



**MONITORING REPORT FORM (F-CDM-MR)**  
**Version 02.0**

**MONITORING REPORT**

|  |   |
|--|---|
| <b>Title of the project activity</b>   | Loma Los Colorados Landfill Gas Project   |
| <b>Reference number of the project activity</b>  | 0822  |
| <b>Version number of the monitoring report</b>   | 1   |
| <b>Completion date of the monitoring report</b>  | 01/07/2012  |
| <b>Registration date of the project activity</b>   | 17/03/2007  |
| <b>Monitoring period number and duration of this monitoring period</b>   | Monitoring Period #6<br>From 01/05/2011 to 31/05/2012   |
| <b>Project participant(s)</b>  | KDM S.A.<br>The Kansai Electric Power Co., Inc.<br>Urbaser S.A.   |
| <b>Host Party(ies)</b>   | Chile   |
| <b>Sectoral scope(s) and applied methodology(ies)</b>  | <p>Sectoral Scopes:<br/> 1: Energy industries (renewable/non-renewable sources);<br/> 13 : Waste handling and disposal;</p> <p>Applied CDM baseline and monitoring methodologies:<br/> ACM0001 - Consolidated methodology for landfill gas project activities (version 4);<br/> ACM0002 - Consolidated methodology for grid-connected electricity generation from renewable sources (version 6)</p> |
| <b>Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD</b> | 710,652   |
| <b>Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period</b>                            | 464,019   |

**SECTION A. Description of project activity****A.1. Purpose and general description of project activity**

The Loma Los Colorados Landfill Gas Project encompasses the construction and operation of landfill gas (LFG) collection and utilization/destruction initiative. LFG is collected and flared and utilized as gaseous fuel for electricity generation. Apart of promoting reduction of emissions of methane, the project also promotes GHG emissions reductions by displacing equivalent amount of electricity that would otherwise be generated using fossil.

At the end of the monitoring period covered by this Monitoring Report, 230 LFG collecting wells were installed over a 55 ha landfill surface. The LFG collecting wells are connected to the LFG flaring station and to the project's electricity generation facility through an active LFG extraction system. At the end of the considered monitoring period, the electricity generation facility currently have 11.8 MW of nameplate installed capacity. .

The table below summarizes the nameplate LFG flaring installed capacity and nameplate electricity generation installed capacity at closing date of the considered monitoring period:

| Flaring          | Flare N° 1               | Flare N° 2:              | Total = 10,194 Nm <sup>3</sup> /h |
|------------------|--------------------------|--------------------------|-----------------------------------|
|                  | 5,097 Nm <sup>3</sup> /h | 5,097 Nm <sup>3</sup> /h |                                   |
| Power generation | Power plant 1            | Power plant 2            | Total = 11.8 MW                   |
|                  | 2.0 MW                   | 9.8 MW                   |                                   |

During the monitoring period from 01/05/2011 to 31/05/2012, a new power plant was built (power plant 2) and started to operate at the Loma Los Colorados Landfill. The new electricity generation facility<sup>1</sup> Power plant 1 comprises the installation of 2 GE Waukesha model APG1000 engine-generator sets with a nameplate power of 1.0 MW each. During the first gradual implementation phase of the Power plant 2, it was first interconnected to the CDEC-SIC<sup>2</sup> on 20/09/2011.

The gradual implementation first phase of the Power plant 2 comprised the installation of seven GE Jenbacher J420 engines-generator sets, with nameplate installed capacity of 1.4 MW each, totalizing 9.8 MW of total nameplate installed for Power plant 2. As per current forecasts, under the subsequent gradual implementation phases for Power plant 2, additional GE Jenbacher model J420 engine-generator sets are expected to be implemented. For year 2012, an additional set of 4 engine-generator sets are expected to be installed. Further engine-generator sets capacity additions (always utilizing GE Jenbacher engine-generator sets units model J420, or equivalent) are planned to occur within the project's lifetime. By year 2028, a total nameplate installed capacity of 33.1 MW is expected to be in place.

The following relevant events occurred within the monitoring period from 01/05/2011 to 31/05/2012:

| Event description   | Date                     |
|---|--------------------------|
| Construction of 52 new LFG collecting wells   | 30-03-2012               |
| Execution of internal audit of the integrated quality and environmental management system (certified under ISO 9001 and ISO 14001 standards). | 20-07-2011               |
| Execution of external audit of the integrated quality and environmental management system (certified under ISO 9001 and ISO                   | 21-09-2010<br>14-09-2011 |

<sup>1</sup> Central Loma Los Colorados – Loma Los Colorados Plant

<sup>2</sup> Centro de Despacho Económico de Carga del Sistema Interconectado Central - Interconnected Central System - Load Economic Dispatch Center, is the central power grid operator



| Event description  | Date       |
|--|------------|
| 14001standards). This external audit was performed by the Certification Company AENOR. |            |
| The construction of Power Plant 2 construction initiated                               | 02-11-2010 |
| The construction of a new transmission line and new power sub-station was finalized.   | 15-07-2011 |
| Power plant 2 was connected to the National Electricity Grid of Chile (CDEC-SIC grid)  | 15-09-2011 |

Emission Reductions (ER) achieved during the period from 01/05/2011 to 31/05/2012 are **464,019** tCO<sub>2</sub>e.

## A.2. Location of project activity

The Loma Los Colorados Landfill is located in the administrative district (“Comuna”) of Til-Til, 63.5 km North of Santiago, Chile, near a village named Montenegro. Til-Til is located 578 meters above the sea level. According to the last census (2002), it has a population of 18,000 inhabitants covering an area of 667.3 km<sup>2</sup>.

The coordinates in decimal notation are:

Latitude: -32.9564;

Longitude: -70.8013.

## A.3. Parties and project participant(s)

| Party involved<br>(host) indicates a host Party) | Private and/or public<br>entity(ies) project participants<br>(as applicable) | Indicate if the Party involved<br>wishes to be considered as<br>project participant (Yes/No) |
|--|--|--|
| Chile (host)                                     | KDM S.A  | No   |
| Japan  | The Kansai Electric Power Co.,<br>Inc.                                       | No   |
| Spain  | Urbaser S.A.   | No   |

## A.4. Reference of applied methodology

The following baseline and monitoring methodologies are applied:

- ACM0001 - “Consolidated baseline methodology for landfill gas project activities” (version 4);
- ACM0002 - “Consolidated Baseline Methodology for Grid- Connected Power Generation from Renewable Sources” (version 6);

The following methodological tools are also applied:

- Tool to calculate baseline, project and/or leakage emissions from electricity consumption (version 1);
- Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion” (version 2);

## A.5. Crediting period of project activity

From 17/03/2007 to 16/03/2014 (7 year renewable crediting period).

## SECTION B. Implementation of project activity

### B.1. Description of implemented registered project activity

The following equipment encompasses the project activity:

#### A. Two enclosed high temperature flares (equipment provided by LFG Specialities LLC.)



Figure 1. Flaring Station and HDPE Piping with view of the flares

**Flare Stacks:** Carbon steel construction with ANSI 150 lb flanged inlet connection. Top portion of flare stack is 304 stainless steel. Carbon steel shell (10' diameter, 45' height) is internally insulated with ceramic fiber insulation (to resist operation temperatures, reaching values of 1095°C), and painted inside and out with high temperature paint. According to manufacturer's specification, each flare have a flow range of 500 – 3,000 scfm (800 – 5,097 Nm<sup>3</sup>/h)<sup>3</sup>. During the present monitoring period there are 2 flare units under operation.

**Burner Assembly:** All 304 stainless steel construction. Burner is suitable for operation over a 6:1 turndown range. (Proper blower and drive selection is required to realize the full 6:1 turndown range)

**Igniter Assembly:** The igniter is a small burner used to light the main burner. Typically fueled with bottled propane gas, the igniter assembly consists of a 304 stainless steel burner tube with spark plug ignition and type K thermocouple for flame confirmation. The spark plug is supplied with high temperature leads and a transformer in a NEMA 4 enclosure.

**Flame Supervision:** Typically consists of an ultraviolet flame detector to confirm flame integrity.

**Temperature Control:** – A dedicated closed loop temperature controller is used to maintain flare temperature setpoint. Process temperature is selectable from among multiple thermocouples (Pyromation), and control is maintained by modulating combustion air dampers at the flare base.

**Flare System Controllers:** Enclosed flares all use the Flame-Trol IV PLC (programmable logic controller) based control system. This is a technically advanced, fully automatic flare system controller specifically designed for maximum operating flexibility and efficiency.

**Sample Ports:** Sample ports are provided near the flare top as per EPA requirements to allow for emissions compliance testing.

<sup>3</sup>On section C it is included the operational conditions of the flares as well as the data collection architecture diagram.

Flame Arrestor: This device prevents flame flash back in the event of high oxygen concentrations in the landfill gas. The standard flame arrestor is equipped with an aluminium core assembly.

Standard Insulation: The enclosed flare interior is insulated with a nominal 2 inches of ceramic fiber blanket insulation. This amount of insulation will result in a hot metal skin temperature which is useful in preventing acid gas condensation from occurring on the metal shell ID.

#### B. Condensate Knock-Out Pot (KOP)

A 60 inches diameter x 90 inches OAH LFG Specialties L.L.C. KOP with 150# flanged 24 inches inlet and 18 inches outlet connections. KOP with the following characteristics:

- Internal coating of hi-build epoxy to resist acidic condensate
- External finish with rust resistant primer and industrial enamel color coat
- Stainless steel mist extraction pad with a 98% filtration efficiency of free liquids and solid particles of 20 microns or larger
- Removable lid to facilitate inspection and repair of coating if necessary
- Heavy duty gage glass liquid indicator
- Drain connection with manual ball valve and plug
- Liquid level switch for high condensate level alarm/shutdown

#### C. Blowers

3 landfill gas blowers, operating with 380 V voltage, 3 phase, 50 Hz power requirement. Each blower is of centrifugal type, spark proof, cast iron construction, cast aluminium impellers, with 75 HP TEFC motor. The impellers, inlet & outlet heads, and blower casing are coated with resistant phenolic coating. Each blower delivers 3,000 SCFM (5,097 Nm<sup>3</sup>/h) gas flow with 60 in. water column (14,944.92 Pa) inlet vacuum and 15 in. water column (3,736.23 Pa) discharge pressure.



Figure 2. View of the blowers



Figure 3. Specification plates of each blower

#### D. Automatic shut-off valves

12 in. bubble-tight carbon steel wafer type butterfly valve with Teflon seat materials and stainless steel shafts and discs with a Bettis CB Series or equal pneumatic actuator and 3 way solenoid valve with a spring operated "fail safe" closing in case of a power failure.

#### E. Thermal mass LFG flow meters & chart recorder

Flow of collected LFG is measured by the following equipments, where the parameter measured is also specified:

- i) Thermal mass flow meter total: 3 thermal mass flow meter that totalizes all LFG collected by the project activity ( $LFG_{total}$ )
- ii) Thermal mass flow meter flare n°1: 1 thermal mass Flowmeter and two more as backup ( $LFG_{flare}$ )
- iii) Thermal mass flow meter flare n°2: 1 thermal mass Flowmeter and two more as backup. These flow meters measures LFG flow sent to the flares ( $LFG_{flare}$ )
- iv) Thermal mass flow meter electricity 1: 3 thermal mass flow meter which measure LFG flow sent to the electricity generation facility 1 (power plant 1) ( $LFG_{electricity}$ )
- v) Thermal mass flow meter electricity 2: 1 thermal mass flow meter which measure LFG flow sent to the electricity generation facility 2 (power plant 2) ( $LFG_{electricity}$ )

All flow meters are manufactured by Fluid Components International LLC. (FCI). The flow meters provide measurements in normalized cubic meters per hour ( $Nm^3/h$ ). Thus, there is no need of utilization of measurements of LFG pressure and LFG temperature to convert flow measurements into  $Nm^3/h$ . The flow meters have a local displays for flow reading and output signal wired to the flare control panel. The project activity is equipped with a Yokogawa FX112 digital data acquisition system to record measured data.

#### F. Pressure/Vacuum transmitters & Variable frequency drives

1 Yokogawa vacuum transmitter and 2 Yokogawa pressure transmitters. The transmitters have a local display reading in percent of full scale and a 4 to 20 mA linear output wired to the flare control panel. The flare control panel manipulates the signals from the transmitters and sends a command signal to the variable frequency drives. The variable frequency drives controls the speed of the gas blower motors based on this signal. The vacuum and pressure is also recorded by the chart recorder.

#### G. Gas analyser

1 Siemens Ultramat 23 gas analyser. The gas analyser continuously monitors the composition of landfill gas in terms of methane ( $CH_4$ ), oxygen ( $O_2$ ), and carbon dioxide ( $CO_2$ ). The installed gas analyzer sends alarm signal to the flare control panel in case LFG content is out of pre-defined operating range. The gas



analyser also sends a 4 to 20 mA linear measurement output signal wired to the chart recorder to keep record of gas composition.



Figure 4. View of the installed gas Analyser

#### H. Piping

Include all on-skid interconnecting piping and valves between KOP and flare as follows:

- Piping of standard schedule 40, carbon steel pipe with flanged connections for equipment and valves, coated internally with hi-solid epoxy to resist acidic condensate;
- Valves will of Flow Line or equal cast iron wafer style butterfly type with Buna seat materials and stainless steel shafts and discs;
- Miscellaneous equipment including required vacuum and pressure gauges and temperature gauges.

#### I. SCADA

A general view of the SCADA system used in this project activity is shown on the following pictures, prior and after the start-up of power plant 2:

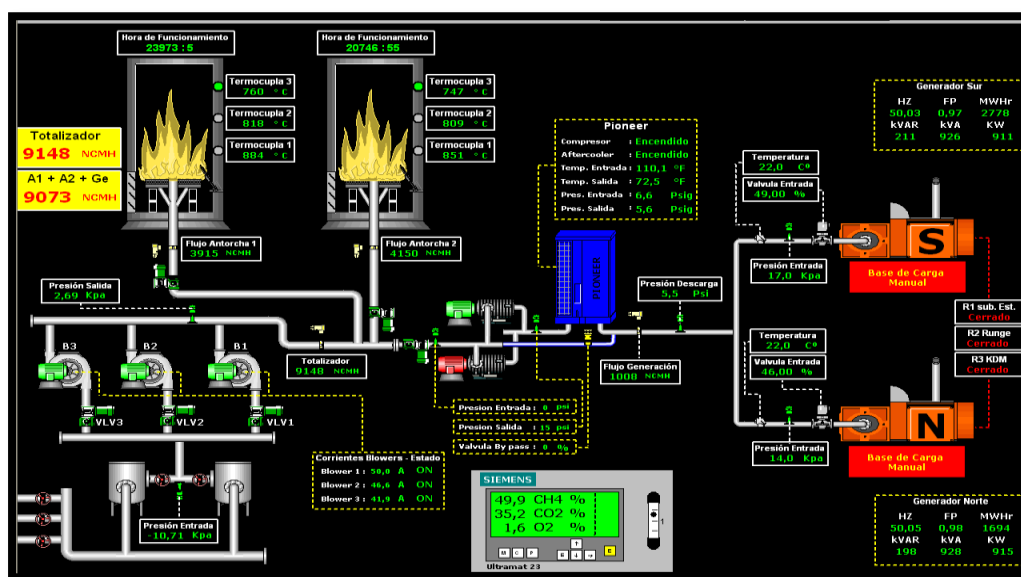


Figure 5. View of the installed SCADA system prior to the start-up of power plant 2

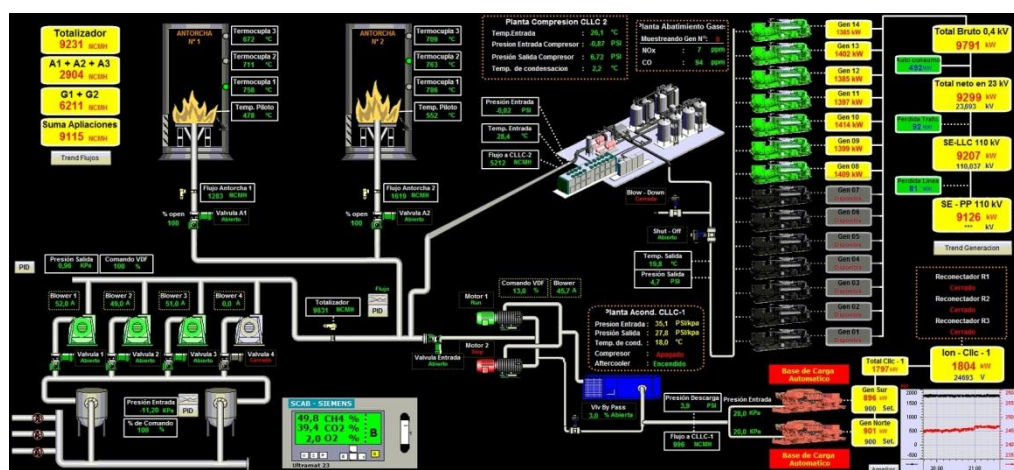


Figure 6. View of the installed SCADA system after the start-up of power plant 2

In the following sections a general description of the project's electricity generation components and their associated equipment is presented.

