



Industrie Service

Verification Report

**Initial Verification and Verification of the
First Monitoring Period**

of the

**“Onyx Alexandria Landfill Gas Capture and Flaring Project”
CDM registration number 0508**

Report No. 1099811, Version 1

Revised version according to the corrections requested in EB39 §71

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**TÜV SÜD Industrie Service GmbH
Carbon Management Service
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**Initial Verification and Verification of the First Monitoring Period
of the “Onyx Alexandria Landfill Gas Capture and Flaring
Project”**



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Page 1 of 22

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Subject:		Initial and First Periodic Verification of a CDM Project		
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Client:		Veolia Propreté – Veolia Environment Services 169 avenue Georges Clémenceau 92735 Nanterre France		
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Report Title:		Initial Verification and Verification of the First Monitoring Period of the “Alexandria Landfill Gas Capture and Flaring Project”		
Number of pages		22 (excluding annexes)		
Summary: <p>TÜV SÜD Industrie Service GmbH has performed a verification of the CDM project: “Alexandria Landfill Gas Capture and Flaring Project”. The verification is based on the currently valid documentation of the UN Framework Convention on Climate Change (UNFCCC). In this context, the relevant documents are the "Marrakech Accords".</p> <p>The management of Veolia Propreté – Veolia Environment Services is responsible for the preparation of the GHG emissions data and the reported GHG emissions reductions of the project “Alexandria Landfill Gas Capture and Flaring Project” on the basis set out within the project Monitoring Plan indicated in the final PDD version dated April 2006. The development and maintenance of records and reporting procedures is in accordance with that plan. The calculation and determination of GHG emission reductions from the project is in the responsibility of the management of the project.</p> <p>The verifier confirms that the project is implemented as planned and described in validated and registered project design documents. Installed equipment being essential for generating emission reduction runs reliably. The monitoring system is in place and the project is ready to generate GHG emission reductions.</p> <p>The verifier can confirm that the GHG emission reduction is calculated without material misstatements. Our opinion relates to the project’s GHG emissions and resulting GHG emissions reductions reported and related to the valid and registered project baseline and monitoring, and its associated documents. Based on the information we have seen and evaluated we confirm the following statement:</p> <p><u>Reporting period:</u> From 15-12-2006 to 30-09-2007</p> <p><u>Verified emission in the above reporting period:</u></p> <p>Baseline emissions: 22.524 t CO₂ equivalents Project emissions: 4.700 t CO₂ equivalents Emission reductions: 17.824 t CO₂ equivalents</p>				
Work carried out by: <ul style="list-style-type: none">• Werner Betzenbichler (project manager, GHG ATL)• Sven Kolmetz (project manager, GHG ATL)• Luciano Grugni (GHG auditor)			Internal Quality Control by: <ul style="list-style-type: none">• Javier Castro	

Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CR	Clarification Request
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
ER	Emission Reduction
FAR	Forward Action Request
GHG	Greenhouse gas(es)
JI	Joint Implementation
KP	Kyoto Protocol
MP	Monitoring Plan
MW	Megawatts
NGO	Non Governmental Organization
PDD	Project Design Document
TÜV SÜD	TÜV SÜD Industrie Service GmbH
UNFCCC	United Nations Framework Convention on Climate Change
VVM	Validation and Verification Manual

Table of Contents	Page
1 INTRODUCTION	4
1.1 Objective	4
1.2 Scope	4
1.3 GHG Project Description	6
2 METHODOLOGY	7
2.1 Review of Documents	9
2.2 Follow-up Interviews	9
2.3 Resolution of Clarification, Corrective and Forward Action Requests	10
3 VERIFICATION FINDINGS.....	11
INITIAL VERIFICATION FINDINGS	12
3.1 Remaining issues, CARs, FARs from previous validation	12
3.2 Project Implementation	12
3.3 Internal and External data	15
3.4 Environmental and Social Indicators	16
3.5 Management and Operational System	16
PERIODIC VERIFICATION FINDINGS	17
3.6 Completeness of Monitoring	17
3.7 Accuracy of Emission Reduction Calculations	17
3.8 Quality of Evidence to Determine Emission Reductions	17
3.9 Management System and Quality Assurance	18
3.10 Corrections requested in EB39, §71	18
4 PROJECT SCORECARD	21
5 VERIFICATION STATEMENT	22
Annex 1: Verification Protocol	
Annex 2: Information Reference List	

1 INTRODUCTION

1.1 Objective

Veolia Environment Service has commissioned an independent verification by TÜV SÜD Industrie Service GmbH (TÜV SÜD) of its CDM project: “Alexandria Landfill Gas Capture and Flaring Project”. Verification is the periodic independent review and ex post determination by the Designated Operational Entity / Independent Entity of the monitored reductions in GHG emissions during the defined verification period.

The objective of verification can be divided in Initial Verification and Periodic Verification:

- **Initial Verification:** The objective of an initial verification is to verify that the project is implemented as planned, to confirm that the monitoring system is in place and fully functional, and to assure that the project will generate verifiable emission reductions. A separate initial verification prior to the project entering into regular operations is not a mandatory requirement.
- **Periodic Verification:** The objective of the periodic verification is to verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan; further more the periodic verification evaluates the GHG emission reduction data and express a conclusion with a high, but not absolute, level of assurance about whether the reported GHG emission reduction data is “free” of material misstatements; and verifies that the reported GHG emission data is sufficiently supported by evidence, i.e. monitoring records. If no prior initial verification has been carried out, the objective of the first periodic verification also includes the objectives of the initial verification.

The verification shall consider both quantitative and qualitative information on emission reductions. Quantitative data comprises the monitoring reports submitted to the verifier by the project entity. Qualitative data comprises information on internal management controls, calculation procedures, and procedures for transfer, frequency of emissions reports, review and internal audit of calculations/data transfers.

The verification follows UNFCCC criteria referring to the Kyoto Protocol criteria and the CDM rules and modalities as agreed in the Bonn Agreement and the Marrakech Accords.

1.2 Scope

Verification scope is defined as an independent and objective review and ex post determination by the Designated Operational Entity of the monitored reductions in GHG emissions. The verification is based on validated project design document including baseline. These documents are reviewed against Kyoto Protocol requirements, UNFCCC rules and associated interpretations. TÜV SÜD has, based on the recommendations in the Validation and Verification Manual, employed a risk-based approach in the verification, focusing on the identification of significant risks and reliability of project monitoring and generation of CERs.

The verification is not meant to provide any consulting towards the client. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the project design.

The audit team has been provided with a Draft Monitoring Report in the beginning of October 2007, covering the period December 15, 2006 – September 30, 2007. A fact finding mission in form of an on-site audit and - based on the documentation received - a document review has taken place. Afterwards the client decided to revise the Monitoring Report according to minor findings during the on-site visit. The revised Monitoring Report was then submitted again to the verifier and serves as the basis for the assessment presented herewith. The Monitoring Report

has to be made publicly available on the UNFCCC website (see the following link: <http://cdm.unfccc.int/Issuance/MonitoringReports>).

Studying the existing documentation belonging to this project, it was obvious that the competence and capability of the audit team performing the verification have to cover at least the following aspects:

- Knowledge of Kyoto Protocol and the Marrakech Accords
- Environmental and Social Impact Assessment
- Skills in environmental auditing (ISO 14000, EMAS)
- Quality assurance
- Technical aspects of landfill gas electricity generation
- Monitoring concepts
- Political, economical and technical random conditions in host country

According to these requirements TÜV SÜD has composed a project team in accordance with the appointment rules of the TÜV certification body “climate and energy”:

Mr. Werner Betzenbichler was head of the department Carbon Management Service of TÜV SÜD and head of the “Certification Body for Climate and Energy” and he is expert for conventional energy generation, renewable energy, energy expansion planning and familiar with the recent version of CDM and JI criteria as necessary for the implementation of Art. 6 and Art. 12 of the KP. Since 2000 he has been working in the international climate change and emission trading business as a verifier.

