designed to include self-draining condensate traps and condensate manholes with pumps where necessary.
2. **LFG Flare System:** The John Zink Biogas Flare System has been installed in the project activity and consists of:
    - An Enclosed ZTOF Biogas Flare which offers automated operation and is designed to destroy safely, with automatic temperature control, typical organic compounds generated by solid waste and other biogas processes. The flare system is controlled with a processor, or programmable logic controller (PLC), which receives and transmits signals with respect to operating conditions. If an unacceptable operating condition occurs, the control system discontinues flow of biogas or adjusts the operating parameters to correct the problem. Control of the Enclosed ZTOF Biogas Flare includes an initial purge cycle, automatic ignition sequence, and fail-safe controls. A self-checking flame scanner monitors the pilot flame and main flame and safety shutdown features prevent equipment damage. The Enclosed ZTOF Biogas Flare is equipped with all the monitoring equipment as per the methodology requirements including continuous exhaust gas monitoring.
    - A skid assembly containing a panel rack with flare control panel, a moisture separator, and a blower station. The blower station has been installed to provide the necessary suction pressure for the flare and leachate evaporator systems, considering future electricity generator flow demands.

b) Information on the implementation and actual operation of the project activity, including relevant dates (e.g. construction, commissioning, continued operation periods, etc.).

The LFG Flare System of El Verde Landfill Gas Project was commissioned on 11/01/2010 and has been operating since then. The construction works for the LFG Collection System and the Leachate Evaporator System were completed on 27/02/2010. The project was fully operational by the date of registration on 27/10/2010. Since its registration date it has been implemented and monitored as per the monitoring plan of the PDD, with continuous operation.

The events which have interrupted the actual operation of the "Landfill Gas Recovery and Flaring Project in the El Verde Landfill, León" during the fourth monitoring period have been summarized in the following table:

[2] As per Version 13 of the updated CDM-PDD completed on 01/07/2013 and approved by the CDM Executive Board on 02/12/2013 after the request for post-registration changes, there have been permanent changes to the project design of the registered project activity consisting on the removal of the Leachate Evaporator System. The project participant decided to permanently cease the use of the Leachate Evaporator System on the EL Verde Landfill effectively from 01/11/2011 due to unexpected technical difficulties and failure to operate in a proper manner.

[3] The PDD assumed the installation of two blowers with 30 HP each whereas finally two blowers with 75 HP each were installed. The monitored value of on-site consumption of electricity provided by the grid attributable to the project activity ($EC_{PJ,y}$) considering the two blowers of 75 HP each is used for the calculation of the project emissions from electricity consumption by the project activity ($PE_{EC,y}$)

Table 1. Information regarding the events which have interrupted the actual operation of the Project

From	To	Duration (dd hh:mm)	Event of actual operation[4]	Type of Event
24/01/2014 09:00	25/01/2014 16:00	01 07:00	Power outage from CFE (national electricty provider).	Power Outage
26/04/2014 17:23	28/04/2014 08:39	01 15:16	Power outage from CFE (national electricty provider).	Power Outage
24/05/2014 19:50	26/05/2014 10:00	01 14:10	Power outage from CFE (national electricty provider).	Power Outage
08/06/2014 07:03	09/06/2014 11:03	01 04:00	Power outage from CFE (national electricty provider).	Power Outage
05/07/2014 20:20	07/07/2014 08:08	01 11:48	Power outage from CFE (national electricty provider).	Power Outage
01/08/2014 17:06	10/08/2014 21:34	09 04:28	Failure of FAU	Service / Maintenance
28/08/2014 21:45	30/08/2014 19:45	01 22:00	Power outage from CFE (national electricty provider).	Power Outage
27/09/2014 04:30	29/09/2014 08:40	02 04:10	Power outage from CFE (national electricty provider).	Power Outage
11/10/2014 15:06	13/10/2014 14:20	01 23:14	Power outage from CFE (national electricty provider).	Power Outage
01/11/2014 16:03	03/11/2014 09:41	01 17:38	Power outage from CFE (national electricty provider).	Power Outage
03/11/2014 16:48	04/11/2014 18:41	01 01:53	Power outage from CFE (national electricty provider).	Power Outage
13/11/2014 12:29	16/11/2014 07:00	02 18:31	Gas Blower Failure	Service / Maintenance
11/01/2015 07:23	12/01/2015 12:10	01 04:47	Failure of FAU	Service / Maintenance
31/01/2015 16:21	03/02/2015 11:07	02 18:46	Power outage from CFE (national electricty provider).	Power Outage
14/03/2015 07:07	16/03/2015 18:14	02 11:07	Power outage from CFE (national electricty provider).	Power Outage
03/05/2015 12:49	07/05/2015 14:19	04 01:30	Leachate problem	Collection System Issue
25/05/2015 10:42	26/05/2015 14:07	01 03:25	Maintenance of gas blower	Service / Maintenance
08/08/2015 18:06	10/08/2015 09:56	01 15:50	Power outage from CFE (national electricty provider).	Power Outage
04/09/2015 20:35	07/09/2015 18:48	02 22:13	Power outage from CFE (national electricty provider).	Power Outage
18/12/2015 11:15	28/12/2015 19:00	10 07:45	Failure of FAU	Service / Maintenance
15/01/2016 05:43	27/01/2016 18:13	12 12:30	PLC Failure	Flare Control Device Issue
27/03/2016 02:37	28/03/2016 11:38	01 09:01	Power outage from CFE (national electricty provider).	Power Outage
23/04/2016 19:42	25/04/2016 12:16	01 16:34	Gas Blower Failure	Service / Maintenance
12/06/2016 09:59	13/06/2016 10:23	01 00:24	Gas leak in well #31	Collection System Issue

[4] Arbitrarily, only events with more than 24 hours of duration have been included in the table.

c) Description of events or situations that occurred during the monitoring period that may impact the applicability of the methodology and how the issues resulting from these events or situations are being addressed:

During the monitoring period, there were not major events or situations that affected the applicability of the methodology.

B.2. Post-registration changes

B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

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Not applicable. The section is left blank intentionally.

B.2.2. Corrections

>>
Not applicable. The section is left blank intentionally.

B.2.3. Changes to start date of crediting period

>>
Not applicable. The section is left blank intentionally.

B.2.4. Inclusion of a monitoring plan to the registered PDD that was not included at registration

>>
Not applicable. The section is left blank intentionally.

B.2.5. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

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The monitoring system was found not in line with the description in the registered PDD. A revised PDD was prepared by the project participant during the 3rd CDM Verification and informed the contracted DOE about such changes. The revised PDD was approved by the EB on 02/12/2013 under reference PRC-3378-001. As per Table 5, "Operational Management Structure" for El Verde project Monitoring Plan of the registered PDD, the monitoring task described that daily data on temperature (T) and pressure (P) would be recorded in a spreadsheet file which would be filed. Daily data on pressure and temperature is not required for the ER calculations in the actual operation structure as the project activity is using flow meters that measures within the flow temperature and pressure, expressing LFG volumes in normalized cubic meters (Nm^3).

B.2.6. Changes to project design of registered project activity

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A revised PDD was prepared by the project participant during the 3rd CDM Verification and informed the contracted DOE about such changes. The revised PDD was approved by the EB on 02/12/2013 under reference PRC-3378-001. The following points provide a description of the changes as compared to the description in the registered PDD and description of the changes to the monitoring plan:

a) The project participant decided to permanently cease the use of the leachate evaporator on the EL Verde Landfill effectively from 1 November 2011 due to unexpected technical difficulties and failure to operate in a proper manner. Operation of the project is not

compromised by the ceased of the leachate evaporator as the landfill gas not used for the leachate will be directly send to the flare and to the LFG fuelled power generator once it is installed.

b) According to the registered PDD, on section B.6.3 Ex-ante calculation emission reductions considers: “Blower electricity consumption: Based on manufacturer’s information, it is assumed that a blower will use 25 HP or about 18 kW to pump 1,869 m3/h of LFG (@ 50% methane). However, during the site visit two blowers were identified as 75 HP each. No operational impact has been identified from this change. The installation of the two 75 HP blowers made possible the delivery of LFG to the flare.

c) For parameters LFG_{total}, $LFG_{flare,y}$, $LFG_{electricity,y}$, as per registered PDD is stated in page 7 that according to the SCS Engineers study, a capacity of 2.4 MW power generators would be purchased in order to start operations in January 2012. Power generation equipment has not been installed during this monitoring period. Operation of the project is not compromised by the postponed installation of the power generator as the collected LFG is flared.

The contracted DOE was able to confirm that the discontinuation of the leachate evaporator, the installation of two 75 HP blowers and the postponed purchase of the LFG power generator would not impact the additionality of project activity negatively, would not change the scale of CDM project activity, and would not change the applicability of ACM0001 (version 10).

B.2.7. Types of changes specific to afforestation or reforestation project activity

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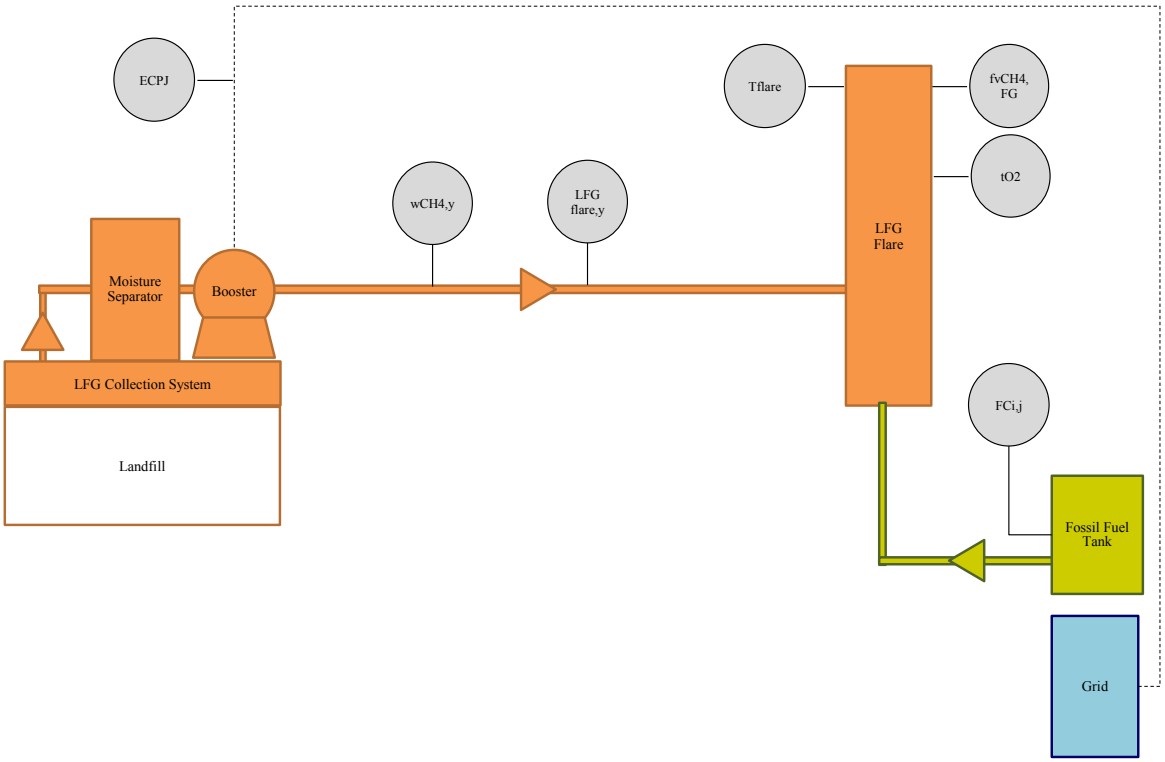
Not applicable. The section is left blank intentionally.