## J. Power plant 1

Power plant 1 comprises two GE Waukesha APG1000 engines-generator sets, with nameplate installed capacity of 1.0 MW each. These engine-generator sets were earlier commissioned on 07/07/2009. On 26/11/2009 the connection of power plant 1 to the National Electricity Grid of Chile was completed.





Figure 7. View of the installed Waukesha APG1000 engine-generator sets

The following image shows the complete generation system with the generation units in their respective soundproof container:



Figure 8. View of the LFG flaring station, conditioning plant and power plant 1

#### K. Power transmission for power plant 1

Power transmission for power plant 1 utilizes a 1 km length transmission line that was built to export electricity to the grid. This transmission line is connected to a previously existing transmission line as described on the following schematics: .



Figure 9. General lay-out of the landfill facilities and the project activity (prior to the start-up of power plant 2). The 23 kV transmission line for power plant 2 is shown.

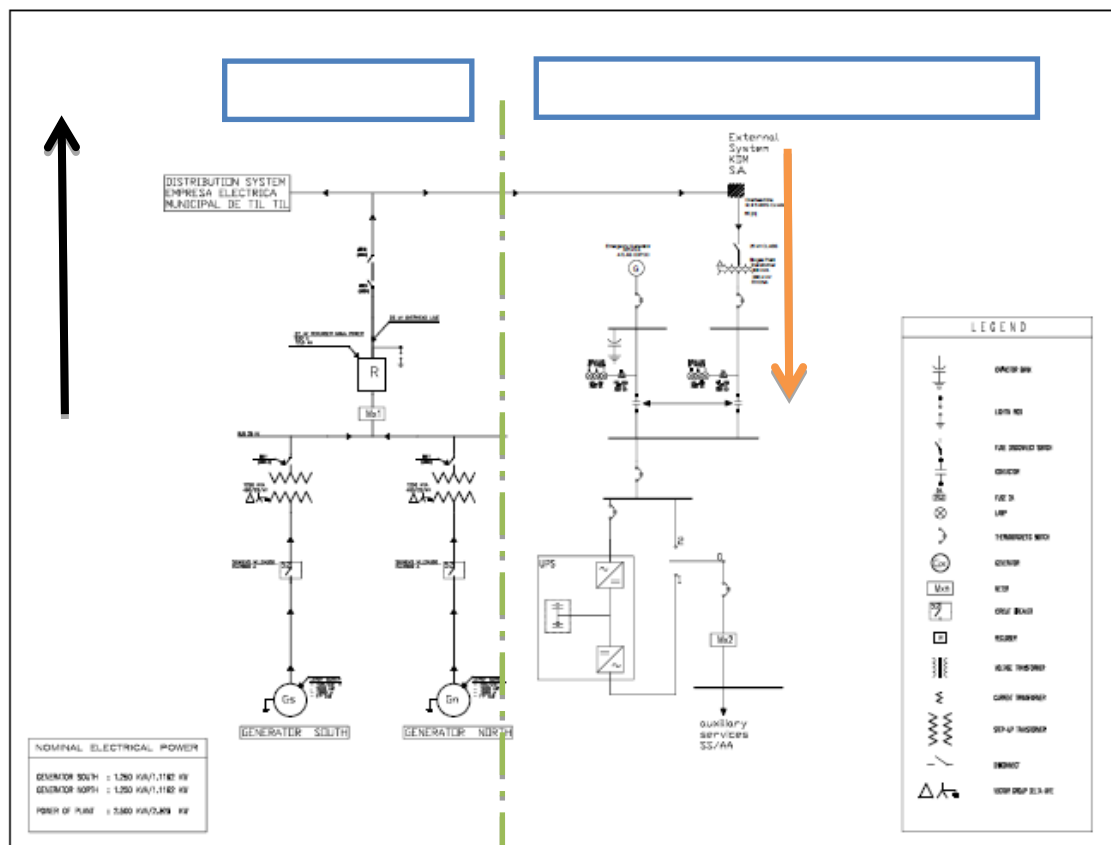


Figure 10. View of a schematic diagram showing the grid electricity supply to the facility and generated electricity exported to the grid<sup>4</sup>

<sup>4</sup> Power plant 2 is not shown in figure 10, however the layout described here remains unchanged even after the implementation of power plant 2. Power plant 2 electricity measurements and its transmission system is currently completely independent of power plant 1 (a dedicated transmission line is currently utilized for power plant 2).

### L. Power plant 2

During the monitoring period from 01/05/2011 to 31/05/2012, the first phase of power plant 2 was implemented. By the end of the considered monitoring period, power plant 2 comprised 7 GE Jenbacher J420 engine-generator sets with nameplate installed capacity of 1.4 MW each (total nameplate installed capacity of 9.8 MW).

Power plant 2 is coupled to an LFG supply pipeline of 20,000 m<sup>3</sup>/h capacity and to a LFG cooling and filtering plant. The LFG cooling and filtering plant is designed to eliminate unwanted contaminants from the collected LFG (such as moisture and siloxanes). The exhaust gases produced by each 7 GE Jenbacher J420 engine-generator sets are evacuated through ducts equipped with a double filtration system, consisting of a catalytic oxidation filter which reduces carbon monoxide emissions, and a selective catalytic type filter, or SCR, designed to reduce NO<sub>x</sub> emissions.

Each engine-generator set is coupled to a power transformer that increases the voltage level from 400 volts to 23,000 volts. Next, electricity generated by each unit motor-generator-transformer is connected to an overhead power line leading collector that concentrates all the electricity generated in an electrical sub-station which is set with protective and power maneuvers equipment.

### M. Power transmission for power plant 2

Power transmission for power plant 2 consists on a power sub-station that transmits electricity generated by power plant 2 by converting electricity from 23,000 Volt to 110,000 Volt. The power substation includes a power transformer and a protection and control system for high voltage (which is equipped with switches, circuit breakers and transformers). The transmission line has 20 km length and connects the power plant to the new substation, Punta Peuco, which is part of the SIC grid.



Figure 11. View of power plant 2





Figure 12. View of power plant 2

The next figure illustrates the actual project design:

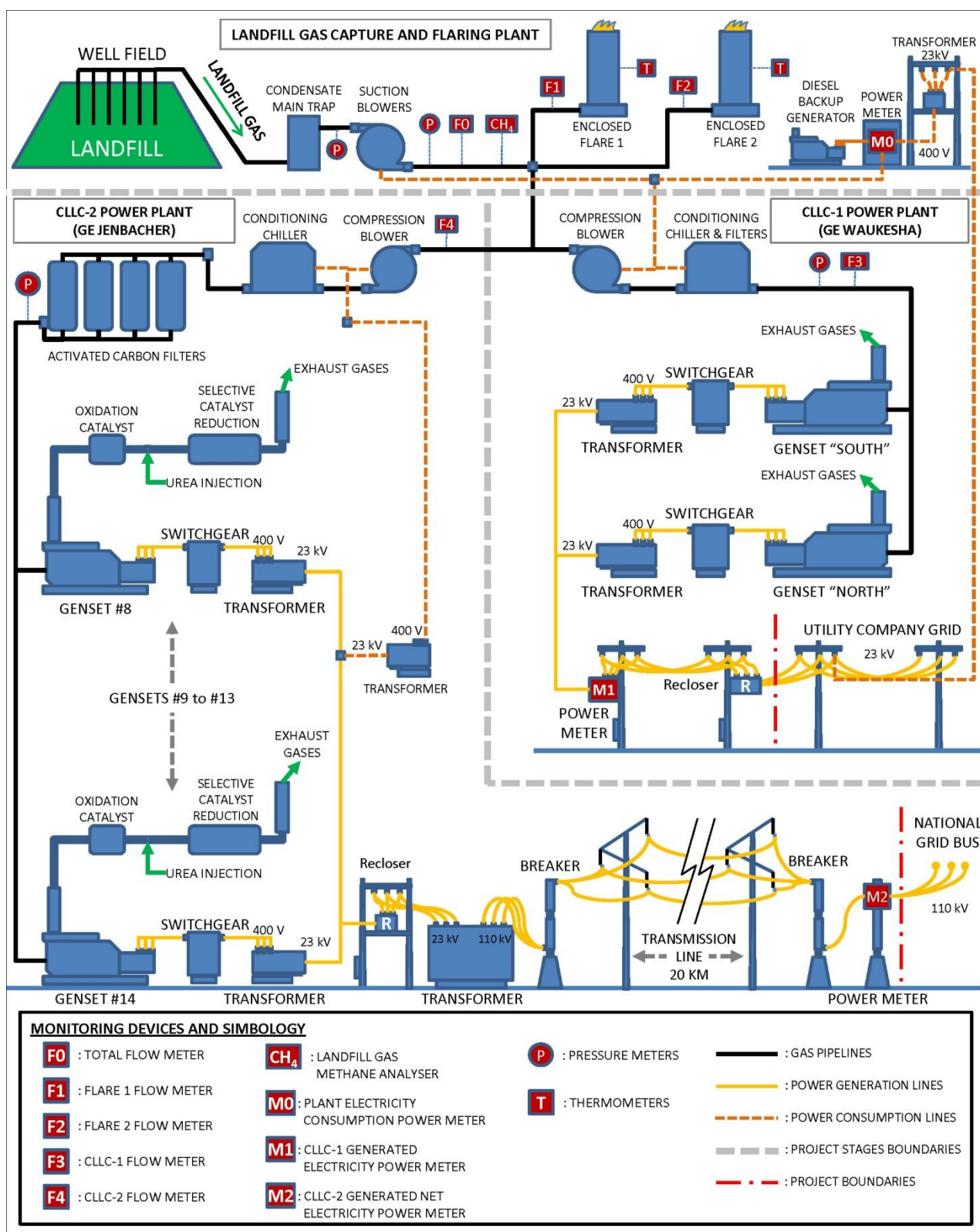


Figure 13. Schematics of the current project design

During the monitoring period from 01/05/2011 to 31/05/2012 the following relevant events occurred as part of the operation of the project activity<sup>5</sup>:

<sup>5</sup> In power plant 2 the installed set of 7 engine-generator sets are numbered from 8 to 14.

**Table N°1: Relevant operational events in the flaring station**

| Starting date | Ending date | Events   |
|---------------|-------------|--|
| 12-05-2011    | 12-05-2011  | Flow is restricted in Flare N°2 in order to perform measurements in exhaust gas in Flare “1” (measurements performed by the inspection service company “Airon Ingeniería y Control Ambiental S.A.”)        |
| 13-05-2011    | 13-05-2011  | Flow is restricted in Flare N°1 in order to perform measurements in exhaust gas in Flare “2” (measurements performed by the inspection service company “Airon Ingeniería y Control Ambiental S.A.”)        |
| 01-06-2011    | 01-06-2011  | Flares are stopped in order to perform general maintenance service   |
| 12-07-2011    | 12-07-2011  | In Flare N°1, flow meter (serial number 300542), is replaced by another one (serial number 278712).  |
| 18-07-2011    | 18-07-2011  | Flares are stopped in order to perform general maintenance service<br>In Flare N°2, flow meter (serial number 268935) is replaced by another one (serial number 285359)                                    |
| 10-08-2011    | 10-08-2011  | Flow is restricted due to high oxygen levels in collected LFG  |
| 17-08-2011    | 17-08-2011  | Flares are stopped in order to perform general maintenance service   |
| 18-08-2011    | 18-08-2011  | Flow is restricted in Flare N°2 in order to perform measurements in exhaust gas in Flare N°1 (measurements performed by the inspection service company “Airon Ingeniería y Control Ambiental S.A.”)        |
| 19-08-2011    | 19-08-2011  | Flow is restricted in Flare N°1 in order to perform measurements in exhaust gas in Flare N°2 (measurements performed by the inspection service company “Airon Ingeniería y Control Ambiental S.A.”)        |
| 08-09-2011    | 08-09-2011  | Isokinetic measurement is performed in Flare N°1   |
| 09-09-2011    | 09-09-2011  | Isokinetic measurement is performed in Flare N°2   |
| 24-09-2011    | 24-09-2011  | Flares are stopped due to power blackout. The power emergency unit (captive off-grid electricity generator fuelled by diesel) starts to work.  |
| 13-10-2011    | 13-10-2011  | Flare “2” is stopped to perform maintenance service  |
| 22-10-2011    | 22-10-2011  | Flares are stopped to perform general maintenance service  |
| 09-11-2011    | 09-11-2011  | Power Plant N°2 stops operation. All collected LFG is directed to the flares.  |
| 20-11-2011    | 20-11-2011  | Power Plant N°2 stops operation. All collected LFG is directed to the flares.  |
| 06-01-2012    | 06-01-2012  | Flares are stopped in order to perform general maintenance.  |
| 02-02-2012    | 02-02-2012  | In Flare N°2, flow meter (serial number 285359) is replaced by another one (serial number 341600-A).   |
| 18-04-2012    | 18-04-2012  | In Flare N°1, flow meter (serial number 278712), is replaced by another one (serial number 268935).<br><br>Totalizer flow meter (serial number 303215), is replaced by another one (serial number 300541). |
| 20-04-2012    | 20-04-2012  | Overall maintenance work at LFG collecting pipeline  |

**Table N°2: Relevant operational events in power plant 1**

| Starting date | Ending date | Events                                |
|---------------|-------------|---------------------------------------|
| 09-05-2011    | 10-05-2011  | Engine generator failure (south unit) |
| 13-06-2011    | 15-06-2011  | Engine generator failure (both units) |





|            |            |  |
|------------|------------|--|
| 15-06-2012 | 11-07-2012 | Engine generator failure (south unit)<br>Power transformer failure                                 |
| 26-06-2011 | 28-06-2011 | Engine generator shutdown (North unit), due to 4L cylinder failure                                 |
| 07-07-2011 | 08-07-2011 | Engine generator shutdown (North unit), due to 4L cylinder failure                                 |
| 17-09-2011 | 14-11-2011 | Wastegate valve failure (North engine generator)   |
| 06-10-2011 | 06-10-2011 | Measurement of exhaust gas is performed in engine generator (Waukesha brand) PR-10187              |
| 12-11-2011 | 14-11-2011 | Power Plant N°1 stops operation  |
| 14-11-2011 | 14-11-2011 | Flow meter (serial number 300541) is replaced by another one (serial number 342850)                |
| 29-12-2011 | 27-02-2011 | Major maintenance service (12.000 hours) and extra repair service in North engine generator        |
| 06-03-2012 | 04-04-2012 | Major maintenance service (12.000 hours) and extra repair service in South engine generator        |
| 23-05-2012 | 02-06-2012 | Fuel control system upgrade (South engine generator)<br>Gas train upgrade (South engine generator) |
| 03-06-2012 | 04-06-2012 | Fuel control system upgrade (North engine generator)<br>Gas train upgrade (North engine generator) |

**Table N°3: Relevant operational events in power plant 2**

| Starting date | Ending date | Events   |
|---------------|-------------|--|
| 15-09-2011    | 20-09-2011  | Evidence of power synchronization with the CDEC-SIC grid                       |
| 09-11-2011    | 09-11-2011  | Power Plant N°2 stops operating due to failure in transmission line            |
| 17-11-2011    | 17-11-2011  | Power Plant N°2 stops operating due to low pressure in the LFG treatment plant |
| 12-12-2011    | 12-12-2011  | Power Plant N°2 stops operating due to low pressure in LFG treatment plant     |
| 17-01-2012    | 17-01-2012  | Power Plant N°2 stops operating  |
| 05-03-2012    | 05-03-2012  | Power Plant N°2 stops operating due to low methane level in collected LFG      |
| 24-03-2012    | 24-03-2012  | Power Plant N°2 is stopped in order to perform maintenance service             |
| 05-04-2012    | 05-04-2012  | Power Plant N°2 is stopped in order to perform maintenance service             |
| 18-04-2012    | 18-04-2012  | Power Plant N°2 stops operating due to low pressure in gas treatment plant     |

**B.2. Post registration changes****B.2.1. Temporary deviations from registered monitoring plan or applied methodology**

Not applicable

**B.2.2. Corrections**

See Section 2.3.

