

page 1

CLEAN DEVELOPMENT MECHANISM PROJECT DESIGN DOCUMENT FORM (CDM-PDD)

Version 03 - in effect as of: 28 July 2006

CONTENTS

- General description of project activity A.
- B. Application of a baseline and monitoring methodology
- C. Duration of the project activity / crediting period
- D. Environmental impacts
- E. Stakeholders' comments

Annexes

- Annex 1: Contact information on participants in the <u>project activity</u>
- Annex 2: Information regarding public funding
- Annex 3: <u>Baseline</u> information
- Annex 4: Monitoring plan



UNFCCC

CDM - Executive Board

page 2

SECTION A. General description of project activity

A.1 Title of the project activity:

CTRVV Landfill emission reduction project Version 05 25 October 2007

A.2. Description of the project activity:

Vila Velha's landfill is owned and operated by the private company CTRVV Central de Tratamento de Resíduos Vila Velha Ltda. (CTRVV), who holds all necessary licences of the local and state authorities to operate the landfill as well as waste disposal contracts with the municipalities mentioned below. The landfill is located at the municipality of Vila Velha. The city has a population of approximately 320,000 inhabitants. Vila Velha is a part of the metropolitan area of Vitória, the capital of Espírito Santo State. The site receives approx. 500 tons/day of municipal and some small quantities of industrial solid waste from the surrounding municipalities Guarapari, Anchieta, Iconha, Piúma and Cachoeiro de Itapemirim. The landfill has been operated since 2002 and received until today approx. 450,000 tons of refuse. Until the closure of the landfill, expected for 2031, another 4.5 million tons of waste will be deposited.

Purpose of the Project Activity

The main objective of the project is to capture and flare landfill gas emitted from the large quantities of degrading solid municipal waste which have already been deposited at the landfill and which are to be added yet until the planned closing of the landfill site in 2031. Landfill gas contains approximately 50% of methane (CH₄), which is a powerful greenhouse gas (GHG) contributing to global warming and climate change, besides creating fire hazard on the landfill. In addition, the landfill gas causes bad odours in the vicinity of the landfill. Thus, by capturing and combusting the landfill gas, global GHG emissions are reduced significantly, local environmental impacts are mitigated and operational safety is increased.

The project activity consists of installing, operating and maintaining a comprehensive landfill gas capturing and flaring system with a capacity of $3,500 \text{ m}^3/\text{h}$ in 2007 expanding to $5,000 \text{ m}^3/\text{h}$ in 2031. The major benefit of the project is the reduction of approx 180,000 tons of methane emissions over the whole project life, compared to the current situation. Methane (CH₄) is a 21-times stronger greenhouse gas than CO_2 , thus emissions reductions of approximately 3.34 million tons of CO_2 equivalent accrue in total. For the first crediting period of 7 years, the projected emission reductions are 661,183 tons of CO_2e .

Further on, following local environmental benefits arise as a result of the project implementation: reduced emissions of toxic trace gases, such as H₂S; significant reduction of bad odours; and further reduction of the fire hazard.

Contribution of the Project Activity to Sustainable Development

Beside the environmental benefits, the project will co-operate to sustainable development in Brazil.

The project is consistent with the sustainable development requirements of the Brazilian Designated National Authority, outlined at "Resolução nº 1", September 11, 2003, of the Brazilian Inter-ministerial Commission of Global Climate Change. It is the declared intention of the project company CTRVV to share parts of the revenues from the generation and sales of carbon credits with the local stakeholders, by





CDM - Executive Board

page 3

initiating a comprehensive social activity program linked with an innovative waste management concept, covering, among others:

- Support Environmental Education Projects for teachers from the neighbourhood areas Grande Terra Vermelha, Xurí and Camboapina;
- Promote Environmental Education as an integral part of educational programs in the neighbourhood of the landfill;
- Promote Professional Courses for the communities of Xurí and Camboapina;
- Support Trainee Programs for students of environmental disciplines in the metropolitan area of Vitória:
- Maintain main roads near the landfill, in the area of Xurí and Camboapina;
- Support the community of Camboapina, with the payment for employees who are responsible for potable water treatment;
- Support the Criadouro Conservacionista de Animais Silvestres: environmental education programs with the promotion of school visits, University research programs, species reproduction projects.

In summary, the project is likely to contribute to the sustainable development of Brazil and the local communities due to:

- Increased tax income for the municipality of Vila Velha, the state and the federal Government based on the project company's operational results.
- Improvement of the economic and social situation of local stakeholders due to the project and to the planned social activities/programs.
- Enhancement of the environmental situation in the global (reduced greenhouse gas emissions) and local (less water pollution, reduced toxic air emissions and bad odours) contexts.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (host)	CTRVV	No

^(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its <u>approval</u>. At the time of requesting registration, the approval by the Party(ies) involved is required.

CTRVV is a private company which owns and operates the landfill. It will build, own and operate the new landfill gas collection and flaring system. CTRVV will be entitled to explore the landfill gas, eventually to generate and export electricity and to generate and transfer carbon credits accruing from the project activity.





page 4

A.4. Technical description of the <u>project activity</u>:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Brazil

A.4.1.2. Region/State/Province etc.:

Espírito Santo

A.4.1.3. City/Town/Community etc:

Vila Velha

A.4.1.4. Detail of physical location, including information allowing the unique identification of this <u>project activity</u> (maximum one page):

CTRVV Central de Tratamento de Resíduos Vila Velha Ltda., Estrada do Xurí, km 11, Jabaeté, Vila Velha, Espírito Santo, Brazil.

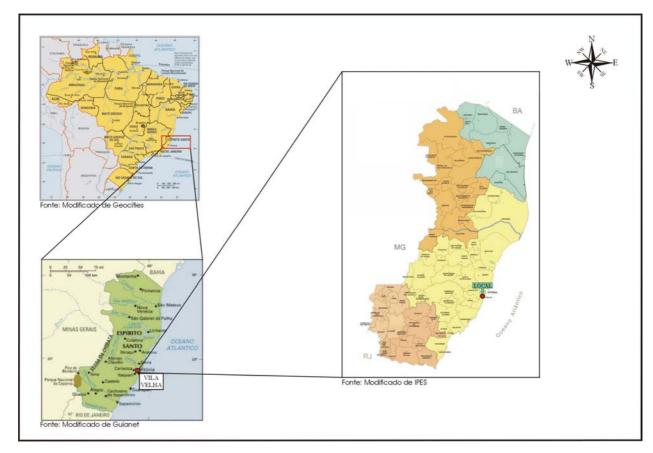


Figure 1: Location of the CTRVV landfill





CDM - Executive Board

page 5

A.4.2. Category(ies) of project activity:

The project activity will be a landfill gas emission reduction project under Sectoral Scope 13: waste handling and disposal.

A.4.3. Technology to be employed by the project activity:

The project activity involves investments in an active gas collection system, improvements of the leachate drainage and landfill covering system and the installation of an adequate gas flaring plant.

A gas collection system with collecting pipes, manifolds, blowers and monitoring and control systems will be installed. About 27 existing wells will be equipped with well heads connected to the gas collecting system. Another 35 to 40 new wells will be drilled and connected to the gas collection system. The new wells will be spread throughout the whole landfill. Beside the gas extraction, these wells will also serve as leachate drains. Additionally a horizontal gas collecting system will be installed in the landfill operation (disposal) area. This will allow gas collection without interfering with the landfill operation. Adequate flaring capacity $(3,500-5,000~\text{m}^3/\text{h})$ will be installed. Figure 2 below illustrates the planned gas collection and flaring system.

The aim is to collect about 3,500 m³/h of landfill gas by begin of October 2007. The flares are to be commissioned by end of September 2007. Based on the experience and monitoring data of the first 6 months of operation, the landfill gas collecting system will be expanded by adding wells and horizontal colleting pipes. The project foresees a total of 70 to 80 gas wells resulting in collection of about 5,000 m³/h in the year 2031.

Gas engine / generator sets (assembled to result in a power plant) can be installed to be operated by parts of the landfill gas collected. The entire electricity demand of the landfill installations can so be covered and excess energy could be sold to the grid, if an adequate power purchase agreement is obtained. In the beginning of the project, the power plant will not exist.

A further alternative use of the landfill gas is not planed at the moment, but could be considered in the future.





page 6

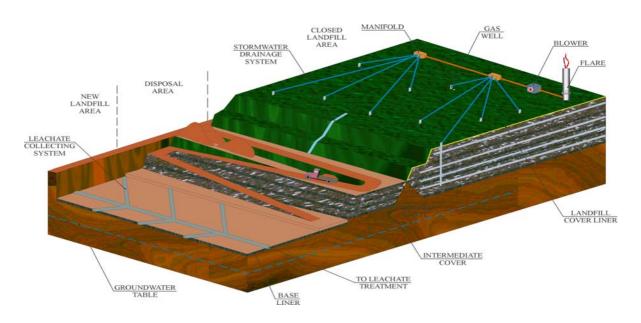


Figure 2: Sectional drawing of a landfill with gas collection / flaring system

Few components employed will have to be imported, since they are not commercially available in Brazil. With the increasing number of CDM landfill projects developed in Brazil, the knowledge of local suppliers is growing fast, which allows the installation and maintenance to be done mainly by local companies.

The following table lists the major components and the standards adhered to.

Component	Imported or locally manufactured	Standard
Wells (concrete pipes)	Locally manufactured	According to Brazil standards
Gas collection system	Partly locally manufactured and partly imported	US or EU standards (operational safety and environmental aspects)
Flaring systems	Locally manufactured	According to Brazil standards
Monitoring and control system	Partly locally manufactured and partly imported	Brazil and US/EU standards
Gas engine and generator sets	Imported from US or EU	US or EU standards (noise, emissions, operational safety)

Table 1: Major components and technologies transferred including standards adhered to





page 7

A.4.4 Estimated amount of emission reductions over the chosen <u>crediting period</u>:

1 st crediting period	
Year	Annual estimation of emission reductions in tons of CO2e
2007 (starting in 01/10/2007)	13,700
2008	67,454
2009	78,904
2010	89,264
2011	98,639
2012	107,121
2013	114,796
2014 (ending in 30/09/2014)	91,305
Total estimated reductions (tons of CO2e) 661,18	
Total number of crediting years	
Annual average over the crediting period of estimated reductions (tons of CO2e)	94,454

A.4.5. Public funding of the project activity:

No public funding is involved in this project.





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page 8

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the <u>approved baseline and monitoring methodology</u> applied to the <u>project activity</u>:

Consolidated Methodology ACM0001 / Version 05 (Sectorial Scope: 13, EB 28): "Consolidated baseline methodology for landfill gas project activities".

Tool for the demonstration and assessment of additionality – Version 03 – EB29

Tool to determine project emissios from flaring gases containing methane – Annex 13 – EB 28

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

The methodology ACM0001 / Version 05 is applicable to landfill gas capture project activities, where the baseline scenario is the partial or total atmospheric release of the gas and the project activities include gas flaring.

As a consequence, the conditions for the methodology applicability are:

- The most attractive course of action is LFG emitted directly to the atmosphere as explained in the following sections;
- No legal or contractual requirements for emission reductions;
- Baseline is occasionally burning of gas on existing gas wells;
- The proposed project activity will not claim any carbon credits from displacing or avoiding energy from other source.

B.3. Description of the sources and gases included in the project boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	Landfill Gas	CO_2	No	Not applicable
	Emissions	CH ₄	Yes	Baseline condition (landfill gas
				released to the atmosphere)
		N_2O	No	Not applicable
Project	Landfill Gas	CO_2	Yes	CO ₂ emissions: quantity of
Activity	Emissions			electricity required multiplied with
				the CO ₂ emissions intensity of the
				electricity displaced
		CH ₄	Yes	Project activity condition (landfill
				gas released to the atmosphere and
				landfill gas flared)
		N_2O	No	Not applicable





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page 9

B.4. Description of how the <u>baseline scenario</u> is identified and description of the identified baseline scenario:

According to the methodology ACM0001 / Version 05, the baseline scenario is the atmospheric release of the landfill gas (existing CTRVV situation).

The baseline methodology considers that some of the methane generated by the landfill may be captured and destroyed to comply with regulations or contractual requirements, or to address safety and odor concerns. In fact, currently there are 27 existing wells that occasionally flare part of the generated LFG.

In this baseline scenario no landfill gas capturing and flaring system exists. This is the activity that would take place in the absence of the proposed project activity.

Brazilian waste has a high organic content, which is greater than 60%, which results in the generation of large amounts of LFG. As there is no regulation for gas flaring, more than 90% of this gas will be released into the atmosphere.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality)

This chapter aims at the identification of the <u>baseline scenario</u> and demonstration of the project additionality. It is based on the document: "*Tool for the demonstration and assessment of additionality (version 3)*", EB29, which describes the following steps:

Step 1	Identification of alternatives to the project activity consistent with mandatory laws and regulations
Step 2	Investment analysis
Step 3	Barrier analysis
Step 4	Common practice analysis

Step 1: Identification of alternatives to the project activity consistent with mandatory laws and regulations

Sub-Step 1a: Define alternatives to the project activity

The following possible and plausible baseline scenarios are considered:

1. No investment scenario (continuation of existing situation): CTRVV, the landfill owner, would continue to operate the landfill as in the past, i.e. to deposit waste until the planned closure of the landfill in 2031, without installing any landfill gas (LFG) collection and flaring equipment. In order to avoid fire hazards, a few additional venting pipes would be installed, as have been in the past. The vented gas then would be occasionally flared by manually igniting the gas. The amount of gas estimated to be flared this way would be in the same range as today, i.e. 5 to 10% of the total gas produced by the landfill.





CDM - Executive Board

page 10

- 2. *Installation of LFG collection and flaring system, with power generation:* CTRVV would install a comprehensive LFG collection/flaring system where the major portion of the collected LFG would subsequently be used for power generation.
- 3. Installation of LFG collection and flaring system, with energetic use in other forms than power generation: CTRVV would invest in a comprehensive LFG collection/flaring system, but instead of using the LFG for power generation, alternative energy forms would be produced, e.g. heat for process steam or absorption cooling applications, or fuel gas for road vehicles (e.g. for its own refuse trucks).

Step 1.b): Consistency with mandatory laws and regulations:

All plausible scenarios, including the no investment scenario (continuation of the existing situation) would be in agreement with all applicable legal requirements.

Currently, CTRVV has all necessary licenses to operate the landfill.

Step 2: Investment analysis:

Sub-Step 2a. – Determine appropriate analysis method

The CDM <u>project activity</u> generates no financial or economic benefits other than CDM related income. Therefore, the simple cost analysis (Option I) was selected.

Sub-Step 2b. – Option I: Apply simple cost analysis

The costs associated with the implementation of the CDM <u>project activity</u> is shown in Table 2.

Items	Costs (USD)
Design, Engineering Projects	70,000.00
Gas capturing system	210,000.00
Gas flaring system	900,000.00
Other costs (insurance, permitting, training, commissioning, start-up, management)	200,000.00
TOTAL	1,380,000.00

Table 2: Costs of the project activity

Additionally, on-going expenses will be incurred to operate the facilities and to maintain the system's components.

The destruction of methane via the <u>project activity</u> would not result in any income other than that derived through revenues generated from the CER exchange mechanism under the CDM. Commercializing the landfill gas would not be an alternative either. Therefore, the <u>project activity</u> is not financially attractive under any scenario except through registration as a CDM project.





page 11

Step 3: Barrier analysis

Sub-Step 3a: Identify barriers that would prevent the implementation of the proposed CDM <u>project</u> <u>activity</u>

The *main barrier is of financial nature*. If the landfill operator chose to implement the <u>project activity</u> without its registration as a CDM project, he would have to raise the tipping fee in order to make this scenario commercially feasible. This raise would stimulate the municipalities to look for cheaper alternatives, regardless of the technique used for the waste disposal, and the CTRVV landfill would no longer be viable.

It is important to note that the majority of the municipal solid wastes generated in Brazil is disposed in open dumps and controlled landfills¹, as it is shown in Figure 3, mainly because of cost issues.

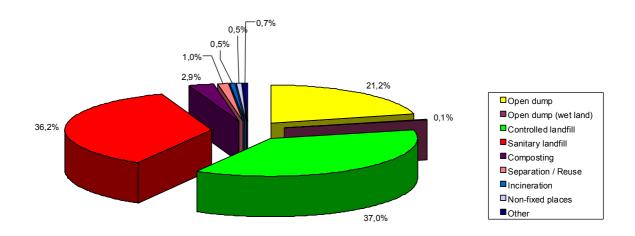


Figure 3: Waste final destination in Brazil

It is also remarkable that government subsidies are not available in Brazil for projects similar to the <u>project activity</u>.

¹ IBGE - Instituto Brasileiro de Geografia e Estatística. *Pesquisa Nacional de Saneamento Básico*, 2000. http://www.ibge.gov.br/home/estatistica/populacao/condicaodevida/pnsb/pnsb.pdf





CDM - Executive Board

page 12

Sub-Step 3b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed <u>project activity</u>)

Table 3 shows the barriers for the alternative scenarios.

Baselii	ne scenarios	Main Barriers
Nr. 1	No investment scenario	<i>No barriers</i> apply for this scenario, since this scenario reflects the current
	(continuation of existing	situation. No changes of the business environment are envisaged, in particular
	situation)	in regard to environmental legislation.
		Reminder: Current legislation in Brazil does not require LFG flaring.
Nr. 3	Installation of LFG	The <i>main barrier is market options</i> . The electricity from LFG is not
	collection/flaring system, with	competitive with the common sources. A first governmental incentive program
	power generation	for alternative energy sources (PROINFA) was closed in 2004 and there is no
		plan for a second program. Therefore, this alternative is not feasible.
Nr. 4	Installation of LFG collection	The <i>main barrier is of financial nature</i> , since the project's IRR is expected
	and flaring system, with	to be even weaker than in scenario 3, mainly due to following reasons:
	energetic use in other forms	- Heat off-take: No significant off-takers for heat (or cooling) energy are
	than power generation	within reasonable distance, thus energy deliveries are economically
		unattractive.
		- Fuel production: "Standard LFG-to-fuel" technology is not yet commercially
		available and economically viable. In particular, the LFG enrichment/cleaning
		technology bears significant technical risks.
		The enriched gas would have to compete with the growing Natural Gas market.

Table 3: Barriers for the alternative scenarios

The investment barrier affects less strongly scenarios 2 and 3 than they affect the CDM <u>project activity</u>, because, in these scenarios, incomes other than CDM revenues are possible (e.g.: electric power generation, heat energy and fuel distribution revenues).

The investment barrier does not prevent the implementation of scenario 1. Continuation of the current situation, complying with Brazilian regulation and representing Brazilian Business as Usual is the common scenario. There is no additional investment or technology needed, in this case. Therefore, this is a viable alternative scenario.

Step 4: Common practice analysis

Sub-Step 4a: Analyze other activities similar to the proposed project activity

LFG emission is a particular situation that cannot be compared to other activities. Surface emission over the whole landfill area will occur over a long period, even after landfill closure.

In Brazil, there is no similar activity to the proposed <u>project activity</u> that is not under the CDM environment and the common practice in final disposal sites is not to capture and flare LFG. As shown in Figure 3, approximately 58% of the generated municipal waste is disposed in precarious or inadequate sites (dumps or controlled landfills) that do not even have gas venting systems.



UNFCCC

CDM - Executive Board

page 13

Sub-Step 4b: Discuss any similar options that are occurring

There are similar projects in Brazil, which were developed and registered as CDM activities, as shown below:

- Brazil NovaGerar Landfill Gas to Energy Project UNFCCC Ref. 0008
- Onyx Landfill Gas Recovery Project Tremembé, Brazil UNFCCC Ref. 0027
- Salvador da Bahia Landfill Gas Management Project UNFCCC Ref. 0052
- Landfill Gas to Energy Project at Lara Landfill, Mauá, Brazil UNFCCC Ref. 0091
- Brazil MARCA Landfill Gas to Energy Project UNFCCC Ref. 0137
- ESTRE's Paulínia Landfill Gas Project (EPLGP) UNFCCC Ref. 0165
- Caieiras landfill gas emission reduction UNFCCC Ref. 0171

No other similar activities are observed without registration as a CDM activity.

