CLEAN DEVELOPMENT MECHANISM
CDM MONITORING REPORT FROM THE
ESTRE'S PAULÍNIA LANDFILL GAS PROJECT (EPLGP)

MONITORING PERIOD:
FROM 01 SEPTEMBER 2008 TO 31 JANUARY 2009

5TH VERIFICATION – VERSION 5
3 FEBRUARY 2009

CONTENTS

Annexes

Initial remark (referring to Decision 17/CP.7, Annex H, paragraph 54, 56, 58 and 60)
The monitoring plan contained in the registered project design document is to be implemented by the project participants and the monitoring report shall be written in accordance with this registered monitoring plan.

The monitoring plan shall be based on a previously approved monitoring methodology or a new methodology.

The implementation of the registered monitoring plan and its revision, as applicable, shall be a condition for verification, certification and issuance of CERs.

SECTION A. General project activity information

A.1 Title of the project activity:
ESTRE's Paulínia Landfill Gas Project (EPLGP)

A.2. CDM registration number:
The ESTRE's Paulínia Landfill Gas Project (EPLGP) was registered in March 3rd, 2006, reference number 0165.

A.3. Short description of the project activity:

A.3.1. Real Project Implementation
EPLGP is a landfill gas collection and flare project in Brazil. The project's core idea is to avoid methane emissions from the landfill managed by ESTRE in Paulínia municipality. This goal will be achieved through installing an active gas recovery with a flaring system in the landfill.

The project aimed to enhance the previous installed passive vent system, in order to increase the efficiency in collecting the gas and flare it systematically, continuously monitoring the operation. For that purpose, an active recovery system was installed in the landfill, as well as a flare facility. This comprises the connection of well heads through pipes, which are connected to a blower, where the gas is sent to the flare system.

The system assembly (including flare) and tests were concluded in 2006. The biogas unit entered in operation on September 14th, 2006. The flare details are below:

Flares specification

Flare 1	Manufacturer	Biotecnogás (BTG)
	Model	2000 HT
	Serial number	133/05A
	Year of manufacturing	2006
	Nominal gas flow	2000 Nm³/h
	Minimum gas flow	400 Nm³/h
	Minimum efficiency	97%
	Lowest operation temperature	850 °C
Flare 2	Manufacturer	Biotecnogás (BTG)
	Model	2000 HT
	Serial number	133/05B
	Year of manufacturing	2006
	Nominal gas flow	2000 Nm³/h
	Minimum gas flow	400 Nm³/h
	Minimum efficiency	97%
	Lowest operation temperature	850 °C
Flare 3	Manufacturer	Biotecnogás (BTG)
	Model	2500 HT
	Serial number	110/07-C
	Year of manufacturing	2007
	Nominal gas flow	2500 Nm³/h
	Minimum gas flow	500 Nm³/h
	Minimum efficiency	97%
	Lowest operation temperature	850 °C

A.3.2. Changes against the PDD

1. Blowers are much smaller than described in the PDD

In the PDD, it was assumed to be installed a 380 kW blower. The system which is installed work with 2 blowers of 75 kW. During this monitoring period most of the time one blower was in use, however in times of increased gas flow the two blowers were used at the same time.

2. Application of a diesel generator which is not described in the registered PDD

A diesel fuelled generator is used as backup system for the imported grid electricity, which is not explicitly mentioned in the registered PDD. The technical features of these equipment is shown below:

Generator Manufacturer: STEMAC (WEG)
Generator Model: GTA
Engine Manufacturer: STEMAC (Cummins)
Engine Model: NTA63
Serial Number: 0450533001
Capacity: 450 kVA
Frequency: 60 Hz
Tension: 380 V
Current: 614 A
Year: 10/2001
Commissioning date: 14/09/2006

A.4. Monitoring period:

From 1st September 2008 to 31st January 2009.

A.5. Methodology applied to the project activity (incl. version number):

A.5.1. Baseline methodology:

AM0003 ver.3 – Simplified financial analysis for landfill gas capture projects.

A.5.2. Monitoring methodology:
AM0003 ver.3 – Simplified financial analysis for landfill gas capture projects.