SECTION C. Description of monitoring system

The following section provides a description of the monitoring system including data collection procedures (information flow including data generation, aggregation, recording, calculation and reporting), organizational structure, roles and responsibilities of personnel, and emergency procedures for the monitoring system for the El Verde Landfill Project:

- **Line diagram showing all relevant monitoring points:** The following line diagram shows the monitoring points applied in the El Verde Landfill Gas Project during the monitoring period:



- **Data collection procedures:** The following points provide a description of the data collection procedures followed by the El Verde Landfill Project during the monitoring period:

  a) **Data generation:** The data generation for the El Verde Landfill Gas Project is using both Automatic Continuous and Manual Periodic (Daily) Data Gathering System as follows:

  - Manual Periodic (Daily) Data Gathering System: The following parameters are gathered manually in daily log sheets:

1. Table 2. Parameters gathered manually in Leon LFS

Parameter	Data unit	Description of the parameter
$EC_{PJ,y}$	MWh	On-site consumption of electricity provided by the grid attributable to the project activity
$FC_{i,j,y}$	m^3	Quantity of fuel type i combusted in process j

- Automatic Continuous Data Gathering System: In normal operating conditions, data has been recorded every two minutes electronically and it will be kept during the crediting period and two years after. The company LANDTEC is responsible to aggregate monthly the raw data and transmits these through Excel file to PASA. The following parameters are gathered automatically under such procedure:

2. *Table 3. Parameters gathered automatically in Leon LFS.*

Parameter	Data unit	Description of the parameter
$LFG_{flare,y}$	Nm^3	Amount of landfill gas flared at normal temperature and pressure
$w_{CH4,y}$	m^3 CH_4 / m^3 LFG	Methane fraction in the landfill gas.
$t_{O2,h}$	%	Volumetric fraction of O_2 in the exhaust gas of the flare in the hour h.
$fv_{CH4,FG,h}$	mg/m^3	Concentration of methane in the exhaust gas of the flare in dry basis at normal conditions in the hour h.
T_{flare}	ºC	Temperature in the exhaust gas of the flare.

b) Data aggregation: The data is aggregated monthly in a Monthly Report which is presented to the Board of Promotora Ambiental S.A.B. de C.V (PASA) as per internal procedures.

c) Data recording: The data which is gathered automatically is recorded in monthly spreadsheets while the data gathered manually is recorded both in paper forms and in spreadsheets. Promotora Ambiental S.A.B. de C.V (PASA) has an in-house back-up system to record the data during the crediting period. In parallel, LANDTEC provides support to back-up the automatic raw data.

d) ER calculation and reporting: The gathered data is used to calculate the Emission Reductions (ER) as per the applicable methodologies and the registered PDD and these are reported in the CDM-MR. Previous to this process, a QA/QC procedure is used with the aim of disregard any raw data in the same time interval which do not accomplish the following three operational conditions at the same time:

- Condition 1: The $LFG_{flare,y}$ should be between 450 and 5047 Nm^3/h
- Condition 2: The $w_{CH4,y}$ should be between 25 and 75% in CH_4
- Condition 3:The T_{flare} should be between 500 and 1200ºC.

The following scheme simplifies the Data collection procedures followed in the El Verde Landfill Gas Project during the monitoring period:

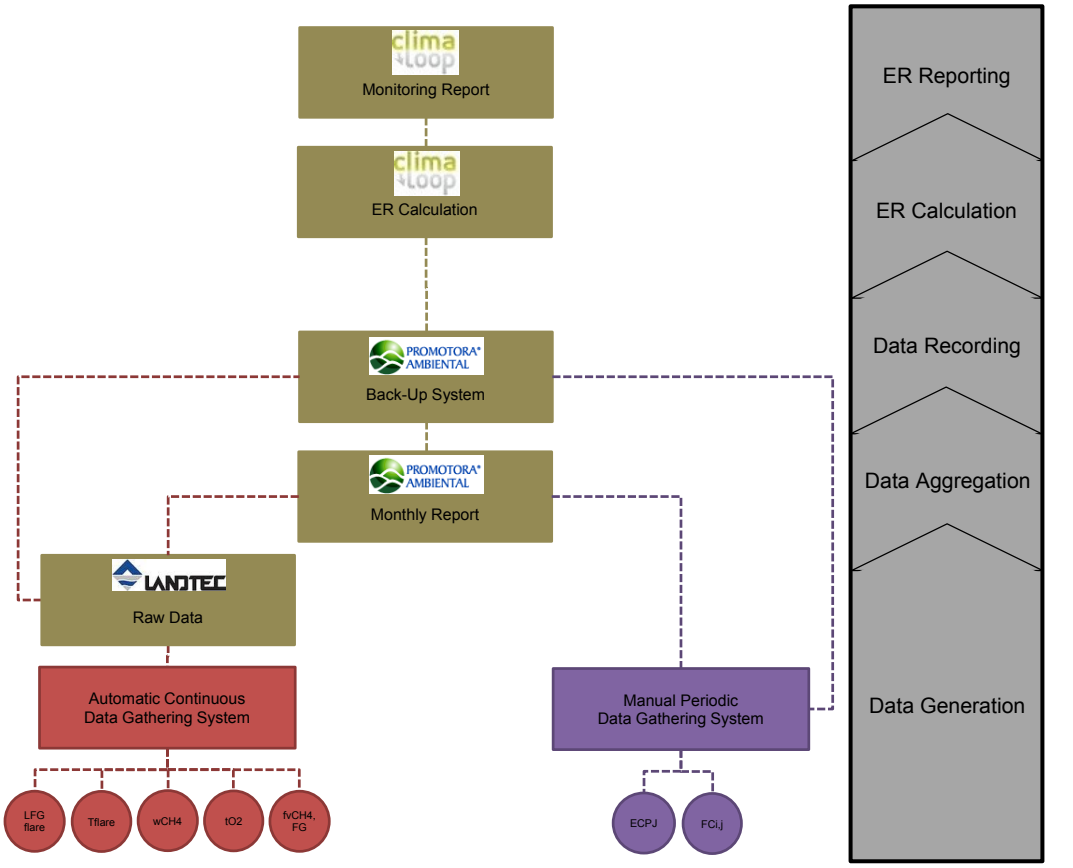


Figure 2. Scheme of the data collection procedures for El Verde Landfill Gas Project.

As shown in the scheme above, the Data collection procedures in the El Verde Landfill Gas Project are divided in an Automatic Continuous Data Gathering System (which gathers the parameters $LFG_{flare,y}$, $w_{CH4,y}$, $t_{O2,h}$, $fv_{CH4,FG,h}$ and T_{flare}) and a Manual Periodic Data Gathering System (which gathers the parameters $EC_{PJ,y}$ and $FC_{i,j,y}$).

Once the data is collected, it is aggregated in a monthly basis to report the expected CER generation to PASA´s Board. Once data is archived in back-up system of the facility, all data is sent to the CDM Consultant to conduct the ER calculations and the preparation of the Monitoring Report (CDM-MR).

e) Organizational structure, roles and responsibilities: The following list simplifies the responsibilities allocated of each role during the monitoring period:

3. Table 4. Roles and responsibilities in the El Verde Landfill Gas Project.

Name	Role	Organization	Process Involvement
Gerardo Palato	Field Technician	PASA	Data Collection
Jesus Garcia Castro	Monitoring and Biogas Manager	PASA	
Ricardo López Loredo	Landfill Sites Manager	PASA	Data Aggregation
Sergi Cuadrat	CDM Consultant	ClimaLoop	ER Calculation and Reporting

The following scheme simplifies the Organizational Structure followed by the El Verde Landfill Gas Project:

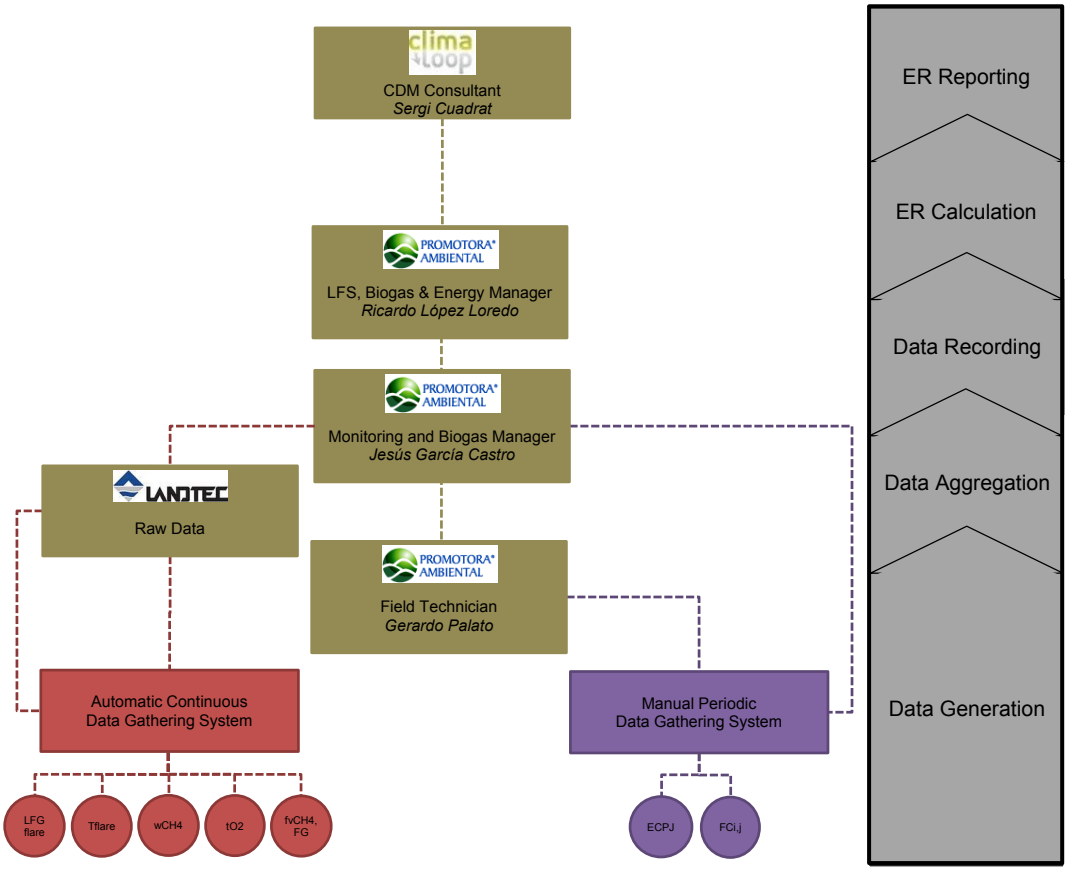


Figure 3. Organizational Structure followed in El Verde Landfill Gas Project.