**B.2.3. Permanent changes from registered monitoring plan or applied methodology**

A revised and updated version of the PDD was submitted to the DOE in order to have occurred and planned permanent post-registration changes in the project design for the project activity being assessed.

These post-registration changes encompass (i) changes to the project design, (ii) permanent changes in the monitoring plan and (iii) minor text corrections

*Changes in the project design:*

The changes are related to the implementation and operation of the electricity generation component of the project activity. The occurred changes are summarized as follows:

- Occurred and yet to occur (planned) gradual installation of electricity generation equipment (fuelled by collected landfill gas) with higher energy conversion efficiency than earlier forecasted.
- Occurred and yet to occur gradual installation of electricity generation equipment under a revised timeline/schedule.
- 

*Permanent changes in the monitoring plan:*

Furthermore, the revised version of the PDD also incorporates a more appropriate approach for determining and monitoring project emissions due to the consumption of electricity by the project (electricity supplied from the grid and/or electricity supplied by a captive off-grid electricity generator) as well as project emissions due to the consumption of Liquefied Petroleum Gas (LPG) by the project activity (LPG is used for igniting the flares).

*Minor text corrections:*

Finally, minor text corrections are also implemented in the revised version of the PDD, of which assessment by the DOE and approval by the CDM-Executive Board is yet pending.

#### **B.2.4. Changes to project design of registered project activity**

See B.2.3.

#### **B.2.5. Changes to start date of crediting period**

Not applicable.

#### **B.2.6. Types of changes specific to afforestation or reforestation project activity**

Not applicable

### **SECTION C. Description of monitoring system**

The data collection flows for the project activity includes measurement and data recording for LFG methane content (by using a gas analyzer) and the measurement of LFG flow to each enclosed high temperature flare and power plants (by using thermal mass flow meters). All measurement signals are processed by programmable logic controller unit (PLC unit) which is connected to the main data base collection system (WinCC). LFG related monitoring data is continuously measured and recorded every 15 seconds. Data is recorded in the WinCC (logger). Data is automatically retrieved upon user request to a master spreadsheet, in which the data is discriminated based on the following criteria:

As part of the monitoring procedure, data is transferred manually (as per working instruction I-RSL-021), to a spreadsheet which is used as part of the emission reduction calculation and data reporting process. Details about monitoring equipment is made available in Section D.

The data collection architecture is presented in the schematic diagram below:

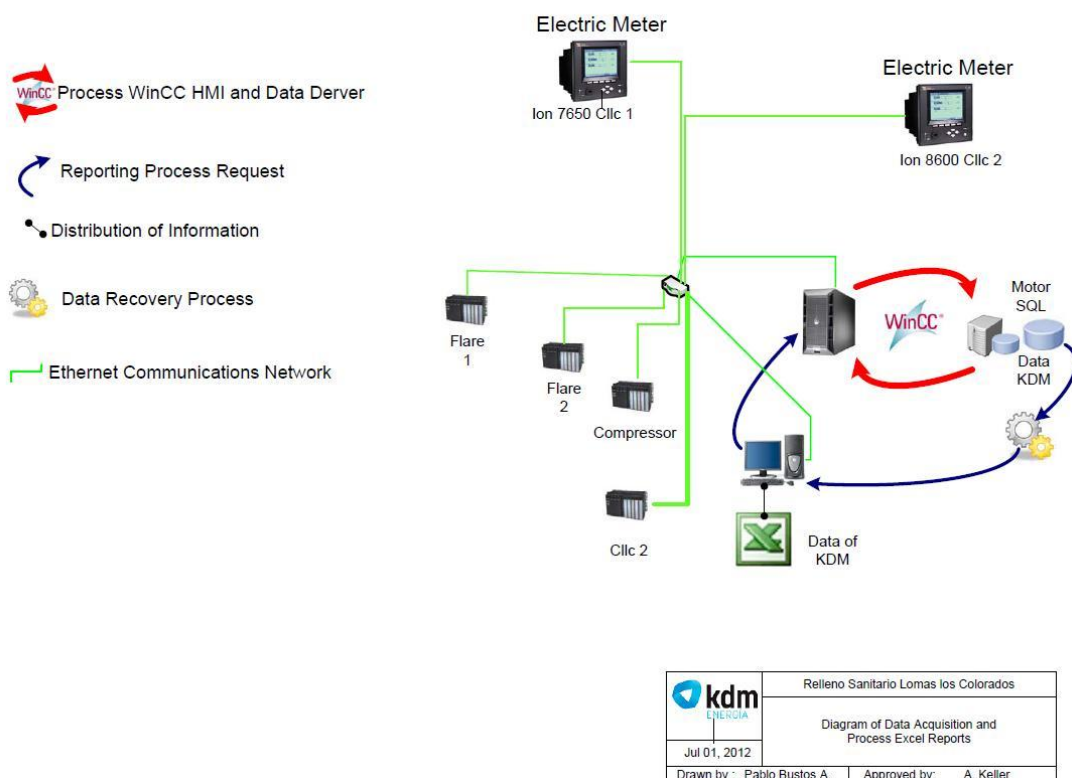
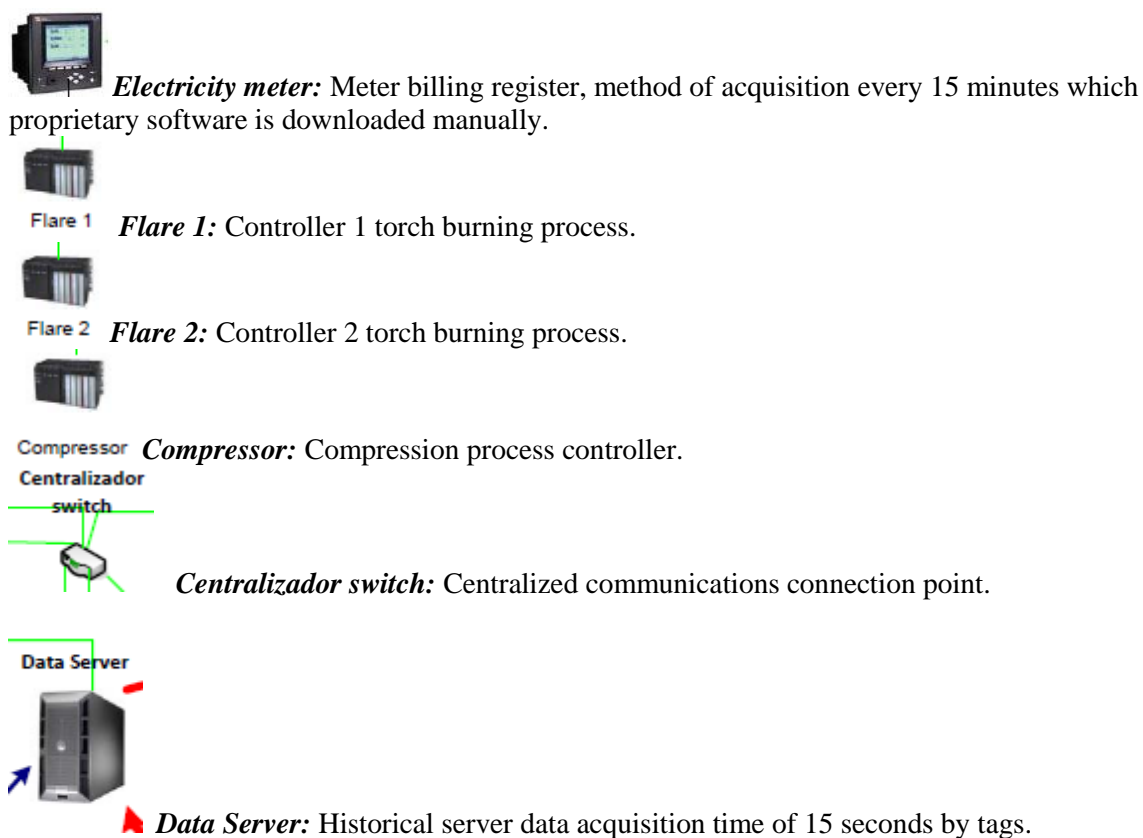
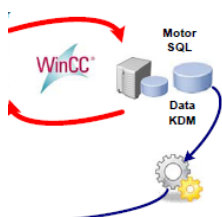


Figure 14. View of the data collection architecture schematics





**SQL Engine:** data storage engine, daily download process.

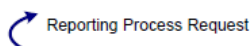


**Customer visualization:** Visualization display for process and data, report generator.



Data of  
KDM

**Historical Data:** Final emission reduction calculation spreadsheet and summary of historical data.



**Reporting Process request:** application process and dump data.



Process WinCC HMI and Data Server

**Process WinCC and data Server:** daily routine tasks of storage of data.

Ethernet Communications Network

**Communication Protocol:** communication path for equipment..

## SECTION D. Data and parameters

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

| Data/Parameter     | $GWP_{CH_4}$   |
|--------------------|--|
| Unit               | tCO <sub>2</sub> e/tCH <sub>4</sub>                    |
| Description        | Global Warming Potential of methane                    |
| Source of data     | Default value as per ACM0001 (version 4)               |
| Value(s) applied   | 21   |
| Purpose of data    | Value used in for determination of baseline emissions. |
| Additional comment |  |

| Data/Parameter     | $D_{CH_4}$   |
|--------------------|--|
| Unit               | tCH <sub>4</sub> /m <sup>3</sup> CH <sub>4</sub>       |
| Description        | Density of methane                                     |
| Source of data     | Default value as per ACM0001 (version 4)               |
| Value(s) applied   | 0.0007168  |
| Purpose of data    | Value used in for determination of baseline emissions. |
| Additional comment |  |



|                           |  |
|---------------------------|--|
| <b>Data/Parameter</b>     | <b>TDL<sub>j,y</sub></b>   |
| <b>Unit</b>               | <b>%</b>   |
| <b>Description</b>        | Average technical transmission and distribution losses for providing electricity to source j in year y.  |
| <b>Source of data</b>     | Default values as per applicable guidance of the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” is applied. |
| <b>Value(s) applied</b>   | 20%  |
| <b>Purpose of data</b>    | Value used in for determination of project emissions.  |
| <b>Additional comment</b> |  |

|                           |   |
|---------------------------|---|
| <b>Data/Parameter</b>     | <b>MD<sub>reg,y</sub></b>   |
| <b>Unit</b>               | <b>tCH<sub>4</sub></b>  |
| <b>Description</b>        | Amount of methane that would have been destroyed during the year in the absence of the project activity |
| <b>Source of data</b>     | Value is ex-ante defined in the registered PDD.   |
| <b>Value(s) applied</b>   | 245 tCH <sub>4</sub>  |
| <b>Purpose of data</b>    | Value used in for determination of baseline emissions.  |
| <b>Additional comment</b> |   |

## D.2. Data and parameters monitored

| <b>Data/Parameter</b>                  | <b>LFG<sub>total,y</sub></b>  |                     |               |        |                          |        |                          |        |                          |        |                       |
|--|---|---------------------|---------------|--------|--------------------------|--------|--------------------------|--------|--------------------------|--------|-----------------------|
| <b>Unit</b>                            | Nm <sup>3</sup>   |                     |               |        |                          |        |                          |        |                          |        |                       |
| <b>Description</b>                     | Total amount of landfill gas captured   |                     |               |        |                          |        |                          |        |                          |        |                       |
| <b>Measured /Calculated /Default</b>   | Measured  |                     |               |        |                          |        |                          |        |                          |        |                       |
| <b>Source of data</b>                  | Measured by a thermal mass LFG flow meter.  |                     |               |        |                          |        |                          |        |                          |        |                       |
| <b>Value(s) of monitored parameter</b> | Values are reported in monthly emission reduction calculation spreadsheets.   |                     |               |        |                          |        |                          |        |                          |        |                       |
| <b>Monitoring equipment</b>            | <p><i>Specifications of the LFG flow meters used to measure LFG<sub>total,y</sub>:</i></p> <p>The alternately used flow meters is of thermal mass type<br/> Manufacturer: Fluid Components International (FCI)</p> <p>Model: ST98 Flow meter</p> <p>Accuracy: ±1%</p> <table border="1"> <thead> <tr> <th>Serial Number (S/N)</th><th>Period in use</th></tr> </thead> <tbody> <tr> <td>303215</td><td>19/08/2009 to 19/07/2010</td></tr> <tr> <td>325925</td><td>19/07/2010 to 06/01/2011</td></tr> <tr> <td>303215</td><td>06/01/2011 to 18/04/2012</td></tr> <tr> <td>300541</td><td>18/04/2012 to present</td></tr> </tbody> </table> <p>Calibration frequency and maintenance requirements: Every two years.</p> | Serial Number (S/N) | Period in use | 303215 | 19/08/2009 to 19/07/2010 | 325925 | 19/07/2010 to 06/01/2011 | 303215 | 06/01/2011 to 18/04/2012 | 300541 | 18/04/2012 to present |
| Serial Number (S/N)                    | Period in use   |                     |               |        |                          |        |                          |        |                          |        |                       |
| 303215                                 | 19/08/2009 to 19/07/2010  |                     |               |        |                          |        |                          |        |                          |        |                       |
| 325925                                 | 19/07/2010 to 06/01/2011  |                     |               |        |                          |        |                          |        |                          |        |                       |
| 303215                                 | 06/01/2011 to 18/04/2012  |                     |               |        |                          |        |                          |        |                          |        |                       |
| 300541                                 | 18/04/2012 to present   |                     |               |        |                          |        |                          |        |                          |        |                       |