A.6. Intended deviations or revisions to the registered PDD:
No deviation to the registered PDD is requested.

A.7. Intended deviations or revisions to the registered monitoring plan (Decision 17/CP.7, Annex H, paragraph 57 to be considered):
No deviation to the registered PDD is requested.

A.8. Changes since last verification:
Both electricity meters were replaced as well as the temperature meter was replaced.

A.9. Person(s) responsible for the preparation and submission of the monitoring report:
This monitoring report was developed and reviewed by:

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SECTION B. Key monitoring activities according to the monitoring plan for the monitoring period stated in A.4. (referring to Decision 17/CP.7, Annex H, paragraph 53 (a) – (d) on data collection and archiving)

B.1. Monitoring equipment:

The monitoring equipments of the EPLGP and their location are presented in Annex I below. All monitoring equipments were running properly during this period.

The temperature data, pressure data, electricity consumption data, flow data and methane (CH_4) content data is measured on-line and hourly compiled in an Excel data sheet. All the data transmission and compilation is made electronically to the calculation spreadsheet.

The methane content of the flare exhaust gas is measured at least quarterly by an independent company specialized in gas analysis. Then the flare efficiency is calculated and this value will be used until the next methane content analysis is conducted.

B.1.2. Table providing information on the equipment used (including type, manufacturer, model, serial number, location, information to specific uncertainty and range):

Type	Manufacturer	Model	Serial Number	Location	Error / Uncertainty	Range
Flow Meter	RMG Messtechnik	TRZ-03	32392	Container – main pipeline	Error: 0.22% Uncertainty: 0.33%	320-6500m^3
Electricity meter from the grid	Yokogawa	UPD200-2480M	40962200082	Primary cabins' electric panel	Error: 0.134% Uncertainty: 0.067%	300V 5A
Electricity meter from the diesel generation	Yokogawa	UPD200-2480M	40964200869	Generator's electric panel	Error: 0.6% Uncertainty: 0.134%	300V 5A
Methane content analyser	SIEMENS	ULTRAMAT23	N1-U4-0790	Container – analysis room	Error: 0.0879% Uncertainty: 0.032%	O_2 - 0-25% CH_4 0-100%
Pressure meter	ABB	264HS	6406013007	Container – main pipeline	Error: 0.075%	0-250 mbar
Temperature meter	ELSI	PT100	06-26229	Container – main pipeline	Error: 0.048% Uncertainty: 0.032%	0-250^oC
Flow meter line "A"	ABB	264DSE	6406013218	Container – line "A"	Error: 0.075%	0-16kPa
Flow meter line "B"	ABB	264DSE	6406013216	Container – line "B"	Error: 0.075%	0-16kPa
Flow meter line "C"	ABB	264DSE	6406013217	Container – line "C"	Error: 0.075%	0-16kPa

B.1.3. Calibration procedures:

According to CGR Paulínia's Environmental Management, the calibration frequency is as presented below:

Type	Calibration Frequency	Date of the last external calibration	Date of the next external calibration
Flow Meter	7 years	26 June 2007	25 June 2014
Electricity meter from the grid	Annual	20 January 2009	19 January 2010
Electricity meter from the diesel generation	Annual	21 January 2009	20 January 2010
Methane content analyser	Annual	12 January 2009	11 January 2010
Pressure meter	2 years	06 June 2008	05 June 2010
Temperature meter	Annual	19 January 2009	18 January 2010
Flow meter line "A"	2 years	17 July 2008	16 July 2010
Flow meter line "B"	2 years	18 July 2008	17 July 2010
Flow meter line "C"	2 years	18 July 2008	17 July 2010

B.1.4. Involvement of Third Parties:

EPLGP has one third party involved: Bioagri, a company hired to make the analysis of methane content in the exhaust gas periodically. The first collection was made in July 2008, followed by two other collections, dated of September 2008 and December 2008.