The Field Technician is the responsible to conduct the day-to-day operation of equipment and collects data under the Manual Periodic Data Gathering System. The Monitoring and Biogas Manager supervises all CDM activities such as data collection, aggregation and recording and reports to the Landfill Sites, Biogas and Energy Manager who supervises the project activity. Finally, the CDM Consultant is responsible for the CERs calculations and elaborates the Monitoring Report.

f) The responsibilities and authorities for monitoring and reporting: The following list simplifies the responsibilities allocated of each role during the monitoring period:

- Field Technician
  - ✓ Checks day-to-day operation of equipment.
  - ✓ Conduct the required maintenance as per predefined schedule.
  - ✓ Executes the calibration of equipment with procedures and frequency established. Collects data under the Manual Periodic Data Gathering System (which gathers the parameters $EC_{PJ,y}$ and $FC_{i,j,y}$) in paper registries and transfers to electronic registries.
- Automatic Continuous Data Gathering System provider (LANDTEC)
  - ✓ Aggregates the raw data gathered by the Automatic Continuous Data Gathering System.
  - ✓ Transmits raw data gathered in a monthly basis through Excel file to PASA.
  - ✓ Provides support to back-up the automatic raw data.
- Monitoring and Biogas Manager
  - ✓ Supervises the general operations.
  - ✓ Supervises all CDM activities such as data collection, aggregation and recording.
  - ✓ Supervision of Automatic Continuous Data Gathering System.
  - ✓ Ensures that data is collected as per the registered PDD.
  - ✓ Manages the calibration of equipment with procedures and frequency established.
  - ✓ Ensures proper Back-Up of the Raw Data and CDM Documentation.
  - ✓ Sends Raw Data to CDM Consultant.
- Landfill Sites, Biogas and Energy Manager
  - ✓ Supervises the project activity.
  - ✓ Takes major decisions when required (equipment repair/replacement, improvements, etc).
- CDM Consultant (ClimaLoop)

- ✓ Performs the CERs calculations;
- ✓ Performs internal audits of the project;
- ✓ Elaborates the Monitoring Report;
- ✓ Supports the project during the verification site visits.

g) **Emergency procedures for the monitoring system:** The emergency procedures for the monitoring system in the El Verde Landfill Gas Project consist in daily checks of the project activity equipment and meters. If any problem occurs, the responsible personnel take the required action to solve the problem. If a malfunction on meters or equipment occurs, no CERs are claimed for the corresponding period.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data/parameter:	**$\rho_{CH4,n}$**
Unit	kg/m^3
Description	Density of methane gas at normal conditions
Source of data	"Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Value(s) applied)	0.716
Choice of data or measurement methods and procedures	As per "Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Purpose of data	Calculation of baseline emissions
Additional comments	The value of $\rho_{CH4,n}$ has been referred with three significant digits as 0.716 kg/m^3 as per the "Tool to determine project emissions from flaring gases containing methane" (ver. 1)

Data/parameter:	**D_{CH4}**
Unit	tCH_4/m^3CH_4
Description	Methane density at normal temperature and pressure (0°C and 1.013 bar)
Source of data	ACM0001 Version 10 "Consolidated baseline and monitoring methodology for landfill gas project activities"
Value(s) applied)	0.0007168
Choice of data or measurement methods and procedures	As per ACM0001 Version 10 "Consolidated baseline and monitoring methodology for landfill gas project activities"
Purpose of data	Calculation of baseline emissions
Additional comments	The value of D_{CH4} has been referred with four significant digits as 0.0007168 tCH_4/m^3 CH_4 as per the ACM0001 Version 10 "Consolidated baseline and monitoring methodology for landfill gas project activities"

Data/parameter:	**AM_C**
Unit	kg/kmol
Description	Atomic mass of carbon
Source of data	"Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Value(s) applied)	12
Choice of data or measurement methods and procedures	As per "Tool to determine project emissions from flaring gases containing methane" (ver. 1)

Purpose of data	Calculation of baseline emissions
Additional comments	This section has been left blank intentionally

Data/parameter:	**AM_H**
Unit	kg/kmol
Description	Atomic mass of hydrogen
Source of data	"Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Value(s) applied)	1.01
Choice of data or measurement methods and procedures	As per "Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Purpose of data	Calculation of baseline emissions
Additional comments	This section has been left blank intentionally

Data/parameter:	**AM_O**
Unit	kg/kmol
Description	Atomic mass of oxygen
Source of data	"Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Value(s) applied)	16
Choice of data or measurement methods and procedures	As per "Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Purpose of data	Calculation of baseline emissions
Additional comments	This section has been left blank intentionally

Data/parameter:	**AM_N**
Unit	kg/kmol
Description	Atomic mass of nitrogen
Source of data	"Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Value(s) applied)	14.01
Choice of data or measurement methods and procedures	As per "Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Purpose of data	Calculation of baseline emissions
Additional comments	This section has been left blank intentionally

Data/parameter:	**$NA_{C,CH4}$**
Unit	Atoms
Description	Number of atoms of carbon in CH_4
Source of data	"Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Value(s) applied)	1
Choice of data or measurement methods and procedures	As per "Tool to determine project emissions from flaring gases containing methane" (ver. 1)

Purpose of data	Calculation of baseline emissions
Additional comments	This section has been left blank intentionally

Data/parameter:	**$NA_{N,N2}$**
Unit	Atoms
Description	Number of atoms of nitrogen in N2
Source of data	"Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Value(s) applied)	2
Choice of data or measurement methods and procedures	As per "Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Purpose of data	Calculation of baseline emissions
Additional comments	This section has been left blank intentionally

Data/parameter:	**MM_{CH4}**
Unit	kg/kmol
Description	Molecular mass of methane
Source of data	"Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Value(s) applied)	16.04
Choice of data or measurement methods and procedures	As per "Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Purpose of data	Calculation of baseline emissions
Additional comments	This section has been left blank intentionally

Data/parameter:	**MM_{N2}**
Unit	kg/kmol
Description	Molecular mass of nitrogen
Source of data	"Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Value(s) applied)	28.02
Choice of data or measurement methods and procedures	As per "Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Purpose of data	Calculation of baseline emissions
Additional comments	This section has been left blank intentionally

Data/parameter:	**MVn**
Unit	m^3/Kmol
Description	Volume of one mole of any ideal gas at normal temperature and pressure
Source of data	"Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Value(s) applied)	22.414
Choice of data or measurement methods and procedures	As per "Tool to determine project emissions from flaring gases containing methane" (ver. 1)

Purpose of data	Calculation of baseline emissions
Additional comments	This section has been left blank intentionally

Data/parameter:	**MF_{O2}**
Unit	m^3/Kmol
Description	O_2 volumetric fraction of air
Source of data	"Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Value(s) applied)	0.21
Choice of data or measurement methods and procedures	As per "Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Purpose of data	Calculation of baseline emissions
Additional comments	This section has been left blank intentionally

Data/parameter:	**P_n**
Unit	Pa
Description	Atmospheric pressure at normal conditions
Source of data	"Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Value(s) applied)	101325
Choice of data or measurement methods and procedures	As per "Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Purpose of data	Calculation of baseline emissions
Additional comments	This section has been left blank intentionally

Data/parameter:	**R_u**
Unit	Pa m^3/kmol K
Description	Universal ideal gas constant
Source of data	"Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Value(s) applied)	8314.472
Choice of data or measurement methods and procedures	As per "Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Purpose of data	Calculation of baseline emissions
Additional comments	This section has been left blank intentionally

Data/parameter:	**T_n**
Unit	K
Description	Temperature at normal conditions
Source of data	"Tool to determine project emissions from flaring gases containing methane" (ver. 1)
Value(s) applied)	273.15
Choice of data or measurement methods and procedures	As per "Tool to determine project emissions from flaring gases containing methane" (ver. 1)

Purpose of data	Calculation of baseline emissions
Additional comments	This section has been left blank intentionally

Data/parameter:	**GWP_{CH4}**
Unit	tCO_2e/tCH_4
Description	Global Warming Potential of CH_4
Source of data	Table 2.14 of the Fourth Assessment Report of the IPCC.
Value(s) applied)	25
Choice of data or measurement methods and procedures	As per COP Decision 4/CMP.7, "for the second commitment period of the Kyoto Protocol, the global warming potentials used by Parties to calculate the carbon dioxide equivalence of anthropogenic emissions by sources and removals by sinks of the greenhouse gases listed in Annex A to the Kyoto Protocol shall be those listed in the column entitled "Global Warming Potential for Given Time Horizon" in table 2.14 of the errata to the contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, based on the effects of greenhouse gases over a 100-year time horizon, taking into account the inherent and complicated uncertainties involved in global warming potential estimates". Therefore, GWP of methane has been considered as 25 (100-year time horizon) as per Table 2.14 of the Fourth Assessment Report of the IPCCC which can be found at: http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html#table-2-14
Purpose of data	Calculation of baseline emissions
Additional comments	Shall be updated according to any future COP/MOP decisions.

Data/parameter:	**$CEF_{elec,BL,y} = EF_{grid,CM,y}$**
Unit	tCO_2e/MWh
Description	CO_2 emissions intensity of the grid connected to the project site. It is used to determine emissions due to project electricity consumption (EFgrid,CM,y).
Source of data	As shown in the PDD, the emissions factor was calculated using the version 1.1 of the "Tool to calculate the emission factor for an electricity system", recommended by ACM0001 Ver.10.
Value(s) applied)	0.5126
Choice of data or measurement methods and procedures	Calculated using the version 1.1 of the "Tool to calculate the emission factor for an electricity system", recommended by ACM0001 Ver.10.
Purpose of data	Calculation of project emissions
Additional comments	A single, fixed value is used for each crediting period.

Data/parameter:	**Regulatory requirements relating to landfill gas projects**
Unit	Dimensionless
Description	Regulatory requirements relating to landfill gas projects
Source of data	Publicly available information of the host country's regulatory requirements relating to landfill gas.
Value(s) applied)	0
Choice of data or measurement methods and procedures	Publicly available information of the host country's regulatory requirements relating to landfill gas.
Purpose of data	Calculation of baseline emissions

Additional comments	The information though recorded annually, is used for changes to the adjustment factor (AF) or directly $MD_{BL,y}$ at renewal of the credit period.

Data/parameter:	**TDL_y**
Unit	-
Description	Average technical transmission and distribution losses in the grid for the voltage level at which electricity is obtained from the grid.
Source of data	As per "Tool to calculate project, baseline and leakage emissions from electricity consumption" (version 1)
Value(s) applied)	0.2
Choice of data or measurement methods and procedures	As per "Tool to calculate project, baseline and leakage emissions from electricity consumption" (version 1)
Purpose of data	Project
Additional comments	Project electricity consumption is mainly due to the electricity consumption by the LFG blower.