|   | <p>The calibration frequencies adopted for the installed LFG flow meters are as per the recommendations of equipment/instrument manufacturer. The registered PDD and ACM0001 (version 4) methodology do not specify any frequency for the calibration of the LFG flow meters. Moreover, the registered PDD and ACM0001 (version 4) methodology do not specify any accuracy or other specification requirement for such instruments/equipment either.</p> <p>Calibration events valid for the considered verification period:</p> <table><tr><th colspan="2">Calibration Certificate</th><th rowspan="2">Calibration Date</th><th rowspan="2">Calibration Expiration Date</th></tr><tr><th>Serial Number (S/N)</th><th>Calibration by</th></tr><tr><td>303215</td><td rowspan="4">Fluid Components International LLC.</td><td>17/04/2009</td><td>17/10/2010</td></tr><tr><td>325925</td><td>17/05/2010</td><td>17/11/2011</td></tr><tr><td>303215</td><td>22/11/2010</td><td>22/05/2012</td></tr><tr><td>300541</td><td>28/03/2012</td><td>28/09/2013</td></tr></table> | Calibration Certificate |                             | Calibration Date | Calibration Expiration Date | Serial Number (S/N) | Calibration by | 303215 | Fluid Components International LLC. | 17/04/2009 | 17/10/2010 | 325925 | 17/05/2010 | 17/11/2011 | 303215 | 22/11/2010 | 22/05/2012 | 300541 | 28/03/2012 | 28/09/2013 |
|---|--|-------------------------|-----------------------------|------------------|-----------------------------|---------------------|----------------|--------|-------------------------------------|------------|------------|--------|------------|------------|--------|------------|------------|--------|------------|------------|
| Calibration Certificate                 |  | Calibration Date        | Calibration Expiration Date |                  |                             |                     |                |        |                                     |            |            |        |            |            |        |            |            |        |            |            |
| Serial Number (S/N)                     | Calibration by   |                         |                             |                  |                             |                     |                |        |                                     |            |            |        |            |            |        |            |            |        |            |            |
| 303215                                  | Fluid Components International LLC.  | 17/04/2009              | 17/10/2010                  |                  |                             |                     |                |        |                                     |            |            |        |            |            |        |            |            |        |            |            |
| 325925                                  |  | 17/05/2010              | 17/11/2011                  |                  |                             |                     |                |        |                                     |            |            |        |            |            |        |            |            |        |            |            |
| 303215                                  |  | 22/11/2010              | 22/05/2012                  |                  |                             |                     |                |        |                                     |            |            |        |            |            |        |            |            |        |            |            |
| 300541                                  |  | 28/03/2012              | 28/09/2013                  |                  |                             |                     |                |        |                                     |            |            |        |            |            |        |            |            |        |            |            |
| Measuring/ Reading/ Recording frequency | Continuous measurement. Values are to be recorded and reported with frequency not lower than every minute.   |                         |                             |                  |                             |                     |                |        |                                     |            |            |        |            |            |        |            |            |        |            |            |
| Calculation method (if applicable)      | Not applicable.  |                         |                             |                  |                             |                     |                |        |                                     |            |            |        |            |            |        |            |            |        |            |            |
| QA/QC procedures                        | Each calibration event has a validity of 18 months, as informed by the equipment manufacturer. However, for internal operational control, KDM S.A. normally replaces the LFG flow meter after a period not exceeding 12 months. Removed LFG flow meter is sent to the supplier for a calibration. On each replacement event, a calibrated flow meters is installed.  |                         |                             |                  |                             |                     |                |        |                                     |            |            |        |            |            |        |            |            |        |            |            |
| Purpose of data                         | Data is used for the determination of baseline emissions.  |                         |                             |                  |                             |                     |                |        |                                     |            |            |        |            |            |        |            |            |        |            |            |
| Additional comment                      | -  |                         |                             |                  |                             |                     |                |        |                                     |            |            |        |            |            |        |            |            |        |            |            |

|                                 |   |
|---------------------------------|---|
| Data / Parameter                | $LFG_{flare,y}$   |
| Unit                            | Nm <sup>3</sup>   |
| Description                     | Amount of landfill gas flared   |
| Measured /Calculated /Default   | Measured.   |
| Source of data                  | Measured by a thermal mass flow meter.  |
| Value(s) of monitored parameter | Values are provided in monthly emission reduction calculation spreadsheets.   |
| Monitoring equipment            | <p><i>Specifications of the LFG flow meters used to measure <math>LFG_{flare,y}</math>:</i></p> <p>The alternately used LFG flow meters are of thermal mass type</p> <p>Manufacturer: Fluid Components International (FCI)</p> <p>Model: ST-98 Flow meter</p> |





Accuracy:  $\pm 1\%$

*For Flare n° 1:*

| Serial Number (S/N) | Period in use            | Comment   |
|---------------------|--------------------------|---|
| 278712              | 11/01/2008 to 11/11/2008 | Replaced for thermal mass flow meter, serial number: 268935 on 11/11/2008 in the Flare n°1.             |
| 268935              | 11/11/2008 to 23/03/2010 | Installed 11/11/2008 in the Flare n°1, in replacement of thermal mass flow meter serial number: 278712. |
| 278712              | 23/03/2010 to 06/01/2011 | Replaced for thermal mass flow meter, serial number: 268935 on 23/03/2010 in the Flare n°1.             |
| 300542              | 06/01/2011 to 12/07/2011 | Installed 06/01/2011 in the Flare n°1, in replacement of thermal mass flow meter serial number: 278712. |
| 278712              | 12/07/2011 to 18/04/2012 | Replaced for thermal mass flow meter, serial number: 300542 on 12/07/2011 in the Flare n°1.             |
| 268935              | 18/04/2012 to present    | Installed 18/04/2012 in the Flare n°1, in replacement of thermal mass flow meter serial number: 278712. |

*For Flare n° 2:*

| Serial Number (S/N) | Period in use            | Comment              |
|---------------------|--------------------------|----------------------|
| 285359              | 03/03/2008 to 15/05/2009 | Replaced for thermal |



|  |                |                          | mass flow meter, serial number: 300542 on 15/05/2009 in the Flare n°2.                                 |                         |  |                  |                             |                     |                |        |       |            |            |
|--|----------------|--------------------------|--|-------------------------|--|------------------|-----------------------------|---------------------|----------------|--------|-------|------------|------------|
|  | 300542         | 15/05/2009 to 23/03/2010 | Installed 15/05/2009 in the Flare n°2, in replacement of thermal mass flow meter serial number: 285359 |                         |  |                  |                             |                     |                |        |       |            |            |
|  | 285359         | 23/03/2010 to 06/01/2011 | Replaced for thermal mass flow meter, serial number: 300542 on 06/01/2011 in the Flare n°2.            |                         |  |                  |                             |                     |                |        |       |            |            |
|  | 268935         | 06/01/2011 to 18/07/2011 | Installed 06/01/2011 in the Flare n°2, in replacement of thermal mass flow meter serial number: 285359 |                         |  |                  |                             |                     |                |        |       |            |            |
|  | 285359         | 18/07/2011 to 02/02/2012 | Replaced for thermal mass flow meter, serial number: 268935 on 18/07/2011 in the Flare n°2.            |                         |  |                  |                             |                     |                |        |       |            |            |
|  | 341600-A       | 02/02/2012 to present    | Installed 02/02/2012 in the Flare n°2, in replacement of thermal mass flow meter serial number: 285359 |                         |  |                  |                             |                     |                |        |       |            |            |
| Calibration frequency and maintenance requirements: Every two years.   |                |                          |  |                         |  |                  |                             |                     |                |        |       |            |            |
| Calibration events valid for the considered verification period:   |                |                          |  |                         |  |                  |                             |                     |                |        |       |            |            |
| <i>For Flare n° 1:</i>   |                |                          |  |                         |  |                  |                             |                     |                |        |       |            |            |
| <table> <tr> <th colspan="2">Calibration Certificate</th><th rowspan="2">Calibration Date</th><th rowspan="2">Calibration Expiration Date</th></tr> <tr> <th>Serial Number (S/N)</th><th>Calibration by</th></tr> <tr> <td>278712</td><td>Fluid</td><td>16/05/2007</td><td>16/11/2008</td></tr> </table> |                |                          |  | Calibration Certificate |  | Calibration Date | Calibration Expiration Date | Serial Number (S/N) | Calibration by | 278712 | Fluid | 16/05/2007 | 16/11/2008 |
| Calibration Certificate  |                | Calibration Date         | Calibration Expiration Date  |                         |  |                  |                             |                     |                |        |       |            |            |
| Serial Number (S/N)  | Calibration by |                          |  |                         |  |                  |                             |                     |                |        |       |            |            |
| 278712   | Fluid          | 16/05/2007               | 16/11/2008   |                         |  |                  |                             |                     |                |        |       |            |            |



|  |   |                                     |                         |                                    |
|--|---|-------------------------------------|-------------------------|------------------------------------|
|  | 268935  | Components International LLC.       | 21/10/2008              | 21/04/2010                         |
|  | 278712  |                                     | 20/10/2009              | 20/04/2011                         |
|  | 268935  |                                     | 22/11/2010              | 22/05/2012                         |
|  | 278712  |                                     | 01/06/2011              | 01/12/2012                         |
|  | 300542  |                                     | 29/03/2012              | 29/09/2013                         |
|  | For Flare n° 2:   |                                     |                         |                                    |
|  | <b>Calibration Certificate</b>  |                                     | <b>Calibration Date</b> | <b>Calibration Expiration Date</b> |
|  | <b>Serial Number (S/N)</b>  | <b>Calibration by</b>               |                         |                                    |
|  | 285359  | Fluid Components International LLC. | 28/11/2007              | 28/05/2009                         |
|  | 300542  |                                     | 23/01/2009              | 23/07/2010                         |
|  | 285359  |                                     | 20/10/2009              | 20/04/2011                         |
|  | 268935  |                                     | 19-11-2010              | 19-05-2012                         |
|  | 285359  |                                     | 01/06/2011              | 01/12/2012                         |
| 341600-A                                       | 01/08/2011  |                                     | 01/02/2013              |                                    |
| <b>Measuring/ Reading/ Recording frequency</b> | Continuous measurement. Values are to be recorded and reported with frequency not lower than every minute.  |                                     |                         |                                    |
| <b>Calculation method (if applicable)</b>      | Not applicable.   |                                     |                         |                                    |
| <b>QA/QC procedures</b>                        | <p>Each calibration event has a validity of 18 months, as informed by the equipment supplier. The calibration frequencies adopted for the installed LFG flow meters are as per the recommendations of equipment/instrument manufacturer. The registered PDD and ACM0001 (version 4) methodology do not specify any frequency for the calibration of the LFG flow meters. Moreover, the registered PDD and ACM0001 (version 4) methodology do not specify any accuracy or other specification requirement for such instruments/equipment either.</p> <p>However, for internal operational control, KDM S.A. normally replaces the LFG flow meter after a period not exceeding 12 months. Removed LFG flow meter is sent to the supplier for a calibration. On each replacement event, a calibrated flow meters is installed.</p> |                                     |                         |                                    |
| <b>Purpose of data</b>                         | Data is used for the determination of baseline emissions.   |                                     |                         |                                    |
| <b>Additional comment</b>                      | -   |                                     |                         |                                    |

|                                      |   |
|--------------------------------------|---|
| <b>Data / Parameter</b>              | <b>LFG<sub>electricity,v</sub></b>                            |
| <b>Unit</b>                          | Nm <sup>3</sup>   |
| <b>Description</b>                   | Amount of landfill gas combusted in power plant               |
| <b>Measured /Calculated /Default</b> | Measured.   |
| <b>Source of data</b>                | Measured by a thermal mass flow meter.                        |
| <b>Value(s) of monitored</b>         | Values are provided in monthly emission reduction calculation |



| parameter   | spreadsheets.  |                          |                  |                             |                             |                |                          |                  |                          |            |                          |            |            |
|---|--|--------------------------|------------------|-----------------------------|-----------------------------|----------------|--------------------------|------------------|--------------------------|------------|--------------------------|------------|------------|
| Monitoring equipment  | The installed flow meter is of thermal mass type   |                          |                  |                             |                             |                |                          |                  |                          |            |                          |            |            |
|   | Manufacturer: Fluid Components International (FCI)   |                          |                  |                             |                             |                |                          |                  |                          |            |                          |            |            |
|   | Model: ST98 Flow meter   |                          |                  |                             |                             |                |                          |                  |                          |            |                          |            |            |
|   | Accuracy: ±1%  |                          |                  |                             |                             |                |                          |                  |                          |            |                          |            |            |
|   | For Thermal Mass Flow Meter Electricity 1:   |                          |                  |                             |                             |                |                          |                  |                          |            |                          |            |            |
|   | <table><tr><th>Serial Number (S/N)</th><th>Period in use</th></tr><tr><td>300541</td><td>01/09/2009 to 19/07/2010</td></tr><tr><td>325926</td><td>19/07/2010 to 06/01/2011</td></tr><tr><td>300541</td><td>06/01/2011 to 14/11/2011</td></tr><tr><td>342850</td><td>22/12/2012 to 14/11/2011</td></tr></table> | Serial Number (S/N)      | Period in use    | 300541                      | 01/09/2009 to 19/07/2010    | 325926         | 19/07/2010 to 06/01/2011 | 300541           | 06/01/2011 to 14/11/2011 | 342850     | 22/12/2012 to 14/11/2011 |            |            |
|   | Serial Number (S/N)  | Period in use            |                  |                             |                             |                |                          |                  |                          |            |                          |            |            |
|   | 300541   | 01/09/2009 to 19/07/2010 |                  |                             |                             |                |                          |                  |                          |            |                          |            |            |
|   | 325926   | 19/07/2010 to 06/01/2011 |                  |                             |                             |                |                          |                  |                          |            |                          |            |            |
|   | 300541   | 06/01/2011 to 14/11/2011 |                  |                             |                             |                |                          |                  |                          |            |                          |            |            |
| 342850  | 22/12/2012 to 14/11/2011   |                          |                  |                             |                             |                |                          |                  |                          |            |                          |            |            |
| For Thermal Mass Flow Meter Electricity 2:  |  |                          |                  |                             |                             |                |                          |                  |                          |            |                          |            |            |
| <table><tr><th>Serial Number (S/N)</th><th>Period in use</th></tr><tr><td>339540</td><td>July 2011 to present</td></tr></table>   | Serial Number (S/N)  | Period in use            | 339540           | July 2011 to present        |                             |                |                          |                  |                          |            |                          |            |            |
| Serial Number (S/N)   | Period in use  |                          |                  |                             |                             |                |                          |                  |                          |            |                          |            |            |
| 339540  | July 2011 to present   |                          |                  |                             |                             |                |                          |                  |                          |            |                          |            |            |
| Calibration frequency and maintenance requirements <sup>6</sup> : Every two years.  |  |                          |                  |                             |                             |                |                          |                  |                          |            |                          |            |            |
| Calibration events valid for the considered verification period:  |  |                          |                  |                             |                             |                |                          |                  |                          |            |                          |            |            |
| For Thermal Mass Flow Meter Electricity 1:  |  |                          |                  |                             |                             |                |                          |                  |                          |            |                          |            |            |
| <table><tr><th colspan="2">Calibration Certificate</th><th rowspan="2">Calibration Date</th><th rowspan="2">Calibration Expiration Date</th></tr><tr><th>SerialNumber (S/N)</th><th>Calibration by</th></tr><tr><td>300541</td><td rowspan="2">Fluid Components</td><td>02/07/2009</td><td>02/01/2011</td></tr><tr><td>325926</td><td>18/05/2010</td><td>18/11/2011</td></tr></table> | Calibration Certificate  |                          | Calibration Date | Calibration Expiration Date | SerialNumber (S/N)          | Calibration by | 300541                   | Fluid Components | 02/07/2009               | 02/01/2011 | 325926                   | 18/05/2010 | 18/11/2011 |
| Calibration Certificate   |  | Calibration Date         |                  |                             | Calibration Expiration Date |                |                          |                  |                          |            |                          |            |            |
| SerialNumber (S/N)  | Calibration by   |                          |                  |                             |                             |                |                          |                  |                          |            |                          |            |            |
| 300541  | Fluid Components   | 02/07/2009               | 02/01/2011       |                             |                             |                |                          |                  |                          |            |                          |            |            |
| 325926  |  | 18/05/2010               | 18/11/2011       |                             |                             |                |                          |                  |                          |            |                          |            |            |