B.2. Data collection (accumulated data for the whole monitoring period):

B.2.1. List of fixed default values:

Global Warming Potential of CH_4 (GWP_{CH4}) = 21 tCO_2e/tCH_4[1];
Emission Factor of the S-SE-CO Brazilian Grid (EF) = 0.2677 tCO_2e/MWh[2];
Emission factor from the diesel (EF_{diesel}) = 0.8 tCO_2e/MWh[3];
Methane Destruction in the Baseline = 20% of total gas collected[2];
Density of Methane, at STP (D_{CH4})[4] = 0.0007168 $tons/m^3$.

B.2.2. List of variables:

$Q_{biogas,\ flares}$ = amount of biogas collected and sent to flares (Nm^3);
Temperature = temperature of biogas collected and sent to flare (°C);
Pressure = pressure of biogas collected and sent to flare (mbar);
$\%_{CH4}$ = percentage of methane in the biogas (% volume);
EG_y = amount of electricity imported from the grid (MWh);
EG_{diesel} = Electricity consumption from the diesel generation by the project activity (kWh);
FE = Flare Efficiency (calculated using data from methane content in the exhaust gas, methane content in the residual gas, oxygen content in the exhaust gas and oxygen content in the residual gas).
Regulatory requirements relating to landfill gas projects = there are no regulatory requirements for landfill gas in the host country.

B.2.3. Data concerning GHG emissions by sources of the project activity (referring to paragraph 53(a)):

According to AM0003 – version 03, no project emissions need to be addressed.

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[1] Available at http://unfccc.int/ghg_emissions_data/information_on_data_sources/global_warming_potentials/items/3825.php , accessed on August, 20th 2007;

[2] According to the registered the ESTRE Paulinia Landfill Gas Project PDD;

[3] According to the small scale methodology AMS I.D version 13, "*Grid connected renewable electricity generation*";

[4] According to the approved Methodology AM0003 version 3

B.2.4. Data concerning GHG emissions by sources of the baseline (referring to paragraph 53(b)):
The following table presents the collected data from the period between 01/09/2008 and 31/01/2009.

Baseline emissions	
Methane destroyed in FLARE 1, 2 or 3 according to manufacturer specification (Nm^3)	***8,770,373.61***

More detailed data were presented to the audit team in a spreadsheet.

B.2.5. Data concerning leakage (referring to paragraph 53(c)):
The data concerning the leakage emissions during the period of 1 September 2008 and 31 January 2009 were presented in a spreadsheet attached to this document and presented to the verification team. The table below presents a summary of the electricity consumption.

	Grid electricity consumption (MWh)	Electricity consumed by the diesel generators (MWh)
TOTAL	***336.705***	***0.223***

B.2.6. Data concerning environmental impacts (referring to paragraph 53(d)):
According to the Operational License, issued on September 4th, 2006 by CETESB, the project must only present, at January 31st of each year, a report containing information about the gas purity, amount of biogas flared and reports about eventual problems or accidents.

The current operational license comprises two flares. Although ESTRE has already requested the expansion of the current operational license, it was not issued yet due to delays and bureaucracy. To ensure that the biogas facility operates properly and in accordance with the local regulations, the project participants evidenced to the verification team that CETESB has made periodic audits in the project site, and there were no manifestation, non conformity, fine or warning in this regard.

SECTION C. Quality assurance and quality control measures

C.1. Documented procedures and management plan:
CGR Paulínia has an ISO 14001 certification, emitted on January 2004 and renewed recently. All procedures are detailed in the management plan.

C.2. Involvement of Third Parties:
There is no third party involved.

C.3. Internal audits and control measures:
CGR Paulínia has an ISO 14001 certification, emitted on January 2004 and renewed recently. All procedures are detailed in the management plan.

Also, Econergy Brasil developed an internal procedure to develop the Monitoring Report. To ensure the conservativeness, data related to baseline emission were rounded down and data related to leakage emissions was rounded up.