Data/parameter:	**$EF_{CO2,i,y}$**
Unit	tCO_2/GJ
Description	Weighted average CO_2 emission factor of fuel type i in year y
Source of data	IPCC default values as provided in Table 1.4 of Chapter 1 Vol. 2 (energy) of the 2006 IPCC Guidelines on National GHG Inventories.
Value(s) applied)	0.0656
Choice of data or measurement methods and procedures	IPCC default values
Purpose of data	Calculation of project emissions
Additional comments	This section has been left blank intentionally

D.2. Data and parameters monitored

Data/Parameter	**$LFG_{flare,y}$**	
Unit	Nm^3	
Description	Amount of landfill gas flared at normal temperature and pressure	
Measured/Calculated /Default	Measured by a mass flow meter	
Source of data	Automatic Data Gathering System	
Value(s) of monitored parameter		17,617,025
Monitoring equipment	**Equipment 1**	
	Type	LFGflare_Flowmeter
	Accuracy class	± 1% Full Scale
	Manufacturer	Thermal Instruments
	Model	62-9/9500
	Serial Number	2010167
	Calibration Frequency	18 months
	Date of last calibration	05/04/2013
	Validity of last calibration	13/11/2014

	Installation date	14/05/2013
	Validity of calibration runs from	Installation date
	Equipment 2	
	Type	LFGflare_Flowmeter
	Accuracy class	± 1% Full Scale
	Manufacturer	Thermal Instruments
	Model	62-9/9500
	Serial Number	2008394
	Calibration Frequency	18 months
	Date of last calibration	05/04/2013
	Validity of last calibration	04/04/2014
	Installation date	14/02/2014
	Validity of calibration runs from	Installation date
	Equipment 3	
	Type	LFGflare_Flowmeter
	Accuracy class	± 1% Full Scale
	Manufacturer	Thermal Instruments
	Model	62-9/9500
	Serial Number	2011024
	Calibration Frequency	18 months
	Date of last calibration	04/03/2014
	Validity of last calibration	26/04/2016
	Installation date	28/10/2014
	Validity of calibration runs from	Installation date
	Equipment 4	
	Type	LFGflare_Flowmeter
	Accuracy class	± 1% Full Scale
	Manufacturer	Thermal Instruments
	Model	62-9/9500
	Serial Number	2011025
	Calibration Frequency	18 months
	Date of last calibration	08/04/2014
	Validity of last calibration	23/10/2017
	Installation date	25/04/2016
	Validity of calibration runs from	Installation date
Measuring/Reading/ Recording frequency	Continuous mass flow meters will be used to measure flow rates combusted in power plant at normal temperature and pressure when installed. In normal operating conditions, data will be recorded every two minutes electronically and it will be kept during the crediting period and two years after. Data will also be aggregated monthly.	
Calculation method (if applicable)	The value of the monitored value shown in this table is the result of the accumulated flow in which raw data in the same time interval accomplish the following three operational conditions at the same time: • Condition 1: The $LFG_{flare,y}$ should be between 450 and 5047 Nm^3/h • Condition 2: The $w_{CH4,y}$ should be between 25 and 75% in CH_4 • Condition 3:The T_{flare} should be between 500 and 1200ºC.	
QA/QC procedures	Flow meters have been subject to regular maintenance and testing regime to ensure accuracy. The same basis (dry or wet) as CH_4 concentration is considered for this measurement when the residual gas temperature exceeds 60ºC. QA/QC procedure is used with the aim of disregard any raw data in the same time interval which do not accomplish the following three operational conditions at the same time: • Condition 1: The $LFG_{flare,y}$ should be between 450 and 5047 Nm^3/h • Condition 2: The $w_{CH4,y}$ should be between 25 and 75% in CH_4 • Condition 3:The T_{flare} should be between 500 and 1200ºC..	
Purpose of data	Baseline	

Additional comment	No separate monitoring of temperature and pressure have been necessary because the project activity is using flow meters that automatically compensate for temperature and pressure, expressing LFG volumes in normalized cubic meters (Nm^3). The parameter $LFG_{flare,y}$ is measured by the LFGflare_Flowmeter, which is placed before the input to the flare.

Data/Parameter	**$LFG_{electricity,y}$**	
Unit	Nm^3	
Description	Amount of landfill gas combusted in power plant at normal temperature and pressure	
Measured/Calculated /Default	It will be measured by a mass flow meter when installed	
Source of data	Not installed	
Value(s) of monitored parameter		Not installed
Monitoring equipment	Type	Not installed
	Accuracy class	Not installed
	Manufacturer	Not installed
	Model	Not installed
	Serial Number	Not installed
	Calibration Frequency	Not installed
	Date of last calibration	Not installed
	Validity of last calibration	Not installed
	Installation date	Not installed
	Validity of calibration runs from	Not installed
Measuring/Reading/ Recording frequency	Continuous mass flow meters will be used to measure flow rates combusted in power plant at normal temperature and pressure when installed. In normal operating conditions, data will be recorded every two minutes electronically and it will be kept during the crediting period and two years after. Data will also be aggregated monthly.	
Calculation method (if applicable)	Not installed	
QA/QC procedures	Flow meters will be subject to regular maintenance and testing regime to ensure accuracy. The same basis (dry or wet) as CH_4 concentration will be considered for this measurement when the residual gas temperature exceeds 60ºC.	
Purpose of data	Not used	
Additional comment	No separate monitoring of temperature and pressure will be necessary because the project activity will be using flow meters that automatically compensate for temperature and pressure, expressing LFG volumes in normalized cubic meters (Nm^3).	

Data / Parameter:	**$w_{CH4,y}$**
Data unit:	m^3 CH_4 / m^3 LFG
Description:	Methane fraction in the landfill gas.
Measured /Calculated /Default:	Measured by a gas analyzer
Source of data:	Automatic Data Gathering System
Value(s) of monitored parameter	48.9%

Monitoring equipment	**Equipment 1**	
	Type	Field Analyser Unit (FAU)
	Accuracy class	± 0.2% to ± 1% (0 to full scale)
	Manufacturer	Landtec
	Model	FAU
	Serial Number	GA08772/06
	Calibration Frequency	6 months
	Date of last calibration	26/06/2012
	Validity of last calibration	12/01/2013
	Installation date	13/07/2012
	Validity of calibration runs from	Installation date
	Equipment 2	
	Type	Field Analyser Unit (FAU)
	Accuracy class	± 0.2% to ± 1% (0 to full scale)
	Manufacturer	Landtec
	Model	FAU
	Serial Number	GA08966/06
	Calibration Frequency	6 months
	Date of last calibration	17/12/2012
	Validity of last calibration	29/07/2013
	Installation date	28/01/2013
	Validity of calibration runs from	Installation date
	Equipment 3	
	Type	Field Analyser Unit (FAU)
	Accuracy class	± 0.2% to ± 1% (0 to full scale)
	Manufacturer	Landtec
	Model	FAU
	Serial Number	GA-08641
	Calibration Frequency	6 months
	Date of last calibration	23/01/2013
	Validity of last calibration	17/09/2013
	Installation date	19/03/2013
	Validity of calibration runs from	Installation date
	Equipment 4	
	Type	Field Analyser Unit (FAU)
	Accuracy class	± 0.2% to ± 1% (0 to full scale)
	Manufacturer	Landtec
	Model	FAU
	Serial Number	GA08772/do
	Calibration Frequency	6 months
	Date of last calibration	22/05/2013
	Validity of last calibration	12/12/2013
	Installation date	13/06/2013
	Validity of calibration runs from	Installation date
	Equipment 5	
	Type	Field Analyser Unit (FAU)
	Accuracy class	± 0.2% to ± 1% (0 to full scale)
	Manufacturer	Landtec
	Model	FAU
	Serial Number	GA08966/06
	Calibration Frequency	6 months
	Date of last calibration	17/12/2012
	Validity of last calibration	30/04/2014
	Installation date	30/10/2013

Validity of calibration runs from	Installation date
Equipment 6	
Type	Field Analyser Unit (FAU)
Accuracy class	± 0.2% to ± 1% (0 to full scale)
Manufacturer	Landtec
Model	FAU
Serial Number	GA08772/do
Calibration Frequency	6 months
Date of last calibration	06/12/2013
Validity of last calibration	11/06/2014
Installation date	11/12/2013
Validity of calibration runs from	Installation date
Equipment 7	
Type	Field Analyser Unit (FAU)
Accuracy class	± 0.2% to ± 1% (0 to full scale)
Manufacturer	Landtec
Model	FAU
Serial Number	GA-08802
Calibration Frequency	6 months
Date of last calibration	05/02/2014
Validity of last calibration	29/08/2014
Installation date	28/02/2014
Validity of calibration runs from	Installation date
Equipment 8	
Type	Field Analyser Unit (FAU)
Accuracy class	± 0.2% to ± 1% (0 to full scale)
Manufacturer	Landtec
Model	FAU
Serial Number	GA08772/do
Calibration Frequency	6 months
Date of last calibration	23/04/2014
Validity of last calibration	04/02/2015
Installation date	06/08/2014
Validity of calibration runs from	Installation date
Equipment 9	
Type	Field Analyser Unit (FAU)
Accuracy class	± 0.2% to ± 1% (0 to full scale)
Manufacturer	Landtec
Model	FAU
Serial Number	GA08966/06
Calibration Frequency	6 months
Date of last calibration	02/07/2014
Validity of last calibration	07/08/2015
Installation date	06/02/2015
Validity of calibration runs from	Installation date
Equipment 10	
Type	Field Analyser Unit (FAU)
Accuracy class	± 0.2% to ± 1% (0 to full scale)
Manufacturer	Landtec
Model	FAU
Serial Number	GA08772/do
Calibration Frequency	6 months
Date of last calibration	25/03/2015
Validity of last calibration	05/02/2016

	Installation date	07/08/2015
	Validity of calibration runs from	Installation date
	Equipment 11	
	Type	Field Analyser Unit (FAU)
	Accuracy class	± 0.2% to ± 1% (0 to full scale)
	Manufacturer	Landtec
	Model	FAU
	Serial Number	GA08966/06
	Calibration Frequency	6 months
	Date of last calibration	10/11/2015
	Validity of last calibration	28/07/2016
	Installation date	28/01/2016
	Validity of calibration runs from	Installation date
Measuring/Reading/ Recording frequency	Methane content has been measured using a continuous gas analyzer. Data has been measured at least once per hour and recorded electronically. Data will be kept during the crediting period and two years after. Data has been aggregated monthly.	
Calculation method (if applicable)	The value of the monitored value shown in this table is the result of the weighted average in which raw data in the same time interval accomplish the following three operational conditions at the same time: • Condition 1: The $LFG_{flare,y}$ should be between 450 and 5047 Nm^3/h • Condition 2: The $w_{CH4,y}$ should be between 25 and 75% in CH_4 • Condition 3:The T_{flare} should be between 500 and 1200ºC..	
QA/QC procedures	Gas analyzer has been subject to a regular calibration, maintenance and testing regime to ensure accuracy. As per equipment provider, the FAU conducts a span gas check every 8 hours, even though the provider recommends only one check per week. The characteristics of the standard certified gas are as follows: -Bottle 1: 45% CH_4, 40% CO_2 y balance 15% (N_2). -Bottle 2: 5% O_2 y balance 95% (N_2).	
Purpose of data	Baseline	
Additional comment	Paired values of the methane fraction of the landfill gas and LFG flow which are averaged for the same time interval have been used in the calculation of emission reductions. The parameter $w_{CH4,y}$ is measured by the Field Analyser Unit (FAU), which is placed after the booster.	