|  | 300541  | International<br>LLC. | 18/11/2010                        | 18/05/2012 |                         |  |                     |                                   |                        |                   |        |  |            |
|--|---|-----------------------|-----------------------------------|------------|-------------------------|--|---------------------|-----------------------------------|------------------------|-------------------|--------|--|------------|
|  | 342850  |                       | 22/06/2011                        | 22/12/2012 |                         |  |                     |                                   |                        |                   |        |  |            |
|  | For Thermal Mass Flow Meter Electricity 2:  |                       |                                   |            |                         |  |                     |                                   |                        |                   |        |  |            |
|  | <table><tr><th colspan="2">Calibration Certificate</th><th rowspan="2">Calibration<br/>Date</th><th rowspan="2">Calibration<br/>Expiration<br/>Date</th></tr><tr><th>Serial<br/>Number (S/N)</th><th>Calibration<br/>by</th></tr><tr><td>339540</td><td>Fluid<br/>Components<br/>International<br/>LLC.</td><td>06/04/2011</td><td>06/10/2012</td></tr></table>   |                       |                                   |            | Calibration Certificate |  | Calibration<br>Date | Calibration<br>Expiration<br>Date | Serial<br>Number (S/N) | Calibration<br>by | 339540 | Fluid<br>Components<br>International<br>LLC. | 06/04/2011 |
| Calibration Certificate                    |   | Calibration<br>Date   | Calibration<br>Expiration<br>Date |            |                         |  |                     |                                   |                        |                   |        |  |            |
| Serial<br>Number (S/N)                     | Calibration<br>by   |                       |                                   |            |                         |  |                     |                                   |                        |                   |        |  |            |
| 339540                                     | Fluid<br>Components<br>International<br>LLC.  | 06/04/2011            | 06/10/2012                        |            |                         |  |                     |                                   |                        |                   |        |  |            |
| Measuring/ Reading/<br>Recording frequency | Continuous measurement. Values are to be recorded and reported with frequency not lower than every minute.  |                       |                                   |            |                         |  |                     |                                   |                        |                   |        |  |            |
| Calculation method (if<br>applicable)      | Not applicable.   |                       |                                   |            |                         |  |                     |                                   |                        |                   |        |  |            |
| QA/QC procedures                           | <p>Each calibration event has a validity of 18 months, as informed by the equipment supplier. The calibration frequencies adopted for the installed LFG flow meters are as per the recommendations of equipment/instrument manufacturer. The registered PDD and ACM0001 (version 4) methodology do not specify any frequency for the calibration of the LFG flow meters. Moreover, the registered PDD and ACM0001 (version 4) methodology do not specify any accuracy or other specification requirement for such instruments/equipment either.</p> <p>However, for internal operational control, KDM S.A. normally replaces the LFG flow meter after a period not exceeding 12 months. Removed LFG flow meter is sent to the supplier for a calibration. On each replacement event, a calibrated flow meters is installed.</p> |                       |                                   |            |                         |  |                     |                                   |                        |                   |        |  |            |
| Purpose of data                            | Data is used for the determination of baseline emissions.   |                       |                                   |            |                         |  |                     |                                   |                        |                   |        |  |            |
| Additional comment                         | -   |                       |                                   |            |                         |  |                     |                                   |                        |                   |        |  |            |
| Data / Parameter                           | FE  |                       |                                   |            |                         |  |                     |                                   |                        |                   |        |  |            |
| Unit                                       | %   |                       |                                   |            |                         |  |                     |                                   |                        |                   |        |  |            |



|  |   |
|--|---|
| <b>Description</b>                             | Flare/combustion efficiency. Determined by the operation hours and the methane content in the exhaust gas <sup>7</sup>  |
| <b>Measured /Calculated /Default</b>           | Measured /Calculated.   |
| <b>Source of data</b>                          | While flare operational hour is to be continuously monitored (1), measurements of residual methane content in the exhaust gas of the flares shall be monitored yearly (with the first year measurement to be made at the time of installation) by the independent third party laboratorial analysis company “Airon Ingeniería y Control Ambiental S.A.”.  |
| <b>Value(s) of monitored parameter</b>         | <p>For the Flare 1, the efficiency of the flare was determined based on measurements and calculations in the following dates:</p> <p>18/03/2011<br/>12/05/2011<br/>18/08/2011</p> <p>For the Flare 2, the efficiency of the flare was determined based on measurements and calculations in the following dates:</p> <p>17/03/2011<br/>13/05/2011<br/>19/08/2011</p>   |
| <b>Monitoring equipment</b>                    | The accredited independent third party laboratorial analysis company “Airon Ingeniería y Control Ambiental S.A.” performed the CH <sub>4</sub> measurement in the exhaust gases of the enclosed flares.   |
| <b>Measuring/ Reading/ Recording frequency</b> | <p>1) The flare operation shall be continuously monitored by continuous measurement of operation time of flare using a run time meter connected to a flame detector or a flame continuous temperature controller, irrespective of whether the flare efficiency is monitored.</p> <p>(2) Periodic measurement of residual methane content of flare exhaust gas (inter alia other related required measurements for the determination of FE) shall be monitored yearly, with the first year measurement to be made at the time of installation.</p> <p>(3) The enclosed flares shall be operated and maintained as per the specifications prescribed by the flare manufacturer.</p> |
| <b>Calculation method (if applicable)</b>      | According to methodology adopted by the accredited independent third party laboratorial analysis company “Airon Ingeniería y Control Ambiental S.A.”.   |
| <b>QA/QC procedures</b>                        | -   |
| <b>Purpose of data</b>                         | Data is used for the determination of baseline emissions.   |
| <b>Additional comment</b>                      | -   |

<sup>7</sup> The operating hours are calculated with data valid for one day, but as the Measurement instrument are connected to the PLC, it records the data every 15 seconds, and is considered all valid data in one day obtaining thereby the operating flare hours, and the methane content is monitored by an external Laboratory with certified standard gases.





| Data / Parameter                | w <sub>CH<sub>4</sub>,v</sub>  |  |                  |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|---------------------------------|--|--|------------------|-----------------------------|---------------|------------------|-----------------------------|---------------------|-----------------------|-----------|--|------------|------------|------------|------------|------------|------------|------------|------------|-----------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|--|--|
| Unit                            | m <sup>3</sup> CH <sub>4</sub> /m <sup>3</sup> LFG   |  |                  |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
| Description                     | Methane fraction in the landfill gas   |  |                  |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
| Measured /Calculated /Default   | Measured.  |  |                  |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
| Source of data                  | Measurements performed by a CH <sub>4</sub> /O <sub>2</sub> content gas analyzer unit are recorded in a data acquisition system.   |  |                  |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
| Value(s) of monitored parameter | Values are provided in monthly emission reduction calculation spreadsheets.  |  |                  |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
| Monitoring equipment            | <u>Specifications of the gas analyzer:</u>   |  |                  |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 | Manufacturer: Siemens AG   |  |                  |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 | Model: Ultramat 23   |  |                  |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 | Accuracy: ±1%  |  |                  |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 | <table><tr><th>Serial Number (S/N)</th><th>Period in use</th></tr><tr><td>U6-477</td><td>13/03/2007 to 24/09/2009</td></tr><tr><td>N1-W2-678</td><td>24/09/2009 to present</td></tr><tr><td>N1-B2-711</td><td>-</td></tr></table>  |  |                  | Serial Number (S/N)         | Period in use | U6-477           | 13/03/2007 to 24/09/2009    | N1-W2-678           | 24/09/2009 to present | N1-B2-711 | -  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 | Serial Number (S/N)  | Period in use  |                  |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 | U6-477   | 13/03/2007 to 24/09/2009   |                  |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 | N1-W2-678  | 24/09/2009 to present  |                  |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 | N1-B2-711  | -  |                  |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 | Calibration frequency and maintenance requirements: Annual calibration as per equipment manufacturer.  |  |                  |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 | Calibration events valid for the verification:   |  |                  |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 | <table><tr><th colspan="2">Calibration Certificate</th><th rowspan="2">Calibration Date</th><th rowspan="2">Calibration Expiration Date</th></tr><tr><th>Serial Number (S/N)</th><th>Calibration by</th></tr><tr><td rowspan="4">U6-477</td><td rowspan="12">D.2.1.1.1. TAG Instrumentación y Automatización de Procesos Industriales</td><td>03/03/2008</td><td>03/03/2009</td></tr><tr><td>09/03/2009</td><td>09/03/2010</td></tr><tr><td>02/09/2009</td><td>02/09/2010</td></tr><tr><td>17/09/2009</td><td>17/09/2010</td></tr><tr><td rowspan="8">N1-W2-678</td><td>01/10/2009</td><td>01/10/2010</td></tr><tr><td>24/12/2009</td><td>24/12/2010</td></tr><tr><td>23/03/2010</td><td>23/03/2011</td></tr><tr><td>11/05/2010</td><td>11/05/2011</td></tr><tr><td>18/08/2010</td><td>18/08/2011</td></tr><tr><td>29/10/2010</td><td>29/10/2011</td></tr><tr><td>15/11/2010</td><td>15/10/2011</td></tr><tr><td></td><td></td></tr></table> |  |                  | Calibration Certificate     |               | Calibration Date | Calibration Expiration Date | Serial Number (S/N) | Calibration by        | U6-477    | D.2.1.1.1. TAG Instrumentación y Automatización de Procesos Industriales | 03/03/2008 | 03/03/2009 | 09/03/2009 | 09/03/2010 | 02/09/2009 | 02/09/2010 | 17/09/2009 | 17/09/2010 | N1-W2-678 | 01/10/2009 | 01/10/2010 | 24/12/2009 | 24/12/2010 | 23/03/2010 | 23/03/2011 | 11/05/2010 | 11/05/2011 | 18/08/2010 | 18/08/2011 | 29/10/2010 | 29/10/2011 | 15/11/2010 | 15/10/2011 |  |  |
|                                 | Calibration Certificate  |  | Calibration Date | Calibration Expiration Date |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 | Serial Number (S/N)  | Calibration by   |                  |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 | U6-477   | D.2.1.1.1. TAG Instrumentación y Automatización de Procesos Industriales | 03/03/2008       | 03/03/2009                  |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 |  |  | 09/03/2009       | 09/03/2010                  |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 |  |  | 02/09/2009       | 02/09/2010                  |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
| 17/09/2009                      |  |  | 17/09/2010       |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
| N1-W2-678                       | 01/10/2009   |  | 01/10/2010       |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 | 24/12/2009   |  | 24/12/2010       |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 | 23/03/2010   |  | 23/03/2011       |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 | 11/05/2010   |  | 11/05/2011       |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 | 18/08/2010   |  | 18/08/2011       |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 | 29/10/2010   |  | 29/10/2011       |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 | 15/11/2010   |  | 15/10/2011       |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |
|                                 |  |  |                  |                             |               |                  |                             |                     |                       |           |  |            |            |            |            |            |            |            |            |           |            |            |            |            |            |            |            |            |            |            |            |            |            |            |  |  |



|   |   |  |            |            |
|---|---|--|------------|------------|
|   |   |  | 20/01/2011 | 20/01/2012 |
|   |   |  | 01/10/2011 | 01/10/2012 |
|   | N1-B2-711   |  | 03-06-2011 | 03-06-2012 |
|   |   |  | 18-08-2011 | 18-08-2012 |
| Measuring/ Reading/ Recording frequency | Continuous measurement. Values are to be recorded and reported with frequency not lower than every minute.                      |  |            |            |
| Calculation method (if applicable)      | Not applicable.   |  |            |            |
| QA/QC procedures                        | Calibration procedures and schedules are described on the Integrated Management System document PGEN-009, and manual equipment. |  |            |            |
| Purpose of data                         | Data is used for the determination of baseline emissions.   |  |            |            |
| Additional comment                      | -   |  |            |            |

| <b>Data / Parameter</b>                        | <b>Regulatory Requirements</b>  |
|--|---|
| <b>Unit</b>                                    | Text  |
| <b>Description</b>                             | Regulatory requirements relating to landfill gas projects   |
| <b>Measured /Calculated /Default</b>           | Not applicable.   |
| <b>Source of data</b>                          | According to the procedure P-GEN-AMB-003 regulatory requirements must be analysed once a year. As established by this procedure, persons which take part of such revision are the Environmental engineer of the specific area, with collaboration of the quality department of the company, and on specific cases a request of revision of such regulatory requirements should be asked to an external staff of advocates. For the considered monitoring period, the applicable revision was performed on 27/05/2010. For this period the mentioned report shows no new incidents/changes on the Project activities or in the local environmental regulations. The mentioned procedure and document are available for the audit team. The information through recorded annually, is used for changes to the adjustment factor (AF) or directly $MD_{reg,y}$ at renewal of the crediting period. |
| <b>Value(s) of monitored parameter</b>         | -   |
| <b>Monitoring equipment</b>                    | Not applicable.   |
| <b>Measuring/ Reading/ Recording frequency</b> | At the renewable of crediting period.   |
| <b>Calculation method (if applicable)</b>      | Not applicable.   |
| <b>QA/QC procedures</b>                        | All documentation will be available for review for a verifier.  |
| <b>Purpose of data</b>                         | -   |
| <b>Additional comment</b>                      | -   |

|                          |   |
|--------------------------|---|
| <b>Data / Parameter:</b> | <b>EL<sub>EXP LFG,v</sub></b>                               |
| <b>Unit</b>              | MWh   |
| <b>Description</b>       | Total amount of net electricity exported out of the project |



|   |  |                     |                               |
|---|--|---------------------|-------------------------------|
|   |  |                     |                               |
| Measured /Calculated /Default           | Measured.  |                     |                               |
| Source of data                          | Continuous measurement. Accumulated values are to be recorded and reported at least once a week.<br>This parameter is monitored to ensure methane destruction is claimed for methane used in electricity plant when it is operational. |                     |                               |
| Value(s) of monitored parameter         | 49,061.41 MWh  |                     |                               |
| Monitoring equipment                    | <u>Specifications of the installed electricity meters:</u>   |                     |                               |
|   | Model  | Serial number (S/N) | Period in use                 |
|   | JS-09R50110CO  | 092312090           | From 24/08/2009 to 21/12/2012 |
|   | ION 7650   | PJ-1111A463-02      | From 21/12/2012 to present    |
|   | ION 8600   | PT-1011A47-01       | From July 2011 to present     |
|   | Calibration events valid for the considered verification period:   |                     |                               |
|   | Calibration Certificate  |                     | Calibration Date              |
|   | Serial Number (S/N)  | Calibration by      |                               |
|   | 092312090  |                     | 22/06/2010                    |
|   |  |                     | 30/12/2010                    |
| 10/06/2011                              |  |                     |                               |
| PJ-1111A463-02                          | Schneider Electric   | 21/11/2011          |                               |
| PJ-1111A463-02                          | CAM Chile S.A.   | 25/07/2011          |                               |
| PT-1011A47-01                           | CAM Chile S.A.   | 21/02/2012          |                               |
| PJ-1111A463-02                          | CAM Chile S.A.   | 22/02/2012          |                               |
| Measuring/ Reading/ Recording frequency | Continuous measurement, accumulated values are to be recorded and reported at least once a week <sup>8</sup> .   |                     |                               |
| Calculation method (if applicable)      | Not applicable.  |                     |                               |
| QA/QC procedures                        | Project activity registers were crosschecked with the monthly CDEC SIC report.   |                     |                               |
| Purpose of data                         | Data is used for the determination of baseline emissions.  |                     |                               |
| Additional comment                      | -  |                     |                               |

|                         |                              |
|-------------------------|------------------------------|
| <b>Data / Parameter</b> | <b>Operational Hours</b>     |
| <b>Unit</b>             | Hours                        |
| <b>Description</b>      | Operation of the power plant |