SECTION D. Calculation of GHG emission reductions (referring to Decision 17/CP.7, Annex H, paragraph 53 (f) and 59)

D.1. Table providing the formulas used:

The calculation of emission reductions will be made using the formulas listed in the following table:

A	Total LFG collected	m^3
B	Methane content on LFG	$\%_{methane}$
C	Pressure of the LFG	bar
D	Temperature of the LFG	K
E = $B \times \frac{C \times A}{D} \times \frac{273}{1.013} \times 0.0007168$	Methane collected	$t_{methane}$
F	Flow-meter Error	%
G	Flow-meter Uncertainty	%
H	Temperature meter Error	%
I	Temperature meter Uncertainty	%
J	Pressure meter Error	%
K	Pressure meter Uncertainty	%
L	Methane analyzer Error	%
M	Methane analyzer Uncertainty	%
N = $\sqrt{F + G^2 + H + I^2 + J + K^2 + (L+M)^2}$	Equivalent error of gas measuring equipment	%
O = E . (1-N/100)	Total methane collected corrected	$t_{methane}$
P	Flare Efficiency	%
Q = O . P	Total methane destroyed	$t_{methane}$
R = Q . 21	Total CO_2e destroyed	tCO_2e
S = R . 0.2	Total CO_2e destroyed in the baseline[5]	tCO_2e
T = R – S	CO_2e destroyed by EPLGP	tCO_2e
U	Total electricity imported	MWh
V	Emission factor of the grid which EPLGP is connected	tCO_2e/MWh
W	Grid electricity meter error	%
X	Grid electricity meter uncertainty	%
Y = $\sqrt{W + X^2}$	Equivalent error of Grid electricity measuring equipment	%
Z = U . V . (1+Y/100)	Emissions due to the import of electricity	tCO_2e
AA	Electricity produced by the diesel generators	MWh
AB	Emission factor of the diesel electricity generation	tCO_2e/MWh
AC	Grid electricity meter error	%
AD	Grid electricity meter uncertainty	%

[5] During the monitoring period, the Adjustment Factor adopted was 20% (according with AM0003 – version 3) as no obligatory requirement (law/regulation) on LFG destruction was identified in São Paulo State or in Brazil.

AE = $\sqrt{(AC + AD)^2}$	Equivalent error of Grid electricity measuring equipment	%
AF = AA . AB . (1+AE/100)	Emissions due to the production of electricity using diesel	tCO_2e
AG = T – Z – AF	Emissions reductions due to EPLGP	tCO_2e

D.2. Description and consideration of measurement uncertainties and error propagation:

In order to be conservative, the project participants calculated an equivalent error. This equivalent error included all errors from the gas measuring equipment, according to the formula below:

Equivalent error = $\sqrt{(F + G)^2 + (H + I)^2 + (J + K)^2 + (L + M)^2}$;

Where:

F	Flow-meter Error	%
G	Flow-meter Uncertainty	%
H	Temperature meter Error	%
I	Temperature meter Uncertainty	%
J	Pressure meter Error	%
K	Pressure meter Uncertainty	%
L	Methane analyzer Error	%
M	Methane analyzer Uncertainty	%

Also, the equivalent error from electricity meters was added to this measurement. The equivalent error formula for both electricity from the grid and from diesel generation, is presented below:

Equivalent error = $\sqrt{(error + uncertaint y)^2}$

Moreover, the data parameters are measured and rounded to four decimals.
In the baseline calculation the numbers were rounded down after four decimals and in calculation of the project emissions the numbers were rounded up after four decimals. Then, the emissions reductions were rounded down without decimals.

D.3. GHG emission reductions (referring to B.2. of this document):

D.3.1. Project emissions:
According to AM0003 – version 03, project emission does not need to be addressed.

D.3.2. Baseline emissions:

BE_{period} = ***105,009.2416*** tCO_2e

D.3.3. Leakage:

L_{period} = *90.4970* tCO_2e

D.3.4. Summary of the emissions reductions during the monitoring period:

Parameters	***Total***
Total methane collected (Nm^3CH_4)	8,776,700.3347
Total methane destroyed (Nm^3CH_4)	**8,770,373.6122**
Electricity bought from the grid (MWh)	336.7050
Electricity from diesel generation (MWh)	0.2230

	TOTAL
Total CO_2e – Baseline Emissions (tCO_2e)	***105,009.2416***
Total CO_2e – grid electricity consumption (tCO_2e)	***90.3172***
Total CO_2e - diesel generators consumption (tCO_2e)	***0.1798***
Total CO_2e – Total emission reductions (tCO_2e)	***104,918***