Data/Parameter	**T**	
Unit	ºC	
Description	Temperature of the landfill gas	
Measured/Calculated /Default	Measured by thermal flow meter	
Source of data	Automatic Data Gathering System	
Value(s) of monitored parameter		40.81
Monitoring equipment	**Equipment 1**	
	Type	LFGflare_Flowmeter
	Accuracy class	± 1% Full Scale
	Manufacturer	Thermal Instruments
	Model	62-9/9500
	Serial Number	2010167

	Calibration Frequency	18 months
	Date of last calibration	05/04/2013
	Validity of last calibration	13/11/2014
	Installation date	14/05/2013
	Validity of calibration runs from	Installation date
	Equipment 2	
	Type	LFGflare_Flowmeter
	Accuracy class	± 1% Full Scale
	Manufacturer	Thermal Instruments
	Model	62-9/9500
	Serial Number	2008394
	Calibration Frequency	18 months
	Date of last calibration	05/04/2013
	Validity of last calibration	04/04/2014
	Installation date	14/02/2014
	Validity of calibration runs from	Installation date
	Equipment 3	
	Type	LFGflare_Flowmeter
	Accuracy class	± 1% Full Scale
	Manufacturer	Thermal Instruments
	Model	62-9/9500
	Serial Number	2011024
	Calibration Frequency	18 months
	Date of last calibration	04/03/2014
	Validity of last calibration	26/04/2016
	Installation date	28/10/2014
	Validity of calibration runs from	Installation date
	Equipment 4	
	Type	LFGflare_Flowmeter
	Accuracy class	± 1% Full Scale
	Manufacturer	Thermal Instruments
	Model	62-9/9500
	Serial Number	2011025
	Calibration Frequency	18 months
	Date of last calibration	08/04/2014
	Validity of last calibration	23/10/2017
	Installation date	25/04/2016
	Validity of calibration runs from	Installation date
Measuring/Reading/ Recording frequency	Data has been measured at least once per hour, recorded electronically. Data has been aggregated monthly/yearly. Records will be kept during the crediting period and two years after.	
Calculation method (if applicable)	The value of the monitored value shown in this table is the result of the weighted average. The flow meters automatically measure temperature and pressure, expressing LFG volumes in normalized cubic meters (Nm^3).	
QA/QC procedures	Measuring instruments should be subject to a regular maintenance and testing regime to ensure accuracy.	
Purpose of data	Not used.	

Additional comment	No separate monitoring of temperature is necessary when using flow meters that automatically measure temperature and pressure, expressing LFG volumes in normalized cubic meters (Nm^3).

Data/Parameter	**P**	
Unit	Pa	
Description	Pressure of the landfill gas	
Measured/Calculated /Default	Not measured	
Source of data	Not installed	
Value(s) of monitored parameter	Not installed	
Monitoring equipment	Type	Not installed
	Accuracy class	Not installed
	Manufacturer	Not installed
	Model	Not installed
	Serial Number	Not installed
	Calibration Frequency	Not installed
	Date of last calibration	Not installed
	Validity of last calibration	Not installed
	Date of previous calibration	Not installed
	Validity of previous calibration	Not installed
Measuring/Reading/ Recording frequency	Not measured. The flow meters automatically measure temperature and pressure, expressing LFG volumes in normalized cubic meters (Nm^3).	
Calculation method (if applicable)	N/A	
QA/QC procedures	N/A	
Purpose of data	Not used. The flow meters automatically measure temperature and pressure, expressing LFG volumes in normalized cubic meters (Nm^3).	
Additional comment	No separate monitoring of temperature is necessary when using flow meters that automatically measure temperature and pressure, expressing LFG volumes in normalized cubic meters (Nm^3).	

Data/Parameter	**EL_{LFG}**	
Unit	MWh	
Description	Net amount of electricity generated using LFG.	
Measured/Calculated /Default	Not measured	
Source of data	Not installed	
Value(s) of monitored parameter	Not installed	
Monitoring equipment	Type	Not installed
	Accuracy class	Not installed
	Manufacturer	Not installed

	Model	Not installed
	Serial Number	Not installed
	Calibration Frequency	Not installed
	Date of last calibration	Not installed
	Validity of last calibration	Not installed
	Date of previous calibration	Not installed
	Validity of previous calibration	Not installed
Measuring/Reading/ Recording frequency	Not measured. The quantities will be measured with electricity meters. The readings will be made at least once per hour and electronically stored in a spreadsheet. Data will be recorded during crediting period and two years after.	
Calculation method (if applicable)	Not installed	
QA/QC procedures	The meter will be calibrated periodically according to manufacturer's specification.	
Purpose of data	Not used.	
Additional comment	Required to estimate the emission reductions from electricity generation from LFG when credits are claimed.	

Data/Parameter	**Operation of the energy plant**	
Unit	Hours	
Description	Operation of the power plant	
Measured/Calculated /Default	Not measured	
Source of data	Not installed	
Value(s) of monitored parameter	Not installed	
Monitoring equipment	Type	Not installed
	Accuracy class	Not installed
	Manufacturer	Not installed
	Model	Not installed
	Serial Number	Not installed
	Calibration Frequency	Not installed
	Date of last calibration	Not installed
	Validity of last calibration	Not installed
	Date of previous calibration	Not installed
	Validity of previous calibration	Not installed
Measuring/Reading/ Recording frequency	In normal operating conditions, data will be recorded every two minutes electronically and it will be kept during the crediting period and two years after. Data will also be aggregated monthly.	
Calculation method (if applicable)	Not installed	
QA/QC procedures	The meter will be calibrated periodically according to manufacturer's specification.	
Purpose of data	Not used.	
Additional comment	The parameter will be monitored to ensure methane destruction is claimed for methane used in electricity plant when it is operational.	

The following parameters are used to determine the project emissions from flaring of the residual gas stream ($PE_{flare,y}$) and have been monitored as per the *"Tool to determine project emissions from flaring gases containing methane"*.

Data/Parameter	**$PE_{flare,y}$**
Unit	tCO_2e
Description	Project emissions from flaring of the residual gas stream
Measured/Calculated /Default	Calculated
Source of data	Automatic Data Gathering System
Value(s) of monitored parameter	4,919
Measuring/Reading/ Recording frequency	In normal operating conditions, data has been recorded every two minutes electronically and it will be kept during the crediting period and two years after. Data has also been aggregated monthly.
Calculation method (if applicable)	The parameters used for the determination of $PE_{flare,y}$ are $LFG_{flare,y}$, $w_{CH4,y}$, $fv_{i,}$ $fv_{CH4,FG,y}$, $t_{O2,h}$ and T_{flare}. The calculation method is followed as per the "Tool to determine project emissions from flaring gases containing methane".
QA/QC procedures	Regular maintenance will ensure optimal operation of the flare. Analysers will be calibrated according to manufacturer's recommendations.
Purpose of data	Project
Additional comment	The parameters used for determining the project emissions from flaring of the residual gas stream (PEflare,y) have been monitored as per the "Tool to determine project emissions from flaring gases containing methane".

Data/Parameter	**$FV_{RG,h}$**	
Unit	Nm^3	
Description	Volumetric flow rate of the residual gas in dry basis at normal conditions in the hour h.	
Measured/Calculated /Default	Measured by a mass flow meter	
Source of data	Automatic Data Gathering System	
Value(s) of monitored parameter	17,617,025	
Monitoring equipment	**Equipment 1**	
	Type	LFGflare_Flowmeter
	Accuracy class	± 1% Full Scale
	Manufacturer	Thermal Instruments
	Model	62-9/9500
	Serial Number	2010167
	Calibration Frequency	18 months
	Date of last calibration	05/04/2013
	Validity of last calibration	13/11/2014
	Installation date	14/05/2013
	Validity of calibration runs from	Installation date
	Equipment 2	
	Type	LFGflare_Flowmeter

	Accuracy class	± 1% Full Scale
	Manufacturer	Thermal Instruments
	Model	62-9/9500
	Serial Number	2008394
	Calibration Frequency	18 months
	Date of last calibration	05/04/2013
	Validity of last calibration	04/04/2014
	Installation date	14/02/2014
	Validity of calibration runs from	Installation date
	Equipment 3	
	Type	LFGflare_Flowmeter
	Accuracy class	± 1% Full Scale
	Manufacturer	Thermal Instruments
	Model	62-9/9500
	Serial Number	2011024
	Calibration Frequency	18 months
	Date of last calibration	04/03/2014
	Validity of last calibration	26/04/2016
	Installation date	28/10/2014
	Validity of calibration runs from	Installation date
	Equipment 4	
	Type	LFGflare_Flowmeter
	Accuracy class	± 1% Full Scale
	Manufacturer	Thermal Instruments
	Model	62-9/9500
	Serial Number	2011025
	Calibration Frequency	18 months
	Date of last calibration	08/04/2014
	Validity of last calibration	23/10/2017
	Installation date	25/04/2016
	Validity of calibration runs from	Installation date
Measuring/Reading/ Recording frequency	Continuous mass flow meters have been used to measure flow rates. In normal operating conditions, data has been recorded every two minutes electronically and it will be kept during the crediting period and two years after. Data has been also aggregated monthly.	
Calculation method (if applicable)	The value of the monitored value shown in this table is the result of the accumulated flow in which raw data in the same time interval accomplish the following three operational conditions at the same time: • Condition 1: The $LFG_{flare,y}$ should be between 450 and 5047 Nm^3/h • Condition 2: The $w_{CH4,y}$ should be between 25 and 75% in CH_4 • Condition 3:The T_{flare} should be between 500 and 1200ºC..	
QA/QC procedures	Flow meters have been subject to regular maintenance and testing regime to ensure accuracy. The same basis (dry or wet) as CH_4 concentration is considered for this measurement when the residual gas temperature exceeds 60ºC. QA/QC procedure is used with the aim of disregard any raw data in the same time interval which do not accomplish the following three operational conditions at the same time: • Condition 1: The $LFG_{flare,y}$ should be between 450 and 5047 Nm^3/h • Condition 2: The $w_{CH4,y}$ should be between 25 and 75% in CH_4 • Condition 3:The T_{flare} should be between 500 and 1200ºC..	
Purpose of data	Project	

Additional comment	As a simplified approach, this parameter is considered to be the same as the amount of landfill gas flared at normal temperature and pressure ($LFG_{flare,y}$) as per the "Tool to determine project emissions from flaring gases containing methane". No separate monitoring of temperature and pressure have been necessary because the project activity is using flow meters that automatically compensate for temperature and pressure, expressing LFG volumes in normalized cubic meters (Nm^3).