<sup>8</sup> According to the methodology, the parameter should be measured continuously /periodically. On the PDD, we define, based on the design of the project a weekly basis, nonetheless, information is taken daily, being conservative and more accurate.



|  |   |
|--|---|
|  |   |
| <b>Measured /Calculated /Default</b>           | Measured.   |
| <b>Source of data</b>                          | Hour meter  |
| <b>Value(s) of monitored parameter</b>         | 4286:27:45  |
| <b>Monitoring equipment</b>                    | Hour meter included in the collection system.   |
| <b>Measuring/ Reading/ Recording frequency</b> | Measured by hour-meter or equivalent/suitable instrument or method.<br>This is monitored to ensure methane destruction is claimed for methane used in electricity plant when it is operational. |
| <b>Calculation method (if applicable)</b>      | Operational hours are registered by the data collection system. The value is related to the flow of gas in the hour <i>i</i> to the power plant.  |
| <b>QA/QC procedures</b>                        | -   |
| <b>Purpose of data</b>                         | Not applicable.   |
| <b>Additional comment</b>                      | -   |

|  |   |
|--|---|
| <b>Data / Parameter</b>                | $EC_{grid,v}$   |
| <b>Unit</b>                            | MWh   |
| <b>Description</b>                     | Amount of grid electricity consumed by the project activity   |
| <b>Measured /Calculated /Default</b>   | Measured.   |
| <b>Source of data</b>                  | Measurements performed by an electricity meter are recorded in a data acquisition system.   |
| <b>Value(s) of monitored parameter</b> | Values are provided in monthly emission reduction calculation spreadsheets  |
| <b>Monitoring equipment</b>            | <p><u>Specifications of electricity meter 1:</u></p> <p>Model: Power Logic PM 710</p> <p>Manufacturer: Schneider Electric</p> <p>Serial number (S/N): 02B0629</p> <p>Period in use: From 13/03/2007 to present</p> <p>Calibration frequency: Twice a year<sup>9</sup></p> <p>Calibration dates: 03/10/2008, 01/06/2009 and 29/12/2009</p> <p><u>Specifications of electricity meter 2:</u></p> <p>Model: Power Logic PM 710</p> |

<sup>9</sup> According to the letter delivered by the manufacturer Schneider Electric with date of April 23, 2007, the meters installed and used since February 2007 to register the consumption of the plant, doesn't need any calibration, because they are digital and not possess any internal mechanical system to realize the functions of measure and control. However, KDM S.A. performs periodic calibration to ensure the smooth operation of electric meters.



|  |  |
|--|--|
|  | <p>Manufacturer: Schneider Electric</p> <p>Serial number (S/N): 02B0637</p> <p>Period in use: From 13/03/2007 to present</p> <p>Calibration frequency: Twice A year<sup>10</sup></p> <p>Calibration dates: 03/10/2008, 01/06/2009, 29/12/2009, 22/06/2010 and 10/06/2011</p> |
| <b>Measuring/ Reading/ Recording frequency</b> | Continuous measurement. Accumulated values are to be recorded and reported at least once a week <sup>11</sup>  |
| <b>Calculation method (if applicable)</b>      | Not applicable.  |
| <b>QA/QC procedures</b>                        | -  |
| <b>Purpose of data</b>                         | Data is used for the determination of project emissions.   |
| <b>Additional comment</b>                      | -  |

|  |  |
|--|--|
| <b>Data / Parameter</b>                | <b>EF<sub>EL,captive,y</sub></b>   |
| <b>Unit</b>                            | tCO <sub>2</sub> /MWh  |
| <b>Description</b>                     | Emission factor for electricity sourced by the captive off-grid electricity generator  |
| <b>Measured /Calculated /Default</b>   | Default value.   |
| <b>Source of data</b>                  | <p>This parameter will be monitored only if alternative approach 2 is selected for determining project emissions consumption of electricity sourced by the captive off-grid electricity generator (<math>PE_{EC,captive,y}</math>).</p> <p>As per Option B2 of the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”, <math>EF_{EL,captive,y}</math> is directly determined as 1.3 tCO<sub>2</sub>/MWh. This conservative default value may be used as an alternative.</p> <p>In alternative approaches 1, 3 or 4 are used for determining project emissions due to the consumption of electricity sourced by the captive off-grid electricity generator (fuelled by Diesel) during the verification period in question, the value of <math>EF_{EL,captive,y}</math> is not directly selected and <math>EF_{EL,captive,y}</math> is thus not regarded as a monitoring parameter.</p> |
| <b>Value(s) of monitored parameter</b> | 1.3 tCO <sub>2</sub> /MWh  |
| <b>Monitoring equipment</b>            | Not applicable.  |

<sup>10</sup> According to the letter delivered by the manufacturer Schneider Electric with date of 23/04/2007, the meters installed and used since February 2007 to register the consumption of the plant, doesn't need any calibration, because they are digital and not possess any internal mechanical system to realize the functions of measure and control. However, KDM S.A. performs periodic calibration to ensure the smooth operation of electric meters.

<sup>11</sup> According to the methodology, the parameter should be measured continuously /periodically. On the PDD, we define, based on the design of the project a weekly basis, nonetheless, information is taken daily, being conservative and more accurate



|  |  |
|--|--|
|  |  |
| <b>Measuring/ Reading/ Recording frequency</b> | Not applicable.  |
| <b>Calculation method (if applicable)</b>      | Not applicable.  |
| <b>QA/QC procedures</b>                        | Not applicable.  |
| <b>Purpose of data</b>                         | Data is used for the determination of project emissions. |
| <b>Additional comment</b>                      | -  |

|  |   |
|--|---|
| <b>Data / Parameter</b>                        | <b>FC<sub>Diesel</sub></b>  |
| <b>Unit</b>                                    | Liters  |
| <b>Description</b>                             | Quantity of fuel Diesel combusted by the captive off-grid electricity generator   |
| <b>Measured /Calculated /Default</b>           | Measured.   |
| <b>Source of data</b>                          | According to operative instructive IRSL-013 which describes and require procedures to record fuel consumption from each source. |
| <b>Value(s) of monitored parameter</b>         | 5,921 liters  |
| <b>Monitoring equipment</b>                    | Not applicable.   |
| <b>Measuring/ Reading/ Recording frequency</b> | Continuous measurement. Accumulated values are to be recorded and reported at least once a week.                                |
| <b>Calculation method (if applicable)</b>      | Not applicable.   |
| <b>QA/QC procedures applied:</b>               | Not applicable.   |
| <b>Purpose of data</b>                         | Data is used for the determination of project emissions.  |
| <b>Additional comment</b>                      | -   |

|  |  |
|--|--|
| <b>Data/Parameter:</b>                 | <b>NCV<sub>Diesel</sub></b>  |
| <b>Unit</b>                            | GJ/liters  |
| <b>Description</b>                     | Net calorific value of the fuel Diesel   |
| <b>Measured /Calculated /Default</b>   | Calculated.  |
| <b>Source of data</b>                  | Value provided by the fuel supplier in invoices, regional or national default values or IPCC values at upper limit of uncertainty at 95% confidence interval.<br><br>This parameter will be monitored only if alternative approaches 1 or 3 are selected for determining project emissions consumption of electricity sourced by the captive off-grid electricity generator ( $PE_{EC,captive,y}$ ). |
| <b>Value(s) of monitored parameter</b> | 0.0000473 GJ/liters  |
| <b>Monitoring equipment</b>            | Not applicable.  |





|   |  |
|---|--|
| Measuring/ Reading/ Recording frequency | Not applicable.  |
| Calculation method (if applicable)      | Not applicable.  |
| QA/QC procedures                        | Not applicable.  |
| Purpose of data                         | Data is used for the determination of project emissions. |
| Additional comment                      | -  |

|   |  |
|---|--|
| Data / Parameter                        | $EF_{CO_2, Diesel}$  |
| Unit                                    | tCO <sub>2</sub> /TJ   |
| Description                             | CO <sub>2</sub> emission factor of fuel Diesel   |
| Measured /Calculated /Default           | Calculated.  |
| Source of data                          | The applicable conservative default value provided by the fuel supplier in invoices, Energy basis regional or national default values or IPCC values at upper limit of uncertainty at 95% confidence interval may be used as a reference. Appropriate NCV value for LPG may be used for converting energy basis values into mass basis values. |
| Value(s) of monitored parameter         | 74.1 tCO <sub>2</sub> e/TJ   |
| Monitoring equipment                    | Not applicable.  |
| Measuring/ Reading/ Recording frequency | Not applicable.  |
| Calculation method (if applicable)      | Not applicable.  |
| QA/QC procedures                        | Not applicable.  |
| Purpose of data                         | Data is used for the determination of project emissions.   |
| Additional comment                      | -  |

|                                 |   |
|---------------------------------|---|
| Data / Parameter:               | $EG_{Diesel-generator}$   |
| Unit                            | MWh   |
| Description                     | Quantity of electricity generated by captive off-grid electricity generator fuelled by Diesel   |
| Measured /Calculated /Default   | Measured.   |
| Source of data                  | <p>Measured by electricity meter. Continuous measurement. Accumulated values are to be recorded and reported at least once a month.</p> <p>This parameter will be monitored only if alternative approach 1 is selected for determining project emissions consumption of electricity sourced by the captive off-grid electricity generator (<math>PE_{EC, captive, y}</math>).<br/>If all electricity generated by the captive electricity generator is consumed by the project activity, <math>EG_{Diesel-generator} = EC_{captive, y}</math></p> |
| Value(s) of monitored parameter | 49061.41  |



|  |   |
|--|---|
| <b>Monitoring equipment</b>                    | <p><u>Specification of electricity meter 1:</u></p> <p>Model: Power Logic PM 710</p> <p>Manufacturer: Schneider Electric</p> <p>Serial number (S/N): 02B0629</p> <p>Period in use: From 13/03/2007 to present</p> <p>Calibration frequency: Twice A year<sup>12</sup></p> <p>Calibration dates: 03/10/2008, 01/06/2009 and 29/12/2009</p> <p><u>Specification of electricity meter 2:</u></p> <p>Model: Power Logic PM 710</p> <p>Manufacturer: Schneider Electric</p> <p>Serial number (S/N): 02B0637</p> <p>Period in use: From 13/03/2007 to present</p> <p>Calibration frequency: Twice a year<sup>13</sup></p> <p>Calibration dates: 03/10/2008, 01/06/2009, 29/12/2009, 22/06/2010 and 10/06/2011</p> |
| <b>Measuring/ Reading/ Recording frequency</b> | Continuous measurement, weekly recording <sup>14</sup>  |
| <b>Calculation method (if applicable)</b>      | Not applicable.   |
| <b>QA/QC procedures</b>                        | Project activity registers were crosschecked with the monthly CDEC SIC report.  |
| <b>Purpose of data</b>                         | Data is used for the determination of baseline emissions.   |
| <b>Additional comment</b>                      | -   |

<sup>12</sup> According to the letter delivered by the manufacturer Schneider Electric with date of April 23, 2007, the meters installed and used since February 2007 to register the consumption of the plant, doesn't need any calibration, because they are digital and not possess any internal mechanical system to realize the functions of measure and control. However, KDM S.A. performs periodic calibration to ensure the smooth operation of electric meters.

<sup>13</sup> According to the letter delivered by the manufacturer Schneider Electric with date of April 23, 2007, the meters installed and used since February 2007 to register the consumption of the plant, doesn't need any calibration, because they are digital and not possess any internal mechanical system to realize the functions of measure and control. However, KDM S.A. performs periodic calibration to ensure the smooth operation of electric meters.

<sup>14</sup> According to the methodology, the parameter should be measured continuously /periodically. On the PDD, we define, based on the design of the project a weekly basis, nonetheless, information is taken daily, being conservative and more accurate



|  |  |
|--|--|
| <b>Data / Parameter</b>                        | <b>FC<sub>LPG,v</sub></b>  |
| <b>Unit</b>                                    | ton  |
| <b>Description</b>                             | Quantity of fuel LPG combusted by the project activity   |
| <b>Measured /Calculated /Default</b>           | Measured.  |
| <b>Source of data</b>                          | Measurements using mass meters (scale) or an alternative appropriate measurement instrument. Measurements will be cross-checked against receipts of fuel purchasing. |
| <b>Value(s) of monitored parameter</b>         | 5.032,85   |
| <b>Monitoring equipment</b>                    | Not applicable.  |
| <b>Measuring/ Reading/ Recording frequency</b> | Continuous measurement. Accumulated values are to be recorded and reported at least once a week.   |
| <b>Calculation method (if applicable)</b>      | Not applicable.  |
| <b>QA/QC procedures applied:</b>               | Not applicable.  |
| <b>Purpose of data</b>                         | Data is used for the determination of project emissions.   |
| <b>Additional comment</b>                      | -  |

|  |  |
|--|--|
| <b>Data / Parameter</b>                        | <b>EF<sub>CO2,LPG</sub></b>  |
| <b>Unit</b>                                    | tCO <sub>2</sub> /tonLPG   |
| <b>Description</b>                             | CO <sub>2</sub> emission factor for fuel LPG   |
| <b>Measured /Calculated /Default</b>           | Calculated.  |
| <b>Source of data</b>                          | Value provided by the fuel supplier in invoices, Energy basis regional or national default values or IPCC values at upper limit of uncertainty at 95% confidence interval may be used as a reference. Appropriate NCV value for LPG may be used for converting energy basis values into mass basis values. |
| <b>Value(s) of monitored parameter</b>         | 63.1 tCO <sub>2</sub> e/TJ   |
| <b>Monitoring equipment</b>                    | Not applicable.  |
| <b>Measuring/ Reading/ Recording frequency</b> | Not applicable.  |
| <b>Calculation method (if applicable)</b>      | Not applicable.  |
| <b>QA/QC procedures</b>                        | Not applicable.  |
| <b>Purpose of data</b>                         | Data is used for the determination of project emissions.   |
| <b>Additional comment</b>                      | -  |

|  |   |
|--|---|
| <b>Data/Parameter:</b>                         | NCV <sub>LPG</sub>  |
| <b>Unit</b>                                    | GJ/ton LPG  |
| <b>Description</b>                             | Net calorific value of the fuel LPG   |
| <b>Measured /Calculated /Default</b>           | Calculated.   |
| <b>Source of data</b>                          | Value provided by the fuel supplier in invoices, regional or national default values or IPCC values at upper limit of uncertainty at 95% confidence interval. |
| <b>Value(s) of monitored parameter</b>         | 0.0000465 GJ/liters   |
| <b>Monitoring equipment</b>                    | Not applicable.   |
| <b>Measuring/ Reading/ Recording frequency</b> | Not applicable.   |
| <b>Calculation method (if applicable)</b>      | Not applicable.   |
| <b>QA/QC procedures</b>                        | Not applicable.   |
| <b>Purpose of data</b>                         | Data is used for the determination of project emissions.  |
| <b>Additional comment</b>                      | -   |

### D.3. Implementation of sampling plan

Not applicable.