Annex 1 – Monitoring equipment location*

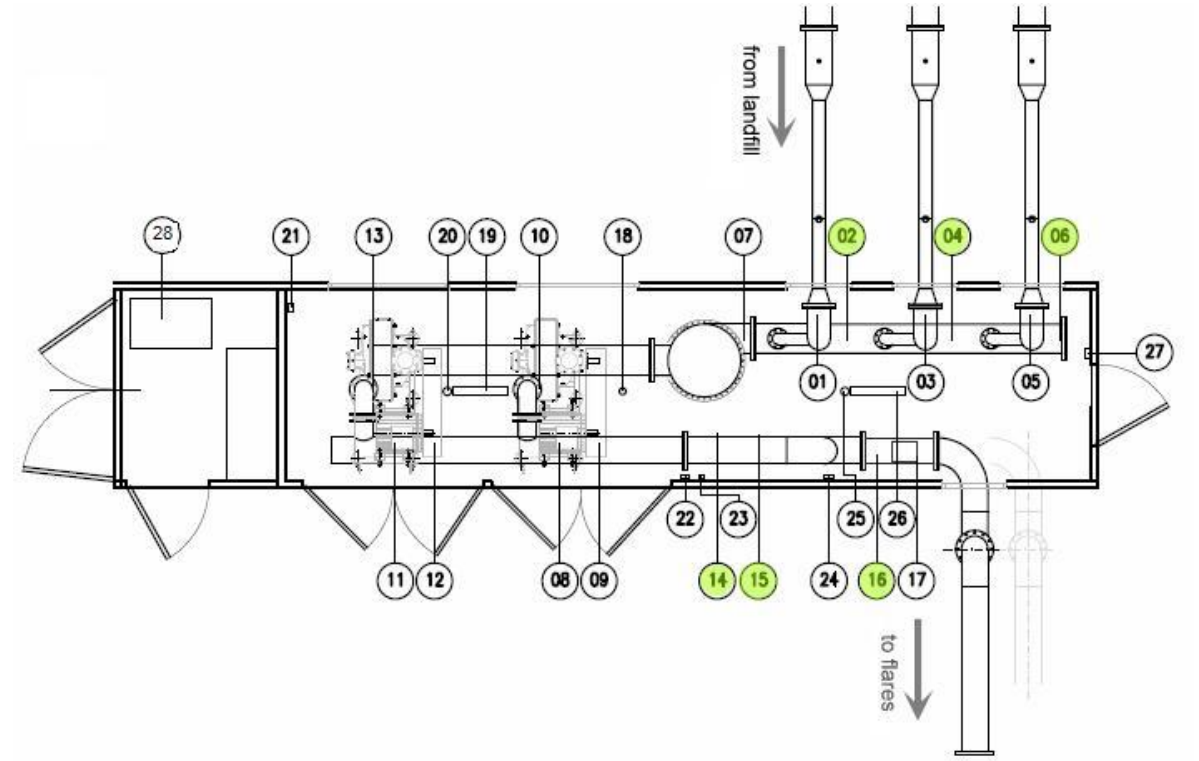

Figure 1 - Monitoring equipment location

2	Backup flow meter
4	Backup flow meter
6	Backup flow meter
14	Pressure meter
15	Thermocouple PT100
16	Flow meter TRZ 03
28	Gas analyzer

* The electricity meters are not presented in this figure because are not placed at the container.