Data/Parameter	**$fv_{i,h}$**	
Unit	-	
Description	Volumetric fraction of component i in the residual gas in the hour h	
Measured/Calculated /Default	Measured by a gas analyzer	
Source of data	Automatic Data Gathering System	
Value(s) of monitored parameter		48.9%
Monitoring equipment	**Equipment 1**	
	Type	Field Analyser Unit (FAU)
	Accuracy class	± 0.2% to ± 1% (0 to full scale)
	Manufacturer	Landtec
	Model	FAU
	Serial Number	GA08772/06
	Calibration Frequency	6 months
	Date of last calibration	26/06/2012
	Validity of last calibration	12/01/2013
	Installation date	13/07/2012
	Validity of calibration runs from	Installation date
	Equipment 2	
	Type	Field Analyser Unit (FAU)
	Accuracy class	± 0.2% to ± 1% (0 to full scale)
	Manufacturer	Landtec
	Model	FAU
	Serial Number	GA08966/06
	Calibration Frequency	6 months
	Date of last calibration	17/12/2012
	Validity of last calibration	29/07/2013
	Installation date	28/01/2013
	Validity of calibration runs from	Installation date
	Equipment 3	
	Type	Field Analyser Unit (FAU)
	Accuracy class	± 0.2% to ± 1% (0 to full scale)
	Manufacturer	Landtec
	Model	FAU
	Serial Number	GA-08641
	Calibration Frequency	6 months
	Date of last calibration	23/01/2013
	Validity of last calibration	17/09/2013
	Installation date	19/03/2013
	Validity of calibration runs from	Installation date
	Equipment 4	
	Type	Field Analyser Unit (FAU)

Accuracy class	± 0.2% to ± 1% (0 to full scale)
Manufacturer	Landtec
Model	FAU
Serial Number	GA08772/do
Calibration Frequency	6 months
Date of last calibration	22/05/2013
Validity of last calibration	12/12/2013
Installation date	13/06/2013
Validity of calibration runs from	Installation date
Equipment 5	
Type	Field Analyser Unit (FAU)
Accuracy class	± 0.2% to ± 1% (0 to full scale)
Manufacturer	Landtec
Model	FAU
Serial Number	GA08966/06
Calibration Frequency	6 months
Date of last calibration	17/12/2012
Validity of last calibration	30/04/2014
Installation date	30/10/2013
Validity of calibration runs from	Installation date
Equipment 6	
Type	Field Analyser Unit (FAU)
Accuracy class	± 0.2% to ± 1% (0 to full scale)
Manufacturer	Landtec
Model	FAU
Serial Number	GA08772/do
Calibration Frequency	6 months
Date of last calibration	06/12/2013
Validity of last calibration	11/06/2014
Installation date	11/12/2013
Validity of calibration runs from	Installation date
Equipment 7	
Type	Field Analyser Unit (FAU)
Accuracy class	± 0.2% to ± 1% (0 to full scale)
Manufacturer	Landtec
Model	FAU
Serial Number	GA-08802
Calibration Frequency	6 months
Date of last calibration	05/02/2014
Validity of last calibration	29/08/2014
Installation date	28/02/2014
Validity of calibration runs from	Installation date
Equipment 8	
Type	Field Analyser Unit (FAU)
Accuracy class	± 0.2% to ± 1% (0 to full scale)
Manufacturer	Landtec
Model	FAU
Serial Number	GA08772/do
Calibration Frequency	6 months
Date of last calibration	23/04/2014
Validity of last calibration	04/02/2015
Installation date	06/08/2014
Validity of calibration runs from	Installation date
Equipment 9	

	Type	Field Analyser Unit (FAU)
	Accuracy class	± 0.2% to ± 1% (0 to full scale)
	Manufacturer	Landtec
	Model	FAU
	Serial Number	GA08966/06
	Calibration Frequency	6 months
	Date of last calibration	02/07/2014
	Validity of last calibration	07/08/2015
	Installation date	06/02/2015
	Validity of calibration runs from	Installation date
	Equipment 10	
	Type	Field Analyser Unit (FAU)
	Accuracy class	± 0.2% to ± 1% (0 to full scale)
	Manufacturer	Landtec
	Model	FAU
	Serial Number	GA08772/do
	Calibration Frequency	6 months
	Date of last calibration	25/03/2015
	Validity of last calibration	05/02/2016
	Installation date	07/08/2015
	Validity of calibration runs from	Installation date
	Equipment 11	
	Type	Field Analyser Unit (FAU)
	Accuracy class	± 0.2% to ± 1% (0 to full scale)
	Manufacturer	Landtec
	Model	FAU
	Serial Number	GA08966/06
	Calibration Frequency	6 months
	Date of last calibration	10/11/2015
	Validity of last calibration	28/07/2016
	Installation date	28/01/2016
	Validity of calibration runs from	Installation date
Measuring/Reading/ Recording frequency	Methane content has been measured using a continuous gas analyzer. Data has been measured at least once per hour and recorded electronically. Data will be kept during the crediting period and two years after. Data has been aggregated monthly.	
Calculation method (if applicable)	The value of the monitored value shown in this table is the result of the weighted average in which raw data in the same time interval accomplish the following three operational conditions at the same time: • Condition 1: The $LFG_{flare,y}$ should be between 450 and 5047 Nm^3/h • Condition 2: The $w_{CH4,y}$ should be between 25 and 75% in CH_4 • Condition 3:The T_{flare} should be between 500 and 1200ºC..	
QA/QC procedures	As a simplified approach, only methane content of the residual gas will be measured and the remaining part will be considered as N2. Gas analyzer has been subject to a regular calibration, maintenance and testing regime to ensure accuracy. The same basis (dry or wet) is considered for this measurement when the residual gas temperature exceeds 60ºC. As per equipment provider, the FAU conducts a span gas check every 8 hours, even though the provider recommends only one check per week. The characteristics of the standard certified gas are as follows: -Bottle 1: 45% CH_4, 40% CO_2 y balance 15% (N_2). -Bottle 2: 5% O_2 y balance 95% (N_2).	
Purpose of data	Project	

Additional comment	This parameter is considered to be the same as the methane fraction in the landfill gas ($w_{CH4,v}$) as per the "Tool to determine project emissions from flaring gases containing methane". As a simplified approach, only methane content of the residual gas has been measured and the remaining part has been considered as N_2.

Data/Parameter	$t_{O2,h}$	
Unit	-	
Description	Volumetric fraction of O_2 in the exhaust has of the flare in the hour h.	
Measured/Calculated /Default	On-site measurements using a continuous gas analyser.	
Source of data	Automatic Data Gathering System	
Value(s) of monitored parameter		13.5%
Monitoring equipment	**Equipment 1**	
	Type	Flare Emissions Analyser (FEA)
	Accuracy class	O_2 = 0.1% + 1% of reading
	Manufacturer	Landtec
	Model	FEA
	Serial Number	4300
	Calibration Frequency	12 months
	Date of last calibration	15/10/2010
	Validity of last calibration	14/10/2011
	Installation date	11/01/2010
	Validity of calibration runs from	Calibration
	Equipment 2	
	Type	Flare Emissions Analyser (FEA)
	Accuracy class	O_2 = 0.1% + 1% of reading
	Manufacturer	Landtec
	Model	FEA
	Serial Number	4300
	Calibration Frequency	12 months
	Date of last calibration	01/11/2011
	Validity of last calibration	30/10/2012
	Installation date	13/01/2010
	Validity of calibration runs from	Calibration
	Equipment 3	
	Type	Flare Emissions Analyser (FEA)
	Accuracy class	O_2 = 0.1% + 1% of reading
	Manufacturer	Landtec
	Model	FEA
	Serial Number	4300
	Calibration Frequency	12 months
	Date of last calibration	10/12/2012
	Validity of last calibration	09/12/2013
	Installation date	13/01/2010
	Validity of calibration runs from	Calibration
	Equipment 4	
	Type	Flare Emissions Analyser (FEA)
	Accuracy class	O_2 = 0.1% + 1% of reading
	Manufacturer	Landtec

	Model	FEA
	Serial Number	4300
	Calibration Frequency	12 months
	Date of last calibration	11/02/2014
	Validity of last calibration	10/02/2015
	Installation date	13/01/2010
	Validity of calibration runs from	Calibration
	Equipment 5	
	Type	Flare Emissions Analyser (FEA)
	Accuracy class	O_2 = 0.1% + 1% of reading
	Manufacturer	Landtec
	Model	FEA
	Serial Number	4300
	Calibration Frequency	12 months
	Date of last calibration	06/02/2015
	Validity of last calibration	05/02/2016
	Installation date	13/10/2010
	Validity of calibration runs from	Calibration
	Equipment 6	
	Type	Flare Emissions Analyser (FEA)
	Accuracy class	O_2 = 0.1% + 1% of reading
	Manufacturer	Landtec
	Model	FEA
	Serial Number	4300
	Calibration Frequency	12 months
	Date of last calibration	28/01/2016
	Validity of last calibration	26/01/2017
	Installation date	13/10/2010
	Validity of calibration runs from	Calibration
Measuring/Reading/ Recording frequency	Oxygen concentration in the exhaust gas has been measured at least once per hour using a continuous gas analyser, and data records will be kept during the crediting period and two years after. Data has also been aggregated monthly.	
Calculation method (if applicable)	The value of the monitored value shown in this table is the result of the weighted average in which raw data in the same time interval accomplish the following three operational conditions at the same time: • Condition 1: The $LFG_{flare,y}$ should be between 450 and 5047 Nm^3/h • Condition 2: The $w_{CH4,v}$ should be between 25 and 75% in CH_4 • Condition 3:The T_{flare} should be between 500 and 1200ºC..	
QA/QC procedures	Analyser has been periodically calibrated according to the manufacturer's recommendation. A zero check and typical value check by comparison with a standard certified gas has been conducted. The FEA is calibrated manually by the Field Technician at least one time per week. The characteristics of the standard certified gas are as follows: -Bottle 1: 400 ppm CH_4, 15% O_2 and balance ≈85% (N_2). -Bottle 2: 100% N_2.	
Purpose of data	Project	
Additional comment	Extractive sampling analysers with water and particulates removal devices have been used. The point of measurement (sampling point) is in the upper section of the flare (80% of total flare height). Sampling is conducted with appropriate sampling probes adequate to high temperatures level (e.g. inconel probes). The variable is monitored, as required by the "Tool to determine project emissions from flaring gases containing methane" to calculate the flare efficiency.	

Data/Parameter	**$fv_{CH4,FG,h}$**	
Unit	mg/m^3	
Description	Concentration of methane in the exhaust gas of the flare in dry basis at normal conditions in the hour h	
Measured/Calculated /Default	On-site measurements using a continuous gas analyser.	
Source of data	Automatic Data Gathering System	
Value(s) of monitored parameter		45.48
Monitoring equipment	**Equipment 1**	
	Type	Flare Emissions Analyser (FEA)
	Accuracy class	CH_4 = 5ppm +1% of reading
	Manufacturer	Landtec
	Model	FEA
	Serial Number	4300
	Calibration Frequency	12 months
	Date of last calibration	15/10/2010
	Validity of last calibration	14/10/2011
	Installation date	11/01/2010
	Validity of calibration runs from	Calibration
	Equipment 2	
	Type	Flare Emissions Analyser (FEA)
	Accuracy class	CH_4 = 5ppm +1% of reading
	Manufacturer	Landtec
	Model	FEA
	Serial Number	4300
	Calibration Frequency	12 months
	Date of last calibration	01/11/2011
	Validity of last calibration	30/10/2012
	Installation date	13/01/2010
	Validity of calibration runs from	Calibration
	Equipment 3	
	Type	Flare Emissions Analyser (FEA)
	Accuracy class	CH_4 = 5ppm +1% of reading
	Manufacturer	Landtec
	Model	FEA
	Serial Number	4300
	Calibration Frequency	12 months
	Date of last calibration	10/12/2012
	Validity of last calibration	09/12/2013
	Installation date	13/01/2010
	Validity of calibration runs from	Calibration
	Equipment 4	
	Type	Flare Emissions Analyser (FEA)
	Accuracy class	CH_4 = 5ppm +1% of reading
	Manufacturer	Landtec
	Model	FEA
	Serial Number	4300
	Calibration Frequency	12 months
	Date of last calibration	11/02/2014
	Validity of last calibration	10/02/2015
	Installation date	13/01/2010