Dr. Sven Kolmetz is physicist and ATL at the department “TÜV Carbon Management Service” located in the head office of TÜV SÜD in Munich. Furthermore he is officially authorized expert in the verification of GHG emissions in the framework of the European Emission Trading Scheme. Before entering TÜV SÜD he worked as energy consultant for industrial companies and as consultant for the German Federal Government on instruments for the reduction of GHG emissions.

Mr. Luciano Grugni is a GHG Auditor and an auditor for environmental management systems at the department “Climate, Energy and Environment” of the Italian branch of TÜV SÜD Group. He has been involved in the topic of environmental auditing, monitoring and verification due to the requirements of the Kyoto Protocol. His main focus lies on emissions trading audits and renewable energies.

It should be noted that the ATL for the proposed project is now changed to Dr. Sven Kolmetz. The audit team covers the above mentioned requirements as follows:

- Knowledge of Kyoto Protocol and the Marrakech Accords (ALL)
- Environmental and Social Impact Assessment (ALL)
- Skills in environmental auditing (ALL)
- Quality assurance (ALL)
- Technical aspects of landfill gas electricity generation (ALL)
- Monitoring concepts (ALL)
- Political, economical and technical random conditions in host country (Betzenbichler)

In order to have an internal quality control of the project, a team of the following persons has been composed by the certification body “climate and energy”:

- Javier Castro (head of the certification body “climate and energy”)



1.3 GHG Project Description

The purpose of the project activity is to maximise the capture of landfill gas (LFG) from two new landfill sites and destroying it by flaring. It applies the CDM methodology ACM0001, vers.2.

Project participants are: Veolia Propreté – Veolia Environment Service (France);
Onyx Alexandria (Egypt)
World Bank (Spain).

The project starting date is 01/01/2006 and the 10 year fixed crediting period starts 01/09/2006.

The CDM registration number is 0508.

2 METHODOLOGY

The project assessment aims at being a risk based approach and is based on the methodology developed in the Validation and Verification Manual, an initiative of all Applicant Entities, which aims to harmonize the approach and quality of all such assessments.

In order to ensure transparency, a verification protocol was customized for the project, according to the Validation and Verification Manual. The protocol shows, in a transparent manner, criteria (requirements), means of verification and the results. The verification protocol serves the following purposes:

- It organizes, details and clarifies the requirements a CDM/JI project is expected to meet;
- It ensures a transparent verification process where the verifier will document how a particular requirement has been proved and the result of the verification.

The verification protocol consists of four tables. The different columns in these tables are described in Figure 1.

The completed protocol is enclosed in Annex 1 to this report.

Initial Verification Checklist – table 1			
OBJECTIVE	Ref.	COMMENTS	Concl.(incl FARs/CARs)
<i>The requirements the project must meet.</i>	<i>Gives reference to the legislation or agreement where the requirement is found.</i>	<i>Description of circumstances and further commendation to the conclusion.</i>	<i>This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR) of risk or non-compliance with stated requirements. The corrective action requests are numbered and presented to the client in the Verification report. The Initial Verification has additional Forward Action Requests (FAR). FAR indicates essential risks for further periodic verifications</i>

Periodic Verification Checklist Table 1: Data Management System/Controls		
Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)

Initial Verification and Verification of the First Monitoring Period of the “Onyx Alexandria Landfill Gas Capture and Flaring Project”



Industrie Service

Page 8 of 22

<p>The project operator's data management system/controls are assessed to identify reporting risks and to assess the data management system's/control's ability to mitigate reporting risks. The GHG data management system/controls are assessed against the expectations detailed in the table.</p>	<p>A score is assigned as follows:</p> <p>Full all best-practice expectations are implemented.</p> <p>Partial a proportion of the best practice expectations is implemented</p> <p>Limited this should be given if little or none of the system component is in place.</p>	<p><i>Description of circumstances and further commendation to the conclusion. This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR) of risk or non-compliance with stated requirements. The corrective action requests are numbered and presented to the client in the Verification report. The Initial Verification has additional Forward Action Requests (FAR). FAR indicates essential risks for further periodic verifications</i></p>
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Periodic Verification Checklist Table 2: GHG calculation procedures and management control testing		
Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
<p>Identification of potential reporting risks based on an assessment of the emission estimation procedures.</p> <p>Identification of key source data. Focus on those risks that impact the accuracy, completeness and consistency of the reported data.</p>	<p>Identification of the key controls for each area with potential reporting risks. Assessment of adequacy of the key controls and eventually test that the key controls are actually in operation.</p> <p>Internal controls include, Understanding of responsibilities and roles, Reporting, reviewing and formal management approval of data; Procedures for ensuring data completeness, conformance with reporting guidelines, maintenance of data trails etc.</p>	<p><i>Identification of areas of residual risks, i.e. areas of potential reporting risks where there are no adequate management controls to mitigate potential reporting risks</i></p> <p><i>Areas where data accuracy, completeness and consistency could be improved are highlighted.</i></p>

Periodic Verification Checklist Table 3: Detailed audit testing of residual risk areas and random testing		
Areas of residual risks	Additional verification testing performed	Conclusions and Areas Requiring Improvement (including FARs)

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Areas of residual risks	Additional verification testing performed	Conclusions and Areas Requiring Improvement (including FARs)
<p><i>List of residual areas of risks of Periodic Verification Checklist Table 2 where detailed audit testing is necessary.</i></p> <p><i>In addition, other material areas may be selected for detailed audit testing.</i></p>	<p><i>The additional verification testing performed is described. Testing may include:</i></p> <ul style="list-style-type: none"> ▪ <i>Sample cross checking of manual transfers of data</i> ▪ <i>Recalculation</i> ▪ <i>Spreadsheet ‘walk throughs’ to check links and equations</i> ▪ <i>Inspection of calibration and maintenance records for key equipment</i> ▪ <i>Check sampling analysis results</i> <p><i>Discussions with process engineers who have detailed knowledge of process uncertainty/error bands.</i></p>	<p><i>Having investigated the residual risks, the conclusions are noted here. Errors and uncertainties are highlighted.</i></p>

Figure 1 Verification Protocol Tables

2.1 Review of Documents

The monitoring report submitted by the client and additional background documents related to the project performance were reviewed. A complete list of all documents reviewed is attached as Annex 2 to this report.

2.2 Follow-up Interviews

On October 28 and 29, 2007 TÜV SÜD performed interviews with project stakeholders to confirm selected information. Representatives of Veolia Propreté – Veolia Environment Service were interviewed. The main topics of the interviews are summarized in Table 1.

Table 1 Interview topics

Interviewed organization	Interview topics
Veolia Propreté – Veolia Environment Service	<ul style="list-style-type: none">➤ Project design and implementation➤ Technical equipment and operation➤ Monitoring plan➤ Monitored data➤ Data uncertainty and residual risks➤ GHG calculation➤ Environmental impacts➤ Stakeholder process➤ Compliance with national laws and regulations

2.3 Resolution of Clarification, Corrective and Forward Action Requests

The objective of this phase of the verification was to resolve the requests for clarification and any other outstanding issues which needed to be clarified for TÜV SÜD's positive conclusion on the GHG emission reduction calculation. The Clarification Requests, raised by TÜV SÜD were resolved during communication between the client and TÜV SÜD. Forward Action Requests are indicated issues which do not effect the generation of emission reduction in the verified period, but shall be improved in order to ensure the reliability of future data. To guarantee the transparency of the verification process, the concerns raised and responses that have been given are summarized in chapter 3 below and documented in more detail in the verification protocol in Annex 1.