As a consequence, it is demonstrated that the <u>project activity</u> is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The calculation of the emissions reduction of the <u>project activity</u> follows the approach determined in the methodology (*text in italics* denotes quotes from ACM0001):

The greenhouse gas emission reduction achieved by the project activity during a given year "y" (ER_y) is estimated as follows:

$$ER_{v} = (MD_{project,v} - MD_{reg,v}) *GWP_{CH4} + EL_{v} *CEF_{electricity,v} - ET_{v} *CEF_{thermal,v}$$
(1)

Where:

ER_y	is emissions reduction, in tones of CO2 equivalents (tCO2e).
$MD_{project,y}$	the amount of methane that would have been destroyed/combusted during the year, in
	tones of methane (tCH4)
$MD_{reg,y}$	the amount of methane that would have been destroyed/combusted during the year in
	the absence of the project, in tones of methane (tCH4)
GWP_{CH4}	Global Warming Potential value for methane for the first commitment period is 21
	tCO2e/tCH4
EL_y	Net quantity of electricity exported during year y, in megawatt hours (MWh)
$CEF_{electricity,y}$	CO2 emissions intensity of the electricity displaced, in tCO2e/MWh. This can estimated
	using either ACM0002 or AMSI.D, if the capacity is within the small scale threshold
	values, when grid electricity is used or displaced
ET_{v}	Incremental quantity of fossil fuel, defined as difference of fossil fuel used in the
	baseline and fossil use during project, for energy requirement on site under project
	activity during the year y, in TJ.
$CEF_{thermal,y}$	CO2 emissions intensity of the fuel used to generate thermal/mechanical energy, in
	tCO_2e/TJ





CDM - Executive Board

page 14

$$ELy = EL_{EX,LFG}$$
- EL_{IMP}

Where:

$EL_{EX,LFG}$	Net quantity of electricity exported during year y, produced using landfill gas, in megawatt
	hours (MWh).
EL_{IMP}	Net incremental electricity imported, defined as difference of project imports less any
	imports of electricity in the baseline, to meet the project requirements, in MWh

In the case where the $MD_{reg,y}$ 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.

$$MD_{reg,y} = MD_{project,y} *AF$$
 (2)

$$MD_{project,v} = MD_{flared,v} + MD_{electricity,v} + MD_{thermal,v}$$
 (3)

$$MD_{flared,y} = LFG_{flare,y} * w_{CH4,y} * D_{CH4} * FE$$
(4)

Where $MD_{flared,y}$ is the quantity of methane destroyed by flaring, $LFG_{flare,y}$ is the quantity of landfill gas flared during the year measured in cubic meters (m₃), w_{CH4,y} is the average methane fraction of the landfill gas as measured during the year and expressed as a fraction (in m³ CH₄ / m³ LFG), FE is the flare efficiency (the fraction of the methane destroyed) and D_{CH4} is the methane density expressed in tones of methane per cubic meter of methane (tCH₄/m³CH₄).

Definition of AF and MD_{reg,y}

The Brazilian legislation does not require landfill gas to be flared. The only requirement is the venting of landfills for safety purposes, i.e. to avoid fires and explosions. This situation is highly unlikely to change over the course of the crediting period, since no regulation requiring flaring or landfill gas use is in the pipeline.

On the CTRVV landfill about half of the 27 existing wells are occasionally burning as a result of manual ignition. Due to heavy rains and intentional extinguishing of the flames when work has to be carried out near the wells, the burning is not constant. On average, it is estimated that the existing wells burn about 50-70% of the year. So it can be considered that just about 50 to 70% of the methane collected on the existing wells is burned. This estimate is conservative because it does not account for incomplete combustion of the methane, which is likely to be substantial.

As there is no suction applied on the wells the efficiency of the actual gas collection is less then 40%, compared to the final active collecting system.

Today's 27 existing wells represent about 25% of the final number of operating wells.





CDM - Executive Board

page 15

The collection efficiency of the existing wells is estimated to be 40% (typical values of collection efficiencies in comprehensive collection systems are above $75\%^2$; data reported in the literature show efficiencies ranging from 30 to $70\%^3$; a value of 40% was used, which is consistent with the passive venting at the landfill.

Burning time is estimated to be 70% and accounts for the time intervals when the flares are not burning, due to weather (rain, wind) or landfill (LFG availability) conditions.

Based on these figures the actual amount of gas burned can be conservatively estimated as: 70% (burning time) x 40% (collection efficiency) x 25% (well number) = 7.0% of the gas estimated in the project activity. Therefore AF in the project activity is set at a rather conservative 10% for the first 7-year crediting period.

From equation (3), $MD_{project,y} = MD_{flared,y}$, as no electricity and thermal energy are considered. In fact $MD_{electricity,y}$ is greater than zero. Nevertheless, as no Emission Reduction will be claimed for electricity generation, $MD_{electricity,y}$ will be considered zero for calculation purposes.

For the Emission Reduction calculation purpose, w_{CH4.v} is supposed to be 50% and FE is considered 98%.

Baseline scenario was determined by applying the ACM0001 methodology:

Brazilian waste has a high organic content (>60%), which results in generation of large amounts of LFG. According the US EPA First Order decay model (described in the software Landfill Gas Emissions Model LandGEM, version 3.02 - 2005 ⁴), with $L_0 = 140$ m³/ton waste and k = 0.10 year⁻¹, during the first crediting period, the waste produces more than 100 million m³ CH₄. As there is no regulation for gas flaring, more then 90% is released into the atmosphere.

 D_{CH4} is 0.0007168 tCH₄/m³CH₄ at standard temperature and pressure (0 degree Celsius and 1.013 bar). D_{CH4} used in the calculations (EPA First Order decay model) is 0.0006671 tCH₄/m³CH₄ (20 degrees Celsius and 1.013 bar).

Project scenario:

The project will be responsible for collection and flaring of at least 60% of the LFG produced.

Calculations are presented in Annex 3.

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	L_0
Data unit:	m ³ CH ₄ / tonne of waste
Description:	Potential CH ₄ generation capacity of waste

² http://dnr.wi.gov/org/aw/wm/solid/gas/finalpaperLFGefficiency2006-Michels.pdf

http://www.cleantech.re.kr/note/main.cgi/200509005.pdf?down_num=1129679090&board=bbs&command=down_load&d=&filename=200509005.pdf

⁴ http://www.epa.gov/ttn/catc/products.html#software





CDM – Executive Board

Source of data used:	EPA 430-B-96-0004, September 1996, Turning a Liability into an Asset: A Landfill Gas-to-Energy Project Development Handbook; "Landfill Control Technologies", in: "Landfill Gas System Engineering Design Seminar", 1994
Value applied:	140
Justification of the	The value for the potential CH ₄ generation capacity of waste (L ₀) depends only
choice of data or	on the type of waste in the landfill. The higher the organic content of the waste,
description of	the higher the value of Lo. The values of theoretical and obtainable L ₀ range
measurement methods	from 0 to 310 m ³ /Mg of waste (EPA 430-B-96-0004, September 1996, Turning a
and procedures	Liability into an Asset: A Landfill Gas-to-Energy Project Development
actually applied:	Handbook). According to "Landfill Control Technologies", in: "Landfill Gas
	System Engineering Design Seminar", 1994, L ₀ ranges from 140 to 180 in wet
	climates. A conservative value was used.
Any comment:	These values are in line with those used in the PDD for the Nova Gerar landfill
	gas project, which is located in a similar climate near Rio de Janeiro, and which
	was registered by the CDM Executive Board in November 2004.

Data / Parameter:	k
Data unit:	year ⁻¹
Description:	Rate of methane generation
Source of data used:	EPA 430-B-96-0004, September 1996, Turning a Liability into an Asset: A
	Landfill Gas-to-Energy Project Development Handbook; "Landfill Control
	Technologies", in: "Landfill Gas System Engineering Design Seminar", 1994
Value applied:	0.10
Justification of the	The CH_4 generation rate constant, k , determines the rate of $CH4$ generation for
choice of data or	each submass of waste in the landfill. The higher the value of k , the faster the
description of	CH_4 generation rate increases and then decays over time. The value of k is a
measurement methods	function of (1) waste moisture content, (2) availability of the nutrients for
and procedures	methanogens, (3) pH, and (4) temperature. The k values range from 0.003 to 0.4
actually applied:	(EPA 430-B-96-0004, September 1996, Turning a Liability into an Asset: A
	Landfill Gas-to-Energy Project Development Handbook). According to "Landfill
	Control Technologies", in: "Landfill Gas System Engineering Design Seminar",
	1994, k ranges from 0.1 to 0.35 in wet climates. A conservative value was used.
Any comment:	These values are in line with those used in the PDD for the Nova Gerar landfill
	gas project, which is located in a similar climate near Rio de Janeiro, and which
	was registered by the CDM Executive Board in November 2004.





CDM - Executive Board

page 17

B.6.3 Ex-ante calculation of emission reductions:

Calculations are presented in Annex 3, using formulae described in section B.6.1.

B.6.4 Summary of the ex-ante estimation of emission reductions:

The summary of the ex-ante estimation of emission reductions is presented in the table below (*):

	Estimation of	Estimation of	Estimation of	Estimation of
Year	project activity	baseline emissions	leakage	overall emission
	emissions	(tonnes of CO ₂ e)	(tonnes of CO_2e)	reductions
	(tonnes of CO ₂ e)			(tonnes of CO ₂ e)
2007	9,599	23,299	0	13,700
2008	47,264	114,718	0	67,454
2009	55,287	134,191	0	78,904
2010	62,546	151,810	0	89,264
2011	69,114	167,753	0	98,639
2012	75,057	182,178	0	107,121
2013	80,435	195,231	0	114,796
2014	63,976	155,281	0	91,305
TOTAL	463,278	1,124,461	0	661,183
(tonnes of CO ₂ e)				

^(*) Considering the Adjustment Factor (AF) of 10%





page 18

B.7 Application of the monitoring methodology and description of the monitoring plan:

Consolidated Methodology ACM0001 / Version 05 (Sectorial Scope: 13, EB 28): "Consolidated monitoring methodology for landfill gas project activities" was used.

The project activity can be represented in the schematic illustration shown in Figure 4:

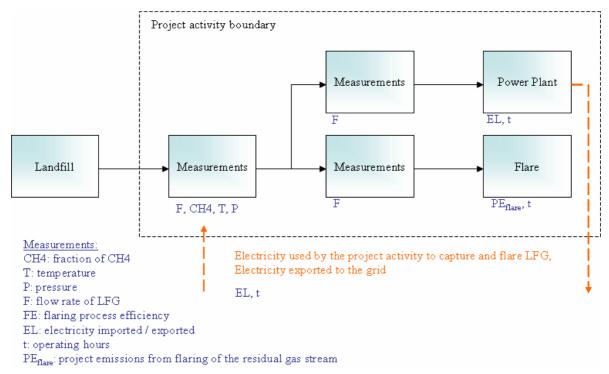


Figure 4: Schematic illustration of the system

Section B.7.1. presents all the monitored parameters of the <u>project activity</u>.





CDM – Executive Board

B.7.1 Data and parameters monitored:	
(Copy this table for each data and parameter)	
Data / Parameter:	LFGtotal,y
Data unit:	m^3
Description:	Total volume of landfill gas
Source of data to be	Measured and calculated value
used:	
Value of data applied	US EPA First Order decay model – Please refer to Annex 3.
for the purpose of	
calculating expected	
emission reductions in	
section B.5	
Description of	Measurement with a continuous flow meter. Regular recording frequency (e.g.: 1
measurement methods	record each 15 minutes). Data will be aggregated monthly and yearly. Accuracy
and procedures to be	of approximately 0.5%.
applied:	
QA/QC procedures to	Periodical calibration by an officially accredited entity, complying with the flow
be applied:	meter manufacturer's specifications, to ensure accuracy. Flow meter will have a
	regular maintenance program.
Any comment:	Automatic calculation of CH ₄ density, to adjust measured values to standard
	temperature and pressure conditions.

Data / Parameter:	LFGflared,y
Data unit:	m^3
Description:	Volume of landfill gas flared
Source of data to be used:	Measured and calculated value
Value of data applied for the purpose of calculating expected emission reductions in section B.5	US EPA First Order decay model – Please refer to Annex 3.
Description of measurement methods and procedures to be applied:	Measurement with a continuous flow meter. Regular recording frequency (e.g.: 1 record each 15 minutes). Data will be aggregated monthly and yearly. Accuracy of approximately 0.5%.
QA/QC procedures to be applied:	Periodical calibration by an officially accredited entity, complying with the flow meter manufacturer's specifications, to ensure accuracy. Flow meter will have a regular maintenance program.
Any comment:	Automatic calculation of CH ₄ density, to adjust measured values to standard temperature and pressure conditions.





CDM – Executive Board

Data / Parameter:	LFGelectricity,y
Data unit:	m^3
Description:	Volume of landfill gas consumed in the power plant to generate electricity
Source of data to be	Measured and calculated value
used:	
Value of data applied	0
for the purpose of	
calculating expected	
emission reductions in	
section B.5	
Description of	Measurement with a continuous flow meter. Regular recording frequency (e.g.: 1
measurement methods	record each 15 minutes). Data will be aggregated monthly and yearly. Accuracy
and procedures to be	of approximately 0.5%.
applied:	
QA/QC procedures to	Periodical calibration by an officially accredited entity, complying with the flow
be applied:	meter manufacturer's specifications, to ensure accuracy. Flow meter will have a
	regular maintenance program.
Any comment:	Automatic calculation of CH ₄ density, to adjust measured values to standard
	temperature and pressure conditions.

Data / Parameter:	PE _{flare,y}
Data unit:	t CO ₂ e
Description:	Project emissions from flaring of the residual gas stream in year y
Source of data to be used:	Parameters used for determining the project emissions from flaring of the residual gas stream in year y will be monitored as per the "Tool to determine project emissions from flaring gases containing Methane": $fv_{i,h}$, $FV_{RG,h}$, $t_{O2,h}$, $fv_{CH4,FG,h}$, T_{flare}
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Flare efficiency was considered to be 98% in the ex-ante calculations. Hence, $PE_{flare,y}$ was assumed to be 2% of the methane sent to the flare.
Description of measurement methods and procedures to be applied:	Continuous measurements and regular recording frequency (e.g.: 1 record each 15 minutes) of fv _{i,h} , FV _{RG,h} , t _{O2,h} , fv _{CH4,FG,h} , T _{flare} . Calculations according to the "Tool to determine project emissions from flaring gases containing Methane"
QA/QC procedures to be applied:	Please refer to $fv_{i,h}$, $FV_{RG,h}$, $t_{O2,h}$, $fv_{CH4,FG,h}$, T_{flare} below (QA/QC procedures as per the "Tool to determine project emissions from flaring gases containing Methane"
Any comment:	Calculations according to "Tool to determine project emissions from flaring gases containing Methane", using fv _{i,h} , FV _{RG,h} , f _{VCH4,FG,h} , T _{flare}





CDM – Executive Board

Data / Parameter:	W _{CH4,y}
Data unit:	m^3 CH4 / m^3 LFG
Description:	Methane fraction in LFG
Source of data to be	Measured value
used:	
Value of data applied	50%
for the purpose of	
calculating expected	
emission reductions in	
section B.5	
Description of	Measurement with a continuous analyzer. Regular recording frequency (e.g.: 1
measurement methods	record each 15 minutes). Accuracy of approximately 0.5%.
and procedures to be	
applied:	
QA/QC procedures to	Regular maintenance and testing will ensure accuracy. Gas analyser will be
be applied:	calibrated periodically, according to the manufacturer's specifications.
Any comment:	-

Data / Parameter:	LFG,T
Data unit:	°C
Description:	Landfill gas temperature
Source of data to be	Measured value
used:	
Value of data applied	20
for the purpose of	
calculating expected	
emission reductions in	
section B.5	
Description of	Temperature transmitter will perform continuous measurement. Regular recording
measurement methods	frequency (e.g.: 1 record each 15 minutes). Accuracy of approximately 0.1%.
and procedures to be	
applied:	
QA/QC procedures to	Temperature indicator will allow verification of the transmitted values. Regular
be applied:	calibration and maintenance will ensure accuracy.
Any comment:	Temperature is required to calculate methane gas density.





CDM – Executive Board

Data / Parameter:	LFG,P
Data unit:	Pa
Description:	Landfill gas pressure
Source of data to be	Measured value
used:	
Value of data applied	101,325
for the purpose of	
calculating expected	
emission reductions in	
section B.5	
Description of	Pressure transmitter will perform continuous measurement. Regular recording
measurement methods	frequency (e.g.: 1 record each 15 minutes). Accuracy of approximately 0.5%.
and procedures to be	
applied:	
QA/QC procedures to	Pressure indicator will allow verification of the transmitted values. Regular
be applied:	calibration and maintenance will ensure accuracy.
Any comment:	Pressure is required to calculate methane gas density.

Data / Parameter:	$\mathrm{EL}_{\mathrm{IMP}}$
Data unit:	MWh
Description:	Total amount of electricity imported to meet project requirement
Source of data to be	Measured value
used:	
Value of data applied	0 (No leakage effects need to be accounted under methodology ACM0001
for the purpose of	Version 05 – in fact, leakage effects are negligible)
calculating expected	
emission reductions in	
section B.5	
Description of	Energy meter will perform continuous measurement. Energy totalizer will display
measurement methods	cumulative electricity imported. Accuracy of approximately 0.5%.
and procedures to be	
applied:	
QA/QC procedures to	Regular calibration and maintenance will ensure accuracy.
be applied:	
Any comment:	-





CDM – Executive Board

Data / Parameter:	$\mathrm{EL}_{\mathrm{EX,LFG}}$
Data unit:	MWh
Description:	Total amount of electricity exported to the grid
Source of data to be used:	Measured value
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Energy meter will perform continuous measurement. Energy totalizer will display cumulative electricity exported. Accuracy of approximately 0.5%.
QA/QC procedures to be applied:	Regular calibration and maintenance will ensure accuracy.
Any comment:	-

Data / Parameter:	CO ₂ emission intensity of the electricity and/or other energy carriers in
	$\mathrm{EL}_{\mathrm{EX,LFG}}$
Data unit:	tCO ₂ e/MWh
Description:	CO ₂ emissions intensity of the electricity displaced, in tCO ₂ e/MWh.
Source of data to be	If necessary, this parameter can be estimated using either ACM0002 or AMS.1.D,
used:	if the capacity is within the small scale threshold values, when grid electricity is used or displaced.
Value of data applied	This parameter was not used, as no Emission Reductions will be claimed for
for the purpose of	exported electricity ($EL_{EX,LFG}$) and no leakage effects need to be accounted under
calculating expected	methodology ACM0001 Version 05 (EL _{IMP}).
emission reductions in	
section B.5	
Description of	If necessary, as specified in ACM0002 or AMS.1.D.
measurement methods	
and procedures to be	
applied:	
QA/QC procedures to	If necessary, describe all assumptions and sources used in calculations, to allow
be applied:	verification.
Any comment:	-





CDM – Executive Board

Data / Parameter:	Regulatory requirements relating to landfill gas projects
Data unit:	-
Description:	Regulatory requirements relating to landfill gas projects
Source of data to be	Research
used:	
Value of data applied	Not applicable.
for the purpose of	
calculating expected	
emission reductions in	
section B.5	
Description of	At the renewal of crediting period, a review of regulatory criteria and permitting
measurement methods	conditions will be performed.
and procedures to be	
applied:	
QA/QC procedures to	Describe all assumptions and sources, to allow verification.
be applied:	
Any comment:	-

Data / Parameter:	Operation of the energy plant
Data unit:	Hours
Description:	Operating hours of the energy plant
Source of data to be	Measured value
used:	
Value of data applied	0
for the purpose of	
calculating expected	
emission reductions in	
section B.5	
Description of	Run-time device will perform continuous measurement. Elapsed time totalizer
measurement methods	will display cumulative operating hours. Accuracy of approximately 0.5%.
and procedures to be	
applied:	
QA/QC procedures to	Regular calibration and maintenance will ensure accuracy.
be applied:	
Any comment:	-





CDM – Executive Board

Data / Parameter:	$fv_{i,h}$
Data unit:	-
Description:	Volumetric fraction of component i in the residual gas in the hour h , where $i =$
	CH_4 , CO , CO_2 , O_2 , H_2 , N_2 . Simplified approach: $i = CH_4$, N_2 , O_2 .
Source of data to be	Measured and calculated value. Methane and oxygen contents will be measured.
used:	Nitrogen content will be calculated (balance).
Value of data applied	Flare efficiency was considered to be 98% in the ex-ante calculations. fv _{i,h} was
for the purpose of	not used this simplified calculation. Methane content in the residual gas was
calculating expected	considered 50%.
emission reductions in	
section B.5	
Description of	Measurement with a continuous analyzer. Regular recording frequency (e.g.: 1
measurement methods	record each 15 minutes). Data will be averaged hourly or at a shorter time
and procedures to be	interval. Accuracy of approximately 0.5%.
applied:	
QA/QC procedures to	Regular maintenance and testing will ensure accuracy. Gas analyser will be
be applied:	calibrated periodically (zero check and typical value check with a standard
	certified gas), according to the manufacturer's specifications.
Any comment:	Simplified approach: only the methane and oxygen content of the residual gas will
	be measured and the remaining part will be considered N_2 .

Data / Parameter:	$FV_{RG,h}$
Data unit:	m³/h
Description:	Volumetric flow rate of the residual gas in dry basis at normal conditions in the
	hour h
Source of data to be used:	Measured and calculated value
Value of data applied	US EPA First Order decay model – Please refer to Annex 3.
for the purpose of	
calculating expected	
emission reductions in	
section B.5	
Description of	Measurement with a continuous flow meter. Regular recording frequency (e.g.: 1
measurement methods	record each 15 minutes) with hourly averaged values or at a shorter time interval.
and procedures to be	Accuracy of approximately 0.5%. Same basis (dry or wet) will be used for this
applied:	measurement and for the measurement of $fv_{i,h}$
QA/QC procedures to	Periodical calibration by an officially accredited entity, complying with the flow
be applied:	meter manufacturer's specifications, to ensure accuracy. Flow meter will have a
	regular maintenance program.
Any comment:	Automatic calculation to adjust measured values to standard temperature and
	pressure conditions.