Annex 2

Biogas Facility

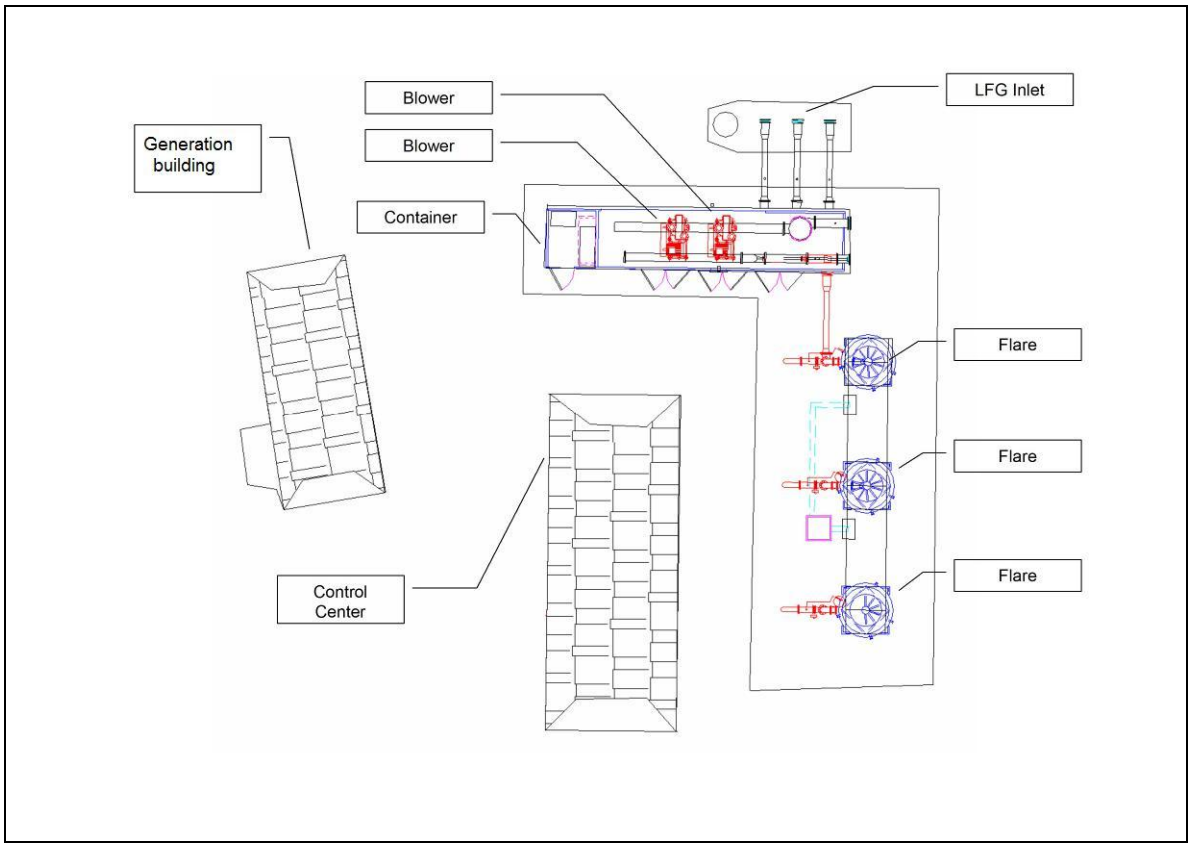

Figure 2.Biogas facility

Annex 3
Analysis of Methane Content in the exhaust gas

The methane content analyses in the exhaust gas were made by BIOAGRI. The analysis is showed below: CH_4

Gaseous Organic Mixture Emission Determination
Table 01 - Flare 01

Collection	Date	Carbon Band	Gas Concentration (ppm v/v)	Gas Concentration (mg / Nm³)
01	02-Sep-08	CH_4	0.544	0.389
02	02-Sep-08	CH_4	1.61	1.15
03	02-Sep-08	CH_4	1.84	1.31

Gases Composition
Table 02 - Flare 01

Oxygen Content (O_2) (% v/v)	Carbon Dioxide Content (CO_2) (% v/v)	Nitrogen Content (N_2) (% v/v)
13.8	4.1	82.1
14.1	4.3	81.6
13.9	4.2	81.9

Determination of Tracer Recuperation (Dimethyl Ether)
Table 03 - Flare 01

Collection	Tracer Volume Added (mL) (*)	BAG Gas Volume (L) (**)	Dimethyl Ether Theoretical Concentration (ppm v/v)	Dimethyl Ether Found Concentration (ppm v/v)	Recovery (%)
01	10	18.23	54.9	47.7	86.9
02	10	17.928	55.8	49.8	89.2
03	10	17.345	57.7	53.2	92.2

Obis: Acceptable recovery range recommended by USEPA Method 18 (70 a 130%).