3 VERIFICATION FINDINGS

In the following sections the findings of the verification are stated. The verification findings for each verification subject are presented as follows:

The findings from the desk review of the final monitoring report and the findings from interviews during the follow up visit are summarized. A more detailed record of these findings can be found in the Verification Protocol in Annex 1.

- 1) Where TÜV SÜD identified issues that needed clarification, corrective action or that represented a risk to the fulfillment of the project objectives, a Corrective Action Request or Forward Action Request, respectively, was issued. The Requests are stated, where applicable, in the following sections and are further documented in the Verification Protocol in Annex 1. The verification of the project resulted in 8 Corrective Action Requests and 2 Forward Action Requests.
- 2) Where Corrective Action Requests have been issued, the exchanges between the Client and TÜV SÜD to resolve these Requests are summarized.
- 3) In the context of Forward Action Requests, risks have been identified, which may endanger the delivery of high quality CERs in the future, i.e. by deviations from standard procedures as defined by the MP. As a consequence, such aspects should receive a special focus during the next consecutive verification. A FAR may originate from lack of data sustaining claimed emission reductions. Forward Action Requests are understood as recommendation for future project monitoring; they are stated, where applicable, in the following sections and are further documented in the Verification Protocol in Annex 1.
- 4) The final conclusions for verification subject are presented.

The verification findings relate to the project implementation as documented and described in the final monitoring report.

Initial Verification Findings

3.1 Remaining issues, CARs, FARs from previous validation

3.1.1 Discussion

Based on the validation report the verification team identified no missing steps. The project has been registered under the CDM on December 15, 2006 under the reference number 0508.

3.1.2 Findings

None.

3.1.3 Conclusion

The project complies with the requirements.

3.2 Project Implementation

3.2.1 Discussion

The Project has been implemented as defined in the PDD. The landfill gas recovery and flare systems are delivered as announced in the PDD.

At Borg El Arab landfill two flares are installed at the site, both of them are working however only one is running at the time. The project activity started on January 1st, 2006 with the first flare. The second flare has been commissioned April 3rd, 2007. The system at the Borg El Arab landfill site is fitted with two leachate evaporators which are not operational yet.

The flare at the El Hammam started operation on August 1st 2006. No leachate evaporators are present on this site.

All major components of the project were checked. This includes biogas wells, landfill gas collection piping and blower system, diesel engines, methane flaring system, evaporators and measurement equipment including the control system.

The data to be collected in order to monitor project emissions comprise the landfill gas flow (Nm³), methane fraction and flare temperature. The landfill gas flow metering is based on the measurement of temperature, pressure and flow as stated in the monitoring plan.

There has been problems with the first monitoring equipment and in particular with the datalogger which was not functioning well both in Borg El Arab and El Hammam. In Borg El Arab the datalogger worked fine until March 31st, 2007 than manual readings of the parameters were taken 9 times a day. At El Hammam the datalogger never registered the values so manual readings were taken initially once a day and from April 1st 9 times a day. Starting of 28 October 2007 a new monitoring and metering system has been commissioned. The old system will be kept as a back up for cross reference in case of malfunctioning.

It has been verified on-site that the data are complete since the beginning of the monitoring period.

The control and computer system is dual-power supplied, all the data could be remained and back-up if there is a system power failure.

Initial Verification and Verification of the First Monitoring Period of the “Onyx Alexandria Landfill Gas Capture and Flaring Project”



Industrie Service

Page 13 of 22

It has been verified on-site that all relevant meters of flow and methane fraction are supplied by qualified manufacturers with national certificate; the meters were quality control certified before delivery to landfill sites.

It has been verified by the documents that the flow meter is calibrated annually by ECON Petroleum Industrial & Technical Services, and the methane fraction meter is calibrated annually by Siemens.

The data of landfill gas flow is acquired by the flow meter and displayed and stored by the flow accumulating meter (datalogger), and then sent to the central control computer.

Different monitoring protocols were used during the period to integrate the maintenance and/or failure of equipment. The monitoring frequency evolves from one set of data per day to one set of data recorded every 5 minutes.

Every working day, data are recorded manually by a technician or a site engineer. In parallel, a data logger records the main parameters of the flare.

A counter is installed at each facility in order to account for the running hours of the flare. This value is used during the crediting period, except for the period December 2006 to March 2007, where the information from the datalogger could be used.

When data logger is used, flare operation is monitored through the flare stack temperature. The flare is considered burning landfill gas when the temperature is above 100°C.

Data issued from the data logger are automatically checked with several coherence tests. If data fails one coherence check, it will be checked manually. The coherence tests are listed below:

- Methane concentration: if the methane concentration is below 20% or above 65%, the coherence test indicates the value 0, and 1 otherwise.
- Flare temperature: if the temperature in the exhaust gas of the flare is below 500°C or above 1500°C, the coherence test indicates the value 0, and 1 otherwise.
- All data: if the difference between 3 consecutive data is identical, the coherence test indicates the value 0, and 1 otherwise.

At El Hammam landfill, the data logger did not run correctly. Consequently, the data were recorded once a day from the start of the crediting period to the 31st of March. Then, the monitoring frequency increased to 9 set of records per day.

For Borg El Arab, the data logger was operational from the crediting period to the 31st of March. Then, periodic manual records were taken. The manually recorded values were taken at a specific time, on a daily basis, by the flare operator. This approach is in compliance with the monitoring methodology (ACM0001 vers.2) and it reflects what it has been described in the monitoring plan that has been approved and registered. The DOE is confident that the accuracy of the data is respected for every different monitoring approach and the changing in the monitoring system from an electronic continuous reading system connected to a datalogger to a periodic manual reading system is compliant with the monitoring methodology, it guarantees sufficient accuracy of the data and there is no need for a request of deviation. The decision to implement a new continuous monitoring system has been taken in order to guarantee a higher level of accuracy and safety of the data and it goes beyond what it is declared in the monitoring plan already approved.

The recorded data are archived within one file for each site named:

- 'Monitoring data 07 EH vers 0.xls' for the El Hammam landfill
- 'Monitoring data BEA vers 0.xls' for the Borg El Arab landfill

At the beginning of each month, the daily record sheet has to be combined into the monthly report and submitted by the Landfill Manager to the CDM responsible and to the Managing Director of Onyx Alexandria and Veolia Propertè for the ER calculation.

It was checked by the audit team that the involved personnel is trained in all relevant segments. No specific evidences on the training that was conducted by GRS Valtec were available.

Also the Onyx management at the landfill sites has all appropriate competences, capabilities and qualifications.

Training will be provided by Landtec to all the workers involved in monitoring to understand the new system.

3.2.2 Findings

Corrective Action Request #1

In the PDD and in the Monitoring Report it is stated that on Borg El Arab site only one leachate evaporator is present, none of them was working though. During the on site visit 2 evaporators were present. This should be corrected in the MR.

Response:

A mention on the second leachate evaporator has been included in the MR.

Corrective Action Request 2:

The monitoring methodology requires that the recording frequency of the data should be continuous or periodical; in the monitoring plan annexed to the registered PDD it has been decided to use a periodical frequency of data recording. The switch between continuous recording to manual reading in March 2007 for Burg El Harab, due to the malfunctioning of the datalogger is anyway in compliance with the methodology. Hence in the Monitoring Report it should better mentioned that the new monitoring system has been commissioned to assure a continuous recording frequency even if it is not required by the methodology and in order to have a better accuracy and reliability of the data readings.

Response:

A chapter to explain the decision to implement a new monitoring system has been included in the MR.

Corrective Action Request 3:

There should be a clear and documented structure of instruction documents. All the reporting procedures together with the responsibilities, the necessary training, the list of instruments and their calibration and troubleshooting procedures should be organized in a specific procedure to better systematize the monitoring system. This procedure should be later included in the company management system.