CDM – Executive Board

Data / Parameter:	$t_{\mathrm{O2,h}}$
Data unit:	
Description:	Volumetric fraction of O_2 in the exhaust gas of the flare in the hour h
Source of data to be	Measured and calculated value
used:	
Value of data applied	Flare efficiency was considered to be 98% in the ex-ante calculations. t _{O2,h} was
for the purpose of	not used in this simplified calculation.
calculating expected	
emission reductions in	
section B.5	
Description of	Measurement with a continuous analyzer. Regular recording frequency (e.g.: 1
measurement methods	record each 15 minutes). Accuracy of approximately 0.5%. Point of measurement
and procedures to be	will be in the upper section of the flare (above 80% of the flare height).
applied:	
QA/QC procedures to	Regular maintenance and testing will ensure accuracy. Gas analyser will be
be applied:	calibrated periodically (zero check and typical value check with a standard
	certified gas), according to the manufacturer's specifications.
Any comment:	-

Data / Parameter:	fv _{CH4,FG,h}
Data unit:	mg/m^3
Description:	Concentration of methane in the exhaust gas of the flare in dry basis at normal
	conditions in the hour h
Source of data to be	Measured and calculated value
used:	
Value of data applied	Flare efficiency was considered to be 98% in the ex-ante calculations. fv _{CH4,FG,h}
for the purpose of	was not used n this simplified calculation.
calculating expected	
emission reductions in	
section B.5	
Description of	Measurement with a continuous analyzer. Regular recording frequency (e.g.: 1
measurement methods	record each 15 minutes). Accuracy of approximately 0.5%. Point of measurement
and procedures to be	will be in the upper section of the flare (above 80% of the flare height).
applied:	
QA/QC procedures to	Regular maintenance and testing will ensure accuracy. Gas analyser will be
be applied:	calibrated periodically (zero check and typical value check with a standard
	certified gas), according to the manufacturer's specifications.
Any comment:	Measuring instruments typically read ppmv or % values. To convert from ppmv
	to mg/m ³ , readings will be multiplied by 0.716. 1% equals 10.000 ppmv





CDM – Executive Board

Data / Parameter:	T _{flare}
Data unit:	°C
Description:	Temperature in the exaust gas of the flare
Source of data to be used:	Measured value
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Flare efficiency was considered to be 98% in the ex-ante calculations. T_{flare} was not used n this simplified calculation.
Description of measurement methods and procedures to be applied:	Measurement of the temperature of the exhaust gas stream in the flare by a type N thermocouple. Regular recording frequency (e.g.: 1 record each 15 minutes). Accuracy of approximately 0.5%.
QA/QC procedures to be applied:	Thermocouples will be replaced or calibrated every year.
Any comment:	-

Data / Parameter:	Operation of the flare
Data unit:	-
Description:	Flame detection
Source of data to be	Verified condition
used:	
Value of data applied	Flare efficiency was considered to be 98% in the ex-ante calculations.
for the purpose of	
calculating expected	
emission reductions in	
section B.5	
Description of	A flame detector will continuously verify if landfill gas is actually burning in the
measurement methods	flare. System will automatically shut down if there is no flame detection.
and procedures to be	
applied:	
QA/QC procedures to	Flame detector will be inspected and calibrated every year.
be applied:	
Any comment:	-



UNFCCC

CDM - Executive Board

page 28

B.7.2 Description of the monitoring plan:

To assure correct monitoring, the staff will be trained adequately.

A minimum of 3 operators will be trained for:

- General knowledge of the equipment used for monitoring;
- Reading and recording procedures and data storage;
- Calibration methodologies and procedures;
- Emergency situation procedures.

All monitored data (as defined under B.7.1.) will undergo an internal semi-annual review. During this review, the records will be checked by two internal persons that are not involved in the actual data recording. All data will be electronically archived and kept during the crediting period and two years after.

The two reviewers will a) double-check the quality of the data recorded and b) audit the GHG project compliance with operational requirements. If they identify a need for corrective actions they propose the same to the management of CTRVV. The reviewers will summarize their findings in written form. The semi-annual review will be scheduled in a way that one of the reviews is always carried out within 30 days before the data is submitted for independent validation.

Sustainable development indicators will also be monitored. The amount of money spent in each sustainable development project will be accounted. The following additional indicators will be monitored:

- Support Environmental Education Projects for teachers from the neighbourhood areas Grande Terra Vermelha, Xurí and Camboapina: number of teachers trained
- Promote Environmental Education as an integral part of educational programs in the neighbourhood of the landfill: number of students taught;
- Promote Professional Courses for the communities of Xurí and Camboapina: number of professional courses supported and number of students taught;
- Support Trainee Programs for students of environmental disciplines in the metropolitan area of Vitória: numer of trainees accepted;
- Maintain main roads near the landfill, in the area of Xurí and Camboapina: extension of roads maintained;
- Support the community of Camboapina, with the payment for employees who are responsible for potable water treatment: payments made;
- Support the Criadouro Conservacionista de Animais Silvestres: environmental education programs with the promotion of school visits, University research programs, species reproduction projects: number of school visits, research programs and produced species.



UNFCCC

CDM - Executive Board

page 29

B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

The application of the baseline study and monitoring methodology was completed in 29/08/2006 and revised in 12/02/2007.

ARQUIPÉLAGO Engenharia Ambiental Mr. Amauri RODRIGUES Junior, Director Rua Princesa Isabel, 94 – 12°. Andar – São Paulo

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In collaboration with:

CTRVV Central de Tratamento de Resíduos Vila Velha Ltda.

Mr. Valdir Damo, Director

Rua Enrique Laranja 264, Cobertura, Vila Velha, Espírito Santo, Brazil. Direct Phone: +55 27 3339 4433

Email: ctrvv@ctrvv.com.br

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

05/03/2007

C.1.2. Expected operational lifetime of the project activity:

21 years.

C.2 Choice of the <u>crediting period</u> and related information:

C.2.1. Renewable crediting period

C.2.1.1.	Starting date of the first <u>crediting period</u> :	

01/10/2007

C.2.1.2. Length of the first <u>crediting period</u> :	
--	--

7 years.



UNFCCC

CDM - Executive Board

page 30

C.2.2	C.2.2. Fixed crediting period:		
	C.2.2.1.	Starting date:	
Not applicable	2 .		
	C.2.2.2.	Length:	
Not applicable	e.		

SECTION D. Environmental impacts

By collecting and combusting landfill gas, the CTRVV LFG project will reduce both global and local environmental effects of uncontrolled releases. The major components of landfill gas, methane and carbon dioxide, are colourless and odourless. The main global environmental concern over these compounds is the fact that they are greenhouse gases. Although the majority of landfill gas emissions are quickly diluted in the atmosphere, in confined spaces there is a risk of asphyxiation and/or toxic effects if landfill gas is present at high concentrations. Landfill gas also contains over 150 trace components that can cause other local and global environmental effects such as odour nuisances, stratospheric ozone layer depletion, and ground level ozone creation. Through an appropriate management, the CTRVV landfill gas will be captured and combusted, removing the risks of toxic effects on the local community and local environment.

The project is likely to result in a reduction of toxic trace gases such as H₂S. On the other hand, formation of new toxic trace compounds, and notably dioxins, as a result of the project is likely to be completely negligible due to the fact that the CTRVV landfill receives almost no industrial (but rather municipal) waste.

Where methane is burned to obtain Carbon Credits, operational practices at the landfill are improved thus contributing to sustainable development. Specifically for landfills, sustainable means accelerating waste stabilisation such that the landfill processes can be said to be largely complete within one generation (30 - 50 years). This ensures that both leachate and methane are more carefully managed and controlled, and the degradation processes are accelerated.

Groundwater and surface water can be contaminated by untreated leachate from landfill sites. Leachate may cause serious water pollution if not properly managed. Surface water run-off from a landfill site can also cause unacceptable sediment loads in receiving waters, while uncontrolled surface water run-on can lead to excessive generation of leachate and migration of contaminated waters off-site. With CTRVV improving appropriate management on the site, these problems will be reduced.

Other potential hazards and amenity impacts include the risks of fire or explosions, landfill gas migration, dust, odour, pests, vermin, unsightliness and litter, each of which may occur onsite or off-site. They are all minimised by an appropriate management of the CTRVV landfill.

In addition, the following aspects of the landfill gas project have also been addressed:





CDM - Executive Board

page 31

- Noise There will be some increase in noise from the site associated with energy recovery, although the engines will be housed to reduce noise emissions. The impacts are likely to be marginal given the noise typically associated with operations at the landfill.
- Visual amenity Placement of energy recovery facilities at the landfill site will increase the visual presence of the site, however the impacts are expected to be marginal given the visual intrusion currently associated with the waste disposal operations.

The landfill gas project of CTRVV promotes in parallel best practices to improve landfill management standards, and contributes towards a global sustainable development.

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

To obtain the environmental license, new landfills or site expansions need an Environmental Impact Assessment (EIA-RIMA by Brazilian law). The EIA was conducted in 1999 by Adalberto Leão Bretas, civil and sanitary engineer, for an area of 6 ha. CTRVV owns the operation environmental license LO SL/N° 032/2005/Classe IV, issued in 09 March 2005.

For the implementation of the landfill gas collecting system an engineering conceptual project was prepared to obtain the installing and operating license. The permitting process was submitted to the environmental agency in 06 December 2006 and the corresponding installation license LI – GCA/SAIA/N° 047/2007/CLASSE II was issued in 06 March 2007.







page 32

D.2. If environmental impacts are considered significant by the project participants or the <u>host Party</u>, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the <u>host Party</u>:

No significant negative impacts to the environment will result from the project activity. On the contrary, the following environmental benefits will result in:

- Significant reduction of methane emission
- Generation of green energy
- Reduction of toxic gas emission (H₂S, organic mercury compounds)
- Improvement of landfill cover, reducing leachate generation
- Leachate pumping, reducing risk of groundwater pollution
- Reduction of nuisance odour

SECTION E. Stakeholders' comments

The project company acknowledges the importance of sound corporate governance and a transparent information policy, and thus pays great attention to healthy relations with all stakeholders involved. To foster the project's acceptance, the various local stakeholders will be informed on all details of the project on different occasions. Stakeholders will be invited to submit their comments or ideas regarding the project and its design at any time. Any comments and the results of discussions will be reported, summarised and published, and will be considered by the project company during the further development of the project (see details below).

E.1. Brief description how comments by local stakeholders have been invited and compiled:

Based on the resolution N.1.⁵ of the Brazilian Designate National Authority represented by the Interministerial Commission on Climate Change (Comissão Interministerial de Mudança Global do Clima), the following entities are to be addressed in the course of the stakeholder process:

- Municipal governments and City Councils;
- State and Municipal Environmental Agencies;
- Brazilian Forum of NGOs and Social Movements for Environment and Development;
- Community associations;
- Ministério Público (State Attorney for the Public Interest).

-

⁵ http://www.mct.gov.br/upd blob/2736.pdf





CDM – Executive Board

page 33

In line with this resolution, the following stakeholders will be addressed in the period of September and October 2006:

- Prefeitura Municipal de Vila Velha
- Secretaria Municipal de Meio-Ambiente de Vila Velha (SEMMA)
- Câmara dos Vereadores de Vila Velha
- Secretaria de Estado do Meio Ambiente e Recursos Hídricos (SEAMA)
- Associação de Moradores de Bairros (Xurí, Camboapina)
- Ministério Público do Estado do Espírito Santo
- Fórum Brasileiro de ONGs

E.2. Summary of the comments received:

During the public consultation period, only the Brazilian Forum of NGOs (FBOMS) provided one comment, suggesting that CTRVV adopted additional criteria for the social activity programs, such as those described in the Gold Standard ⁶.

E.3. Report on how due account was taken of any comments received:

CTRVV responded to the Brazilian Forum of NGOs (FBOMS), mentioning that the use of the Gold Standard will be evaluated. CTRVV also stated that transparency, one of Gold Standard's main principles, is absolutely necessary for the project and that all related social activities will be frequently disclosed to the public.

⁶ http://www.cdmgoldstandard.org/





page 34

Annex 1 CONTACT INFORMATION ON PARTICIPANTS IN THE <u>PROJECT ACTIVITY</u>

Organization:	CTRVV Central de Tratamento de Resíduos Vila Velha Ltda.
Street/P.O.Box:	Rua Enrique Laranja 264, Cobertura
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Telephone:	+55 27 3339 4433
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URL:	-
Represented by:	Valdir Damo
Title:	Director
Salutation:	Mr.
Last Name:	Damo
Middle Name:	-
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page 35

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

NO PUBLIC FUNDING INVOLVED







page 36

Annex 3

BASELINE INFORMATION





CDM - Executive Board

JSER INPUTS Landfill N	ame or Identi	fier: CTR VILA VE	LHA		
1: PROVIDE LANDFILL CHARACT	ERISTICS			L Non-Parameter ts/Selections	
Landfill Open Year	2002				
Landfill Closure Year	2031				
Have Model Calculate Closure Year?	Yes O	No			
Waste Design Capacity	'	megagrams	₹		
2: DETERMINE MODEL PARAME	TERS	Restore Def			
Methane Generation Rate, k (<i>year</i> ⁻¹)	User-specified l	value should be based o	n site-specific da		
User-specified		User-specified value:	0,100	by EPA Method 2E.	
Potential Methane Generation Capacity	, L _o (m³/Mg)	User-specified Lo	alue should be l	based on site-specific	
User-specified		User-specified value:	140	data and determined by waste and composition.	type
NMOC Concentration (ppmv as hexane)	•			
CAA - 4,000	-				
Methane Content (% by volume) CAA - 50% by volume	v				
3: SELECT GASES/POLLUTANTS	1				
Gas / Pollutant #1	Default polluta	ant parameters are curi	ently being us	ed by model.	
Total landfill gas		▼	Edit	Existing or Add	
Gas / Pollutant #2				ew Pollutant	
Methane		-		Parameters	
Gas / Pollutant #3					
Carbon dioxide		-	Re	estore Default Pollutant	
Gas / Pollutant #4				Parameters	
NMOC		•			
Description/Comments:					





page 38

4: ENTER WASTE ACCEPTANCE RATES

Input Units: Mg/year

	Input Units	Calculated Units
Year	(Mg/year)	(short tons/year)
2002	12.750	14.025
2003	128.522	141.374
2004	128.729	141.602
2005	180.000	198.000
2006	180.000	198.000
2007	180.000	198.000
2008	180.000	198.000
2009	180.000	198.000
2010	180.000	198.000
2011	180.000	198.000
2012	180.000	198.000
2013	180.000	198.000
2014	180.000	198.000
2015	180.000	198.000
2016	180.000	198.000
2017	180.000	198.000
2018	180.000	198.000
2019	180.000	198.000
2020	180.000	198.000
2021	180.000	198.000
2022	180.000	198.000
2023	180.000	198.000
2024	180.000	198.000
2025	180.000	198.000
2026	180.000	198.000
2027	180.000	198.000
2028	180.000	198.000
2029	180.000	198.000
2030	180.000	198.000
2031	180.000	198.000
2032		
2033		
2034		
2035		
2036		
2037		
2038		
2039		
2040		
2041		





CDM - Executive Board

page 39

METHANE

Landfill Name or Identifier: CTR VILA VELHA

First-Order Decomposition Rate Equation:

 Q_{CH4} = annual methane generation in the year of the calculation ($m^3/year$)

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

 $k = methane generation rate (year^{-1})$

When Model Calculates Closure Year...

 L_o = potential methane generation capacity (m³/Mg)

 M_i = mass of waste accepted in the ith year (Mg)

140 m³/Mg

 t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (decimal

years, e.g., 3.2 years)

Model Parameters from User Inputs:

Final Non-Zero Acceptance Entered = 180.000 megagrams in 2031

2031 2031 Model Waste Acceptance Limit = 80 years $k = 0,100 \ year^{-1}$ L_o=

Waste Design Capacity = megagrams Closure Year (with 80-year limit) = Actual Closure Year (without limit) =





page 40

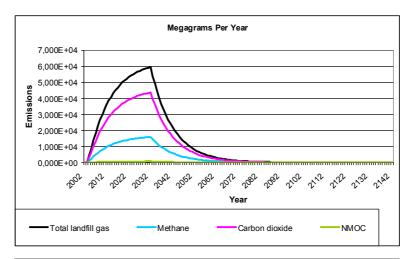
Year	User Waste Acceptance Inputs	User Waste-In Place	Waste Acceptance	Waste-In- Place
	(Mg/year)	(Mg)	(Mg/year)	(Mg)
2002	12.750	0	12.750	0
2003	128.522	12.750	128.522	12.750
2004	128.729	141.272	128.729	141.272
2005	180.000	270.001	180.000	270.001
2006	180.000	450.001	180.000	450.001
2007	180.000	630.001	180.000	630.001
2008	180.000	810.001	180.000	810.001
2009	180.000	990.001	180.000	990.001
2010	180.000	1.170.001	180.000	1.170.001
2011	180.000	1.350.001	180.000	1.350.001
2012	180.000	1.530.001	180.000	1.530.001
2013	180.000	1.710.001	180.000	1.710.001
2014	180.000	1.890.001	180.000	1.890.001
2015	180.000	2.070.001	180.000	2.070.001
2016	180.000	2.250.001	180.000	2.250.001
2017	180.000	2.430.001	180.000	2.430.001
2018	180.000	2.610.001	180.000	2.610.001
2019	180.000	2.790.001	180.000	2.790.001
2020	180.000	2.970.001	180.000	2.970.001
2021 2022	180.000	3.150.001 3.330.001	180.000	3.150.001 3.330.001
	180.000		180.000	3.510.001
2023 2024	180.000	3.510.001	180.000 180.000	3.690.001
2024	180.000 180.000	3.690.001 3.870.001	180.000	3.870.001
2026	180.000	4.050.001	180.000	4.050.001
2027	180.000	4.230.001	180.000	4.230.001
2028	180.000	4.410.001	180.000	4.410.001
2029	180.000	4.590.001	180.000	4.590.001
2030	180.000	4.770.001	180.000	4.770.001
2031	180.000	4.950.001	180.000	4.950.001
2032	0	5.130.001	0	5.130.001
2033	0	5.130.001	0	5.130.001
2034	0	5.130.001	0	5.130.001
2035	0	5.130.001	0	5.130.001
2036	0	5.130.001	0	5.130.001
2037	0	5.130.001	0	5.130.001
2038	0	5.130.001	0	5.130.001
2039	0	5.130.001	0	5.130.001
2040	0	5.130.001	0	5.130.001
2041	0	5.130.001	0	5.130.001
2042	0	5.130.001	0	5.130.001
2043	0		0	5.130.001
2044	0	5.130.001	0	5.130.001
2045 2046	0	5.130.001	0	5.130.001
	0	5.130.001	0	5.130.001 5.130.001
2047 2048	0	5.130.001 5.130.001	0	5.130.001
2048	0	5.130.001	0	5.130.001
2049	0	5.130.001	0	5.130.001
2050	0	5.130.001	0	5.130.001
2051	0	5.130.001	0	5.130.001
2053	0	5.130.001	0	5.130.001
2054	0	5.130.001	0	5.130.001
2055	0	5.130.001	0	5.130.001
2056	0	5.130.001	0	5.130.001
2057	0	5.130.001	0	5.130.001
2058	0	5.130.001	0	5.130.001
2059	0	5.130.001	0	5.130.001
2060	0	5.130.001	0	5.130.001
2061	0	5.130.001	0	5.130.001

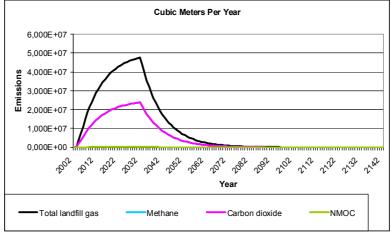


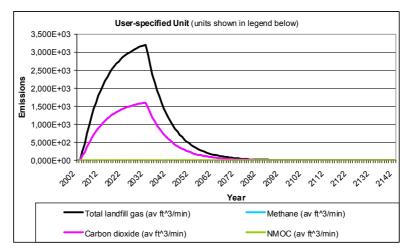


page 41

GRAPHS Landfill Name or Identifier: CTR VILA VELHA









CDM – Executive Board page 42

RESULTS Landfill Name or Identifier: CTR VILA VELHA

Please choose a third unit of measure to represent all of Closure Year (with 80-year limit) = 2031 the emission rates below.