	Validity of calibration runs from	Calibration
	Equipment 5	
	Type	Flare Emissions Analyser (FEA)
	Accuracy class	CH_4 = 5ppm +1% of reading
	Manufacturer	Landtec
	Model	FEA
	Serial Number	4300
	Calibration Frequency	12 months
	Date of last calibration	06/02/2015
	Validity of last calibration	05/02/2016
	Installation date	13/10/2010
	Validity of calibration runs from	Calibration
	Equipment 6	
	Type	Flare Emissions Analyser (FEA)
	Accuracy class	CH_4 = 5ppm +1% of reading
	Manufacturer	Landtec
	Model	FEA
	Serial Number	4300
	Calibration Frequency	12 months
	Date of last calibration	28/01/2016
	Validity of last calibration	26/01/2017
	Installation date	13/10/2010
	Validity of calibration runs from	Calibration
Measuring/Reading/ Recording frequency	Methane concentration in the exhaust gas has been measured at least once per hour using a continuous gas analyser, and data records will be kept during the crediting period and two years after. Data has also been aggregated monthly.	
Calculation method (if applicable)	The value of the monitored value shown in this table is the result of the weighted average in which raw data in the same time interval accomplish the following three operational conditions at the same time: • Condition 1: The $LFG_{flare,y}$ should be between 450 and 5047 Nm^3/h • Condition 2: The $w_{CH4,y}$ should be between 25 and 75% in CH_4 • Condition 3:The T_{flare} should be between 500 and 1200ºC..	
QA/QC procedures	Analyser has been periodically calibrated according to the manufacturer's recommendation. A zero check and typical value check by comparison with a standard certified gas has been conducted. The FEA is calibrated manually by the Field Technician at least one time per week. The characteristics of the standard certified gas are as follows: -Bottle 1: 400 ppm CH_4, 15% O_2 and balance ≈85% (N_2). -Bottle 2: 100% N_2.	
Purpose of data	Project	
Additional comment	Extractive sampling analysers with water and particulates removal devices have been used. The point of measurement (sampling point) is in the upper section of the flare (80% of total flare height). Sampling is conducted with appropriate sampling probes adequate to high temperatures level (e.g. inconel probes). To convert from ppmv to mg/m^3, the monitored values have been multiplied by 0.716 as per the page 13 of the "Tool to determine project emissions from flaring gases containing methane" (Annex 13, EB 28). The variable is monitored, as required by the "Tool to determine project emissions from flaring gases containing methane" to calculate the flare efficiency.	

Data/Parameter	**T_{flare}**	
Unit	ºC	
Description	Temperature in the exhaust gas of the flare.	
Measured/Calculated /Default	On-site measurements using a thermocouple.	
Source of data	Automatic Data Gathering System	
Value(s) of monitored parameter		687.87
Monitoring equipment	**Equipment 1**	
	Type	Thermocouple
	Accuracy class	± 2.2° C or 0.75% of reading, whichever is greater
	Manufacturer	Thermo Sensors Corporation
	Model	494-92716-8-K-I600
	Serial Number	127490-1,2,3 and 4
	Calibration Frequency	18 months
	Date of last calibration	07/06/2012
	Validity of last calibration	22/01/2014
	Installation date	24/07/2012
	Validity of calibration runs from	Installation date
	Equipment 2	
	Type	Thermocouple
	Accuracy class	± 2.2° C or 0.75% of reading, whichever is greater
	Manufacturer	Thermo Sensors Corporation
	Model	494-92716-8-K-I600
	Serial Number	131575-1,2,3 and 4
	Calibration Frequency	18 months
	Date of last calibration	29/01/2014
	Validity of last calibration	11/08/2015
	Installation date	10/02/2014
	Validity of calibration runs from	Installation date
	Equipment 3	
	Type	Thermocouple
	Accuracy class	± 2.2° C or 0.75% of reading, whichever is greater
	Manufacturer	Thermo Sensors Corporation
	Model	494-92716-8-K-I600
	Serial Number	1099113C-1,2,3 and 4
	Calibration Frequency	18 months
	Date of last calibration	03/07/2015
	Validity of last calibration	07/02/2017
	Installation date	10/08/2015
	Validity of calibration runs from	Installation date
Measuring/Reading/ Recording frequency	Temperature in the exhaust gas has been measured at least once per hour using four thermocouples distributed along the flare stack. Data records will be kept during the crediting period and two years after. Data has also been aggregated monthly.	

Calculation method (if applicable)	The value of the monitored value shown in this table is the result of the weighted average in which raw data in the same time interval accomplish the following three operational conditions at the same time: • Condition 1: The $LFG_{flare,y}$ should be between 450 and 5047 Nm^3/h • Condition 2: The $w_{CH4,y}$ should be between 25 and 75% in CH_4 • Condition 3:The T_{flare} should be between 500 and 1200ºC..
QA/QC procedures	Continuous measurement of the temperature of the exhaust gas stream in the flare by a thermocouple. A temperature above 500 ºC indicates that a significant amount of gases are still being burnt and that the flare is operating.
Purpose of data	Not used directly in the calculations
Additional comment	An excessively high temperature at the sampling point may be an indication that the flare is not being adequately operated or that its capacity is not adequate to the actual flow. The parameter T_{flare} is measured with four measurements (sampling points), distributed along the flare stack.

The following variables are required to determine the electricity consumption from the grid using the *"Tool to calculate baseline, project and/or leakage emissions from electricity consumption",* version 1.

Data/Parameter	**$PE_{EC,y}$**
Unit	tCO_2
Description	Project emissions from electricity consumption by the project activity during the year y
Measured/Calculated /Default	Calculated as per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (Version 1)
Source of data	Manual Data Gathering System
Value(s) of monitored parameter	172
Monitoring equipment	No equipment is directly used to measure the parameter. The parameter is calculated from on-site consumption of electricity, which is measured continuously with electricity meter
Measuring/Reading/ Recording frequency	Calculated from on-site consumption of electricity, which is measured continuously with electricity meter and aggregated monthly in invoices provided by the grid operator.
Calculation method (if applicable)	As per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (Version 1)
QA/QC procedures	As per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (Version 1)
Purpose of data	Project.
Additional comment	Project electricity consumption is the sum of electricity consumption by the LFG blower, the monitoring equipment (incl. office) and is monitored as per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (Version 1).. Each component has the same emissions factor for electricity generation and the same transmission and distribution losses. The meter has been installed in this first phase of the project activity outside the compound in order to be accessible by the electricity

	company (CFE).

Data/Parameter	**$EC_{PJ,y}$**	
Unit	MWh	
Description	On-site consumption of electricity provided by the grid and/or LFG-based power plant(s) and attributable to the project activity during the year y	
Measured/Calculated /Default	On-site measurements and monthly invoices.	
Source of data	Manual Data Gathering System	
Value(s) of monitored parameter		279
Monitoring equipment	**Equipment 1**	
	Type	Electricity Meter
	Accuracy class	±0.25%
	Manufacturer	ABB
	Model	FM 9S (8S)
	Serial Number	6AZPGZ
	Calibration Frequency	N/A
	Date of last calibration	N/A
	Validity of last calibration	N/A
	Date of previous calibration	03/12/2012
	Validity of previous calibration	N/A
	Installation date	01/10/2012
	Validity of calibration runs from	N/A
	Equipment 2	
	Type	Electricity Meter
	Accuracy class	±0.25%
	Manufacturer	ABB
	Model	FM 9S (8S)
	Serial Number	40B9C408
	Calibration Frequency	N/A
	Date of last calibration	N/A
	Validity of last calibration	N/A
	Date of previous calibration	01/10/2012
	Validity of previous calibration	N/A
	Installation date	19/11/2015
	Validity of calibration runs from	N/A
Measuring/Reading/ Recording frequency	Measured continuously with electricity meter, aggregated monthly in invoices provided by the grid operator.	
Calculation method (if applicable)	Monthly invoices are aggregated and compared against accumlated electricity readings from electricty meter.	
QA/QC procedures	According to manufacturer's specifications, the electricty meters does not need to be calibrated. Monthly invoices are aggregated and cross-checked against accumlated electricity readings from electricty meter to ensure reliability of data.	
Purpose of data	Project	

Additional comment	Project electricity consumption is the sum of electricity consumption by the LFG blower, the monitoring equipment (incl. office) and is monitored as per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (Version 1).. Each component has the same emissions factor for electricity generation and the same transmission and distribution losses. The meter has been installed in this first phase of the project activity outside the compound in order to be accessible by the electricity company (CFE).

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	A default value of 20%.
Source of data	As per "Tool to calculate project, baseline and leakage emissions from electricity consumption" (version 1)
Value(s) of monitored parameter	20%
Measuring/Reading/ Recording frequency	Default value of average technical transmission and distribution losses is used so its Measuring/ Reading/ Recording frequency are not relevant for its accuracy.
Calculation method (if applicable)	No calculation method is used.
QA/QC procedures	In the absence of data from the relevant year, most recent figures should be used, but not older than 5 years.
Purpose of data	Project
Additional comment	Project electricity consumption is the sum of electricity consumption by the LFG blower, the monitoring equipment (incl. office) and is monitored as per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (Version 1).. Each component has the same emissions factor for electricity generation and the same transmission and distribution losses. The meter has been installed in this first phase of the project activity outside the compound in order to be accessible by the electricity company (CFE).

The following variables are required to determine the CO_2 emissions from fossil fuel combustion using the "*Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion*".

Data/Parameter	**$PE_{FC,j,y}$**
Unit	tCO_2e
Description	Project emissions from fossil fuel combustion in process j during the year y
Measured/Calculated /Default	Calculated as per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
Source of data	Manual Data Gathering System
Value(s) of monitored parameter	1
Monitoring equipment	No monitoring equipment directly measures this parameter since it is calculated from on-site consumption of fuel, which is measured periodically with a Liquid-Level Gauge and aggregated monthly in invoices provided by the fuel provider.
Measuring/Reading/ Recording frequency	Calculated from on-site consumption of fuel, which is measured periodically with a Liquid-Level Gauge and aggregated monthly in invoices provided by the fuel provider.

Calculation method (if applicable)	Calculated as per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
QA/QC procedures	Not applicable
Purpose of data	Project
Additional comment	Any eventual fossil fuel consumption during project activity will be accounted for with purchase receipts or invoices. For the current Monitoring Period, LPG has been used to start-up the flare.

Data/Parameter	**$FC_{i,j,y}$**	
Unit	m^3	
Description	Quantity of fuel type i combusted in process j during the year y	
Measured/Calculated /Default	Onsite measurements	
Source of data	Manual Data Gathering System	
Value(s) of monitored parameter		0.1900
Monitoring equipment	Type	Liquid-Level Gauge
	Accuracy class	±5%
	Manufacturer	Rochester Gauges, Inc
	Model	6281
	Serial Number	N/A
	Calibration Frequency	N/A
	Date of last calibration	N/A
	Validity	0
	Validity of last calibration	N/A
	Date of previous calibration	N/A
	Validity of previous calibration	N/A
	Installation date	28/10/2009
	Validity of calibration runs from	N/A
Measuring/Reading/ Recording frequency	Measured continuously with a volume meter. Since fuel (LPG) is supplied from small daily tanks, a ruler is used to determine the volume of the fuel consumed. The ruler gauge is part of the daily tank and the control for recording the measurements is done in daily logsheets.	
Calculation method (if applicable)	The consumed value in a daily basis is determined by the difference of two consecutive Liquid-Level Gauge readings (%) and multiplied by the storage tank capacity.	
QA/QC procedures	The consistency of metered fuel consumption quantities has been crosschecked by an energy balance that is based on purchased quantities and stock changes. Since the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities have also been crosschecked with available purchase invoices from the financial records as per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". As per manufacturer´s specification, the Liquid-Level Gauge does not require a calibration.	
Additional comment	The parameter $FC_{i,j,y}$ is measured by the Liquid Level Gauge. Since fuel (LPG) is supplied from small daily tanks, this measurement method have been used to determine the volume of the fuel consumed as per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" in its Version 2. The ruler gauge is part of the tank, installed inside the compound.	