Response:

A clear “Monitoring & Reporting Procedure plan” has been prepared and documented in the company management system. The Plan includes all the Personnel, Responsibilities, Monitoring, Reporting & Maintenance Procedures, along with the Emergency Scenario. The manual has been provided to the DOE.

Corrective Action Request #4

It should be better specified in the Monitoring Report that the Flare Temperature measured is the temperature of the exhaust gas of the flare.

Response:

The sentence has been clarified and corrected in the updated MR.

Forward Action Request #1

Relevant evidence of the training that is provided to all level of people involved in the CDM system should be stored.

Response:

This has been arranged. Training Certificates will be provided by the new monitoring system supplier to verify the training that took place. A training form has also been prepared for further activities.

3.2.3 Conclusion

The project is in compliance to the requirements.

3.3 Internal and External data

3.3.1 Discussion

The following internal parameters need to be obtained according to the monitoring plan:

- Landfill gas flow
- Flare efficiency
- Methane fraction, pressure, temperature for the standardization of the flow measurement
- Running hours of the flare

The data to be collected in order to monitor project emissions every working day are recorded manually by a technician or a site engineer. In parallel, a data logger records the main parameters of the flare.

The recorded data are archived within one file for each site named:

- ‘Monitoring data 07 EH vers 0.xls’ for the El Hammam landfill
- ‘Monitoring data BEA vers 0.xls’ for the Borg El Arab landfill

Predefined algorithms are used to compute the entry values into the final emission reduction results.

At the beginning of each month, the daily record sheet has to be combined into the monthly report and submitted to the Landfill Manager and with ER calculation to the Managing Director of Onyx Alexandria.

3.3.2 Findings

Corrective Action Request #5

In the Monitoring Report it is stated that the flow meters have been set up to provide a correct reading in normal condition at 20°C and the formula to normalize the temperature in the gas flow shall only be applied between 20 and 45°C, this is not correct, please solve this inconsistency.

Response:

The sentence has been canceled in the MR. The flow meters have been set up to provide a correct reading in normal condition at 20°C.

Forward Action Request #2

The datasheet of Borg El Arab should be updated in order to be ready to receive the datas coming from the leachate evaporator which will be commissioned soon.

Response:

The Data Sheet has been updated and a form is prepared to receive data from the Leachate Evaporator as soon as it's commissioned. The manual has been provided to the DOE.

3.3.3 Conclusion

The project complies with the requirements.

3.4 Environmental and Social Indicators

3.4.1 Discussion

No environmental and social indicators are defined in the monitoring plan. Hence the question is not applicable.

3.4.2 Findings

None.

3.4.3 Conclusion

The project complies with the requirements.

3.5 Management and Operational System

3.5.1 Discussion

The sites will follow the management system in place which has been certified via the international certification systems ISO 9000, ISO 14000 and ISO 18000.

The overall responsible person of the project is Patrick Brisset who supervises the site manager and all the engineers and workers.

Once a year the monitoring personnel will be trained internally or externally. Training will include: landfill gas collection system balancing; calibration of monitoring equipment; impact of the monitoring on the CDM activity.

Fallback solutions are provided in case of instrument failures. There is not yet an explicit procedure related to unexpected data access / data quality problems. This should be added as part of the quality assurance routines.

The data trail from the meter to the monitoring report is clearly described. The monitoring report has been sent by email to the verifier; hence the source can be retraced.

3.5.2 Findings

Corrective Action Request #6

The allocation of responsibilities is not documented in a written form. The document should be provided to the verifier.

Response:

Responsibilities & Authorities have been clearly illustrated in a Manual that also includes each job's Description & Qualifications. The manual has been provided to the DOE.

3.5.3 Conclusion

The project complies with the requirements.

Periodic Verification Findings

3.6 Completeness of Monitoring

The reporting procedures reflect the monitoring plan content. There were no requirements missing.

3.7 Accuracy of Emission Reduction Calculations

The critical parameter for the determination of GHG emissions is the landfill gas flow. All key parameters are measured twice.

The calibration and maintenance procedures are in appliance as described in the initial verification protocol but needs some better organization of the related documents. The calibration of the portable gas analyzer has been demonstrated during the audit.

3.7.1 Findings

Corrective Action Request #7

Some inconsistencies due to malfunctioning of the datalogger were found in the calculations in the Monitoring Datasheet submitted to the verifier, and they should be verified and corrected. Updated datasheets and the Monitoring Report should be submitted to the DOE.

Response:

Updated datasheets and Monitoring Report has been prepared and sent to the DOE.

Corrective Action Request #8

The fuel consumption included in the Monitoring Datasheet for the calculation of the project emissions in Borg El Arab landfill site are not correct and should be revised; moreover for both landfill sites the calculation for the project emission should take into account the adjustment factor of 20% due to the baseline.

Response:

Updated datasheets and Monitoring Report has been prepared and provided to the DOE.

3.7.2 Conclusion

The project complies with the requirements.

3.8 Quality of Evidence to Determine Emission Reductions

The calculations reflect the methodology as mentioned in the initial verification and are applied according to the monitoring plan.

At El Hammam landfill, the relevant data were recorded once a day from the start of the crediting period to the 31st of March. Then, the monitoring frequency increased to 9 set of records per day.

For Borg El Arab, the data logger was operational from the crediting period to the 31st of March. Then, periodic manual records were taken. The manually recorded values were taken at a specific time, on a daily basis (9 times a day), by the flare operator.

This approach is in compliance with the monitoring methodology (ACM0001 vers.2) and it reflects what it has been described in the monitoring plan that has been approved and registered. The DOE is confident that the accuracy of the data is respected and the changing in the monitoring system from an electronic continuous reading system connected to a datalogger to a periodic manual reading system is compliant with the monitoring methodology and it guarantees sufficient accuracy of the data. All documents with the primary data are available and all primary data which were retrieved on a random basis could be confirmed. This includes also exceptional cases like meter exchanges. Primary data are directly entered into the workbook sheets, without any in-between steps.

3.9 Management System and Quality Assurance

See Initial verification. The above mentioned procedures are working.

The audit team did verify the following parameters: sample record for the gas flow, pressure, temperature and methane fraction. All data were in compliance with the figures stated in the monitoring report.

The data measured on site are recorded manually and electronically. The electronic data are archived different computers in different sites, with back up systems.

The IT system is based on standard PC and MS-office solutions. Hence the verification team feels confident about its use.

3.10 Corrections requested in EB39, §71

3.10.1 Background

As a result of the the datalogger failures incurred in both sites, the following series of data are available for each of the two landfill sites:

“Borg El Arab” - the datalogger has worked properly for a limited period of time:

- 15 December 2007 to 31st March: datalogger properly working – 288 data/day;
- 1st April 2007 to 30 September 2007: manual readings – 9 data/day;

“El Hamman” - the datalogger has never worked properly:

- 15 December 2007 to 31st March: manual readings – 1 data/day;
- 1st April to 30 September 2007: manual readings – 9 data/day;

With EB38 the project was considered for a review by the Executive Board and the related scope identified. Initial comments by DOE and PPs have been submitted to the EB on April 2008; with reference to the first response provided by DOE and PPs in April 2008 answering the first round of requests (EB38), the initial approach of the TUEV SÜD according to the methodology was to consider the methane fraction and LFG flow as measured with a continuous analyzer and the reading frequency was periodical due to the malfunctioning of the data logger. According to this there was no need to consider the 95% confidence level.