r (with 80-year limit) = 2031 the emission

Methane = 50 % by volume

User-specified Unit: av ft^3/min

V	Wast	e Accepted	Wast	te-In-Place	Total landfill gas			Methane			Carbon dioxide		NMOC					
Year	(Mg/year)	(short tons/year)	(Mg)	(short tons)	(Mg/year)	(m³/year)	(av ft^3/min)	(Mg/year)	(m³/year)	(av ft^3/min)	(Mg/year)	(m³/year)	(av ft^3/min)	(Mg/year)	(m³/year)	(av ft^3/min)		
2002	12.750	14.025	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
2003	128.522	141.374	12.750	14.025	4,264E+02	3,414E+05	2,294E+01	1,139E+02	1,707E+05	1,147E+01	3,125E+02	1,707E+05	1,147E+01	4,895E+00	1,366E+03	9,176E-02		
2003	128.729	141.602	141.272	155.399	4,684E+03	3,751E+06	2,520E+02	1,251E+03	1,875E+06	1,260E+02	3,433E+03	1,875E+06	1,260E+02	5,378E+01	1,500E+04	1,008E+00		
2005																		
	180.000	198.000	270.001	297.001	8,543E+03	6,841E+06	4,596E+02	2,282E+03	3,420E+06	2,298E+02	6,261E+03	3,420E+06	2,298E+02	9,808E+01	2,736E+04	1,839E+00		
2006	180.000	198.000	450.001	495.001	1,375E+04	1,101E+07	7,398E+02	3,673E+03	5,505E+06	3,699E+02	1,008E+04	5,505E+06	3,699E+02	1,579E+02	4,404E+04	2,959E+00		
2007	180.000	198.000	630.001	693.001	1,846E+04	1,478E+07	9,932E+02	4,931E+03	7,391E+06	4,966E+02	1,353E+04	7,391E+06	4,966E+02	2,120E+02	5,913E+04	3,973E+00		
2008	180.000	198.000	810.001	891.001	2,272E+04	1,820E+07	1,223E+03	6,070E+03	9,098E+06	6,113E+02	1,665E+04	9,098E+06	6,113E+02	2,609E+02	7,278E+04	4,890E+00		
2009	180.000	198.000	990.001	1.089.001	2,658E+04	2,128E+07	1,430E+03	7,100E+03	1,064E+07	7,151E+02	1,948E+04	1,064E+07	7,151E+02	3,052E+02	8,514E+04	5,720E+00		
2010	180.000	198.000	1.170.001	1.287.001	3,007E+04	2,408E+07	1,618E+03	8,032E+03	1,204E+07	8,089E+02	2,204E+04	1,204E+07	8,089E+02	3,452E+02	9,632E+04	6,472E+00		
2011	180.000	198.000	1.350.001	1.485.001	3,323E+04	2,661E+07	1,788E+03	8,876E+03	1,330E+07	8,939E+02	2,435E+04	1,330E+07	8,939E+02	3,815E+02	1,064E+05	7,151E+00		
2012	180.000	198.000	1.530.001	1.683.001	3,609E+04	2,890E+07	1,942E+03	9,639E+03	1,445E+07	9,708E+02	2,645E+04	1,445E+07	9,708E+02	4,143E+02	1,156E+05	7,766E+00		
2013	180.000	198.000	1.710.001	1.881.001	3,867E+04	3,097E+07	2,081E+03	1,033E+04	1,548E+07	1,040E+03	2,834E+04	1,548E+07	1,040E+03	4,440E+02	1,239E+05	8,323E+00		
2014	180.000	198.000	1.890.001	2.079.001	4,101E+04	3,284E+07	2,207E+03	1,095E+04	1,642E+07	1,103E+03	3,006E+04	1,642E+07	1,103E+03	4,709E+02	1,314E+05	8,826E+00		
2015	180.000	198.000	2.070.001	2.277.001	4,313E+04	3,454E+07	2,320E+03	1,152E+04	1,727E+07	1,160E+03	3,161E+04	1,727E+07	1,160E+03	4,952E+02	1,381E+05	9,282E+00		
2016	180.000	198.000	2.250.001	2.475.001	4,504E+04	3,607E+07	2,423E+03	1,203E+04	1,803E+07	1,212E+03	3,301E+04	1,803E+07	1,212E+03	5,172E+02	1,443E+05	9,694E+00		
2017	180.000	198.000	2.430.001	2.673.001	4,678E+04	3,746E+07	2,517E+03	1,249E+04	1,873E+07	1,258E+03	3,428E+04	1,873E+07	1,258E+03	5,370E+02	1,498E+05	1,007E+01		
2018	180.000	198.000	2.610.001	2.871.001	4,834E+04	3,871E+07	2,601E+03	1,291E+04	1,936E+07	1,301E+03	3,543E+04	1,936E+07	1,301E+03	5,551E+02	1,548E+05	1,040E+01		
2019	180.000	198.000	2.790.001	3.069.001	4,976E+04	3,985E+07	2,677E+03	1,329E+04	1,992E+07	1,339E+03	3,647E+04	1,992E+07	1,339E+03	5,713E+02	1,594E+05	1,071E+01		
2020	180.000	198.000	2.970.001	3.267.001	5,105E+04	4,088E+07	2,747E+03	1,364E+04	2,044E+07	1,373E+03	3,741E+04	2,044E+07	1,373E+03	5,861E+02	1,635E+05	1,099E+01		
2021	180.000	198.000	3.150.001	3.465.001	5,221E+04	4,181E+07	2,809E+03	1,395E+04	2,090E+07	1,405E+03	3,826E+04	2,090E+07	1,405E+03	5,994E+02	1,672E+05	1,124E+01		
2022	180.000	198.000	3.330.001	3.663.001	5,326E+04	4,265E+07	2,866E+03	1,423E+04	2,132E+07	1,433E+03	3,903E+04	2,132E+07	1,433E+03	6,115E+02	1,706E+05	1,146E+01		
2023	180.000	198.000	3.510.001	3.861.001	5,421E+04	4,341E+07	2,917E+03	1,448E+04	2,171E+07	1,458E+03	3,973E+04	2,171E+07	1,458E+03	6,224E+02	1,736E+05	1,167E+01		
2024	180.000	198.000	3.690.001	4.059.001	5,507E+04	4,410E+07	2,963E+03	1,471E+04	2,205E+07	1,482E+03	4,036E+04	2,205E+07	1,482E+03	6,323E+02	1,764E+05	1,185E+01		
2025	180.000	198.000	3.870.001	4.257.001	5,585E+04	4,472E+07	3,005E+03	1,492E+04	2,236E+07	1,502E+03	4,093E+04	2,236E+07	1,502E+03	6,412E+02	1,789E+05	1,202E+01		
2026	180.000	198.000	4.050.001	4.455.001	5,656E+04	4,529E+07	3,043E+03	1,511E+04	2,264E+07	1,521E+03	4,145E+04	2,264E+07	1,521E+03	6,493E+02	1,811E+05	1,217E+01		
2027	180.000	198.000	4.230.001	4.653.001	5,719E+04	4,580E+07	3,077E+03	1,528E+04	2,290E+07	1,539E+03	4,192E+04	2,290E+07	1,539E+03	6,566E+02	1,832E+05	1,231E+01		
2028	180.000	198.000	4.410.001	4.851.001	5,777E+04	4,626E+07	3,108E+03	1,543E+04	2,313E+07	1,554E+03	4,234E+04	2,313E+07	1,554E+03	6,633E+02	1,850E+05	1,243E+01		
2029	180.000	198.000	4.590.001	5.049.001	5,829E+04	4,668E+07	3,136E+03	1,557E+04	2,334E+07	1,568E+03	4,272E+04	2,334E+07	1,568E+03	6,693E+02	1,867E+05	1,255E+01		
2030	180.000	198.000	4.770.001	5.247.001	5,876E+04	4,706E+07	3,162E+03	1,570E+04	2,353E+07	1,581E+03	4,307E+04	2,353E+07	1,581E+03	6,747E+02	1,882E+05	1,265E+01		
2030	180.000	198.000	4.950.001	5.445.001	5,919E+04	4,740E+07	3,185E+03	1,570E+04 1,581E+04	2,335E+07 2,370E+07	1,592E+03	4,338E+04	2,330E+07	1,592E+03	6,796E+02	1,896E+05	1,203E+01 1,274E+01		
2032	100.000	190.000	5.130.001	5.643.001	5,958E+04	4,771E+07	3,205E+03	1,591E+04	2,385E+07	1,603E+03	4,366E+04	2,385E+07	1,603E+03	6,840E+02	1,908E+05	1,282E+01		
	0	0		5.643.001														
2033	0	0	5.130.001		5,391E+04	4,317E+07	2,900E+03	1,440E+04	2,158E+07	1,450E+03	3,951E+04	2,158E+07	1,450E+03	6,189E+02	1,727E+05	1,160E+01		
2034	0	0	5.130.001	5.643.001	4,878E+04	3,906E+07	2,624E+03	1,303E+04	1,953E+07	1,312E+03	3,575E+04	1,953E+07	1,312E+03	5,600E+02	1,562E+05	1,050E+01		
2035	0	0	5.130.001	5.643.001	4,414E+04	3,534E+07	2,375E+03	1,179E+04	1,767E+07	1,187E+03	3,235E+04	1,767E+07	1,187E+03	5,067E+02	1,414E+05	9,499E+00		
2036	0	0	5.130.001	5.643.001	3,994E+04	3,198E+07	2,149E+03	1,067E+04	1,599E+07	1,074E+03	2,927E+04	1,599E+07	1,074E+03	4,585E+02	1,279E+05	8,595E+00		
2037	0	0	5.130.001	5.643.001	3,614E+04	2,894E+07	1,944E+03	9,652E+03	1,447E+07	9,721E+02	2,648E+04	1,447E+07	9,721E+02	4,149E+02	1,157E+05	7,777E+00		
2038	0	0	5.130.001	5.643.001	3,270E+04	2,618E+07	1,759E+03	8,734E+03	1,309E+07	8,796E+02	2,396E+04	1,309E+07	8,796E+02	3,754E+02	1,047E+05	7,037E+00		
2039	0	0	5.130.001	5.643.001	2,959E+04	2,369E+07	1,592E+03	7,903E+03	1,185E+07	7,959E+02	2,168E+04	1,185E+07	7,959E+02	3,397E+02	9,476E+04	6,367E+00		
2040	0	0	5.130.001	5.643.001	2,677E+04	2,144E+07	1,440E+03	7,151E+03	1,072E+07	7,202E+02	1,962E+04	1,072E+07	7,202E+02	3,074E+02	8,575E+04	5,761E+00		
2041	0	0	5.130.001	5.643.001	2,422E+04	1,940E+07	1,303E+03	6,470E+03	9,698E+06	6,516E+02	1,775E+04	9,698E+06	6,516E+02	2,781E+02	7,759E+04	5,213E+00		
2042	0	0	5.130.001	5.643.001	2,192E+04	1,755E+07	1,179E+03	5,854E+03	8,775E+06	5,896E+02	1,606E+04	8,775E+06	5,896E+02	2,516E+02	7,020E+04	4,717E+00		
2043	0	0	5.130.001	5.643.001	1,983E+04	1,588E+07	1,067E+03	5,297E+03	7,940E+06	5,335E+02	1,453E+04	7,940E+06	5,335E+02	2,277E+02	6,352E+04	4,268E+00		
2044	0	0	5.130.001	5.643.001	1,794E+04	1,437E+07	9,655E+02	4,793E+03	7,185E+06	4,827E+02	1,315E+04	7,185E+06	4,827E+02	2,060E+02	5,748E+04	3,862E+00		
2045	0	0	5.130.001	5.643.001	1,624E+04	1,300E+07	8,736E+02	4,337E+03	6,501E+06	4,368E+02	1,190E+04	6,501E+06	4,368E+02	1,864E+02	5,201E+04	3,494E+00		
2046	0	0	5.130.001	5.643.001	1,469E+04	1,176E+07	7,905E+02	3,924E+03	5,882E+06	3,952E+02	1,077E+04	5,882E+06	3,952E+02	1,687E+02	4,706E+04	3,162E+00		
2047	0	0	5.130.001	5.643.001	1,329E+04	1,065E+07	7,152E+02	3,551E+03	5,323E+06	3,576E+02	9,743E+03	5,323E+06	3,576E+02	1,526E+02	4,258E+04	2,861E+00		
2048	0	0	5.130.001	5.643.001	1,203E+04	9,632E+06	6,472E+02	3,213E+03	4,816E+06	3,236E+02	8,816E+03	4,816E+06	3,236E+02	1,381E+02	3,853E+04	2,589E+00		
2049	0	0	5.130.001	5.643.001	1.088E+04	8,715E+06	5,856E+02	2.907E+03	4,358E+06	2,928E+02	7,977E+03	4.358E+06	2,928E+02	1,250E+02	3,486E+04	2,342E+00		
2050	0	0	5.130.001	5.643.001	9,848E+03	7,886E+06	5,299E+02	2,631E+03	3,943E+06	2,649E+02	7,218E+03	3,943E+06	2,649E+02	1,131E+02	3,154E+04	2,119E+00		
2051	0	0	5.130.001	5.643.001	8,911E+03		4,794E+02	2,380E+03		2,397E+02	6,531E+03		2,397E+02	1,023E+02				
2050	- V	0				7,136E+06			3,568E+06			3,568E+06			2,854E+04	1,918E+00		
2052	0	0	5.130.001	5.643.001	8,063E+03	6,457E+06	4,338E+02	2,154E+03	3,228E+06	2,169E+02	5,909E+03	3,228E+06	2,169E+02	9,257E+01	2,583E+04	1,735E+00		
2053	0	0	5.130.001	5.643.001	7,296E+03	5,842E+06	3,925E+02	1,949E+03	2,921E+06	1,963E+02	5,347E+03	2,921E+06	1,963E+02	8,376E+01	2,337E+04	1,570E+00		
2054	0	0	5.130.001	5.643.001	6,602E+03	5,286E+06	3,552E+02	1,763E+03	2,643E+06	1,776E+02	4,838E+03	2,643E+06	1,776E+02	7,579E+01	2,114E+04	1,421E+00		
2055	0	0	5.130.001	5.643.001	5,973E+03	4,783E+06	3,214E+02	1,596E+03	2,392E+06	1,607E+02	4,378E+03	2,392E+06	1,607E+02	6,858E+01	1,913E+04	1,286E+00		
2056	0	0	5.130.001	5.643.001	5,405E+03	4,328E+06	2,908E+02	1,444E+03	2,164E+06	1,454E+02	3,961E+03	2,164E+06	1,454E+02	6,205E+01	1,731E+04	1,163E+00		
2057	0	0	5.130.001	5.643.001	4,891E+03	3,916E+06	2,631E+02	1,306E+03	1,958E+06	1,316E+02	3,584E+03	1,958E+06	1,316E+02	5,615E+01	1,566E+04	1,052E+00		
2058 2059	0	0	5.130.001	5.643.001	4,425E+03	3,543E+06	2,381E+02	1,182E+03	1,772E+06	1,190E+02	3,243E+03	1,772E+06	1,190E+02	5,081E+01	1,417E+04	9,523E-01		
2059	0	0	5.130.001	5.643.001	4,004E+03	3,206E+06	2,154E+02	1,070E+03	1,603E+06	1,077E+02	2,935E+03	1,603E+06	1,077E+02	4,597E+01	1,282E+04	8,617E-01		
2060	0	0	5.130.001	5.643.001	3,623E+03	2,901E+06	1,949E+02	9,677E+02	1,451E+06	9,746E+01	2,655E+03	1,451E+06	9,746E+01	4,160E+01	1,160E+04	7,797E-01		
2061	0	0	5.130.001	5.643.001	3,278E+03	2,625E+06	1,764E+02	8,756E+02	1,313E+06	8,819E+01	2,403E+03	1,313E+06	8,819E+01	3,764E+01	1,050E+04	7,055E-01		
2062	0	0	5.130.001	5.643.001	2,966E+03	2,375E+06	1,596E+02	7,923E+02	1,188E+06	7,980E+01	2,174E+03	1,188E+06	7,980E+01	3,406E+01	9,501E+03	6,384E-01		
2063	0	0	5.130.001	5.643.001	2,684E+03	2,149E+06	1,444E+02	7,169E+02	1,075E+06	7,220E+01	1,967E+03	1,075E+06	7,220E+01	3,082E+01	8,597E+03	5,776E-01		
2064	n	n	5.130.001	5.643.001	2,429E+03	1,945E+06	1,307E+02	6,487E+02	9,723E+05	6,533E+01	1,780E+03	9,723E+05	6,533E+01	2,788E+01	7,779E+03	5,227E-01		
2065	n	ñ	5.130.001	5.643.001	2,197E+03	1,760E+06	1,182E+02	5,870E+02	8,798E+05	5,911E+01	1,610E+03	8,798E+05	5,911E+01	2,523E+01	7,038E+03	4,729E-01		
2066	0	0	5.130.001	5.643.001	1,988E+03	1,592E+06	1,070E+02	5,311E+02	7,961E+05	5,349E+01	1,457E+03	7,961E+05	5,349E+01	2,283E+01	6,369E+03	4,279E-01		
2067	0	0	5.130.001	5.643.001	1,799E+03	1,441E+06	9,680E+01	4,806E+02	7,203E+05	4,840E+01	1,319E+03	7,203E+05	4,840E+01	2,066E+01	5,763E+03	3,872E-01		
2068	0	0	5.130.001	5.643.001	1,628E+03	1,304E+06	8,759E+01	4,808E+02 4,348E+02	6,518E+05	4,379E+01	1,319E+03	6,518E+05	4,840E+01 4,379E+01	1,869E+01	5,763E+03 5,214E+03	3,503E-01		
2000	<u> </u>	0				1,304E+06 1,180E+06									4,718E+03			
2069 2070	0	0	5.130.001	5.643.001	1,473E+03		7,925E+01	3,935E+02	5,898E+05	3,963E+01	1,080E+03	5,898E+05	3,963E+01	1,691E+01		3,170E-01		
	0	0	5.130.001	5.643.001	1,333E+03	1,067E+06	7,171E+01	3,560E+02	5,336E+05	3,585E+01	9,768E+02	5,336E+05	3,585E+01	1,530E+01	4,269E+03	2,868E-01		
2071	0	0	5.130.001	5.643.001	1,206E+03	9,657E+05	6,489E+01	3,221E+02	4,829E+05	3,244E+01	8,839E+02	4,829E+05	3,244E+01	1,385E+01	3,863E+03	2,595E-01		
2072	0	0	5.130.001	5.643.001	1,091E+03	8,738E+05	5,871E+01	2,915E+02	4,369E+05	2,936E+01	7,997E+02	4,369E+05	2,936E+01	1,253E+01	3,495E+03	2,348E-01		
2073	0	0	5.130.001	5.643.001	9,874E+02	7,906E+05	5,312E+01	2,637E+02	3,953E+05	2,656E+01	7,236E+02	3,953E+05	2,656E+01	1,134E+01	3,163E+03	2,125E-01		
2074	0	0	5.130.001	5.643.001	8,934E+02	7,154E+05	4,807E+01	2,386E+02	3,577E+05	2,403E+01	6,548E+02	3,577E+05	2,403E+01	1,026E+01	2,862E+03	1,923E-01		
2075	0	0	5.130.001	5.643.001	8,084E+02	6,473E+05	4,349E+01	2,159E+02	3,237E+05	2,175E+01	5,925E+02	3,237E+05	2,175E+01	9,281E+00	2,589E+03	1,740E-01		
2076	0	0	5.130.001	5.643.001	7,315E+02	5,857E+05	3,935E+01	1,954E+02	2,929E+05	1,968E+01	5,361E+02	2,929E+05	1,968E+01	8,398E+00	2,343E+03	1,574E-01		
2077	0	0	5.130.001	5.643.001	6,619E+02	5,300E+05	3,561E+01	1,768E+02	2,650E+05	1,780E+01	4,851E+02	2,650E+05	1,780E+01	7,599E+00	2,120E+03	1,424E-01		