(*) = Dimethyl Ether tracer (Nitrogen 10% v/v).

(**) = The BAG gas volume was measured after the chromatographic analysis through the VOST equipment utilization [The accumulated BAG volume (BAG volume + injected tracer volume) is shown on the table above].

Figure 3 - Methane content analysis in the exhaust gas report - Flare 1 – Sep/2008

Gaseous Organic Mixture Emission Determination
Table 01 - Flare 02

Collection	Date	Carbon Band	Gas Concentration (ppm v/v)	Gas Concentration (mg / Nm³)
01	02-Sep-08	CH_4	24.9	17.8
02	02-Sep-08	CH_4	42.4	30.3
03	02-Sep-08	CH_4	45.4	32.4

Gases Composition
Table 02 - Flare 02

Oxygen Content (O_2) (% v/v)	Carbon Dioxide Content (CO_2) (% v/v)	Nitrogen Content (N_2) (% v/v)
13.4	4	82.6
13.9	4.8	81.3
12.9	4.3	82.8

Determination of Tracer Recuperation (Dimethyl Ether)
Table 03 - Flare 02

Collection	Tracer Volume Added (mL) (*)	BAG Gas Volume (L) (**)	Dimethyl Ether Theoretical Concentration (ppm v/v)	Dimethyl Ether Found Concentration (ppm v/v)	Recovery (%)
01	10	18.748	53.3	56.2	105
02	10	19.325	51.7	44.8	86.7
03	10	17.934	55.8	52.5	94.1

Obis: Acceptable recovery range recommended by USEPA Method 18 (70 a 130%).

(*) = Dimethyl Ether tracer (Nitrogen 10% v/v).

(**) = The BAG gas volume was measured after the chromatographic analysis through the VOST equipment utilization [The accumulated BAG volume (BAG volume + injected tracer volume) is shown on the table above].

Figure 4 - Methane content analysis in the exhaust gas report - Flare 2 – Sep/2008

Gaseous Organic Mixture Emission Determination
Table 01 - Flare 03

Collection	Date	Carbon Band	Gas Concentration (ppm v/v)	Gas Concentration (mg / Nm³)
01	02-Sep-08	CH_4	1.07	0.764
02	02-Sep-08	CH_4	0.526	0.376
03	02-Sep-08	CH_4	0.59	0.421

Gases Composition
Table 02 - Flare 03

Oxygen Content (O_2) (% v/v)	Carbon Dioxide Content (CO_2) (% v/v)	Nitrogen Content (N_2) (% v/v)
11.6	5.1	83.3
10.4	4.5	85.1
10.7	5.8	83.5

Determination of Tracer Recuperation (Dimethyl Ether)
Table 03 - Flare 03

Collection	Tracer Volume Added (mL) (*)	BAG Gas Volume (L) (**)	Dimethyl Ether Theoretical Concentration (ppm v/v)	Dimethyl Ether Found Concentration (ppm v/v)	Recovery (%)
01	10	18.125	55.2	55	99.6
02	10	19.102	52.4	4.9	85.7
03	10	18.745	53.3	54.8	103

Obis: Acceptable recovery range recommended by USEPA Method 18 (70 a 130%).

(*) = Dimethyl Ether tracer (Nitrogen 10% v/v).

(**) = The BAG gas volume was measured after the chromatographic analysis through the VOST equipment utilization [The accumulated BAG volume (BAG volume + injected tracer volume) is shown on the table above].

Figure 5 - Methane content analysis in the exhaust gas report - Flare 3 – Sep/2008

Gaseous Organic Mixture Emission Determination
Table 01 - Flare 01

Collection	Date	Carbon Band	Gas Concentration (ppm v/v)	Gas Concentration (mg / Nm³)
01	17-Dec-08	CH_4	0.964	0.689
02	17-Dec-08	CH_4	0.991	0.708
03	17-Dec-08	CH_4	0.876	0.626

Gases Composition
Table 02 - Flare 01

Oxygen Content (O_2) (% v/v)	Carbon Dioxide Content (CO_2) (% v/v)	Nitrogen Content (N_2) (% v/v)
7.6	12.6	79.8
7.5	12.4	80.1
7.6	12.6	79.8