Then, according to EB39, §71, (14-16 May 2008):

“The Board agreed to instruct the CDM registry administrator to issue CERs, subject to satisfactory corrections, for “Onyx Alexandria Landfill Gas Capture and Flaring Project” (0508) for the monitoring period 15 December 2006 - 30 September 2007 if the project participant and the DOE (TÜV-SÜD) if the PP/DOE submit a revised monitoring report and a revised verification report and a new request for issuance, as appropriate, which include:

(a) A statistical analysis, which should include specifying the null hypothesis to be tested and how the variances/standard deviation for the different data sets are calculated and compared, and the justification on the appropriateness of the test for the project situation;

(b) The assessment on how the test confirms that for each site and for each period with different monitoring frequency, the periodical measurements of the fraction of methane in the landfill gas are at a 95% confidence level.”

The PPs have provided a revised Monitoring Report to respond the question.

3.10.2 Results and comments:

The PPs have now complied with the requirements providing a revised Monitoring Report which include a detailed statistical analysis.

The documentation consist of two similar (one for each of the two sites) statistical analysis, whose logic is explained as follows: as required, the PPs have considered the periodical data and have tested (through statistical T-Student test) if the periodicity of the data could guarantee an uncertainty no higher than 10% (p_0) at a 95% confidence level. This kind of test is conducted by verifying the validity of the following hypothesis:

- H_0 : *The difference between the expected methane fraction of periodical measurements and the expected value from “continuous measurements” exceeds p_0 (for instance 10%);*
- H_1 : *The difference between the expected methane fraction of periodical measurements and the expected value from “continuous measurements” does not exceed p_0 (for instance 10%).*

In doing so, in the absence of EB recommendation on the null hypothesis they decided to refer to the Meth Panel of the ‘*Proposed guidance on addressing bias uncertainty*’ which states: *“If the random uncertainty of overall emission reductions of the project activity does not exceed 15% (at a 95% confidence level), no further action to deal with random uncertainty is required.”*

As a conservative approach the PPs have decided to assume $p_0 = 10\%$ that means that uncertainty at a 95% of confidence level will not exceed 10%, if the H_0 hypothesis is rejected as consequence of the results of the t-student test.

The logical basis of the test is that, starting with a reference data set (in this case 288 data/day) it would demonstrate that using an “alternative method” which consist of “N data/day” the null hypothesis have to be rejected and therefore that differences (d_i) in the estimation of the daily average of methane fraction using the reference method or the alternative method does not exceed 10% of uncertainty at 95% of confidence level.

t-test on Borg El Arab landfill site:

- Reference data set (REF) : 15th December 2006 to 31st March 2007: datalogger properly working – 288 data/day;

The statistical t-student test has been performed considering the REF dataset and a new series of data (alternative method A) selecting 9 data per day from the REF series. In particular, as in the REF series is available 1 data every 5 minutes, the A series has been obtained taking 1 data per hour from 7:00 to 15:00.

The result of the test is that the 9 measures per day are enough to guarantee an uncertainty not higher than 10% at a 95% confidence level; this has been presented by PPs in terms of expected value of the methane fraction (W_{CH_4}), estimated error, mean (d_i), variances (d_i) and p-value obtained.

t-test on El Hammam landfill site:

- Reference data set (REF): March 2008 – July 2008: datalogger properly working – 288 data/day

They have chosen this period as the reference, because is the only period in which 288 data /day are available within the whole project history.

The “alternative methods” of monitoring to be compared with the REF have been therefore selected according to the periodicity of the data available for the period under analysis (first monitoring period 15th December 2006 to 30 September 2007):

- AM1: 9 data/day
- AM2: 1 data/day

The result of the statistical test is that the both the 9 measures per day and also the 1 measure per day are enough to guarantee an uncertainty not higher than 10% at a 95% confidence level; this has been presented by PPs in terms of expected value of the methane fraction (W_{CH_4}), estimated error, mean (d_i), variances (d_i) and p-value obtained.

3.10.3 Justification on the appropriateness of the test to the project :

The PPs have demonstrated that the t-student test is applicable to the project situation for both the landfill sites; in doing this, has been performed a validation of the t-student test by applying to the d_i data distribution different types of normality tests (Borg El Arab landfill site) and the Wilcoxon test (El Hammam landfill site). The results of these evaluations demonstrate that, even with some differences, the data (d_i) series can be considered as normally distributed. According to these results we can state that the t-student test is applicable and appropriate to the studied case.

3.10.4 Conclusion:

The revised Monitoring Report and the related attachments (pls. see revised monitoring report - Annex 2 and 3) provided by the PPs clearly explain the statistical t-student test and how this has been applied to the datasets; according to the revised documentation provided it's therefore concluded that the EB39 §71 requirements are fulfilled.

A statistical analysis including the null hypothesis has been provided and the results discussed in terms of variances/standard deviation for the different data sets. Furthermore the justification on the appropriateness of the test for the project situation has been given and demonstrated.

The test confirms that for each site and for each period with different monitoring frequency, the periodical measurements of the fraction of methane in the landfill gas are at a 95% confidence level.

4 PROJECT SCORECARD

Risk Areas		Conclusions			Summary of findings and comments
		Baseline Emissions	Project Emissions	Emission Reductions	
Completeness	Source coverage/ boundary definition	✓	✓	✓	All relevant sources are covered by the monitoring plan and the boundaries of the project are defined correctly and transparently.
Accuracy	Physical Measurement and Analysis	✓	✓	✓	The indicated CAR have been resolved.
	Data calculations	✓	✓	✓	It can be stated that emission reductions are calculated correctly.
	Data management & reporting	✓	✓	✓	A data management system is in place.
Consistency	Changes in the project	-	-	-	There are no changes in the project to date.

5 VERIFICATION STATEMENT

TÜV SÜD Industrie Service GmbH has performed a verification of the CDM project: “Alexandria Landfill Gas Capture and Flaring Project”. The verification is based on the currently valid documentation of the UN Framework Convention on Climate Change (UNFCCC). In this context, the relevant documents are the “Marrakech Accords”.

The management of Veolia Propertè – Veolia Environmental Services is responsible for the preparation of the GHG emissions data and the reported GHG emissions reductions of the project “Alexandria Landfill Gas Capture and Flaring Project” on the basis set out within the project Monitoring Plan indicated in the final PDD version dated April 2006. The development and maintenance of records and reporting procedures is in accordance with that plan. The calculation and determination of GHG emission reductions from the project is in the responsibility of the management of the project.

The verifier confirms that the project is implemented as planned and described in validated and registered project design documents. Installed equipment being essential for generating emission reduction runs reliably. The monitoring system is in place and the project is ready to generate GHG emission reductions.

The verifier can confirm that the GHG emission reduction is calculated without material misstatements. Our opinion relates to the project’s GHG emissions and resulting GHG emissions reductions reported and related to the valid and registered project baseline and monitoring, and its associated documents. Based on the information we have seen and evaluated we confirm the following statement:

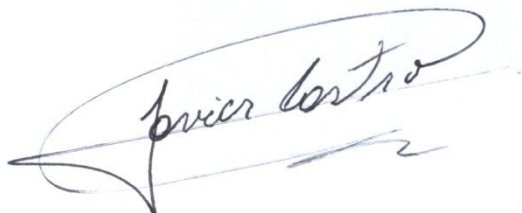
Reporting period: From 15-12-2006 to 30-09-2007

Verified emission in the above reporting period:

Baseline emissions:	22,524 t CO ₂ equivalents
Project emissions:	4,700 t CO ₂ equivalents
Emission reductions:	17,824 t CO ₂ equivalents