CDM – Executive Board page 43

2078	0 0 5.130.001	5.643.001	5,989E+02	4,796E+05	3,222E+01	1,600E+02	2,398E+05	1,611E+01	4,389E+02	2,398E+05	1,611E+01	6,876E+00	1,918E+03	1,289E-01
2079	0 5.130.001	5.643.001	5,419E+02	4,339E+05	2,915E+01	1,447E+02	2,170E+05	1,458E+01	3,971E+02	2,170E+05	1,458E+01	6,221E+00	1,736E+03	1,166E-01
2080	0 5.130.001	5.643.001	4,903E+02	3,926E+05	2,638E+01	1,310E+02	1,963E+05	1,319E+01	3,593E+02	1,963E+05	1,319E+01	5,629E+00	1,571E+03	1,055E-01
2081	0 5.130.001	5.643.001	4,437E+02	3,553E+05	2,387E+01	1,185E+02	1,776E+05	1,194E+01	3,252E+02	1,776E+05	1,194E+01	5,094E+00	1,421E+03	9,548E-02
2082	0 0 5.130.001 0 0 5.130.001	5.643.001 5.643.001	4,014E+02 3,632E+02	3,215E+05	2,160E+01 1,954E+01	1,072E+02	1,607E+05	1,080E+01 9,772E+00	2,942E+02 2,662E+02	1,607E+05	1,080E+01 9,772E+00	4,609E+00	1,286E+03	8,639E-02 7,817E-02
2083	0 0 5.130.001	5.643.001	3,632E+02 3,287E+02	2,909E+05 2,632E+05	1,954E+01 1,768E+01	9,702E+01 8,779E+01	1,454E+05 1,316E+05	8,842E+00	2,662E+02 2,409E+02	1,454E+05 1,316E+05	8,842E+00	4,170E+00 3,774E+00	1,163E+03 1,053E+03	7,817E-02 7,073E-02
2085	0 0 5.130.001	5.643.001	2,974E+02	2,032E+05 2,381E+05	1,600E+01	7,944E+01	1,316E+05 1,191E+05	8,000E+00	2,409E+02 2,180E+02	1,191E+05	8,000E+00	3,414E+00	9,526E+02	6,400E-02
2086	0 0 5.130.001	5.643.001	2,691E+02	2,155E+05	1,448E+01	7,188E+01	1,077E+05	7,239E+00	1,972E+02	1,077E+05	7,239E+00	3,089E+00	8,619E+02	5,791E-02
2087	0 5.130.001	5.643.001	2,435E+02	1,950E+05	1,310E+01	6,504E+01	9,749E+04	6,550E+00	1,784E+02	9,749E+04	6,550E+00	2,795E+00	7,799E+02	5,240E-02
2088	0 5.130.001	5.643.001	2,203E+02	1,764E+05	1,185E+01	5,885E+01	8,821E+04	5,927E+00	1,615E+02	8,821E+04	5,927E+00	2,529E+00	7,057E+02	4,741E-02
2089	0 5.130.001	5.643.001	1,993E+02	1,596E+05	1,073E+01	5,325E+01	7,981E+04	5,363E+00	1,461E+02	7,981E+04	5,363E+00	2,289E+00	6,385E+02	4,290E-02
2090	0 0 5.130.001	5.643.001	1,804E+02	1,444E+05	9,705E+00	4,818E+01	7,222E+04	4,852E+00	1,322E+02	7,222E+04	4,852E+00	2,071E+00	5,778E+02	3,882E-02
2091	0 0 5.130.001 0 0 5.130.001	5.643.001 5.643.001	1,632E+02 1,477E+02	1,307E+05 1,183E+05	8,781E+00 7,946E+00	4,360E+01 3,945E+01	6,535E+04 5,913E+04	4,391E+00 3,973E+00	1,196E+02 1,082E+02	6,535E+04 5,913E+04	4,391E+00 3,973E+00	1,874E+00 1,696E+00	5,228E+02 4,730E+02	3,513E-02 3,178E-02
2092	0 0 5.130.001	5.643.001	1,477E+02 1,336E+02	1,070E+05	7,946E+00 7,190E+00	3,569E+01	5,913E+04 5,350E+04	3,595E+00	9,793E+01	5,350E+04	3,595E+00	1,534E+00	4,730E+02 4,280E+02	2,876E-02
2093	0 0 5.130.001	5.643.001	1,209E+02	9,682E+04	6,505E+00	3,230E+01	4,841E+04	3,253E+00	8,861E+01	4,841E+04	3,253E+00	1,388E+00	3,873E+02	2,602E-02
2095	0 0 5.130.001	5.643.001	1,094E+02	8,761E+04	5,886E+00	2,922E+01	4,380E+04	2,943E+00	8,018E+01	4,380E+04	2,943E+00	1,256E+00	3,504E+02	2,355E-02
2096	0 0 5.130.001	5.643.001	9,899E+01	7,927E+04	5,326E+00	2,644E+01	3,963E+04	2,663E+00	7,255E+01	3,963E+04	2,663E+00	1,137E+00	3,171E+02	2,130E-02
2097	0 0 5.130.001	5.643.001	8,957E+01	7,173E+04	4,819E+00	2,393E+01	3,586E+04	2,410E+00	6,565E+01	3,586E+04	2,410E+00	1,028E+00	2,869E+02	1,928E-02
2098	0 5.130.001	5.643.001	8,105E+01	6,490E+04	4,361E+00	2,165E+01	3,245E+04	2,180E+00	5,940E+01	3,245E+04	2,180E+00	9,305E-01	2,596E+02	1,744E-02
2099	0 0 5.130.001	5.643.001	7,334E+01	5,872E+04	3,946E+00	1,959E+01	2,936E+04	1,973E+00	5,375E+01	2,936E+04	1,973E+00	8,420E-01	2,349E+02	1,578E-02
2100	0 0 5.130.001	5.643.001	6,636E+01	5,314E+04	3,570E+00	1,772E+01	2,657E+04	1,785E+00	4,863E+01	2,657E+04	1,785E+00	7,619E-01	2,125E+02	1,428E-02
2101 2102	0 0 5.130.001 0 0 5.130.001	5.643.001 5.643.001	6,004E+01 5,433E+01	4,808E+04 4,350E+04	3,230E+00 2,923E+00	1,604E+01 1,451E+01	2,404E+04 2,175E+04	1,615E+00 1,462E+00	4,400E+01 3,982E+01	2,404E+04 2,175E+04	1,615E+00 1,462E+00	6,894E-01 6,238E-01	1,923E+02 1,740E+02	1,292E-02 1,169E-02
2102	0 0 5.130.001	5.643.001	4,916E+01	3,936E+04	2,923E+00 2,645E+00	1,313E+01	1,968E+04	1,462E+00 1,322E+00	3,603E+01	1,968E+04	1,322E+00	5,644E-01	1,740E+02 1,575E+02	1,058E-02
2104	0 0 5.130.001	5.643.001	4,448E+01	3,562E+04	2,393E+00	1,188E+01	1,781E+04	1,197E+00	3,260E+01	1,781E+04	1,197E+00	5,107E-01	1,425E+02	9,573E-03
2105	0 0 5.130.001	5.643.001	4,025E+01	3,223E+04	2,165E+00	1,075E+01	1,611E+04	1,083E+00	2,950E+01	1,611E+04	1,083E+00	4,621E-01	1,289E+02	8,662E-03
2106	0 5.130.001	5.643.001	3,642E+01	2,916E+04	1,959E+00	9,728E+00	1,458E+04	9,797E-01	2,669E+01	1,458E+04	9,797E-01	4,181E-01	1,166E+02	7,837E-03
2107	0 5.130.001	5.643.001	3,295E+01	2,639E+04	1,773E+00	8,802E+00	1,319E+04	8,865E-01	2,415E+01	1,319E+04	8,865E-01	3,783E-01	1,055E+02	7,092E-03
2108	0 5.130.001	5.643.001	2,982E+01	2,388E+04	1,604E+00	7,964E+00	1,194E+04	8,021E-01	2,185E+01	1,194E+04	8,021E-01	3,423E-01	9,550E+01	6,417E-03
2109	0 0 5.130.001	5.643.001	2,698E+01	2,160E+04	1,452E+00	7,206E+00 6.521E+00	1,080E+04	7,258E-01	1,977E+01	1,080E+04	7,258E-01	3,097E-01	8,641E+01	5,806E-03 5,254E-03
2110	0 0 5.130.001 0 0 5.130.001	5.643.001 5.643.001	2,441E+01 2,209E+01	1,955E+04 1,769E+04	1,313E+00 1,188E+00	5,900E+00	9,774E+03 8,844E+03	6,567E-01 5,942E-01	1,789E+01 1,619E+01	9,774E+03 8,844E+03	6,567E-01 5,942E-01	2,803E-01 2,536E-01	7,819E+01 7,075E+01	5,254E-03 4,754E-03
2112	0 0 5.130.001	5.643.001	1,999E+01	1,600E+04	1,075E+00	5,339E+00	8,002E+03	5,377E-01	1,465E+01	8,002E+03	5,377E-01	2,295E-01	6,402E+01	4,301E-03
2113	0 0 5.130.001	5.643.001	1,808E+01	1,448E+04	9,730E-01	4,831E+00	7,241E+03	4,865E-01	1,325E+01	7,241E+03	4,865E-01	2,076E-01	5,793E+01	3,892E-03
2114	0 0 5.130.001	5.643.001	1,636E+01	1,310E+04	8,804E-01	4,371E+00	6,552E+03	4,402E-01	1,199E+01	6,552E+03	4,402E-01	1,879E-01	5,241E+01	3,522E-03
2115	0 5.130.001	5.643.001	1,481E+01	1,186E+04	7,966E-01	3,955E+00	5,928E+03	3,983E-01	1,085E+01	5,928E+03	3,983E-01	1,700E-01	4,743E+01	3,186E-03
2116	0 5.130.001	5.643.001	1,340E+01	1,073E+04	7,208E-01	3,579E+00	5,364E+03	3,604E-01	9,819E+00	5,364E+03	3,604E-01	1,538E-01	4,291E+01	2,883E-03
2117	0 5.130.001	5.643.001	1,212E+01	9,707E+03	6,522E-01	3,238E+00	4,854E+03	3,261E-01	8,884E+00	4,854E+03	3,261E-01	1,392E-01	3,883E+01	2,609E-03
2118	0 0 5.130.001 0 0 5.130.001	5.643.001	1,097E+01 9,925E+00	8,783E+03 7,947E+03	5,902E-01 5,340E-01	2,930E+00 2,651E+00	4,392E+03 3,974E+03	2,951E-01 2,670E-01	8,039E+00 7,274E+00	4,392E+03 3,974E+03	2,951E-01 2,670E-01	1,259E-01	3,513E+01 3,179E+01	2,361E-03 2,136E-03
2120	0 5.130.001	5.643.001 5.643.001	8,981E+00	7,947E+03 7,191E+03	4,832E-01	2,399E+00	3,596E+03	2,416E-01	6,582E+00	3,596E+03	2,416E-01	1,139E-01 1,031E-01	2,876E+01	1,933E-03
2121	0 0 5.130.001	5.643.001	8,126E+00	6,507E+03	4,372E-01	2,171E+00	3,253E+03	2,186E-01	5,955E+00	3,253E+03	2,186E-01	9,329E-02	2,603E+01	1,749E-03
2122	0 0 5.130.001	5.643.001	7,353E+00	5,888E+03	3,956E-01	1,964E+00	2,944E+03	1,978E-01	5,389E+00	2,944E+03	1,978E-01	8,442E-02	2,355E+01	1,582E-03
2123	0 0 5.130.001	5.643.001	6,653E+00	5,327E+03	3,579E-01	1,777E+00	2,664E+03	1,790E-01	4,876E+00	2,664E+03	1,790E-01	7,638E-02	2,131E+01	1,432E-03
2124	0 5.130.001	5.643.001	6,020E+00	4,820E+03	3,239E-01	1,608E+00	2,410E+03	1,619E-01	4,412E+00	2,410E+03	1,619E-01	6,911E-02	1,928E+01	1,296E-03
2125	0 0 5.130.001	5.643.001	5,447E+00	4,362E+03	2,931E-01	1,455E+00	2,181E+03	1,465E-01	3,992E+00	2,181E+03	1,465E-01	6,254E-02	1,745E+01	1,172E-03
2126	0 5.130.001	5.643.001	4,929E+00	3,947E+03	2,652E-01	1,316E+00	1,973E+03	1,326E-01	3,612E+00	1,973E+03	1,326E-01	5,659E-02	1,579E+01	1,061E-03
2127 2128	0 0 5.130.001 0 0 5.130.001	5.643.001 5.643.001	4,460E+00 4.035E+00	3,571E+03 3,231E+03	2,399E-01 2.171E-01	1,191E+00 1.078E+00	1,786E+03 1.616E+03	1,200E-01 1.086E-01	3,268E+00 2.957E+00	1,786E+03 1.616E+03	1,200E-01	5,120E-02 4.633E-02	1,428E+01 1,292E+01	9,597E-04 8.684E-04
2128	0 5.130.001	5.643.001 5.643.001	4,035E+00 3,651E+00	3,231E+03 2,924E+03	2,171E-01 1,964E-01	1,078E+00 9,753E-01	1,616E+03 1.462E+03	1,086E-01 9,822E-02	2,957E+00 2,676E+00	1,616E+03 1.462E+03	1,086E-01 9,822E-02	4,633E-02 4,192E-02	1,292E+01 1,169E+01	8,684E-04 7,858E-04
2130	0 0 5.130.001	5.643.001	3,304E+00	2,645E+03	1,777E-01	8,825E-01	1,323E+03	8,887E-02	2,421E+00	1,323E+03	8,887E-02	3,793E-02	1,058E+01	7,006E-04 7,110E-04
2131	0 0 5.130.001	5.643.001	2,989E+00	2,394E+03	1,608E-01	7,985E-01	1,197E+03	8,042E-02	2,191E+00	1,197E+03	8,042E-02	3,432E-02	9,575E+00	6,433E-04
2132	0 0 5.130.001	5.643.001	2,705E+00	2,166E+03	1,455E-01	7,225E-01	1,083E+03	7,276E-02	1,982E+00	1,083E+03	7,276E-02	3,105E-02	8,664E+00	5,821E-04
2133	0 5.130.001	5.643.001	2,447E+00	1,960E+03	1,317E-01	6,537E-01	9,799E+02	6,584E-02	1,794E+00	9,799E+02	6,584E-02	2,810E-02	7,839E+00	5,267E-04
2134	0 5.130.001	5.643.001	2,215E+00	1,773E+03	1,191E-01	5,915E-01	8,867E+02	5,957E-02	1,623E+00	8,867E+02	5,957E-02	2,543E-02	7,093E+00	4,766E-04
2135	0 0 5.130.001	5.643.001	2,004E+00	1,605E+03	1,078E-01	5,352E-01	8,023E+02	5,391E-02	1,469E+00	8,023E+02	5,391E-02	2,301E-02	6,418E+00	4,312E-04
2136	0 0 5.130.001	5.643.001	1,813E+00	1,452E+03	9,755E-02	4,843E-01	7,259E+02	4,878E-02	1,329E+00	7,259E+02	4,878E-02	2,082E-02	5,807E+00	3,902E-04
2137 2138	0 0 5.130.001 0 0 5.130.001	5.643.001 5.643.001	1,641E+00 1,484E+00	1,314E+03 1,189E+03	8,827E-02 7,987E-02	4,382E-01 3,965E-01	6,569E+02 5,943E+02	4,413E-02 3,993E-02	1,202E+00 1,088E+00	6,569E+02 5,943E+02	4,413E-02 3,993E-02	1,884E-02 1,704E-02	5,255E+00 4,755E+00	3,531E-04 3,195E-04
2138	0 0 5.130.001	5.643.001	1,484E+00 1,343E+00	1,189E+03 1,076E+03	7,987E-02 7,227E-02	3,965E-01 3,588E-01	5,943E+02 5,378E+02	3,993E-02 3,613E-02	9,844E-01	5,943E+02 5,378E+02	3,993E-02 3,613E-02	1,704E-02 1,542E-02	4,755E+00 4,302E+00	3,195E-04 2,891E-04
2140	0 0 5.130.001	5.643.001	1,215E+00	9,732E+02	6,539E-02	3,246E-01	4,866E+02	3,270E-02	8,907E-01	4,866E+02	3,270E-02	1,395E-02	3,893E+00	2,616E-04
2141	0 0 5.130.001	5.643.001	1,100E+00	8,806E+02	5,917E-02	2,937E-01	4,403E+02	2,958E-02	8,060E-01	4,403E+02	2,958E-02	1,263E-02	3,522E+00	2,367E-04
2142	0 0 5.130.001	5.643.001	9,951E-01	7,968E+02	5,354E-02	2,658E-01	3,984E+02	2,677E-02	7,293E-01	3,984E+02	2,677E-02	1,142E-02	3,187E+00	2,141E-04