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

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

>>

#### Baseline emissions for the project's methane destruction component:

GHG emission reduction associated with methane destruction to be achieved by the project activity during a given year “y” ( $ERM_y$ ) are determined as the difference between the amount of methane actually destroyed during the year ( $MD_{project,y}$ ) and the amount of methane that would have been destroyed during the year in the absence of the project activity ( $MD_{reg,y}$ )<sup>15</sup>, times the approved GWP Global Warming Potential value for methane ( $GWP_{CH_4}$ ).

$$ERM_y = (MD_{project,y} - MD_{reg,y}) * GWP_{CH_4} \quad (1)$$

Where:

$ERM_y$  is measured in ton of CO<sub>2</sub> equivalent (tCO<sub>2e</sub>)

<sup>15</sup> Reg = regulatory and contractual requirements.

$MD_{project,y}$  and  $MD_{reg,y}$  are measured in ton of methane (tCH<sub>4</sub>)

$$GWP_{CH_4} = 21 \text{ tCO}_2\text{e/tCH}_4$$

As established by ACM0001 (version 4), in the case where  $MD_{reg,y}$  is given/defined as a quantity that quantity will be used. In cases where regulatory or contractual requirements do not specify  $MD_{reg,y}$  an “Adjustment Factor” (AF) shall be used and justified, taking into account the project context.

Even though  $MD_{reg,y}$ , is not specified in regulatory or contractual requirements, since there are no legal requirements to capture and flare landfill gas in Chile, in recent years a small amount of landfill gas has been collected and flared at this project site. In order to be conservative, we have considered the three-year average (2002-04) mass of methane captured (245 ton methane per year) and flared (assuming 100% flare efficiency) to be the amount of methane destroyed in the baseline scenario.

$$MD_{project,y} = MD_{flared,y} + MD_{electricity,y} \quad (2)$$

$$MD_{flared,y} = LFG_{flare,y} * W_{CH_4,y} * D_{CH_4} * FE \quad (3)$$

Where:

$MD_{flared,y}$  Quantity of methane destroyed by flaring during the year measured (in tCH<sub>4</sub>)

$LFG_{flared,y}$  Quantity of landfill gas flared or during the year (in Nm<sup>3</sup>)

$W_{CH_4,y}$  Methane fraction of the landfill gas (in m<sup>3</sup>CH<sub>4</sub>/m<sup>3</sup>LFG)

$FE$  Flare efficiency (the fraction of the methane destroyed)

$D_{CH_4}$  Density of methane (in tCH<sub>4</sub>/m<sup>3</sup>CH<sub>4</sub>).

Where FE is determined by measurement of methane content in LFG sent to the flares as well as residual methane in the exhaust gas of the flare according to:

$$FE = 1 - \frac{\left[ W_{CH_4,y} \times L_{Exhaust} \right]_{out}}{\left[ W_{CH_4,y} \times L_{LFG} \times D_{CH_4} \right]_{in}} \quad (4)$$

The results of FE during the present monitoring period were as follows:

Flare 1

| From       | To                       | % CH <sub>4</sub> | LFG (m <sup>3</sup> /h) | CH <sub>4</sub> Density (Ton/m <sup>3</sup> ) | MD Flared (Kg/h) | Measurement Results                   |                           | MD       |           | Flare Efficiency |
|------------|--------------------------|-------------------|-------------------------|---|------------------|---------------------------------------|---------------------------|----------|-----------|------------------|
|            |                          |                   |                         |   |                  | CH <sub>4</sub> (mg/m <sup>3</sup> N) | Flow (m <sup>3</sup> N/h) | mg/h     | Kg/h      |                  |
| 18-03-2011 | 11-05-2011               | 50                | 4165                    | 0.000716                                      | 1491.07000       | 0.8                                   | 51308                     | 41046.4  | 0.0410464 | 0.999972         |
| 12-05-2011 | 17-08-2011               | 50.06             | 4177                    | 0.000716                                      | 1497.16044       | 0.6                                   | 52437                     | 31462.2  | 0.0314622 | 0.999979         |
| 18-08-2011 | End of monitoring period | 47.38             | 4193                    | 0.000716                                      | 1422.43667       | 3.2                                   | 52946                     | 169427.2 | 0.1694272 | 0.999881         |

Flare 2

| From       | To                       | % CH <sub>4</sub> | LFG (m <sup>3</sup> /h) | CH <sub>4</sub> Density (Ton/m <sup>3</sup> ) | MD Flared (Kg/h) | Measurement Results                   |                           | MD      |           | Flare Efficiency |
|------------|--------------------------|-------------------|-------------------------|---|------------------|---------------------------------------|---------------------------|---------|-----------|------------------|
|            |                          |                   |                         |   |                  | CH <sub>4</sub> (mg/m <sup>3</sup> N) | Flow (m <sup>3</sup> N/h) | mg/h    | Kg/h      |                  |
| 17-03-2011 | 12-05-2011               | 50.5              | 4199.3                  | 0.000716                                      | 1518.38289       | 0.3                                   | 53567                     | 16070.1 | 0.0160701 | 0.999989         |
| 13-05-2011 | 18-08-2011               | 49.44             | 4114                    | 0.000716                                      | 1456.31651       | 1.6                                   | 51460                     | 82336   | 0.082336  | 0.999943         |
| 19-08-2011 | End of monitoring period | 47.79             | 4324                    | 0.000716                                      | 1479.57075       | 3.4                                   | 50910                     | 173094  | 0.173094  | 0.999883         |

On the following tables a summary of calculations are included for baseline emission s:

| Flare 1         |            |  |                              |                          |
|-----------------|------------|--|------------------------------|--------------------------|
| Period          |            | Methane destroyed and sent to flare [m3] | Methane sent to flare [tons] | Total tCO <sub>2</sub> e |
| 01-05-2011      | 31-05-2011 | 1,416,928.6311                           | 1,015.6544                   | 21,328.7424              |
| 01-06-2011      | 30-06-2011 | 1,261,766.9701                           | 904.4345                     | 18,993.1245              |
| 01-07-2011      | 31-07-2011 | 1,308,844.9563                           | 938.1800                     | 19,701.7800              |
| 01-08-2011      | 31-08-2011 | 1,210,285.4608                           | 867.5326                     | 18,218.1846              |
| 01-09-2011      | 30-09-2011 | 727,986.2126                             | 521.8205                     | 10,958.2305              |
| 01-10-2011      | 31-10-2011 | 10,672.5321                              | 7.6500                       | 160.6500                 |
| 01-11-2011      | 30-11-2011 | 19,734.2778                              | 14.1455                      | 297.0555                 |
| 01-12-2011      | 31-12-2011 | 37,450.7662                              | 26.8447                      | 563.7387                 |
| 01-01-2012      | 31-01-2012 | 4,898.5644                               | 3.5112                       | 73.7352                  |
| 01-02-2012      | 29-02-2012 | 262,401.5332                             | 188.0894                     | 3,949.8774               |
| 01-03-2012      | 31-03-2012 | 334,363.3948                             | 239.6716                     | 5,033.1036               |
| 01-04-2012      | 30-04-2012 | 458,313.3591                             | 328.5190                     | 6,898.8990               |
| Total of period |            | 7,053,646.6586                           | 5,056.0539                   | 106,177.1319             |

| Flare 2         |            |                            |                              |                          |
|-----------------|------------|----------------------------|------------------------------|--------------------------|
| Period          |            | Methane sent to flare [m3] | Methane sent to flare [tons] | Total tCO <sub>2</sub> e |
| 01-05-2011      | 31-05-2011 | 1,473,625.9766             | 1,056.2951                   | 22,182.1971              |
| 01-06-2011      | 30-06-2011 | 1,318,184.9198             | 944.8749                     | 19,842.3729              |
| 01-07-2011      | 31-07-2011 | 1,328,278.0877             | 952.1097                     | 19,994.3037              |
| 01-08-2011      | 31-08-2011 | 1,210,166.6204             | 867.4474                     | 18,216.3954              |
| 01-09-2011      | 30-09-2011 | 807,397.9513               | 578.7428                     | 12,153.5988              |
| 01-10-2011      | 31-10-2011 | 40,870.4075                | 29.2959                      | 615.2139                 |
| 01-11-2011      | 30-11-2011 | 35,755.3520                | 25.6294                      | 538.2174                 |
| 01-12-2011      | 31-12-2011 | 30,446.1108                | 21.8237                      | 458.2977                 |
| 01-01-2012      | 31-01-2012 | 394,658.5383               | 282.8912                     | 5,940.7152               |
| 01-02-2012      | 29-02-2012 | 300,548.2562               | 215.4329                     | 4,524.0909               |
| 01-03-2012      | 31-03-2012 | 594,835.6597               | 426.3782                     | 8,953.9422               |
| 01-04-2012      | 30-04-2012 | 612,775.5672               | 439.2375                     | 9,223.9875               |
| Total of period |            | 8,147,543.4476             | 5,840.1591                   | 122,643.3411             |

Regarding electricity component of the project:

$$MD_{electricity,y} = LFG_{electricity,y} * w_{CH_4,y} * D_{CH_4} \quad (5)$$

Where:

|                       |   |
|-----------------------|---|
| $MD_{electricity,y}$  | Quantity of methane destroyed by generation of electricity during the year (in tCH <sub>4</sub> ) |
| $LFG_{electricity,y}$ | Quantity of landfill gas fed into electricity generator during the year (in Nm <sup>3</sup> )     |
| $w_{CH_4,y}$          | Methane fraction of the landfill gas (in m <sup>3</sup> CH <sub>4</sub> /m <sup>3</sup> LFG)      |
| $D_{CH_4}$            | Density if methane (in tCH <sub>4</sub> /m <sup>3</sup> CH <sub>4</sub> ).                        |

| Electricity Flow |            | Power Plant 1                    |                              |                          |
|------------------|------------|----------------------------------|------------------------------|--------------------------|
| Period           |            | Methane sent to Electricity [m3] | Methane sent to flare [tons] | Total tCO <sub>2</sub> e |
| 01-05-2011       | 31-05-2011 | 343,595.8289                     | 246.2894                     | 5,172.0774               |
| 01-06-2011       | 30-06-2011 | 214,739.5196                     | 153.9252                     | 3,232.4292               |
| 01-07-2011       | 31-07-2011 | 255,632.7943                     | 183.2375                     | 3,847.9875               |
| 01-08-2011       | 31-08-2011 | 216,835.0902                     | 155.4273                     | 3,263.9733               |
| 01-09-2011       | 30-09-2011 | 217,308.6085                     | 155.7668                     | 3,271.1028               |
| 01-10-2011       | 31-10-2011 | 172,756.5224                     | 123.8318                     | 2,600.4678               |
| 01-11-2011       | 30-11-2011 | 121,240.5858                     | 86.9052                      | 1,825.0092               |
| 01-12-2011       | 31-12-2011 | 195,417.9314                     | 140.0755                     | 2,941.5855               |
| 01-01-2012       | 31-01-2012 | 167,873.2168                     | 120.3315                     | 2,526.9615               |
| 01-02-2012       | 29-02-2012 | 135,746.5050                     | 97.3030                      | 2,043.3630               |
| 01-03-2012       | 31-03-2012 | 146,610.9867                     | 105.0907                     | 2,206.9047               |
| 01-04-2012       | 30-04-2012 | 211,387.1441                     | 151.5223                     | 3,181.9683               |
| Total of period  |            | 2,399,144.7337                   | 1,719.7069                   | 36,113.8449              |

| Electricity Flow |            | Power Plant 2                    |                              |                          |
|------------------|------------|----------------------------------|------------------------------|--------------------------|
| Period           |            | Methane sent to Electricity [m3] | Methane sent to flare [tons] | Total tCO <sub>2</sub> e |
| 01-05-2011       | 31-05-2011 | 0.0000                           | 0.0000                       | 0.0000                   |
| 01-06-2011       | 30-06-2011 | 0.0000                           | 0.0000                       | 0.0000                   |
| 01-07-2011       | 31-07-2011 | 0.0000                           | 0.0000                       | 0.0000                   |
| 01-08-2011       | 31-08-2011 | 14,484.3066                      | 10.3823                      | 218.0283                 |
| 01-09-2011       | 30-09-2011 | 682,096.2669                     | 488.9266                     | 10,267.4586              |
| 01-10-2011       | 31-10-2011 | 1,724,477.2905                   | 1,236.1053                   | 25,958.2113              |
| 01-11-2011       | 30-11-2011 | 1,498,539.3726                   | 1,074.1530                   | 22,557.2130              |
| 01-12-2011       | 31-12-2011 | 1,597,041.2115                   | 1,144.7591                   | 24,039.9411              |
| 01-01-2012       | 31-01-2012 | 1,663,085.8617                   | 1,192.0999                   | 25,034.0979              |
| 01-02-2012       | 29-02-2012 | 1,694,962.2456                   | 1,214.9489                   | 25,513.9269              |
| 01-03-2012       | 31-03-2012 | 1,789,307.9546                   | 1,282.5759                   | 26,934.0939              |
| 01-04-2012       | 30-04-2012 | 1,592,321.6797                   | 1,141.3761                   | 23,968.8981              |
| Total of period  |            | 12,256,316.1897                  | 8,785.3274                   | 184,491.8754             |

### Baseline emissions for the project's renewable energy generation component:

Carbon dioxide emissions reductions promoted by the project's renewable energy component during a given year  $y$  ( $ERC_y$ ) are determined (in tCO<sub>2</sub>) as follows:

$$ERC_y = EL_y * CEF_y \quad (7)$$

Where:

$ERC_y$  Quantity of net exported electricity during the year  $y$  (in MWh), given by:

$$EL_y = EL_{EXPLFG,y}$$

Where:

$EL_{EXPLFG,y}$  Quantity of net electricity generated by the project activity using LFG as fuel which is exported during year  $y$  (in MWh)

Note that “exported” here refers to net electricity being exported by the project activity through the SIC power grid: Note that exported net electricity could eventually be used to meet electricity demand from the landfill (e.g. leachate treatment, office use, etc., that are *not* associated with the landfill gas collection, flaring and use).

$CEF_y$  Emissions factor for electricity generation (in tCO<sub>2</sub>/MWh).  $CEF_y$  is determined as follows:

$$CEF_y = \frac{CEF_{OM,y} + CEF_{BM,y}}{2} \quad (8)$$

Where:

$CEF_{OM,y}$  Operating margin emission factor (in tCO<sub>2</sub>/MWh)

$CEF_{BM,y}$  Build margin emission factor (in tCO<sub>2</sub>/MWh).

$CEF_y$  is determined by using the applicable approved consolidated methodology ACM0002 (version 6), requiring a determination of the Build Margin (BM), the Operating Margin (OM) and a Combined Margin (CM).  $CEF_y$  is ex-ante calculated as 0.408 tCO<sub>2</sub>/MWh.