Munich, 2008-08-07

Munich, 2008-08-07



**Head of certification body
“climate and energy”**




**Sven Kolmetz
Project Manager**



Annex 1: Verification Protocol


6 INITIAL VERIFICATION CHECKLIST

OBJECTIVE	Ref.	COMMENTS	Conclusion.(incl FARs/CARs)
A. Opening Session			
A.1. Introduction to audits	4, 5	<p>The intention and the target of the audit were illustrated to the participants of the audit.</p> <p>Participants at the audit were the following persons:</p> <p>Verification team: Mr. Luciano Grugni TÜV Italia Srl – TÜV SÜD Group</p> <p>Interviewed persons: Mr Lionel Bondois Project manager, Veolia Environmental Services Mr Patrick Brisset Treatment Director, Onyx Alexandria Mr Mohammed Abdel Rahman Site coordinator, Onyx Alexandria Ms May Hafez CDM Respnsable, Onyx Alexandria Mr Assem Sabry Biogas Engineer, Onyx Alexandria Mr Mohammed Gaber Maintenance Technician, Onyx Alexandria, Borg El Arab Mr Abdel Fayz Maintenance Technician, Onyx Alexandria, El Hammam</p>	<input checked="" type="checkbox"/>
A.2. Clarification of access to data archives, records, plans, drawings etc.	6-15	The verification team got open access to all required plans, data, records, drawings and to all relevant facilities.	<input checked="" type="checkbox"/>
A.3. Contractors for equipment and installa-	10,	The Project has been implemented as defined in the PDD. The	<input checked="" type="checkbox"/>

Final Report	2007-11-26	Initial and First Periodic Verification of the "Alexandria Landfill Gas Capture and Flaring Project"	Page 25 of 50	 Industrie Service
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OBJECTIVE	Ref.	COMMENTS	Conclusion.(incl FARs/CARs)
tion works	11, 13	landfill gas recovery and flare system are delivered as announced in the PDD. The main contractor was: GRS Valtech, France Enclosed flare supplier is: GRS Valtech, France New controls systems main manufacturer is: Landtec, USA	
A.4. Actual status of installation works	1, 4, 6	Borg El Arab: two flares are installed at the landfill, both of them are working however only one is running at the time. The project activity started on January 1 st , 2006 with the first flare. The second flare has been commissioned April 3 rd , 2007. The system at the Borg El Arab landfill site is fitted with two leachate evaporators which are not operational yet. The flare at the El Hammam started operation on August 1 st 2006. No leachate evaporators are present on this site.	<input checked="" type="checkbox"/>
<i>B. Open issues indicated in validation report</i>			
B.1. Missing steps to final approval	1, 2	Based on the validation report the verification team identified no missing steps. The project has been registered at the UNFCCC under the reference number 0508 on 15 December 2006.	<input checked="" type="checkbox"/>
<i>C. Implementation of the project</i>			
C.1. Physical components	1, 2, 4, 6, 11, 13	All major components of the project were checked. This includes biogas wells, landfill gas collection piping and blower system, diesel engines, methane flaring system, evaporators and measurement equipment including the control system. Borg El Arab and El Hammam equipment: biogas pumping and burning unit TOR-BG2500 composed of: frame, flare, biogas	CAR1 <input checked="" type="checkbox"/>


OBJECTIVE	Ref.	COMMENTS	Conclusion.(incl FARs/CARs)
		blower, condensation separator, electric power and command cabinet Borg El Arab only: biogas pumping and burning unit STA-BG2000 composed of: frame, flare, biogas blower, condensation separator, electric power and command cabinet <u>Corrective Action Request #1</u> In the PDD and in the Monitoring Report it is stated that on Borg El Arab site only one leachate evaporator is present. During the on site visit 2 evaporators were present, none of them was working though. This should be corrected in the MR.	
C.2. Project boundaries	1, 2, 4, 6	The project boundaries were checked and they are in compliance with the PDD.	<input checked="" type="checkbox"/>
C.3. Monitoring and metering systems	1, 6, 11, 13, 16	The data to be collected in order to monitor project emissions comprise the landfill gas flow (Nm3), methane fraction and flare temperature. The landfill gas flow metering is based on the measurement of temperature, pressure and flow as stated in the monitoring plan. The monitoring system is implemented according to the validated monitoring plan. There has been problems with the first monitoring equipment and in particular with the datalogger which was not functioning well both in Borg El Arab and El Hammam. In Borg El Arab the datalogger worked fine until march 31 st , than manual readings of the parameters were taken 9 times a day. At El Hammam the datalogger never registered the values so manual readings were taken initially once a day and from April 1st 9 times a day. Starting of 28 October 2007 a new monitoring and metering system from Landtec has been commissioned. The old system	CAR2 <input checked="" type="checkbox"/>

Final Report	2007-11-26	Initial and First Periodic Verification of the "Alexandria Landfill Gas Capture and Flaring Project"	Page 27 of 50	 Industrie Service
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OBJECTIVE	Ref.	COMMENTS	Conclusion.(incl FARs/CARs)
		<p>will be kept as a back up for cross reference in case of malfunctioning.</p> <p>The efficiency of the flare was monitored through an analysis carried out on March 18th, 2007 at Borg el Arab and at El Hammam landfill sites. The analysis were carried out by an independent laboratory (NCESOH). Default value of 90% was used for the flare efficiency because not enough analysis were carried out to apply the Tool to Determine project emissions from flaring gases containing methane.</p> <p>All required monitoring systems have been identified and checked. The following equipments are the most relevant for the calculation of emission reductions:</p> <p>Borg El Arab</p> <ul style="list-style-type: none"> Flow meter: built in flow gage Fuji Electric transmitter FKCP 11D4A serial n. A5H0242F, with built in pressure element JUMO serial n. 00694540-004 and temperature gage Flow meter: built in flow gage Fuji Electric transmitter FKCP 11D4A serial n. A2P2326F, with built in pressure and temperature gage Gas Analyzer Panel: Siemens Ultramat 23 serial n. N1P9-0692 Portable gas analyzer: Geotechnical Instruments GA94 Portable Flow gage Testo-Strasse1435 Portable Pressure gage Comark C9553 <p>El Hammam</p> <ul style="list-style-type: none"> Flow meter: built in flow gage Fuji Electric transmitter FKCP 11D4A serial n. A4M4132F, with built in pressure element 	

OBJECTIVE	Ref.	COMMENTS	Conclusion.(incl FARs/CARs)
		<p>and temperature gage New Landtec system</p> <ul style="list-style-type: none"> Flow meter ST98 Fluids Component Intl Portable gas analyzer: Landtec GEM2000 serial n. GA10160/07 <p><u>Corrective Action Request #2</u></p> <p>The monitoring methodology requires that the recording frequency of the data should be continuous or periodical; in the monitoring plan annexed to the registered PDD it has been decided to use a periodical frequency of data recording. The switch between continuous recording to manual reading in March 2007 for Burg El Harab, due to the malfunctioning of the datalogger is anyway in compliance with the methodology. Hence in the Monitoring Report it should better mentioned that the new monitoring system has been commissioned to assure a continuous recording frequency even if not required by the methodology and in order to have a better accuracy and reliability of the data readings.</p> <p>All meters were from leading international suppliers. They were calibrated and sealed. They comply with the appropriate standards.</p>	
C.4. Data uncertainty	9, 10, 12	<p>It has been verified on-site that the data are complete since the beginning of the monitoring period.</p> <p>The control and computer system is dual-power supplied, all the data could be remained and back-up if there is a system power failure. Manual readings are also recorded on a daily basis to complete the data recorded via the datalogger.</p> <p>There is a designed protection function of the control system</p>	<input checked="" type="checkbox"/>

		that the landfill gas blower system will be shut down automatically if there is a no-flaring signal detected in the flare system during operation.	
C.5. Calibration and quality assurance	1, 11	<p>It has been verified on-site that all relevant meters of flow and methane fraction are supplied by qualified manufacturers with national certificate; the meters were quality control certified before delivery to landfills sites.</p> <p>It has been verified by the documents that the flow meter is calibrated annually by ECON Petroleum Industrial & Technical Services, and the methane fraction meter is calibrated annually by Siemens</p> <p>Please see CAR3 below.</p>	Open <input checked="" type="checkbox"/>
C.6. Data acquisition and data processing systems	1, 9, 10, 12	<p>The data of landfill gas flow is acquired by the flow meter and displayed and stored by the flow accumulating meter (datalogger), and then sent to the central control computer.</p> <p>Different monitoring protocols were used during the period to integrate the maintenance and/or failure of equipment. The monitoring frequency evolves from one set of data per day to one set of data recorded every 5 minutes.</p> <p>Every working day, data are recorded manually by a technician or a site engineer. In parallel, a datalogger records the main parameters of the flare.</p> <p>A counter is installed at each facility in order to account for the running hours of the flare. This value is used during the crediting period, except for the period December 2006 to March 2007, where the information from the datalogger could be used.</p> <p>When datalogger is used, flare operation is monitored through the flare stack temperature. The flare is considered burning landfill gas when the temperature is above 100°C.</p> <p>At El Hammam landfill, the datalogger did not run correctly. Consequently, the data were recorded once a day from the start</p>	<input checked="" type="checkbox"/>