CDM – Executive Board page 44

Annex 3: LFG Generation																												
Annox of El C Contractor																												
In																												
Input data																												
Project description and time schedule																												
Short description of project: Landfill		flaring																										
Planned proportion of LFG/methane collected: %	60%				crediting period		01.10.2007																					
Commissioning & start of CER generation: month /	/ear 09 / 2007			Finish first	crediting perio	d: 3	31.12.2012																					
Crediting time: year	3 x 7			Total CER	s first crediti	ing period:	455.082																					
Landfill data																												
Landfill opening: yea	2002																											
Landfill closure (planned): year	2031																											
Waste deposited until the end of 2004: t	270.001																											
Annual amount of waste deposited from 2005 until closure: t / a	180.000																											
Waste deposited from 2002 until 2031: t	5.130.001																											
Process Data																												
Flare efficiency %	98%																											
Waste stream Year	2002	2003	2004	2005 200	6 2007	2008	2009	2010	2011	2012	2013 2	14 20	5 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	20
Waste deposited: t / a	12.750	128.522			0 180.000	180.000	180.000	180.000			30.000 180.							180.000	180.000	180.000		180.000						
Cumulative: t	12.750		270.001	450.001 630.00			1.170.001					01 2.250.00			2.790.001												4.950.001	
Landfill gas (LFG) / Methane generation																												
Methane generation constant k: 1/a	0,10																											
Methane generation potential L _o : m ³ / t w																												
Methane content in LFG: %	50%																											
				9,92 kWh/m³ me	46	40.005 14	Wh/t methane	_	4.00	kWh/m³ LFG,		17 kWh/t LFG																
Calorific value of methane: MJ / r		equivalent to): 	9,92 KVVn/m* me	tnane,	13.035 K	vvn/t metnane	e,	4,90	KVVn/m- LPG,	0.	17 KWN/t LFG																
GWP CH4: t CO ₂ / t																												
Density of methane (standard temperature and pressure): kg / n																												
Density of methane (20°C, standard pressure): kg / n	0,6671																											
Baseline																												
Short description of baseline:	Continuation of ex	disting situatio	on (partial ventin	g only)																								
Effectiveness Adjustment Factor (EAF):	40%																											
	10%																											
	10%																											
Results	10.70																											
Results Model equation: US EPA	10.70																											
Model equation: US EPA	first oder decay model		2004	2005 2000	as 2007	2008	2009	2040	2014	2012	2013	14 20	5 2016	2017	2048	2010	2020	2024	2022	2023	2024	2025	2026	2027	2028	2029	2030	20.
Model equation: US EPA Yea	first oder decay model		3 2004	2005 200	6 2007	2008	2009	2010	2011	2012	2013 2	14 20 [.]	5 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	20:
Model equation: US EPA Yea Total GHG emissions of landfill over time	first oder decay model	2003																										
Model equation: US EPA Yea Total GHG emissions of landfill over time Methane production: m²/fi	first oder decay model			2005 200 390 620	8 844	1.039	1.215	1.374	1.519	1.649	1.768 1.8	74 1.97	1 2.059	2.138	2.210	2.274	2.333	2.386	2.434	2.478	2.517	2.553	2.585	2.614	2.640	2.664	2.686	2.70
Model equation: US EPA Yea Total GHG emissions of landfill over time Methane production: m²/ñ Gas Collection (50% methane): m²/ñ	first oder decay model	2003			8 844	1.039	1.215 1.458	1.374 1.649	1.519 1.822	1.649 1.979	1.768 1.8 2.121 2.1	74 1.97 49 2.36	1 2.059 5 2.470	2.138 2.566	2.210 2.652	2.274 2.729	2.333	2.386 2.863	2.434 2.921	2.478 2.973	2.517 3.021	2.553	2.585 3.102	2.614 3.137	2.640 3.168	2.664 3.197	2.686 3.223	2.70
Model equation: US EPA Yea Total GHG emissions of landfill over time Methane production: m²/n Gas Collection (50% methane): m²/n Methane collection (60%): m²/n	first oder decay model	2003	214	390 624	8 844 1.013 506	1.039 1.246 623	1.215 1.458 729	1.374 1.649 825	1.519 1.822 911	1.649 1.979 990	1.768 1.8 2.121 2.1 1.061 1.	74 1.97 49 2.36 25 1.18	1 2.059 5 2.470 3 1.235	2.138 2.566 1.283	2.210 2.652 1.326	2.274 2.729 1.365	2.333 2.800 1.400	2.386 2.863 1.432	2.434 2.921 1.461	2.478 2.973 1.487	2.517 3.021 1.510	2.553 3.063 1.532	2.585 3.102 1.551	2.614 3.137 1.568	2.640 3.168 1.584	2.664 3.197 1.599	2.686 3.223 1.612	2.70 3.24 1.62
Model equation: US EPA Yea Total GHG emissions of landfill over time Methane production: m²/r Methane collection (60%): m²/r Methane production: m²/r	first oder decay model	2003 19 170.716	1.875.314	390 628 3.420.469 5.505.070	8 844 1.013 506 6 7.391.306	1.039 1.246 623 9.098.038 1	1.215 1.458 729 10.642.353	1.374 1.649 825 12.039.707	1.519 1.822 911 13.304.085	1.649 1.979 990 14.448.141 15.4	1.768 1.3 2.121 2.1 1.061 1.3 3.326 16.420.4	74 1.97 49 2.36 25 1.18 00 17.267.53	1 2.059 5 2.470 3 1.235 8 18.034.422	2.138 2.566 1.283 18.728.328	2.210 2.652 1.326 19.356.199	2.274 2.729 1.365 19.924.321	2.333 2.800 1.400 20.438.379	2.386 2.863 1.432 20.903.517	2.434 2.921 1.461 21.324.392	2.478 2.973 1.487 21.705.215	2.517 3.021 1.510 22.049.799 2	2.553 3.063 1.532 2.361.590	2.585 3.102 1.551 22.643.711	2.614 3.137 1.568 22.898.985	2.640 3.168 1.584 23.129.966	2.664 3.197 1.599 23.338.966	2.686 3.223 1.612 23.528.077	2.70 3.24 1.62 23.699.19
Model equation: US EPA Yea Total GHG emissions of landfill over time Methane production: m²/r Gas Collection (50% methane): m²/r Methane collection (60%): m²/r Methane production: m²/r Methane production: t CH ₄ .	first oder decay model 2002 - 0 0 a 0	2003 19 170.716 114	1.875.314 1.251	390 624	8 844 1.013 506 6 7.391.306 3 4.931	1.039 1.246 623 9.098.038 1 6.070	1.215 1.458 729 10.642.353 7.100	1.374 1.649 825 12.039.707 8.032	1.519 1.822 911 13.304.085 8.876	1.649 1.979 990 14.448.141 15.4 9.639	1.768 1.3 2.121 2.3 1.061 1.3 3.326 16.420.4 0.330 10.8	74 1.97 49 2.36 25 1.18 00 17.267.53 55 11.52	1 2.059 5 2.470 3 1.235 8 18.034.422 0 12.032	2:138 2:566 1:283 18:728:328 12:495	2.210 2.652 1.326 19.356.199 12.913	2.274 2.729 1.365 19.924.321 13.292	2.333 2.800 1.400 20.438.379 13.635	2.386 2.863 1.432 20.903.517 13.946	2.434 2.921 1.461 21.324.392 14.227	2.478 2.973 1.487 21.705.215 14.481	2.517 3.021 1.510 22.049.799 2 14.710	2.553 3.063 1.532 2.361.590 14.918	2.585 3.102 1.551 22.643.711 15.107	2.614 3.137 1.568 22.898.985 15.277	2.640 3.168 1.584 23.129.966 15.431	2.664 3.197 1.599 23.338.966 15.571	2.686 3.223 1.612 23.528.077 15.697	2.70 3.24 1.62 23.699.19 15.81
Model equation: US EPA Yea Total GHG emissions of landfill over time Methane production: m²/r Methane collection (60%: m²/r Methane production: Methane production: default collection (60%: m²/r Methane production: default collection (60%: m²/r Methane production: t CH4. MD_project_s = MD_peag(eff. 98%): t CH4.	first oder decay model 2002	2003 19 170.716 114	1.875.314	390 628 3.420.469 5.505.070	8 844 1.013 506 6 7.391.306 3 4.931 0 2.899	1.039 1.246 623 9.098.038 1 6.070 3.569	1.215 1.458 729 10.642.353 7.100 4.175	1.374 1.649 825 12.039.707 8.032 4.723	1.519 1.822 911 13.304.085 8.876 5.219	1.649 1.979 990 14.448.141 15.4 9.639 5.668	1.768 1.3 2.121 2.3 1.061 1. 3.326 16.420.0 0.330 10.3 6.074 6.4	74 1.97 49 2.36 25 1.18 00 17.267.53 55 11.52 41 6.77	1 2.059 5 2.470 3 1.235 8 18.034.422 0 12.032 4 7.075	2.138 2.566 1.283 18.728.328 12.495 7.347	2.210 2.652 1.326 19.356.199 12.913 7.593	2.274 2.729 1.365 19.924.321 13.292 7.816	2.333 2.800 1.400 20.438.379 13.635 8.018	2.386 2.863 1.432 20.903.517 13.946 8.200	2.434 2.921 1.461 21.324.392 14.227 8.365	2.478 2.973 1.487 21.705.215 14.481 8.515	2.517 3.021 1.510 22.049.799 2 14.710 8.650	2.553 3.063 1.532 2.361.590 14.918 8.772	2.585 3.102 1.551 22.643.711 15.107 8.883	2.614 3.137 1.568 22.898.985 15.277 8.983	2.640 3.168 1.584 23.129.966 15.431 9.073	2.664 3.197 1.599 23.338.966 15.571 9.155	2.686 3.223 1.612 23.528.077 15.697 9.230	2.70 3.24 1.62 23.699.19 15.81
Model equation: US EPA Yea Total GHG emissions of landfill over time Methane production: m²/r/ Methane collection (60%): m²/r Methane production: m²/r Methane production: defaultion (60%): m²/r Methane production: t CH ₄ MD _{#998853} = MD _{Reesa,} (eff. 98%): t CH ₄ MD _{#998853} = t CH ₄ MD _{#998853} = t CH ₄	first oder decay model 2002 - 0 a 0 a 0 a 0 a 0	2003 19 170.716 114 0	1.875.314 1.251 0	3.420.469 5.505.07(2.282 3.673 0 (8 844 1.013 506 6 7.391.306 3 4.931 0 2.899 0 290	1.039 1.246 623 9.098.038 1 6.070 3.569	1.215 1.458 729 10.642.353 7.100 4.175 417	1.374 1.649 825 12.039.707 8.032 4.723 472	1.519 1.822 911 13.304.085 8.876 5.219	1.649 1.979 990 14.448.141 15.4 9.639 5.668 567	1.768 1.3 2.121 2.3 1.061 1. 3.326 16.420.0 0.330 10.3 6.074 6.4 607 (6	74 1.97 49 2.36 25 1.18 00 17.267.53 55 11.52 41 6.77 44 67	1 2.059 5 2.470 3 1.235 8 18.034.422 0 12.032 4 7.075 7 707	2.138 2.566 1.283 18.728.328 12.495 7.347 735	2.210 2.652 1.326 19.356.199 12.913 7.593	2.274 2.729 1.365 19.924.321 13.292 7.816 782	2.333 2.800 1.400 20.438.379 13.635 8.018 802	2.386 2.863 1.432 20.903.517 13.946 8.200 820	2.434 2.921 1.461 21.324.392 14.227 8.365 837	2.478 2.973 1.487 21.705.215 14.481 8.515 851	2.517 3.021 1.510 22.049.799 2 14.710 8.650 865	2.553 3.063 1.532 2.361.590 14.918 8.772 877	2.585 3.102 1.551 22.643.711 15.107 8.883 888	2.614 3.137 1.568 22.898.985 15.277 8.983 898	2.640 3.168 1.584 23.129.966 15.431 9.073 907	2.664 3.197 1.599 23.338.966 15.571 9.155	2.686 3.223 1.612 23.528.077 15.697 9.230	2.70 3.24 1.62 23.699.19 15.81 9.29
Model equation: US EPA Yea Total GHG emissions of landfill over time Methane production: m²//r Methane collection (60%): m²/r Methane production: m²/r Methane production: m²/r Methane production: 1 CH ₄ MD _{#998643} = MD _{Reed3} (eff. 98%): 1 CH ₄ Landfill GHG emissions in CO _{LECUIVASE45} t CO ₂ .	first oder decay model 2002	19 170.716 114 0 0 2.392	1.875.314 1.251 0	390 628 3.420.469 5.505.070	8 844 1.013 506 6 7.391.306 3 4.931 0 2.899 0 290 7 103.553	1.039 1.246 623 9.098.038 1 6.070 3.569 357	1.215 1.458 729 10.642.353 7.100 4.175 417	1.374 1.649 825 12.039.707 8.032 4.723 472 168.678	1.519 1.822 911 13.304.085 8.876 5.219 522 186.392	1.649 1.979 990 14.448.141 15.4 9.639 5.668 567 202.420	1.768 1.4 2.121 2.4 1.061 1.3 3.326 16.420.1 0.330 10.9 6.074 6.6 607 (6.923 230.1	74 1.97 49 2.36 25 1.18 00 17.267.53 55 11.52 41 6.77 44 67	1 2.059 5 2.470 3 1.235 8 18.034.422 0 12.032 4 7.075 7 707 0 252.664	2.138 2.566 1.283 18.728.328 12.495 7.347 735 262.386	2.210 2.652 1.326 19.356.199 12.913 7.593 759 271.183	2.274 2.729 1.365 19.924.321 13.292 7.816 782 279.112	2.333 2.800 1.400 20.438.379 13.635 8.018 802 286.344	2.386 2.863 1.432 20.903.517 13.946 8.200 820 292.861	2.434 2.921 1.461 21.324.392 14.227 8.365 837 298.757	2.478 2.973 1.487 21.705.215 14.481 8.515 851 304.093	2.517 3.021 1.510 22.049.799 2 14.710 8.650 865 308.920	2.553 3.063 1.532 2.361.590 14.918 8.772 877 313.288	2.585 3.102 1.551 22.643.711 15.107 8.883 888 317.241	2.614 3.137 1.568 22.898.985 15.277 8.983 898 320.817	2.640 3.168 1.584 23.129.966 15.431 9.073 907 324.054	2.664 3.197 1.599 23.338.966 15.571 9.155 916 326.982	2.686 3.223 1.612 23.528.077 15.697 9.230 923 329.631	2.70 3.24 1.62 23.699.19 15.81 9.29 93
Model equation: US EPA Yea Total GHG emissions of landfill over time Methane production: m²/l/ Methane collection (60%): m²/l/ Methane production: m²/l/ Methane production: m²/l/ Methane production: 1CH ₄ MD _{propetty} = MD _{Passay} (eff. 98%): 1CH ₄ MD _{propetty} = MD _{Passay} (eff. 98%): 1CH ₄ Landfill GHG emissions in CO _{2-monotonic} 1CO ₂ PEffarey: 1CO ₂	First oder decay model 2002	19 170.716 114 0 0 2.392	1.875.314 1.251 0	3.420.469 5.505.07(2.282 3.673 0 (8 844 1.013 506 6 7.391.306 3 4.931 0 2.899 0 290 7 103.553 0 1.243	1.039 1.246 623 9.098.038 1 6.070 3.569 357 127.465	1.215 1.458 729 10.642.353 7.100 4.175 417 149.101	1.374 1.649 825 12.039.707 8.032 4.723 472 168.678 2.024	1.519 1.822 911 13.304.085 8.876 5.219 522 186.392 2.237	1.649 1.979 990 14.448.141 15.4 9.639 5.668 567 202.420 2.429	1.768 1.4 2.121 2.1 1.061 1. 3.326 16.420.1 0.330 10.1 6.074 6. 6.074 6. 6.923 230.1 2.603 2.	74 1.97 49 2.36 25 1.18 00 17.267.53 55 11.52 41 6.77 44 67 16 241.92	1 2.059 5 2.470 3 1.235 8 18.034.422 0 12.032 4 7.075 7 707 0 252.664 3 3.032	2.138 2.566 1.283 18.728.328 12.495 7.347 735 262.386 3.149	2.210 2.652 1.326 19.356.199 12.913 7.593 759 271.183 3.254	2.274 2.729 1.365 19.924.321 13.292 7.816 782 279.142 3.350	2.333 2.800 1.400 20.438.379 13.635 8.018 802 286.344 3.436	2.386 2.863 1.432 20.903.517 13.946 8.200 820 292.861 3.514	2.434 2.921 1.461 21.324.392 14.227 8.365 837 298.757 3.585	2.478 2.973 1.487 21.705.215 14.481 8.515 851 301.093 3.649	2.517 3.021 1.510 22.049.799 2 14.710 8.650 865 308.920 3.707	2.553 3.063 1.532 2.361.590 14.918 8.772 877 313.288 3.759	2.585 3,102 1.551 22.643.711 15,107 8.883 888 317.241 3.807	2.614 3.137 1.568 22.898.985 15.277 8.963 898 320.817 3.850	2.640 3.168 1.584 23.129.966 15.431 9.073 907 324.054 3.889	2.664 3.197 1.599 23.338.966 15.571 9.155 916 326.982 3.924	2.686 3.223 1.612 23.528.077 15.697 9.230 923 329.631 3.956	2.70 3.24 1.62 23.699.19 15.81 9.29 93 332.01
Model equation: US EPA Yea Total GHG emissions of landfill over time Methane production: m²/l/ Methane collection (60%): m²/l/ Methane production: m²/l/ Methane production: m²/l/ Methane production: 1CH ₄ MD _{project,y} = MD _{Pases,y} (eff. 98%): 1CH ₄ Landfill GHG emissions in CO _{2-monotoner} PEflare,y: 1CO2 PEflare,y: 1CC4	First oder decay model 2002	19 170.716 114 0 0 2.392	1.875.314 1.251 0	3.420.469 5.505.07(2.282 3.673 0 (8 844 1.013 506 6 7.391.306 3 4.931 0 2.899 0 290 7 103.553	1.039 1.246 623 9.098.038 1 6.070 3.569 357	1.215 1.458 729 10.642.353 7.100 4.175 417	1.374 1.649 825 12.039.707 8.032 4.723 472 168.678	1.519 1.822 911 13.304.085 8.876 5.219 522 186.392	1.649 1.979 990 14.448.141 15.4 9.639 5.668 567 202.420	1.768 1.4 2.121 2.1 1.061 1. 3.326 16.420.1 0.330 10.1 6.074 6. 6.074 6. 6.923 230.1 2.603 2.	74 1.97 49 2.36 25 1.18 00 17.267.53 55 11.52 41 6.77 44 67	1 2.059 5 2.470 3 1.235 8 18.034.422 0 12.032 4 7.075 7 707 0 252.664 3 3.032	2.138 2.566 1.283 18.728.328 12.495 7.347 735 262.386	2.210 2.652 1.326 19.356.199 12.913 7.593 759 271.183	2.274 2.729 1.365 19.924.321 13.292 7.816 782 279.112	2.333 2.800 1.400 20.438.379 13.635 8.018 802 286.344	2.386 2.863 1.432 20.903.517 13.946 8.200 820 292.861	2.434 2.921 1.461 21.324.392 14.227 8.365 837 298.757	2.478 2.973 1.487 21.705.215 14.481 8.515 851 304.093	2.517 3.021 1.510 22.049.799 2 14.710 8.650 865 308.920	2.553 3.063 1.532 2.361.590 14.918 8.772 877 313.288	2.585 3.102 1.551 22.643.711 15.107 8.883 888 317.241	2.614 3.137 1.568 22.898.985 15.277 8.983 898 320.817	2.640 3.168 1.584 23.129.966 15.431 9.073 907 324.054	2.664 3.197 1.599 23.338.966 15.571 9.155 916 326.982	2.686 3.223 1.612 23.528.077 15.697 9.230 923 329.631	2.7(3.24 1.62 23.699.11 15.8 9.24 9.23 332.02
Model equation: US EPA Yea Total GHG emissions of landfill over time Methane production: m²/r Methane collection (60%): m²/r Methane production: m²/r Methane production: m²/r Methane production: tCH ₄ MD _{production} + MD _{production} + CH ₄ Landfill GHG emissions in CO _{production} + CO _{production} + CO _{production} PEfiarey: tCO ₂ PEfiarey: tCO ₄ Emission Reductions (ER) 2004 - 2024	7 2002 2002	19 170.716 114 0 0 2.392	1.875.314 1.251 0	3.420.469 5.505.07(2.282 3.673 0 (8 844 1.013 506 8 7.391.306 3 4.931 0 2.899 7 103.553 0 1.243 0 59	1.039 1.246 623 9.098.038 1 6.070 3.569 357 127.465 1.530 73	1.215 1.458 729 10.642.353 7.100 4.175 417 149.101 1.789 85	1.374 1.649 825 12.039.707 8.032 4.723 4.723 168.678 2.024	1.519 1.822 911 13.304.085 8.876 5.219 522 186.392 2.237 107	1.649 1.979 990 14.448.141 15.4 9.639 5.668 567 202.420 2.429	1.768 1.3 2.121 2.3 1.061 1. 3.326 16.420.0 0.330 10.1 6.074 6. 6.072 6. 6.093 230.3 2.603 2.	1,9774 1,97749 2,36 49 2,36 25 1,18 300 17,267,53 55 11,52 41 6,77 44 67 46 241,92 51 2,90 31 13	1 2.059 5 2.470 3 1.235 8 18.034.422 0 12.032 4 7.075 7 707 0 252.664 3 3.032 8 144	2.138 2.566 1.283 18.728.328 12.495 7.347 7.35 262.386 3.149	2.210 2.652 1.326 19.356.199 12.913 7.593 759 271.483 3.254 155	2.274 2.729 1.365 19.924.321 13.292 7.816 782 279.142 3.350 160	2.333 2.800 1.400 20.438.379 : 13.635 8.018 802 286.341 3.436 164	2.386 2.863 1.432 20.903.517 13.946 8.200 820 292.861 3.514	2.434 2.921 1.461 21.324.392 14.227 8.365 837 298.767 3.585	2.478 2.973 1.487 21.705.215 14.481 8.515 851 304.093 3.649 174	2.517 3.021 1.510 22.049.799 2.14.710 8.650 865 308.920 3.707 177	2.553 3.063 1.532 2.361.590 14.918 8.772 877 313.288 3.759	2.585 3.102 1.551 22.643.711 15.107 8.883 888 317.241 3.807 181	2.614 3.137 1.568 22.898.985 15.277 8.983 898 320.817 3.850 183	2.640 3.168 1.584 23.129.966 15.431 9.073 907 324.054 3.889 185	2,664 3,197 1,599 23,338,966 15,571 9,155 916 326,982 3,924 187	2.686 3.223 1.612 23.528.077 15.697 9.230 923 329.631 3.956 188	2.7(3.2- 1.6) 23.699.11 15.8 9.2- 9; 332.0; 3.9- 15
Model equation: US EPA Yea Total GHG emissions of landfill over time Methane production: m²/r Methane collection (60%): m²/r Methane production: Methane production: m²/r Methane production: tCH ₄ , MD _{product,2} = MD _{product,3} = MD _{product,4} = MD _{product,4} = tCH ₄ , Landfill GHG emissions in CO _{2-current,4} tCO ₂ PEffare,y: tCO ₄ PEffare,y: tCO ₄ Emission Reductions (ER) 2004 - 2024 Project emissions (non-flared/combusted): tCO ₂ .	7 2002 2002 2002 2002 2002 2002 2002 200	2003 19 170.716 114 0 0 2.392 0 0	214 1.875.314 1.251 0 0 26.273 0	390 626 3.420.469 5.505.077 2.262 3.677 0 (47.921 77.122 0 (0 (8 844 1.013 506 6 7.391.306 3 4.931 0 2.899 0 290 7 103.553 0 1.243 0 59	1.039 1.246 623 9.098.038 1 6.070 3.569 357 127.465 1.530 73	1.215 1.458 729 10.642.353 7.100 4.175 417 149.101 1.789 85	1.374 1.649 825 12.039.707 8.032 4.723 472 168.678 2.024 96	1.519 1.822 911 13.304.085 8.876 5.219 522 186.392 2.237 107 74.557	1.649 1.979 990 14.448.141 15.4 9.639 5.668 567 202.420 5 2.429 116	1.768 1.3 2.121 2.3 1.061 1.3 3.326 16.420.0 3.330 10.9 6.074 6.6 607 60 6.893 230.0 2.603 2.5 124 6.769 92.0	1.974 1.9749 2.36625 1.18 2.90 17.267.535 11.5225 11.627.535 11.5225 1	1 2.059 5 2.470 3 1.235 8 18.034.422 0 12.032 4 7.075 7 707 7 707 0 252.664 3 3 3.032 8 144	2.138 2.566 1.283 18.728.328 12.495 7.347 735 262.386 3.149 150	2.210 2.652 1.326 19.356.199 12.913 7.593 759 271.183 3.254 155	2.274 2.729 1.365 19.924.321 13.292 7.816 782 279.142 3.350 160	2.333 2.800 1.400 20.438.379 13.635 8.018 802 286.344 3.436 164	2.386 2.863 1.432 20.903.517 13.946 8.200 820 292.881 3.514 167	2.434 2.921 1.461 21.324.392 14.227 8.365 837 298.757 3.585 171	2.478 2.973 1.487 21.705.215 14.481 8.515 851 304.093 3.649 174	2.517 3.021 1.510 22.049.799 14.710 8.650 865 308.920 3.707 177	2.553 3.063 1.532 2.361.590 14.918 8.772 877 313.288 3.759 179	2.585 3.102 1.551 22.643.711 15.107 8.883 888 317.241 3.807 181	2.614 3.137 1.568 22.898.985 15.277 8.983 898 320.817 3.850 183	2.640 3.168 1.584 23.129.966 15.431 9.073 907 324.054 3.889 185	2.664 3.197 1.599 23.338.966 15.571 9.155 916 326.982 3.924 187	2.686 3.223 1.612 23.528.077 15.697 9.230 923 329.631 3.956 188	2.70 3.24 1.62 23.699.19 15.81 9.29 93 332.07 3.98 19
### Model equation: US EPA Yea Yea	0 a 0 a 0 a 0 a 0 a 0 a 0 a 0 a 0 a 0 a	2003 19 170.716 114 0 0 2.392 0 0	214 1.875.314 1.251 0 0 26.273 0 0	3.420.469 5.505.07(2.282 3.673 0 (8 844 1.013 506 5 7.391.306 3 4.931 0 2.899 0 290 7 103.553 0 1.243 0 59	1.039 1.246 623 9.096.038 1 6.070 3.569 127.465 1.530 73 50.986	1.215 1.458 729 10.642.353 7.100 4.175 417 149.101 1.789 85 59.640 149.101	1.374 1.649 825 12.039.707 8.032 4.723 472 168.678 2.024 96 67.471 168.678	1.519 1.822 911 13.304.085 8.876 5.219 522 186.392 2.237 107 74.557 186.392	1.649 1.979 990 14.448.141 15.4 9.639 5.668 567 202.420 5 2.429 116 80.968 202.420 5	1.768 1.172 1.22 1.21 2.23 1.061 1.23 3.26 16.420 1.03 3.30 10.10 1.03 3.00 10.00 3.00 10.	1.974 1.9749 2.36625 1.18 1.9267.535 11.52	1 2.059 5 2.470 3 1.235 8 18.034.422 0 12.032 4 7.075 7 0.0 252.664 3 .032 6 101.066 0 252.664	2.138 2.566 1.283 18.728.328 12.495 7.347 735 262.386 3.149 150 104.954 262.386	2.210 2.652 1.326 19.356.199 12.913 7.593 759 271.183 3.254 155	2.274 2.729 1.365 19.924.321 13.292 7.816 782 279.142 3.350 160 111.657 279.142	2,333 2,800 1,400 20,438,379 ; 13,635 8,018 8,022 286,344 14,538 286,344	2.386 2.863 1.432 20.903.517 13.946 8.200 820 292.861 3.514 167	2.434 2.921 1.461 21.324.392 14.227 8.365 837 298.767 3.585 171 119.503 298.757	2.478 2.973 1.487 21.705.215 14.481 8.515 851 304.093 174 121.637 304.093	2.517 3.021 1.510 22.049.799 14.710 8.650 865 308.920 3.707 177 123.568 308.920	2.553 3.063 1.532 2.361.590 14.918 8.772 877 313.288 3.759 179 125.315 313.288	2.585 3.102 1.551 22.643.711 15.107 8.883 888 317.241 3.807 181 126.896 317.241	2.614 3.137 1.568 22.896.985 15.277 8.983 898 320.817 3.850 183 128.327 320.817	2,640 3,168 1,584 23,129,966 15,431 9,073 907 324,054 3,889 185 129,621 324,054	2.664 3.197 1.599 23.338.966 15.571 9.155 916 326.982 3.924 187 130.793 326.982	2.686 3.223 1.612 23.528.077 15.697 9.230 923 329.631 3.956 188	2.7(3.2- 1.6) 23.699.11 15.8 9.2! 9: 332.0; 3.94 11 132.8 332.0;
Total GHG emissions of landfill over time Methane production: Teth. Midray: Teth. Landfill GHG emissions in CO _{2-reservation} Teth. Landfill GHG emissions in CO _{2-reservation} Teth. Emission Reductions (ER) 2004 - 2024 Project emissions (non-flared/combusted): LO2, Baseline emissions: LC02, ER without effectivness adjustment: LC03	2002 2002 2002 2002 2002 2002 2002 200	2003 19 170.716 114 0 0 2.392 0 0	214 1.875.314 1.251 0 0 26.273 0 0	390 626 3.420.469 5.505.077 2.262 3.677 0 (47.921 77.122 0 (0 (8 844 1.013 506 6 7.391.306 3 4.931 0 2.899 0 290 7 103.553 0 1.243 0 59	1.039 1.246 623 9.096.038 1 6.070 3.569 127.465 1.530 73 50.986	1.215 1.458 729 10.642.353 7.100 4.175 417 149.101 1.789 85	1.374 1.649 825 12.039.707 8.032 4.723 472 168.678 2.024 96 67.471 168.678	1.519 1.822 911 13.304.085 8.876 5.219 522 186.392 2.237 107 74.557 186.392	1.649 1.979 990 14.448.141 15.4 9.639 5.668 567 202.420 5 2.429 116	1.768 1.172 1.22 1.21 2.23 1.061 1.23 3.26 16.420 1.03 3.30 10.10 1.03 3.00 10.00 3.00 10.	1.974 1.9749 2.36625 1.18 1.9267.535 11.52	1 2.059 5 2.470 3 1.235 8 18.034.422 0 12.032 4 7.075 7 0.0 252.664 3 .032 6 101.066 0 252.664	2.138 2.566 1.283 18.728.328 12.495 7.347 735 262.386 3.149 150	2.210 2.652 1.326 19.356.199 12.913 7.593 759 271.183 3.254 155	2.274 2.729 1.365 19.924.321 13.292 7.816 782 279.142 3.350 160 111.657 279.142	2,333 2,800 1,400 20,438,379 ; 13,635 8,018 8,022 286,344 14,538 286,344	2.386 2.863 1.432 20.903.517 13.946 8.200 820 292.881 3.514 167	2.434 2.921 1.461 21.324.392 14.227 8.365 837 298.757 3.585 171	2.478 2.973 1.487 21.705.215 14.481 8.515 851 304.093 174 121.637 304.093	2.517 3.021 1.510 22.049.799 14.710 8.650 865 308.920 3.707 177	2.553 3.063 1.532 2.361.590 14.918 8.772 877 313.288 3.759 179 125.315 313.288	2.585 3.102 1.551 22.643.711 15.107 8.883 888 317.241 3.807 181 126.896 317.241	2.614 3.137 1.568 22.896.985 15.277 8.983 898 320.817 3.850 183 128.327 320.817	2,640 3,168 1,584 23,129,966 15,431 9,073 907 324,054 3,889 185 129,621 324,054	2.664 3.197 1.599 23.338.966 15.571 9.155 916 326.982 3.924 187 130.793 326.982	2.686 3.223 1.612 23.528.077 15.697 9.230 923 329.631 3.956 188	2.7 3.2 1.6 23.699.1 15.8 9.2 9 332.0 3.9 1 132.8 332.0