The following variables have been provided by third parties and no equipment has been used for its measurement:

Data/Parameter	$NCV_{i,y}$
Unit	GJ/m^3
Description	Weighted average net calorific value of fuel type i (LPG) in year y
Measured/Calculated /Default	Default
Source of data	Upper Limit of the 95% Confident Interval in Table 1.2 of Chapter 1 Vol. 2 (energy) of the 2006 IPCC
Value(s) of monitored parameter	30.90
Monitoring equipment	Not necessary since it is a default value
Measuring/Reading/ Recording frequency	Not applicable since it is a default value
Calculation method (if applicable)	Not applicable since it is a default value
QA/QC procedures	Not applicable
Purpose of data	Project
Additional comment	LPG used to start-up the flare.

Data/Parameter	$EF_{CO2,i,y}$
Unit	tCO_2/GJ
Description	Weighted average CO_2 emission factor of fuel type i in year y
Measured/Calculated /Default	Default
Source of data	IPCC default values as provided in Table 1.4 of Chapter 1 Vol. 2 (energy) of the 2006 IPCC Guidelines on National GHG Inventories.
Value(s) of monitored parameter	0.0656
Monitoring equipment	Not necessary since it is a default value
Measuring/Reading/ Recording frequency	Not applicable since it is a default value
Calculation method (if applicable)	Not applicable since it is a default value
QA/QC procedures	Not applicable
Purpose of data	Project
Additional comment	LPG used to start-up the flare.

D.3. Implementation of sampling plan

>>

Not applicable. The section is left blank intentionally.

SECTION E. Calculation of emission reductions or GHG removals by sinks

The raw data gathered is presented in Monthly ER Spreadsheets to calculate the Emission Reductions (ERy) in a monthly basis as per the applicable methodologies and the registered PDD and these are aggregated and reported in the Summary ER Spreadsheet presented in conjunction with the CDM-MR.

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

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The following table summarizes the actual values used to calculate the baseline emissions (BE_y) with the corresponding results applying the formulae as per the registered PDD:

Table 5 Results and parameters used to calculate the Baseline Emissions

Data / Parameter:	Description	Source	Total Value	Unit
BE_y	Baseline emissions in year y (tCO2e)			
$BE_y = (MD_{project,y} - MD_{BL,y}) * GWP_{CH4} + EL_{LFG,y} * CEF_{elec,BL,y}$		Eq. (1a)	**149,173**	tCO2e
$MD_{project,y}$	Amount of methane that would be destroyed/combusted during the year, in tonnes of methane (tCH4)			
$MD_{project,y} = MD_{flared,y} + MD_{electricity,y} + MD_{thermal,y}$		Eq (8a)	**5,967**	tCH4
$MD_{flared,y}$	Quantity of methane destroyed by flaring (tCH4)			
$MD_{flared,y} = (LFG_{flare,y} * w_{CH4,y} * D_{CH4}) - (PE_{flare,y} / GWP_{CH4})$		Eq (9)	**5,967**	tCH4
$LFG_{flare,y}$	Quantity of landfill gas fed to the flare(s) during the year measured in cubic meters (m3)	Monitored	**17,617,025**	Nm3 LFG
$w_{CH4,y}$	Average methane fraction of the landfill gas as measured during the year and expressed as a fraction	Monitored	**48.9%**	m^3CH4/m^3LFG
D_{CH4}	Methane density expressed in tonnes of methane per cubic meter of methane	Default	**0.0007168**	tCH4/m3CH4
$PE_{flare,y}$	Project emissions from flaring of the residual gas stream in year y (tCO2e)			
$PE_{flare,y} = \Sigma TM_{RG,h} * (1 - \eta_{flare,h}) * GWP_{CH4} / 1000$		Eq (8)	**4,919**	tCO2e
$TM_{RG,h}$	Mass flow rate of methane in the residual gas in the hour h	Step 5. Eq (T.13)	**6,156,829**	kg
$\eta_{flare,h}$	Flare efficiency in hour h	Step 6. Eq (T.14)	**96.9%**	
GWP_{CH4}	Global Warming Potential value of methane	Default	**25**	tCO2e/tCH4

As shown in the Table 5 and according to ACM0001 (version 10), the greenhouse gas baseline emissions (BE_y) during the monitoring period are given by the Equation (1a), once the required simplifications have been adopted (i.e EL_{LFG}=0 and ET_{LFG}=0). The methane destroyed by the project activity ($MD_{project,y}$) during the monitoring period is determined by monitoring the quantity of methane actually flared which in turn is the total quantity of methane captured applying Equation (8a). Since there is no generation of electricity or thermal energy during the monitoring period, $MD_{electricty,y}$ and $MD_{thermal,y}$ have been considered as 0.

The calculation of $MD_{flared,y}$ is conducted applying the Equation (9) where the methane sent to the flare is determined by monitoring $LFG_{flare,y}$ and $w_{CH4,y}$ every 2 minutes (under normal operational conditions) with paired values added over the monitoring period. In the Table 5 above, the values of $LFG_{flare,y}$ and $w_{CH4,y}$ are cumulative and average values, respectively. The calculation of $PE_{flare,y}$ in Equation (9) is conducted as per the seven steps described in the "Tool to determine project emissions from flaring gases containing methane" (ver. 1) using continuous monitoring of the methane destruction efficiency of the flare (flare efficiency) as can be checked in the Monthly ER Spreadsheets (see details and Raw Data) and expressed in Equation (8).

E.2. Calculation of project emissions or actual net GHG removals by sinks

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The following table summarizes the actual values used to calculate the project emissions (PE_y) with the corresponding results applying the formulae as per the registered PDD:

Table 6 Results and parameters used to calculate the Project Emissions

Data / Parameter:	Description	Source	Total Value	Unit
PE_y	Project emissions in year y (tCO2e)			
$PE_y = PE_{EC,y} + PE_{FC,j,y}$		Eq. (16)	**173**	tCO2
$PE_{EC,y}$	Emissions from consumption of electricity in the project case.			
$PE_{EC,y} = EC_{PJ,j,y} * EF_{EL,j,y} * (1 + TDL_{j,y})$		Eq. (TE.1)	**172**	tCO2
$EC_{PJ,j,y}$	Quantity of electricity consumed by the project electricity consumption sour	Monitored	**279**	MWh
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y	Default	**0.5126**	tCO2/MWh
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricit	Default	**20.0%**	%
$PE_{FC,j,y}$	Project emissions from fossil fuel combustion in process j			
$PE_{FC,j,y} = FC_{i,j,y} * COEF_{i,y}$		Eq. (TF.1)	**1**	tCO2
$FC_{i,j,y}$	Quantity of fuel type i combusted in process j during the year y	Monitored	**0.1900**	m3
$COEF_{i,y}$	CO2 emission coefficient of fuel type i in year y			
$COEF_{i,y} = NCV_{i,y} * EF_{CO2,i,y}$		Eq. (TF.4)	**2.027**	tCO2/TJ
$NCV_{i,y}$	Weighted average net calorific value of the fuel type i in year y	IPCC	**30.90**	GJ/m3
$EF_{CO2,i,y}$	Weighted average CO2 emission factor of fuel type i in year y	IPCC	**0.0656**	tCO2/GJ

As shown in the Table 6 and according to ACM0001 (version 10), the greenhouse gas project emissions (PE_y) during the monitoring period are given by the Equation (16). The values for $PE_{EC,y}$ and $PE_{FC,j,y}$ in Equation (16) are calculated as follows:

- The project emissions from consumption of electricity ($PE_{EC,y}$) have been calculated using the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (TE) applying Equation (TE.1) using the monitored value of the quantity of electricity consumed by the project activity, a fixed value of the emission factor ($EF_{EL,j,y}$) and an average technical transmission and destruction losses ($TDL_{j,y}$).
- The project emissions from the fossil consumption ($PE_{FC,j,y}$) have been calculated according to the version 2 of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (TF) and is given by the Equation (TF.1), using the monitored value of the quantity of fuel LPG consumed by the project activity ($FC_{i,j,y}$) and the CO_2 emission coefficient of the LPG ($COEF_{i,y}$) calculated as per the Equation (TF.4).

E.3. Calculation of leakage

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The calculation does not need to consider leakage emissions, so LE_y=0

E.4. Summary of calculation of emission reductions or net GHG removals by sinks

The following table summarizes the actual values used to calculate the emission reductions (ER_y) with the corresponding results applying the Equation (17) as per the registered PDD:

Item	Baseline emissions or baseline net GHG removals by sinks (t CO_2e)	Project emissions or actual net GHG removals by sinks (t CO_2e)	Leakage (t CO_2e)	GHG emission reductions or net GHG removals by sinks (t CO_2e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
Total	149,173	173	0	0	149,000	149,000

E.5. Comparison of actual emission reductions or net GHG removals by sinks with estimates in registered PDD

The following table shows a comparison of actual values of the emission reductions achieved during the monitoring period with the estimations in the registered CDM-PDD. Since the monitoring period is considered from from 01/01/2014 to 31/07/2016 (both days included), it comprises 365 days of 2014, 365 days of 2015 and 213 days of 2016 hence relative values (tCO_2e/day) for each year have been compared against relative values presented in the CDM-PDD.

Item	Values estimated in ex ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO_2e)	545,352 tCO_2e	149,000 tCO_2e

The values in the ex-ante calculation of the updated CDM-PDD approved on 02/12/2013 after the request for post-registration changes are 204,270 tCO_2e for 2014 (365 days), 212,537 tCO_2e for 2015 (365 days), and 220,889 tCO_2e for 2016 (366 days). The daily average for 2014, 2015 and 2016 equate to 560, 582 and 604 tCO_2e/day, respectively. The ex-ante estimation is calculated by multiplying each of the daily average for 2014, 2015 and 2016 by the days per year of the current monitored period (365, 365 and 213 days, respectively).

In order to compare the actual emission reductions with the estimated values in the registered CDM-PDD in the same period, the actual relative emission reductions achieved during the current monitoring period (158 tCO_2e/day) are lower than the relative emission reductions stated in the registered CDM-PDD (582 tCO_2e/day). Considering the same time basis and the same periods, the actual emission reductions achieved during the current monitoring period (149,000 tCO_2e) are lower than the emission reductions derived from the yearly values stated in the registered CDM-PDD (545,352 tCO_2e).

E.6. Remarks on difference from estimated value in registered PDD

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The actual emission reductions achieved during the current monitoring period (149,000 tCO_2e) are lower than the emission reductions derived from the yearly values stated in the registered CDM-PDD (545,352 tCO_2e). Therefore, there is no need to provide explanation of any increase.

Appendix 1. Contact information of project participants and responsible persons/entities

Project participant and/or responsible person/ entity	☒ Project participant ☐ Person/entity responsible for completing the CDM-MR-FORM
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Document information

Version	*Date*	*Description*
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 (EB70, 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).
01	28 May 2010	EB 54, Annex 34. Initial adoption.

Decision Class: Regulatory
Document Type: Form
Business Function: Issuance
Keywords: monitoring report