Final Report	2007-11-26	Initial and First Periodic Verification of the "Alexandria Landfill Gas Capture and Flaring Project"	Page 30 of 50	 Industrie Service
--------------	------------	--	---------------	---

		<p>of the crediting period to the 31st of March. Then, the monitoring frequency increased to 9 set of records per day.</p> <p>For Borg El Arab, the datalogger was operational from the crediting period to the 31st of March. Then, periodic manual records were taken. The manually recorded values were taken at a specific time, on a daily basis, by the flare operator.</p>	
C.7. Reporting procedures	9, 10, 12, 19	<p>The recorded data are archived within one file for each site named:</p> <ul style="list-style-type: none"> - 'Monitoring data 07 EH vers 0.xls' for the El Hammam landfill - 'Monitoring data BEA vers 0.xls' for the Borg El Arab landfill <p>At the beginning of each month, the daily record sheet has to be combined into the monthly report and submitted by the Landfill Manager to the CDM responsible and to the Managing Director of Onyx Alexandria and Veolia Propertè for the ER calculation.</p> <p><u>Corrective Action Request #3</u></p> <p>There should be a clear and documented structure of instruction documents. All the reporting procedures together with the responsibilities, the necessary training, the list of instruments and their calibration and troubleshooting procedures should be organized in a specific procedure to better systematize the monitoring system. This procedure should be later included in the company management system.</p>	CAR3 <input checked="" type="checkbox"/>
C.8. Documented instructions	1, 14, 16, 19	<p>Onyx Alexandria has defined separate and not specific procedures for monitoring and measurement of process parameters. The sites will follow the management system in place which have been certified via the international certification system ISO 9000, ISO 14000 and ISO 18000.</p> <p>See CAR3</p>	Open <input checked="" type="checkbox"/>
C.9. Qualification and training	1, 4, 5, 14, 19	<p>It was checked by the audit team that the involved personnel is trained in all relevant segments.</p>	FAR1 <input checked="" type="checkbox"/>

		<p>Also the Onyx management at the landfill sites has all appropriate competences, capabilities and qualifications.</p> <p>Training will be provided by Landtec to all the workers involved in monitoring to understand the new system.</p> <p><u>Forward Action Request #1</u></p> <p>Relevant evidence of the training that is provided to all level of people involved in the CDM system should be stored.</p>	
C.10. Responsibilities	1, 4, 5, 14, 19	<p>The overall authority of the project is Patrick Brisset, who supervises the site manager and the staff of engineers and workers.</p> <p>The responsibilities should be better identified and updated in a procedure, so please see CAR3</p>	Open <input checked="" type="checkbox"/>
C.11. Troubleshooting procedures	1, 6, 16, 19	<p>Data issued from the data logger are automatically checked with several coherence tests. If data fails one coherence check, it will be checked manually. The coherence tests are listed below:</p> <ul style="list-style-type: none"> - Methane concentration: if the methane concentration is below 20% or above 65%, the coherence test indicates the value 0, and 1 otherwise. - Flare temperature: if the temperature in the exhaust gas of the flare is below 500°C or above 1500°C, the coherence test indicates the value 0, and 1 otherwise. - All data: if the difference between 3 consecutive data is identical, the coherence test indicates the value 0, and 1 otherwise. <p>Flares are equipped with a telemetry system allowing to notify the landfill gas technician in case the flare is stopped. If the flare is stopped, no landfill gas will be burnt and no credits will be claimed during this period. The running hours of the flares will be monitored as part of the monitoring procedures. In case of failure of one of the monitoring devices, portable tools will be used in order to carry out periodic daily monitoring of the missing parameter(s). These data will be recorded on paper.</p>	CAR4 <input checked="" type="checkbox"/>

		<p>There are electrical and mechanical site engineers in charge of the troubleshooting.</p> <p><u>Corrective Action Request #4</u></p> <p>It should be better specified in the Monitoring Report that the Flare Temperature measured is the temperature of the exhaust gas of the flare.</p>	
D. Internal Data			
D.1. Type and sources of internal data	1, 9, 10, 12	<p>The following internal parameters need to be obtained according to the monitoring plan:</p> <ul style="list-style-type: none"> • Landfill gas flow • Flare efficiency • Methane fraction, pressure, temperature for the standardization of the flow measurement • Running hours of the flare 	<input checked="" type="checkbox"/>
D.2. Data collection	1, 9, 10, 12, 17, 18	<p>The data to be collected in order to monitor project emissions every working day are recorded manually by a technician or a site engineer. In parallel, a data logger records the main parameters of the flare.</p> <p>The recorded data are archived within one file for each site named:</p> <ul style="list-style-type: none"> - 'Monitoring data 07 EH vers 0.xls' for the El Hammam landfill - 'Monitoring data BEA vers 0.xls' for the Borg El Arab landfill <p>Predefined algorithms are used to compute the entry values into the final emission reduction results.</p> <p>At the beginning of each month, the daily record sheet has to be combined into the monthly report and submitted to the Landfill Manager and with ER calculation to the Managing Director of Onyx Alexandria.</p>	CAR5 <input checked="" type="checkbox"/> FAR2

		<p><u>Corrective Action Request #5</u></p> <p>In the Monitoring Report it is stated that the flow meters have been set up to provide a correct reading in normal condition at 20°C and the formula to normalize the temperature in the gas flow shall only be applied between 20 and 45°C, this is not correct, please solve this inconsistency.</p> <p><u>Forward Action Request #2</u></p> <p>The datasheet of Borg El Arab should be updated in order to be ready to receive the datas coming from the leachate evaporator which will be commissioned soon.</p>	
D.3. Quality assurance	1, 14, 16, 17, 18, 19	<p>The sites will follow the management system in place which have been certified via the international certification system ISO 9000, ISO 14000 and ISO 18000.</p> <p>Plausibility checks and experience allows to detect apparent misreading or transmission errors. The staff is trained to know the quality assurance procedures.</p> <p>There is however not yet a well defined overall quality assurance process defined and implemented. Based on the operation experiences of the past year and of the verification audit it is recommended to define and introduce appropriate routines before the end of the next verification period. Hence see CAR3</p>	Open <input checked="" type="checkbox"/>
D.4. Significance and reporting risks	1, 14, 19	The sites will follow the management system in place which have been certified via the international certification system ISO 9000, ISO 14000 and ISO 18000.	<input checked="" type="checkbox"/>
E. External Data			
E.1. Type and sources of external data	1, 4	Regulatory Requirements related to landfill gas projects.	<input checked="" type="checkbox"/>
E.2. Access to external data	1, 19	Official publications will be checked annually.	<input checked="" type="checkbox"/>