### Model equation: US EPA Yea Yea	2002 2002 2002 2002 2002 2002 2002 200	2003 19 170.716 114 0 0 2.392 0 0	214 1.875.314 1.251 0 26.273 0 0 26.273	390 624 3.420.469 5.505.0707 2.282 3.67' 0 0 1 47.921 77.12' 0 0 47.921 77.12' 0 1 47.921 77.12'	8 844 1.013 506 5 7.391.306 3 4.931 0 2.899 0 290 7 103.553 0 1.243 0 59	1.039 1.246 623 9.098.038 1 6.070 3.569 357 127.485 1.530 73 50.986 127.485 76.479	1.215 1.458 729 10.642.353 7.100 4.175 417 149.101 1.789 85 59.640 149.101	1.374 1.649 825 12.039.707 8.032 4.723 472 168.678 2.024 96 67.471 168.678	1.519 1.822 911 13.304.085 8.876 5.219 522 186.392 2.237 107 74.557 186.392 111.835	1.649 1.979 990 14.448.141 15.4 9.639 5.668 202.420 2.429 116 80.968 202.420 2.121.462	1.768 1.172 1.22 1.21 2.23 1.061 1.23 3.26 16.420 1.03 3.30 10.10 1.03 3.00 10.00 3.00 10.	1.974 1.9749 2.36 1.189 2.36 1.1800 17.267.53 1.52 1.52 1.52 1	1 2.059 5 2.470 3 1.235 8 18.034.422 0 12.032 4 7.075 7 70 7 70 7 00 252.664 3 101.066 8 101.066 0 252.664 2 151.599	2.138 2.566 1.283 18.728.328 12.495 7.347 735 262.386 1150 104.954 262.386 157.432	2.210 2.652 1.326 19.356.199 12.913 7.593 7593 271.183 155 108.473 271.183	2.274 2.729 1.365 19.924.321 13.292 7.816 782 279.142 3.350 111.657 279.142 167.485	2,333 2,800 1,400 20,438,379 13,635 8,018 802 286,344 3,436 164 114,538 286,344 171,806	2.386 2.863 1.432 20.903.517 13.946 8.200 820 292.861 3.514 167	2.434 2.921 1.461 21.324.392 14.227 8.365 837 298.767 3.585 171 119.503 298.757	2.478 2.973 1.487 21.705.215 14.481 8.515 851 304.093 3.649 174 121.637 304.093 182.466	2.517 3.021 1.510 22.049.799 14.710 8.650 865 308.920 3.707 177 123.568 308.920	2.553 3.063 1.532 2.361.590 14.918 8.772 877 313.288 3.759 179 125.315 313.288	2.585 3.102 1.551 22.643.711 15.107 8.883 888 317.241 3.807 181 126.896 317.241 190.345	2.614 3.137 1.568 22.896.985 15.277 8.983 898 320.817 3.850 183 128.327 320.817	2,640 3,168 1,584 23,129,966 15,431 9,073 907 324,054 3,889 185 129,621 324,054 194,432	2.664 3.197 1.599 23.338.966 15.571 9.155 916 326.982 3.924 187 130.793 326.982	2.686 3.223 1.612 23.528.077 15.697 9.230 923 329.631 3.956 188	2.7(3.2: 1.6: 23.699.1! 15.8: 9.2! 332.0: 3.9: 1!
Model equation: US EPA Yea Total GHG emissions of landfill over time Methane production: m²/r Methane collection (50% methane): m²/r Methane collection (50%: m²/r Methane production: 1 CH ₄ MD _{PSSRTX} = MD _{Resign} (eff. 98%): 1 CH ₄ MD _{Dgg, 1} 1 CH ₄ Landfill GHG emissions in CO _{2-resistant} 1 CO ₂ PEflare, v: 1 CO2 PEflare, v: 1 CH4 Emission Reductions (ER) 2004 - 2024 Emission Reductions (ER) 2004 - 2024 Englishment (CO2 Baseline emissions: 1 CO2 Project emissions (non-flared/combusted): 1 CO2 Project emissions (non-flared/combusted) (considering adjustment factor): 1 CO2 Baseline emissions (with adjustment factor): 1 CO2 Baseline emissions (with adjustment factor): 1 CO2		2003 19 170.716 1114 0 0 2.392 0 0 2.392 0 0	214 1.875.314 1.251 0 26.273 0 0 26.273	390 628 3 420 469 5.505.07 2 282 3.87 0 6 47.921 77.12 0 6 47.921 77.12 0 7 1 47.921 77.12	8 844 1.013 506 8 7.391.306 3 4.931 0 2.889 0 7 103.553 0 59 0 41.421 7 103.553 0 62.132 0 38.397	1.039 1.246 623 9.096.038 1.6.070 3.569 357 127.468 1.530 73 50.986 127.465 76.479	1,215 1,458 729 10,642,353 7,100 4,175 417 149,101 1,789 85 59,640 149,101 89,460	1.374 1.649 825 12.039.707 8.032 4.723 472 168.678 2.024 96 67.471 168.678 101.207	1.519 1.822 911 13.304.085 8.876 5.219 522 186.392 2.237 107 74.557 186.392 111.835	1.649 1.979 990 14.448.141 15.4 9.639 5.668 567 202.420 2.429 116 80.968 202.420 2.121.452 75.057	1,768 1,1	1.974 1.9749 2.36 25 1.18 20 17.267.53 25 11.52 25 1.18 27 1.52 28 1.52 28 1.52 28 1.52 28 28 28 28 28 28 28 28 28 28 28 28 28 28 28 28 28 28 28 28 28	1 2.059 6 2.470 3 1.235 8 18.034.422 0 12.032 4 7.075 7 707 7 00 252.664 8 101.066 8 101.066 0 252.664 2 151.599 4 93.688	2.138 2.566 1.283 18.728.328 12.495 7.347 735 262.386 3.149 150 104.954 262.386 157.432 97.293	2 210 2 652 1 326 19 356 199 12 913 7 593 271 183 3 254 155 108 473 271 183 162 710	2.274 2.729 1.365 19.924.321 13.292 7.816 782 279.142 3.350 111.657 279.142 167.485	2 333 2 800 1,400 20,438,379 13,635 8,018 802 286,344 3,436 164 114,538 286,344 171,806 106,176	2.386 2.863 1.432 20.903.517 13.946 8.200 820 292.861 3.514 167 117.144 292.861 175.716	2.434 2.921 1.461 21.324.392 14.227 8.365 837 298.767 3.585 171 119.503 298.757 179.254	2.478 2.973 1.487 21.705.215 14.481 8.515 851 304.093 3.649 174 121.637 304.093 182.466 112.758	2.517 3.021 1.510 22.049.799 24.710 8.650 8650 8650 308.920 3.707 177 123.568 308.920 185.352	2.553 3.063 1.532 2.361.590 14.918 8.772 877 313.288 3.759 179 125.315 313.288 187.973 116.167	2.585 3.102 1.551 22.643.711 15.107 8.883 888 317.241 3.807 181 126.896 317.241 190.345 117.633	2.614 3.137 1.568 22.896.985 15.277 8.983 898 320.817 3.850 183 128.327 320.817 192.490	2.640 3.168 1.584 23.129.966 15.431 9.073 907 324.054 185 129.621 324.054 194.432 120.159	2.664 3.197 1.599 23.338.966 15.571 9.155 916 326.962 3.924 187 130.793 326.962 196.189	2.686 3.223 1.612 23.528.077 15.697 9.230 923 329.631 3.956 188 131.852 329.631 197.779	2.70 3.24 1.66 23.699.11 15.8 9.21 9: 332.00 3.99 11 132.8 332.00 199.2 123.1
Model equation: Weath and production: Methane production: Teth. Monage: 1 CCL, PEflare.y: 1 CCL, Baseline emissions: 1 CCQ, ER without effectivness adjustment: 1 CCQ, Project emissions (non-flared/combusted); considering adjustment factor): Proportional Project emissions (non-flared/combusted) (considering adjustment factor): 1 CCQ, Proportional Project emissions (non-flared/combusted) (considering adjustment factor):		2003 19 170.716 1114 0 0 2.392 0 0 2.392 0 0	214 1.875.314 1.251 0 26.273 0 0 26.273	390 621 3.420.469 5.505.07 2.282 3.67 0 1 47.921 77.12 0 1 47.921 77.12 0 1 47.921 77.12	8 844 1.013 506 6 7.391.306 3 4.931 0 290 7 103.553 0 1.243 0 53 0 41.421 7 103.553 0 62.132 0 38.397 4 93.198	1.039 1.246 623 9.098.038 1 6.070 3.569 127.465 1.530 73 50.986 127.465 76.479 47.264	1.215 1.458 729 10.642.353 7.100 4.175 149.101 1.789 85 59.640 149.101 89.460 55.287	1.374 1.649 825 12.039.707 8.032 4.723 4.723 168.678 2.024 96 67.471 168.678 101.207 62.546 151.810	1.519 1.822 911 13.304.085 8.876 5.219 522 186.392 2.237 107 74.557 186.392 111.835 69.114 167.753	1.649 1.979 990 14.448.141 15.4 9.639 5.668 567 202.420 2.429 116 80.968 202.420 2121.452 175.057	1.768 1.1 2.121 2.2 1.061 1. 3.328 16.420.0 3.30 10.0.330 10.0 6.074 6. 6.074 6. 6.072 6. 6.073 22 2.00.330 12 2.1 2.1 2.2 2.00.3 2.1 2.00.3 2	74 1.97 49 2.36 25 1.18 00 17.267.55 55 11.52 55 11.52 67 44 67 44 67 44 67 45 241.92 46 241.92 46 241.92 47 48 96.76 49 96.76 40 98.70 40 99.70 40 99.70	1 2.059 5 2.470 3 1.235 8 18.034.422 0 12.032 4 7.075 7 707 0 252.684 3 3.032 8 144 8 101.066 0 252.684 2 151.599 4 93.688 8 227.398	2.138 2.566 1.283 18.728.328 12.495 7.347 735 262.388 3.149 150 104.954 262.366 157.432 97.293 236.147	2 210 2 652 1 326 19 356 199 12 913 7 599 271.183 3 254 155 108.473 271.183 162.710 100.555 244.064	2.274 2.729 1.365 19.924.321 13.292 7.816 782 279.142 3.350 160 111.657 279.142 167.485 103.506 251.228	2,333 2,800 1,400 20,438,379; 13,635 8,018 802 288,344 3,436 164 114,538 286,344 471,806 106,176 257,710	2.386 2.863 1.432 20.903.517 13.946 8.200 820 292.881 3.514 167 117.144 292.881 175.716 108.593 263.575	2.434 2.921 1.461 21.324.392 14.227 8.365 3.585 171 119.503 298.757 179.254 110.779 268.881	2.478 2.973 1.487 21.705.215 14.481 8.515 304.093 3.649 174 121.637 304.093 182.466 112.758 273.683	2.517 3.021 1.510 22.049.799 14.710 8.650 865 308.920 177 123.568 308.920 185.362 114.548 278.028	2.553 3.063 1.532 2.361.590 14.918 8.772 877 313.288 3.759 179 125.315 313.288 187.973 116.167 281.960	2.585 3.102 1.551 22.643.711 15.107 8.883 317.241 3.807 181 126.896 317.241 190.345 117.633 285.517	2.614 3.137 1.568 22.898.985 15.277 8.983 898 320.817 3.850 183 128.327 320.817 192.490 118.959 288.736	2.640 3.168 1.584 23.129.966 15.431 9.073 907 324.054 185 129.621 324.054 194.432 120.159 291.648	2,664 3,197 1,599 23,338,966 15,571 9,155 916 326,982 3,924 187 130,793 326,982 196,189 121,245 294,283	2.686 3.223 1.612 23.528.077 15.697 9.230 329.631 3.956 188 131.852 329.631 197.779 122.227	2.7/ 3.2 1.6. 23.699.1: 15.8 9.2 9 332.0 3.9 1: 132.8 332.0 199.2 123.1 298.8
Total GHG emissions of landfill over time Methane production: Methane collection (60%): Methane production: MD_project_v =	a 0 0 0 a 0 0 0 a 0	2003 19 170.716 1114 0 0 2.392 0 0 2.392 0 0	214 1.875.314 1.251 0 0 26.273 0 0 26.273	390 621 3.420.469 5.505.07 2.282 3.67 0 1 47.921 77.12 0 1 47.921 77.12 0 1 47.921 77.12	8 844 1.013 506 8 7.391.306 3 4.931 0 2.889 0 7 103.553 0 59 0 41.421 7 103.553 0 62.132 0 38.397	1.039 1.246 623 9.098.038 1 6.070 3.569 127.465 1.530 73 50.986 127.465 76.479 47.264	1,215 1,458 729 10,642,353 7,100 4,175 417 149,101 1,789 85 59,640 149,101 89,460 55,287	1.374 1.849 825 12.039.707 8.032 4.723 472 168.678 2.024 96 67.471 168.678 101.207	1.519 1.822 911 13.304.085 8.876 5.219 522 186.392 2.237 107 74.557 186.392 111.835 69.114 167.753	1.649 1.979 990 14.448.141 15.4 9.639 5.668 567 202.420 2.429 116 80.968 202.420 2121.452 175.057	1,768 1,1	74 1.97 49 2.36 25 1.18 00 17.267.55 55 11.52 55 11.52 67 44 67 44 67 44 67 45 241.92 46 241.92 46 241.92 47 48 96.76 49 96.76 40 98.70 40 99.70 40 99.70	1 2.059 5 2.470 3 1.235 8 18.034.422 0 12.032 4 7.075 7 707 0 252.684 3 3.032 8 144 8 101.066 0 252.684 2 151.599 4 93.688 8 227.398	2.138 2.566 1.283 18.728.328 12.495 7.347 735 262.388 3.149 150 104.954 262.366 157.432 97.293 236.147	2 210 2 652 1 326 19 356 199 12 913 7 599 271.183 3 254 155 108.473 271.183 162.710 100.555 244.064	2.274 2.729 1.365 19.924.321 13.292 7.816 782 279.142 3.350 111.657 279.142 167.485	2,333 2,800 1,400 20,438,379; 13,635 8,018 802 288,344 3,436 164 114,538 286,344 471,806 106,176 257,710	2.386 2.863 1.432 20.903.517 13.946 8.200 820 292.861 3.514 167 117.144 292.861 175.716	2.434 2.921 1.461 21.324.392 14.227 8.365 837 298.757 3.585 171 119.503 298.757 179.254 110.779	2.478 2.973 1.487 21.705.215 14.481 8.515 851 304.093 3.649 174 121.637 304.093 182.466 112.758	2.517 3.021 1.510 22.049.799 24.710 8.650 865 308.920 3.707 177 123.568 308.920 185.352 114.548	2.553 3.063 1.532 2.361.590 14.918 8.772 877 313.288 3.759 179 125.315 313.288 187.973 116.167	2.585 3.102 1.551 22.643.711 15.107 8.883 888 317.241 3.807 181 126.896 317.241 190.345 117.633 285.517	2.614 3.137 1.568 22.898.985 15.277 8.983 898 320.817 3.850 183 128.327 320.817 192.490 118.959	2.640 3.168 1.584 23.129.966 15.431 9.073 907 324.054 185 129.621 324.054 194.432 120.159 291.648	2,664 3,197 1,599 23,338,966 15,571 9,155 916 326,982 3,924 187 130,793 326,982 196,189 121,245 294,283	2.686 3.223 1.612 23.528.077 15.697 9.230 923 329.631 3.956 188 131.852 329.631 197.779	2.7() 3.2() 3.2() 23.699.1() 15.8() 9.2() 9.2() 332.0() 11 132.8() 332.0() 199.2() 123.1() 298.8()
Total GHG emissions of landfill over time Methane production: Methane production: Methane collection (60%): Methane production: Pflarey: Ct. Ct. Landfill GHG emissions in CO2	first oder decay model	2003 19 170.716 1114 0 0 2.392 0 0 2.392 0 0	214 1.875.314 1.251 0 0 26.273 0 0 26.273 0 0 26.273 0 0 26.273	390 621 3.420.469 5.505.07 2.282 3.67 0 1 47.921 77.12 0 1 47.921 77.12 0 1 47.921 77.12	8 844 1.013 506 6 7.391.306 3 4.931 0 299 0 299 0 1.243 0 59 0 41.421 7 103.553 0 38.397 4 93.198 0 9.599	1.039 1.246 623 9.098.038 1 6.070 3.569 357 127.468 1.530 73 50.986 127.465 76.479 47.264	1.215 1.458 729 10.642.353 7.100 4.175 417 149.101 1.789 85 59.640 149.101 89.460 55.287 134.191	1.374 1.649 825 12.039.707 8.032 4.723 4.723 168.678 2.024 96 67.471 168.678 101.207 62.546 151.810	1.519 1.822 911 13.304.085 8.876 5.219 522 186.392 107 74.557 186.392 111.835 69.114 167.753	1.649 1.979 990 14.448.141 15.4 9.639 5.668 67 202.420 2.429 116 80.968 202.420 2121.452 175.057 182.178	1.768 1.1 2.121 2.2 1.061 1. 3.328 16.420.0 3.30 10.0.330 10.0 6.074 6. 6.074 6. 6.072 6. 6.073 22 2.00.330 12 2.1 2.1 2.2 2.00.3 2.1 2.00.3 2	1.974 1.97 19 2.36 25 1.18 20 17.287.55 55 11.52 11.627 11	1 2.059 5 2.470 3 1.235 8 18.034.422 0 12.032 4 7.075 7 707 0 252.684 3 3.032 8 1444 8 101.066 0 252.684 4 93.688 8 227.398 4 93.688 8 227.398	2.138 2.566 1.283 18.728.328 12.495 7.347 735 282.388 3.149 150 104.954 262.366 167.432 97.293 236.147	2 210 2.652 1.326 19.356,199 12.913 7.593 271.183 3.254 155 108.473 271.183 162.710 100.555 244.064	2.274 2.729 1.365 19.924.321 13.292 7.816 782 279.142 3.350 160 111.657 279.142 167.485 103.506 251.228	2.333 2.800 1.400 20.438.379 : 13.635 8.018 802 288.344 3.436 164 114.538 286.344 171.806 106.176	2.386 2.863 1.432 20.903.517 13.946 8.200 820 292.881 3.514 167 117.144 292.881 175.716 108.593 263.575	2.434 2.921 1.461 21.324.392 14.227 8.365 3.585 171 119.503 298.757 179.254 110.779 268.881	2.478 2.973 1.487 21.705.215 14.481 8.515 304.093 3.649 174 121.637 304.093 182.466 112.758 273.683	2.517 3.021 1.510 22.049.799 14.710 8.650 865 308.920 177 123.568 308.920 185.362 114.548 278.028	2.553 3.063 1.532 2.361.590 14.918 8.772 877 313.288 3.759 179 125.315 313.288 187.973 116.167 281.960	2.585 3.102 1.551 22.643.711 15.107 8.883 317.241 3.807 181 126.896 317.241 190.345 117.633 285.517	2.614 3.137 1.568 22.899.985 15.277 8.983 320.817 3.850 183 126.327 320.817 192.490 118.959	2,640 3,168 1,584 23,129,966 15,431 9,073 324,054 3,889 185 129,621 324,054 194,432 124,432 124,159	2,664 3,197 1,599 23,338,966 15,571 9,155 916 326,982 3,924 187 130,793 326,982 196,189 121,245 294,283	2.686 3.223 1.612 23.528.077 15.697 9.230 92.631 3.956 188 131.852 329.631 197.779 122.227 296.668	2.77 3.24 1.62 23.699.18 15.8° 9.28 9.28 9.28 9.33 3.32.02 11 12.8° 3.32.02 199.2° 123.1° 298.82 123.1°
Total GHG emissions of landfill over time Methane production: Methane collection (60%): Methane production: MD_moretax = MD_mess_x (eff. 98%): CC14, MD_moretax = MD_mess_x (eff. 98%): CC2, PEffare y: 1 CO2, PEffare y: 1 CO2, PEffare y: 1 CO2, Project emissions (non-flared/combusted): Project emissions (non-flared/combusted): Proportional Baseline emissions (with adjustment factory: 1 CO2, Proportional Baseline emissions (with adjustment factory: CC2, Proportional Baseline emissions (with adjustment factory: CC3, Proportional Baseline emissions (with adjustment factory: CC4, Proportional Baseline emissions (with adjustment factory: CC5, Proportional Baseline emissions (with adjustment factory: CC6, Proportional Baseline emissions (with adjustment factory: CC7, Proportional Baseline emissions (with adjustment factory: CC8, Proportional Baseline emissions (with adjustment factory: CC9, CC9	first oder decay model	2003 19 170.716 114 0 0 2.392 0 0 2.392 0 2.153	214 1.875.314 1.251 0 26.273 0 0 26.273 0 23.646	390 628 3.420.469 5.505.07 2.282 3.67: 0 (8 844 1.013 506 6 7.391.306 3 4.931 0 299 0 299 0 1.243 0 59 0 41.421 7 103.553 0 38.397 4 93.198 0 9.599	1.039 1.246 623 9.098.038 1 6.070 3.569 357 127.468 1.530 73 50.986 127.465 76.479 47.264	1.215 1.458 729 10.642.353 7.100 4.175 417 149.101 1.789 85 59.640 149.101 89.460 55.287	1.374 1.649 825 12.039,707 8.032 4.723 4.722 168.678 2.024 96 67.471 168.678 101.207 62.546	1.519 1.822 911 13.304.085 8.876 5.219 522 186.392 107 74.557 186.392 111.835 69.114 167.753	1.649 1.979 990 14.448.141 15.4 9.639 5.668 567 202.420 2.429 116 80.968 202.420 121.452 175.057 182.178	1.768 1.1 2.121 2.2 1.061 1.1 0.030 10.330 10.4 0.330 10.4 0.507 6.6 0.607 6.6 0.607 2.2 0.603 2.3 1.24 0.766 9.9 0.	1.974 1.97 19 2.36 25 1.18 20 17.267.55 55 11.52 55 11.52 55 11.52 56 241.92 51 2.92 5	1 2.059 5 2.470 3 1.235 8 18.034.422 0 12.032 4 7.075 7 707 0 252.684 3 3.032 8 1444 8 101.066 0 252.684 4 93.688 8 227.398 4 93.688 8 227.398	2.138 2.566 1.283 18.728.328 12.495 7.347 735 282.388 3.149 150 104.954 262.366 167.432 97.293 236.147	2 210 2.652 1.326 19.356,199 12.913 7.593 271.183 3.254 155 108.473 271.183 162.710 100.555 244.064	2.274 2.729 1.365 19.924.321 13.292 7.816 782 279.142 3.350 160 111.657 279.142 167.485 103.506 251.228	2,333 2,800 1,400 20,438,379; 13,635 8,018 802 288,344 3,436 164 114,538 286,344 171,806 106,176 257,710 106,176 257,710	2.386 2.863 1.432 20.903.517 13.946 8.200 820 292.881 3.514 167 117.144 292.881 175.716 108.593 263.575	2.434 2.921 1.461 21.324.392 14.227 8.365 8.367 298.757 3.585 171 119.503 298.757 179.254 110.779 268.881	2.478 2.973 1.487 21.705.215 14.481 8.515 304.093 3.649 174 121.637 304.093 182.466 112.758 273.683	2.517 3.021 1.510 22.049.799 14.710 8.650 865 308.920 177 123.568 308.920 185.362 114.548 278.028	2.553 3.063 1.532 2.361.590 14.918 8.772 877 313.288 3.759 179 125.315 313.288 187.973 116.167 281.960	2.585 3.102 1.551 22.643.711 15.107 8.883 888 317.241 3.807 181 126.896 317.241 190.345 117.633 285.517	2.614 3.137 1.568 22.899.985 15.277 8.983 320.817 3.850 183 126.327 320.817 192.490 118.959	2.640 3.168 1.584 23.129.966 15.431 9.073 907 324.054 185 129.621 324.054 194.432 120.159 291.648	2.664 3.197 1.599 23.338.966 15.571 9.155 916 326.962 3.924 187 130.793 326.962 196.189 121.245 294.283 173.039	2.686 3.223 1.612 23.528.077 15.697 9.230 9231 3.9631 3.966 188 131.852 329.631 197.779 122.227 296.668 122.227	2.70 3.24 1.62 23.699.16 15.81 9.26 93 332.02 3.96 16 13.81 13.81 123.11 129.82 123.11 298.82 175.76
Model equation: US EPA Yea Total GHG emissions of landfill over time Methane production: m²/li Gas Collecton (50% methane): m²/li Methane collection (60%): m²/li Methane production: Methane production: delta m²/li Methane production: Methane production: delta m²/li Methane production: tella, m²/li Methane production: tella, delta m²/li Lengthill GHG emissions in CO2	Tirst oder decay model 2002	2003 19 170.716 114 0 0 2.392 0 0 2.392 0 2.153	214 1.875.314 1.251 0 26.273 0 0 26.273 0 23.646	390 628 3.420.469 5.505.07 2.282 3.67: 0 (8 844 1.013 506 8 7.391,306 3 4.931 0 2.889 0 1.243 0 59 0 41,421 7 103,553 0 62,132 0 38,397 4 93,198 0 9,599 4 23,299 0 64,800	1.039 1.246 623 9.098.038 1 6.070 3.569 127.465 1.530 73 50.986 127.465 76.479 47.264 114.718	1.215 1.458 729 10.642.353 7.100 4.175 417 149.101 1.789 85 59.640 149.101 89.460 55.287 134.191 78.904	1.374 1.649 825 12.039.707 8.032 4.723 4.723 4.723 168.678 2.024 96 67.471 168.678 101.207 62.546 151.810 89.264	1.519 1.822 911 13.304.085 8.876 5.219 522 186.392 107 74.557 186.392 111.835 69.114 167.753 98.639	1.649 1.979 990 14.448.141 15.4 9.639 5.668 67 202.420 2.429 116 80.968 202.420 2121.452 175.057 182.178	1.768 1.1 2.121 2.2 1.061 1. 3.328 16.420.0 3.30 10.10.3 6.074 6. 607 (6. 607 2. 1.24 2. 2.20.0 1.24 2. 2.20.0 1.24 2. 2.20.0 1.24 2. 2.20.0 1.24 2. 2.20.0 1.24 3.8 2.20.0 1.24 3.8 2.20.0 1.24 3.8 2.20.0 1.24 3.8 2.20.0 1.24 3.8 2.20.0 1.24 3.8 2.20.0 1.24 3.8 2.20.0 1.24 3.8 2.20.0 1.24 3.8 2.20.0 1.25 3.3 2.20.0 1.25 3.3 2.20.0 1.25 3.3 2.20.0 1.25 3.3 2.20.0 1.25 3.3 2.20.0 1.25 3.3 2.20.0 1.20.	1.974 1.97 19 2.36 25 1.18 20 17.287.53 55 11.52 11.6.77 11.6.	1 2.059 6 2.470 3 1.235 8 18.034.422 0 12.032 4 7.075 7 0 252.664 3 3.032 6 144 8 101.066 0 252.664 4 93.688 8 227.398 4 93.688 8 227.398	2.138 2.566 1.283 18.728.328 12.495 7.347 735 282.388 3.149 150 104.954 262.366 167.432 97.293 236.147	2 210 2 652 1 326 19 356 199 12 913 7 593 7 593 271.183 3 254 155 108.473 271.183 162.710 100.555 244.064 143.510	2.274 2.729 1.365 19.924.321 13.292 7.816 782 279.142 3.350 160 111.857 279.142 167.485 103.506 251.228 147.722	2,333 2,800 1,400 20,438,379; 13,635 8,018 8,012 286,344 3,436 164 114,538 286,344 171,806 106,176 257,710 106,176 257,710 151,533	2.386 2.863 1.432 20.903.517 13.946 8.200 292.881 3.514 167 117.144 292.861 175.716 108.593 263.575 108.593 263.575	2.434 2.921 1.461 21.324.392 14.227 8.365 8.365 8.37 298.757 3.585 171 119.503 298.757 179.254 110.779 268.881 110.779 268.881	2.478 2.973 1.487 21.705.215 14.481 8.515 8304.093 3.649 174 121.637 304.093 182.466 112.758 273.683 112.758 273.683 160.926	2.517 3.021 1.510 22.049.799 14.710 8.650 865 308.920 177 123.568 308.920 185.362 114.548 278.028	2.553 3.063 1.532 2.361.590 14.918 8.772 313.288 3.759 179 125.315 313.288 187.973 116.167 281.960 116.167 281.960	2.585 3.102 1.551 22.643,711 15.107 8.883 8317.241 3.807 181 126.896 317.241 190.345 117.633 285.517	2.614 3.137 1.568 22.898.985 15.277 8.983 320.817 3.850 128.327 320.817 192.490 118.959 288.736 118.959	2.640 3.168 1.584 23.129.966 15.431 9.073 321.051 3.889 185 129.621 324.054 194.432 120.159 291.648	2.664 3.197 1.599 23.338.966 15.571 9.155 916 326.962 3.924 187 130.793 326.982 196.189 121.245 294.283 121.245 294.283	2.686 3.223 1.612 23.528.077 15.697 9.230 9231 3.9631 3.966 188 131.852 329.631 197.779 122.227 296.668 122.227	2,70 3,24 1,62 23,699,19 15,81 9,29 93 332,02 3,98 19 132,81 123,11 1298,82 123,11 298,82 175,70
Model equation: US EPA Yea Total GHG emissions of landfill over time Methane production: m²/r Gas Collection (50% methane): m²/r Methane collection (60%): m²/r Methane production: Methane production: Methane production: m²/r Methane production: Methane production: Methane production: Methane production: Methane production: Methane production: 1 CCH, MD_project, = MD_project, = MD_project, = MD_project emissions in CO_project emissions in CO_project emissions in CO_project emissions (non-flared/combusted) total ER without effectivness adjustment factor; ER without effectivness adjustment factor, considering adjustment factor, experiment factor, considering adjustment factor, considering operation months in each year): total Proportional Baseline emissions (with adjustment factor, considering adjustment factor, considering operation months in each year): total ER, total	Ca Ca Ca Ca Ca Ca Ca Ca	2003 19 170.716 114 0 0 2.392 0 0 2.392 0 2.153	214 1.875.314 1.251 0 26.273 0 0 26.273 0 23.646	390 628 3.420.469 5.505.07 2.282 3.67: 0 (8 844 1.013 506 6 7.391.306 3 4.931 0 2.899 0 290 7 103.553 0 1.243 0 59 0 41.421 7 103.553 0 62.132 0 38.397 4 93.198 0 9.599 4 23.299 0 54.800 13.700	1.039 1.246 623 9.098.038 1 6.070 3.569 357 127.465 1.530 73 50.986 127.455 76.479 47.264 114.718 47.264	1.215 1.458 729 10.642.353 7.100 4.175 4417 149.101 1.789 85 59.640 149.101 89.460 55.287 134.191 55.287 134.191 78.904 78.904	1.374 1.649 825 12.039.707 8.033 4.723 4.723 4.72 168.678 2.024 96 67.471 168.678 101.207 62.546 151.810 62.546 151.810 89.264	1.519 1.822 911 13.304.085 8.876 5.219 522 186.392 2.237 107 74.557 186.392 111.835 69.114 167.753 98.639 98.639	1.649 1.979 990 14.448.141 15.4 9.639 5.668 202.420 2.429 116 80.968 202.420 124.452 17.5.657 182.178 75.057	1.768 1.4 2.121 2.3 1.061 1.1 3.326 16.420.0 6.074 6.6 607 (6.923 230.0 2.603 2.3 124 6.769 92.4 6.769 92.4 6.769 6.523 230.0 6.523 23	74 1.97 49 2.36 25 1.18 26 1.17 267 44 67 44 67 44 67 44 67 45 241,92 31 2.90 31 13 38 96,76 46 241,92 28 146,16 30 89,70 42 217,72 46 89,70 31 21,77 40 128,02 56 128,02	1 2.059 5 2.470 3 1.235 8 18.034.422 4 7.075 7 707 0 2.52.664 3 3 3.032 8 144 6 101.066 0 2.52.664 2 151.599 4 93.688 8 227.398 4 93.688 8 227.398 4 133.710 4 133.710 4 133.710	2.138 2.566 1.283 18.728.328 12.495 7.347 735 262.386 3.149 150 104.954 262.386 167.432 97.293 236.147 97.293 236.147 138.855	2.210 2.852 1.326 19.356.199 12.913 7.593 7.593 271.183 3.254 155 108.473 271.183 162.710 100.555 244.064 143.510 143.510	2.274 2.729 1.365 19.924.321 13.292 7.816 782 279.142 3.350 160 111.857 279.142 167.485 103.506 251.228 103.506 251.228 147.722	2,333 2,800 1,400 20,438,379; 13,635 8,018 8,012 286,344 3,436 164 114,538 286,344 171,806 106,176 257,710 106,176 257,710 151,533	2.386 2.863 1.432 20.903.517 13.946 8.200 820 292.881 3.514 187 117.144 292.881 175.716 108.593 263.575 108.593 263.575 154.982	2.434 2.921 1.461 21.324.392 14.227 8.365 837 298.757 3.585 171 119.503 298.757 179.254 110.779 268.881 110.779 268.881 158.102	2.478 2.973 1.487 21.705.215 14.481 8.515 851 304.093 3.649 174 121.637 304.093 182.466 112.758 273.683 112.758 273.683 160.926	2.517 3.021 1.510 22.049,799 22.049,799 24.710 8.650 885 308.920 3.707 177 123.568 308.920 185.362 114.548 278.028 114.548 278.028 163.481 163.481	2.553 3.063 1.532 2.361.590 14.918 8.772 877 313.288 3.759 179 125.315 313.288 187.973 116.167 281.960 116.167 281.960 165.792	2.585 3.102 1.551 22.643,711 15.107 8.883 8317.241 3.807 181 126.896 317.241 190.345 117.633 285.517 117.633 285.517 167.884	2.614 3.137 1.568 22.896.985 15.277 6.983 898 320.817 3.850 183 128.327 320.817 192.490 118.959 288.736 118.959 288.736 169.777	2.640 3.168 1.584 23.129.966 15.431 9.073 324.054 3.869 185 129.621 324.054 194.432 120.159 291.648 171.489	2.664 3.197 1.599 23.38.966 15.571 9.165 916 326.982 3.924 187 130.793 326.982 196.189 121.245 294.283 173.039 173.039	2.686 3.223 1.612 23.528.077 15.697 9.230 923 329.631 3.956 183 131.852 329.631 197.779 122.227 296.668 122.227 296.668	2.70 3.24 1.62 23.699.19 15.81 9.29 93 332.02 3.98 19 132.81 298.82 123.11 298.82 175.70 175.70