Determination of Tracer Recuperation (Dimethyl Ether)
Table 03 - Flare 01

Collection	Tracer Volume Added (mL) (*)	BAG Gas Volume (L) (**)	Dimethyl Ether Theoretical Concentration (ppm v/v)	Dimethyl Ether Found Concentration (ppm v/v)	Recovery (%)
01	10	17.859	56	61.1	109
02	10	18.969	52.7	64	121
03	10	17.635	56.7	53.5	94.4

Obis: Acceptable recovery range recommended by USEPA Method 18 (70 a 130%).

(*) = Dimethyl Ether tracer (Nitrogen 10% v/v).

(**) = The BAG gas volume was measured after the chromatographic analysis through the VOST equipment utilization [The accumulated BAG volume (BAG volume + injected tracer volume) is shown on the table above].

Figure 6 - Methane content analysis in the exhaust gas report - Flare 1 – Dec/2008

Gaseous Organic Mixture Emission Determination
Table 01 - Flare 02

Collection	Date	Carbon Band	Gas Concentration (ppm v/v)	Gas Concentration (mg / Nm³)
01	17-Dec-08	CH_4	0.944	0.674
02	17-Dec-08	CH_4	0.854	0.61
03	17-Dec-08	CH_4	0.779	0.556

Gases Composition
Table 02 - Flare 02

Oxygen Content (O_2) (% v/v)	Carbon Dioxide Content (CO_2) (% v/v)	Nitrogen Content (N_2) (% v/v)
4.6	13.8	81.6
4.2	14	81.8
4	14.2	81.8

Determination of Tracer Recuperation (Dimethyl Ether)
Table 03 - Flare 02

Collection	Tracer Volume Added (mL) (*)	BAG Gas Volume (L) (**)	Dimethyl Ether Theoretical Concentration (ppm v/v)	Dimethyl Ether Found Concentration (ppm v/v)	Recovery (%)
01	10	18.633	53.7	48.7	90.7
02	10	19.748	50.6	61.2	121
03	10	18.745	53.3	51.1	95.9

Obis: Acceptable recovery range recommended by USEPA Method 18 (70 a 130%).

(*) = Dimethyl Ether tracer (Nitrogen 10% v/v).

(**) = The BAG gas volume was measured after the chromatographic analysis through the VOST equipment utilization [The accumulated BAG volume (BAG volume + injected tracer volume) is shown on the table above].

Figure 7 - Methane content analysis in the exhaust gas report - Flare 2 – Dec/2008

Gaseous Organic Mixture Emission Determination
Table 01 - Flare 03

Collection	Date	Carbon Band	Gas Concentration (ppm v/v)	Gas Concentration (mg / Nm³)
01	17-Dec-08	CH_4	1.17	0.836
02	17-Dec-08	CH_4	0.905	0.646
03	17-Dec-08	CH_4	0.754	0.539

Gases Composition
Table 02 - Flare 03

Oxygen Content (O_2) (% v/v)	Carbon Dioxide Content (CO_2) (% v/v)	Nitrogen Content (N_2) (% v/v)
6	12	82
7.6	12.2	80.2
6.2	12	81.8

Determination of Tracer Recuperation (Dimethyl Ether)
Table 03 - Flare 03

Collection	Tracer Volume Added (mL) (*)	BAG Gas Volume (L) (**)	Dimethyl Ether Theoretical Concentration (ppm v/v)	Dimethyl Ether Found Concentration (ppm v/v)	Recovery (%)
01	10	19.746	50.6	54.4	108
02	10	18.996	52.6	62	118
03	10	18.748	53.3	50.4	94.6

Obis: Acceptable recovery range recommended by USEPA Method 18 (70 a 130%).

(*) = Dimethyl Ether tracer (Nitrogen 10% v/v).

(**) = The BAG gas volume was measured after the chromatographic analysis through the VOST equipment utilization [The accumulated BAG volume (BAG volume + injected tracer volume) is shown on the table above].

Figure 8 - Methane content analysis in the exhaust gas report - Flare 3 – Dec/2008