#### Energy Export Power Plant 1

| Period     |            | Electricity export<br>MWh | Emission factor tCO <sub>2</sub> /<br>MWh | Total tCO <sub>2</sub> e |
|------------|------------|---------------------------|---|--------------------------|
| 01-05-2011 | 31-05-2011 | 1,070.5586                | 0.4080                                    | 436.7879                 |
| 01-06-2011 | 30-06-2011 | 668.5106                  | 0.4080                                    | 272.7523                 |
| 01-07-2011 | 31-07-2011 | 898.0171                  | 0.4080                                    | 366.3910                 |
| 01-08-2011 | 31-08-2011 | 930.1990                  | 0.4080                                    | 379.5212                 |
| 01-09-2011 | 30-09-2011 | 804.4456                  | 0.4080                                    | 328.2138                 |
| 01-10-2011 | 31-10-2011 | 568.2787                  | 0.4080                                    | 231.8577                 |
| 01-11-2011 | 30-11-2011 | 389.4600                  | 0.4080                                    | 158.8997                 |
| 01-12-2011 | 31-12-2011 | 660.7363                  | 0.4080                                    | 269.5804                 |
| 01-01-2012 | 31-01-2012 | 602.0332                  | 0.4080                                    | 245.6295                 |
| 01-02-2012 | 29-02-2012 | 494.8481                  | 0.4080                                    | 201.8980                 |
| 01-03-2012 | 31-03-2012 | 549.4132                  | 0.4080                                    | 224.1606                 |
| 01-04-2012 | 30-04-2012 | 786.9379                  | 0.4080                                    | 321.0707                 |
|            |            | 8,423.4383                | <b>Total</b>                              | <b>3,436.7628</b>        |



### Energy Export Power Plant 2

| Period     |            | Electricity export<br>MWh | Emission factor tCO <sub>2</sub> /<br>MWh | Total tCO <sub>2</sub> e |
|------------|------------|---------------------------|---|--------------------------|
| 01-05-2011 | 31-05-2011 | 0.0000                    | 0.4080                                    | 0.0000                   |
| 01-06-2011 | 30-06-2011 | 0.0000                    | 0.4080                                    | 0.0000                   |
| 01-07-2011 | 31-07-2011 | 0.0000                    | 0.4080                                    | 0.0000                   |
| 01-08-2011 | 31-08-2011 | 0.0000                    | 0.4080                                    | 0.0000                   |
| 01-09-2011 | 30-09-2011 | 1,823.4359                | 0.4080                                    | 743.9619                 |
| 01-10-2011 | 31-10-2011 | 5,324.0376                | 0.4080                                    | 2,172.2074               |
| 01-11-2011 | 30-11-2011 | 5,135.2400                | 0.4080                                    | 2,095.1779               |
| 01-12-2011 | 31-12-2011 | 5,472.6000                | 0.4080                                    | 2,232.8208               |
| 01-01-2012 | 31-01-2012 | 5,678.5321                | 0.4080                                    | 2,316.8411               |
| 01-02-2012 | 29-02-2012 | 5,696.2538                | 0.4080                                    | 2,324.0716               |
| 01-03-2012 | 31-03-2012 | 6,042.4117                | 0.4080                                    | 2,465.3040               |
| 01-04-2012 | 30-04-2012 | 5,465.4629                | 0.4080                                    | 2,229.9089               |
|            |            | 40,637.9742               | <b>Total</b>                              | <b>16,580.2934</b>       |

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

&gt;&gt;

$PE_{i,y}$  Total project emissions.  $PE_{i,y}$  is calculated as follows:

$$PE_{i,y} = PE_{EC,y} + PE_{LPG,y}$$

Where:

$PE_{LPG,y}$  = Project emissions due to consumption of fossil fuel LPG by the project activity (for uses other than electricity generation) (in tCO<sub>2</sub>/year). Liquefied Petroleum Gas (LPG) is used for igniting the flares.

$PE_{EC,y}$  = Project emissions due to electricity consumption in year y (in tCO<sub>2</sub>/year).  
*Note:* Although the project activity generates electricity which is exported through the SIC power grid, electricity supplied through the grid might also import and consumed by the project activity, which is calculated as follows:

**Project emissions due to the consumption of electricity by the project activity (grid electricity and/or electricity generated by a captive off-grid electricity generator fuelled by fossil fuel (Diesel)).**

Project emissions due to electricity consumption ( $PE_{EC,y}$ ) are determined (in tCO<sub>2</sub>) as follows:

$$PE_{EC,y} = PE_{EC,grid,y} + PE_{EC,captive,y}$$

Where:

$PE_{EC,grid,y}$  Project emissions due to consumption of grid electricity in year y (tCO<sub>2</sub>).  $PE_{EC,grid,y}$  is calculated by following the applicable guidance of the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (version 1) as follows:

$$PE_{EC,grid,y} = EC_{grid,y} * CEF_y * (1 + TDL_{grid,y})$$

Where:

$EC_{grid,y}$  Amount of grid electricity consumed by the project activity.  $EC_{grid,y}$  will be measured and monitored in MWh as per applicable provisions of the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”.

$CEF_y$  CO<sub>2</sub> emission factor for grid electricity.  $CEF_y$  is ex-ante calculated as 0.408 tCO<sub>2</sub>/MWh,

$TDL_{grid,y}$  Average technical transmission and distribution losses for grid electricity. In accordance with applicable provisions of the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”,  $TDL_{grid,y}$  is ex-ante determined as 20% (conservative default value fixed along the whole crediting period).

$PE_{EC,captive,y}$  Project emissions due to consumption of electricity sourced by the captive off-grid electricity generator (fuelled by Diesel) in year y (tCO<sub>2</sub>).  $PE_{EC,captive,y}$  is calculated as follows:

$$PE_{EC,captive,y} = FC_{Diesel} * COEF_{Diesel}$$

Where:

$FC_{Diesel}$  Quantity of fuel Diesel combusted by the captive off-grid electricity generator (liters)

$COEF_{Diesel}$  The CO<sub>2</sub> emission coefficient for the fuel Diesel (tCO<sub>2</sub>/liters) which is calculated by following Option B of the “Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion” as follows:

$$COEF_{Diesel} = NCV_{Diesel} * EF_{CO2,Diesel}$$

Where:

$NCV_{Diesel}$  Net calorific value of the fuel Diesel (in GJ/liters)

$EF_{CO2,Diesel}$  CO<sub>2</sub> emission factor of fuel Diesel (tCO<sub>2</sub>/GJ)



## Fuel consumption

| Date       | Fuel or Energy | Emission Factor            | Quantity liters | Quantity Kg | Calorific power<br>kJ/kg | Energy Tj | Tons of CO <sub>2e</sub> |
|------------|----------------|----------------------------|-----------------|-------------|--------------------------|-----------|--------------------------|
| 14-05-2011 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 180             | 153.00      | 43,000                   | 0.0066    | 0.4891                   |
| 19-05-2011 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 564             | 479.40      | 43,000                   | 0.0207    | 1.5339                   |
| 24-05-2011 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 355             | 301.75      | 43,000                   | 0.0130    | 0.9633                   |
| 06-06-2011 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 499             | 424.15      | 43,000                   | 0.0183    | 1.3561                   |
| 09-06-2011 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 111             | 94.35       | 43,000                   | 0.0041    | 0.3039                   |
| 04-07-2011 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 212             | 180.20      | 43,000                   | 0.0078    | 0.5780                   |
| 05-08-2011 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 168             | 142.80      | 43,000                   | 0.0062    | 0.4595                   |
| 10-08-2011 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 103             | 87.55       | 43,000                   | 0.0038    | 0.2816                   |
| 27-08-2011 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 101             | 85.85       | 43,000                   | 0.0037    | 0.2742                   |
| 24-09-2011 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 87              | 73.95       | 43,000                   | 0.0032    | 0.2372                   |
| 08-10-2011 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 35              | 29.75       | 43,000                   | 0.0013    | 0.0964                   |
| 18-11-2011 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 141             | 119.85      | 43,000                   | 0.0052    | 0.3854                   |
| 12-12-2011 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 200             | 170.00      | 43,000                   | 0.0074    | 0.5484                   |
| 10-01-2012 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 83              | 70.55       | 43,000                   | 0.0031    | 0.2298                   |
| 11-01-2012 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 93              | 79.05       | 43,000                   | 0.0034    | 0.2520                   |
| 21-01-2012 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 244             | 207.40      | 43,000                   | 0.0090    | 0.6669                   |
| 30-01-2012 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 129             | 109.65      | 43,000                   | 0.0048    | 0.3557                   |
| 17-03-2012 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 428             | 363.80      | 43,000                   | 0.0157    | 1.1634                   |
| 24-03-2012 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 175             | 148.75      | 43,000                   | 0.0064    | 0.4743                   |
| 04-04-2012 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 814             | 691.90      | 43,000                   | 0.0298    | 2.2082                   |
| 05-04-2012 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 266             | 226.10      | 43,000                   | 0.0098    | 0.7262                   |
| 12-04-2012 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 85              | 72.25       | 43,000                   | 0.0032    | 0.2372                   |
| 13-04-2012 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 343             | 291.55      | 43,000                   | 0.0126    | 0.9337                   |
| 14-04-2012 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 423             | 359.55      | 43,000                   | 0.0155    | 1.1486                   |
| 21-04-2012 | Fuel oil       | 74,1 tCO <sub>2e</sub> /Tj | 82              | 69.70       | 43,000                   | 0.0030    | 0.2223                   |
| Total      |                |                            | 5,921           | 5,032.85    |                          | 0.2176    | 16.1253                  |

**Project emissions due to consumption of LPG (for igniting the flares):**

In order to determine project emissions from LPG combustion ( $PE_{LPG,y}$ ) for igniting the flares, applicable guidance of the “Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion” (version 2) is utilized as follows:

$$PE_{LPG,y} = \sum FC_{LPG,y} * COEF_{LPG,y}$$

Where:

$FC_{LPG,y}$  Quantity of consumed fossil fuel (LPG) (in ton LPG);  
 $COEF_{LPG,y}$  CO<sub>2</sub> emission coefficient for LPG (tCO<sub>2</sub>/ton LPG).  $COEF_{LPG,y}$  is determined as follows:

$$COEF_{LPG,y} = NCV_{LPG} * EF_{CO2,LPG}$$

Where:

$NCV_{LPG}$  Net calorific value of the fuel LPG (in GJ/ton LPG)

$EF_{CO2,LPG}$  CO<sub>2</sub> emission factor of fuel LPG (tCO<sub>2</sub>/ton LPG)

On the next table the amount of project emissions due to the consumption of LPG is calculated based on the amount of LPG acquired during th

| Date       | Fuel or Energy            | Emission Factor            | Quantity (Kg) | Calorific power kJ/kg | Energy Tj | Tons of CO <sub>2e</sub> |
|------------|---------------------------|----------------------------|---------------|-----------------------|-----------|--------------------------|
| 27-01-2012 | Liquefied Petroleum Gases | 63.1 tCO <sub>2e</sub> /Tj | 90            | 47,300                | 0.0043    | 0.2714                   |

### Electricity consumption by the project activity:

“Imported” electricity refers to any electricity taken (from the grid) by the project activity, principally for blowers used in landfill gas extraction. Such imports may be present as project emissions. CO<sub>2</sub> emissions from electricity consumption are calculated using the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”: The electricity is purchased from the grid only with no captive plants, so scenario A corresponds to the analysis. Such tool states that:

$$PE_{EC,y} = \sum_j EC_{PJ,j,y} * EF_{EL,j,y} * (1 + TDL_{j,y})$$

Where:

|               |  |
|---------------|--|
| $PE_{EC,y}$   | Project emissions from electricity consumption in year $y$ (tCO <sub>2</sub> /yr)  |
| $EC_{PJ,j,y}$ | Quantity of electricity consumed by the project electricity consumption source $j$ in year $y$ (MWh/yr) <sup>16</sup> .  |
| $EF_{EL,j,y}$ | Emission factor for electricity generation for source $j$ in year $y$ (tCO <sub>2</sub> /MWh) <sup>17</sup> .  |
| $TDL_{j,y}$   | Average technical transmission and distribution losses for providing electricity to source $j$ in year $y$ . As proposed by the tool, scenario A gives the alternative of using a default value of 20%, so that alternative was applied. |

Therefore, the previous equation turns into:

$$PE_{EC,y} = 1.2 * \sum_j EL_{IMP,y} * CEF_y$$

In the tables below the information of the CERs calculation is provided.

### Energy Consumption

| Period     |            | Energy      | Emission Factor              | Quantity Electricity KW | Tons of CO <sub>2e</sub> |
|------------|------------|-------------|------------------------------|-------------------------|--------------------------|
| 01-05-2011 | 31-05-2011 | Electricity | 0.408 tCO <sub>2e</sub> /MWh | 38,041                  | 18.6249                  |
| 01-06-2011 | 30-06-2011 | Electricity | 0.408 tCO <sub>2e</sub> /MWh | 36,487                  | 17.8641                  |
| 01-07-2011 | 31-07-2011 | Electricity | 0.408 tCO <sub>2e</sub> /MWh | 34,141                  | 16.7155                  |
| 01-08-2011 | 31-08-2011 | Electricity | 0.408 tCO <sub>2e</sub> /MWh | 35,351                  | 17.3079                  |
| 01-09-2011 | 30-09-2011 | Electricity | 0.408 tCO <sub>2e</sub> /MWh | 34,975                  | 17.1238                  |
| 01-10-2011 | 31-10-2011 | Electricity | 0.408 tCO <sub>2e</sub> /MWh | 33,703                  | 16.5010                  |
| 01-11-2011 | 30-11-2011 | Electricity | 0.408 tCO <sub>2e</sub> /MWh | 60,136                  | 29.4426                  |
| 01-12-2011 | 31-12-2011 | Electricity | 0.408 tCO <sub>2e</sub> /MWh | 63,395                  | 31.0382                  |
| 01-01-2012 | 31-01-2012 | Electricity | 0.408 tCO <sub>2e</sub> /MWh | 51,344                  | 25.1381                  |
| 01-02-2012 | 29-02-2012 | Electricity | 0.408 tCO <sub>2e</sub> /MWh | 39,169                  | 19.1772                  |
| 01-03-2012 | 31-03-2012 | Electricity | 0.408 tCO <sub>2e</sub> /MWh | 40,611                  | 19.8832                  |
| 01-04-2012 | 30-04-2012 | Electricity | 0.408 tCO <sub>2e</sub> /MWh | 37,837                  | 18.5250                  |
| Total      |            |             |                              | 505,190                 | 247.3415                 |

### Summary of project emissions during the period

<sup>16</sup> This parameter refers to the same monitored variable under  $EL_{IMP,y}$

<sup>17</sup>  $CEF_y$  in this case replaces  $FE_{EL,j,y}$



| Fuel or Energy                                 | Emission Factor              | Quantity    | Calorific power kj/kg | Energy Tj | Tons of CO <sub>2e</sub> |
|--|------------------------------|-------------|-----------------------|-----------|--------------------------|
| Fuel oil                                       | 74.1 tCO <sub>2e</sub> /TJ   | 5,032.85    | 43,000                | 0.2176    | 16.1253                  |
| Liquefied Petroleum Gases                      | 63.1 tCO <sub>2e</sub> /TJ   | 90 kg       | 47,300                | 0.0043    | 0.2714                   |
| Electricity                                    | 0.408 tCO <sub>2e</sub> /MWh | 477,644 MWh |                       |           | 247.3415                 |
| <b>Total Project emission tCO<sub>2e</sub></b> |                              |             |                       |           | <b>263.7382</b>          |

**E.3. Calculation of leakage**

Not applicable

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

| Time Period  | Baseline emissions or baseline net GHG removals by sinks (tCO <sub>2e</sub> ) | Project emissions or actual net GHG removals by sinks (tCO <sub>2e</sub> ) | Leakage (tCO <sub>2e</sub> ) | Emission reductions or net anthropogenic GHG removals by sinks (tCO <sub>2e</sub> ) |
|--------------|---|--|------------------------------|---|
| <b>Total</b> | 464,283   | 263.7382   | 0                            | 464,019   |

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

| Item   | Values estimated in ex-ante calculation of registered PDD | Actual values achieved during this monitoring period |
|--|---|--|
| <b>Emission reductions or GHG removals by sinks (tCO<sub>2e</sub>)</b> | 710,652   | 464,019  |

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

No relative increase in the achieved emission reductions occurred in comparison with related emission reduction estimations as per the registered PDD.

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**History of the document**

| Version   | Date                           | Nature of revision   |
|---|--------------------------------|--|
| 02.0  | EB 66<br>13 March 2012         | Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20). |
| 01  | EB 54, Annex 34<br>28 May 2010 | Initial adoption.  |
| <b>Decision Class:</b> Regulatory<br><b>Document Type:</b> Form<br><b>Business Function:</b> Issuance |                                |  |