UNFCCC

CDM - Executive Board

page 45

Annex 4

MONITORING INFORMATION

Summary of Monitoring Approach

The monitoring will be carried out as described in Section B.7 of this PDD, and in line with ACM0001. The basic approach is to monitor on a continuous basis the amount of methane destroyed through flaring and combustion. The main parameters to be monitored include:

- Total flow of captured landfill gas [Nm³]
- Landfill gas flow to flare [Nm³]
- Landfill gas consumed in the power plant [Nm³] (only if the power plant is built)
- Methane fraction in the landfill gas [m³ CH4 / m³ LFG]
- Landfill gas temperature [°C]
- Landfill gas pressure [Pa]
- Amount of electricity imported by the project [MWh]
- Amount of electricity exported to the grid [MWh] (only if the power plant is built)
- Operation of the energy plant [h] (only if the power plant is built)
- Flare operation time [h]
- Volumetric fraction of components in the residual gas [% CH₄, O₂]
- Volumetric fraction of O2 in the exhaust gas
- Concentration of methane in the exhaust gas [mg/m³]
- Volumetric flow rate of the residual gas [m³/h]
- Temperature in the exhaust gas of the flare [°C]

Landfill gas flows to flare and its component (CH_4 , O_2) contents will be determined on a continuous basis. Volumetric fraction of O_2 and concentration of methane in the exhaust gas will be measured continuously. The same applies for the flare operation time and energy plant operation time (if the energy plant is built). Landfill gas flows will be converted to norm cubic meters (Nm^3) using continuous measurements of pressure and temperature.

The amount of flared methane will be calculated from the flow of landfill gas to the flare, the methane and oxygen content of the landfill gas sent to the flare (residual gas), the methane concentration and the volumetric fraction of oxygen in the exhaust gas, and temperature of the exhaust gas. Hence, project emissions from flaring of the residual gas stream [tCO2e] will be continuously determined.

The precise procedures for the monitoring will be documented in a manual, and the responsible staff will be identified and adequately trained. Key elements of the manual will include:

- Division of responsibilities between staff
- Reading of meters and analysers (method, frequency)
- Data handling and storage
- Data analysis and reporting
- Maintenance and calibration of meters and analysers
- QA / QC procedures, including internal reviews

Some details on the proposed procedures are provided below.



UNFCCC

CDM - Executive Board

page 46

Quality control and quality assurance procedures

Regarding quality control and quality assurance procedures to be undertaken for the monitored data, the practices to be implemented in the context of the project at CTRVV landfill are as follows:

Plausibility testing of data

The plausibility of all collected data will be tested on a routine basis with respect to:

- Consistency with previous measurements (time-series)
- Deviations from ex ante estimations of emission reductions

Any inconsistencies or implausibilities will be resolved immediately. If required, suggestions for the improvement of the monitoring system will be formulated and implemented.

Equipment calibration and maintenance

All meters and other sensors will be subject to regular maintenance and testing regime according to the technical specifications from the manufacturers to ensure accuracy and good performance.

Calibration of equipment will be performed periodically according to technical specifications and in agreement with the requirements of INMETRO (Metrology National Institute), norms applied to ABNT and the precision requirements established in the used equipment Maintenance Plan. Whenever applicable, the calibration will be carried out by qualified companies/entities with recognized experience in the market in this activity, using methods and instruments traceable to international standards of quality.

A maintenance plan will be elaborated with the aim of obtaining the optimum performance and regularity of the system operation, covering at least the following aspects: frequency of equipment preventive maintenance, maintenance procedures detailed according to technical specifications of the equipment manufacturers, when applicable; frequency of equipment calibration, specially of those responsible for the measurement of data to be monitored and routines of periodical check ups to verify the functioning and performance of the equipment.

Internal Audits

As described in Section B.7., all monitoring data will undergo an internal review before being submitted to the designated operational entity for independent verification. During these reviews the records will be checked by two internal staff members that are not involved in the actual data recording. The two reviewers will a) double-check the quality of the data recorded and b) audit the GHG project compliance with operational and monitoring requirements. If a need for corrective action is identified, they will propose the same to the management of CTRVV. The reviewers will summarize their findings in written form.

During the internal audits, all sustainable development indicators will be measured and formally registered.



UNFCCC

CDM - Executive Board

page 47

Corrective, Preventive and Improvement Actions

The CTRVV Landfill administration (Valdir Damo) will be responsible for the project management.

Actions to handle and correct deviations from the Monitoring Plan and Operational Manual procedures will be implemented as these deviations are observed either by the operator or during internal audits. If necessary, technical meetings between the operator, the developer and the sponsor of the project will be held in order to define the corrective actions to be undertaken.

The quality guarantee measures include procedures for treating and correcting non-conformities in the implementation of the Project and in the operation and maintenance of the System. If such non-conformities are detected, specially those related to the corrective maintenance of the equipment:

- 1) An analysis of the non-conformity and its causes will be conducted immediately by the CTRVV Landfill staff;
- 2) The CTRVV Landfill administration will make a decision about the corrective actions adequate to eliminate the non-conformity and its causes;
- 3) Corrective actions are implemented and reported to the Landfill administration.
- 4) If non-conformities that might occur are detected, a similar procedure will be adopted on Preventive Action taking and register.
- 5) On the other hand, improvements that might be incorporated in the process will be registered and followed through Improvement Actions.

Training

The operational staff will be trained in equipment operation, data recording, reports writing, and operation, maintenance and emergency procedures in compliance with the Operational Manual.

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