E.3. Quality assurance		Not applicable	<input checked="" type="checkbox"/>
E.4. Data uncertainty		Not applicable	<input checked="" type="checkbox"/>
E.5. Emergency procedures		Not applicable	<input checked="" type="checkbox"/>
<i>F. Environmental and Social Indicators</i>			
F.1. Implementation of measures	4, 6, 19	No environmental and social indicators are defined in the monitoring plan. Hence the question is not applicable.	<input checked="" type="checkbox"/>
F.2. Monitoring equipment	4, 6, 19	See chapter 6.1.	<input checked="" type="checkbox"/>
F.3. Quality assurance procedures	4, 6, 19	See chapter 6.1.	<input checked="" type="checkbox"/>
F.4. External data	4, 6, 19	See chapter 6.1.	<input checked="" type="checkbox"/>
G. Management and Operational System			
G.1. Documentation	1, 14, 19	The sites will follow the management system in place which has been certified via the international certification systems ISO 9000, ISO 14000 and ISO 18000. Please see CAR3	Open <input checked="" type="checkbox"/>
G.2. Qualification and training	1, 14, 19	The overall responsible person of the project is Mr Patrick Brisset who supervises the site manager, the engineers and the	Open <input checked="" type="checkbox"/>

		workers. Once a year the monitoring personnel will be trained internally or externally. Training will include: Landfill gas collection system balancing; Calibration of monitoring equipment; Impact of the monitoring on the CDM activity. Please see FAR1	
G.3. Allocation of responsibilities	1, 14, 19	<u>Corrective Action Request #6</u> The allocation of responsibilities is not documented in a written form. The document should be provided to the verifier.	CAR6 <input checked="" type="checkbox"/>
G.4. Emergency procedures	1, 6, 14, 16, 19	Fallback solutions are provided in case of instrument failures. There is not yet an explicit procedure related to unexpected data access / data quality problems. This should be added as part of the quality assurance routines. See CAR3	Open <input checked="" type="checkbox"/>
G.5. Data archiving	1, 6, 14, 16, 19	Routines for the archiving of data are defined and documented.	<input checked="" type="checkbox"/>
G.6. Monitoring report	1, 6, 14, 16, 19	The data trail from the meter to the monitoring report is clearly described. The monitoring report has been send by email to the verifier; hence the source can be retraced.	<input checked="" type="checkbox"/>
G.7. Internal audits and management review	1, 14, 19	No CDM specific internal audits are required because the monitoring and measurement are done every day and hence permanent control of the figures in main and auxiliary supply meter readings take place. Internal audits are conducted every three month according to ISO9001 procedure.	<input checked="" type="checkbox"/>

7 PERIODIC VERIFICATION CHECKLIST


Table 1: Data Management System/Controls

Expectations for GHG data management system/controls		Score	Verifiers Comments (including <i>Forward Action Requests</i>)
1	Defined organizational structure, responsibilities and competencies		
1.1	Position and roles	Full	<p>The overall authority of the project is supervised by the Landfill Manager who is an experienced project manager and executive in operation and maintenance of the plant and academically qualified to carry out the task.</p> <p>The rules and procedures as defined in the monitoring plan and are used in practice. See section C8 - C10 in Initial Verification Checklist (IVC).</p> <p>Meanwhile, all the staff is trained for daily operation and maintenance by experts from the Onyx Alexandria headquarter. Hence, see FAR1</p>
1.2	Responsibilities	Partial	<p>The responsibilities are clearly defined as detailed in section C8 and G3 above. Hence, see CAR4</p>

Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)
1.3 Competencies needed	Full	<p>All competencies needed are met by the operating staff. The competencies for each aspect of the GHG determination process have been thoroughly checked. Experience, training program and ISO-accreditation guarantee a high level of competence.</p> <p>The competencies of the Veolia management team could be demonstrated equally well. High level generic experience with landfill management is available as well as detailed knowledge of the plant and its operational monitoring process.</p>
2 Conformance with monitoring plan		
2.1 Reporting procedures	Full	<p>The reporting procedures are working as described in the initial verification protocol. The required documents were shown to the audit team and the Landfill Manager was totally aware of the reporting procedures.</p> <p>The monitoring plan in the PDD presents the monitoring concept on a rather high level.</p>
2.2 Necessary Changes	Partial	Based on CARs and FARs in the IVC some small changes are needed in the Monitoring Plan to reflect added details for quality control routines and internal control procedures.
3 Application of GHG determination methods		
3.1 Methods used	Full	The calculations reflect the methodology as mentioned in the initial verification and are applied according to the monitoring plan.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)
3.2 Information/process flow	Full	Details of the information flow exist and the procedures are applied according to the Monitoring Plan. The procedures were described in the initial verification protocol.
3.3 Data transfer	Full	<p>At El Hammam landfill, the data were recorded once a day from the start of the crediting period to the 31st of March. Then, the monitoring frequency increased to 9 set of records per day.</p> <p>For Borg El Arab, the data logger was operational from the crediting period to the 31st of March. Then, periodic manual records were taken. The manually recorded values were taken at a specific time, on a daily basis, by the flare operator.</p> <p>This approach is in compliance with the monitoring methodology (ACM0001 vers.2) and it reflects what it has been described in the monitoring plan that has been approved and registered. The DOE is confident that the accuracy of the data is respected and the changing in the monitoring system from an electronic continuous reading system connected to a datalogger to a periodic manual reading system is compliant with the monitoring methodology and it guarantees sufficient accuracy of the data.</p>
3.4 Data trails	Full	All documents with the primary data are available and all primary data which were retrieved on a random basis could be confirmed. Primary data are directly entered into the workbook sheets, without any in-between steps.
4 Identification and maintenance of key process parameters		

Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)
4.1 Identification of key parameters	Full	The critical parameter for the determination of GHG emissions is the landfill gas flow. All key parameters are measured twice.
4.2 Calibration/maintenance	Partial	The calibration and maintenance procedures are in compliance as described in the initial verification protocol but needs some better organization of the related documents, hence see CAR3. The calibration of the portable gas analyzer has been demonstrated during the audit.
5 GHG Calculations		

Final Report	2007-11-26	Initial and First Periodic Verification of the "Alexandria Landfill Gas Capture and Flaring Project"	Page 40 of 50	 Industrie Service
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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)
5.1 Use of estimates and default data	Partial	<p>The data to be used in the calculation are automatically/manually recorded every 5 minutes or 9 times a day or once a day and transferred into an excel sheet. Additional the data of the control system are recorded electronically.</p> <p>The diesel oil emission factor is used as a predetermined default value which has been defined in the PDD and confirmed during validation of the project.</p> <p><u>Corrective Action Request #7</u></p> <p>Some inconsistencies due to malfunctioning of the datalogger were found in the calculations in the Monitoring Data-sheet submitted to the verifier, and they should be verified and corrected. Updated datasheets and Monitoring Report should be submitted to the DOE.</p> <p><u>Corrective Action Request #8</u></p> <p>The fuel consumption included in the Monitoring Datasheet for the calculation of the project emissions in Borg El Arab landfill site are not correct and should be revised; moreover for both landfill sites the calculation for the project emission should take into account the adjustment factor of 20% due to the baseline.</p>
5.2 Guidance on checks and reviews	Full	See Initial verification. The above mentioned procedures are mainly applied.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)
5.3 Internal verification and validation	Full	See Initial verification. The above mentioned procedures are working. The audit team did verify the following parameters: sample record for the gas flow, pressure, temperature and methane fraction. All data were in compliance with the figures stated in the monitoring report.
5.4 Data protection measures	Full	The data measured on site are recorded manually and electronically. The electronic data are archived different computers in different sites, with back up systems.
5.5 IT systems	Full	The IT system is based on standard PC and MS-office solutions. Hence the verification team feels confident about its use.


Table 3: GHG calculation procedures and management control testing

Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
<p>Potential reporting risks based on an assessment of the emission estimation procedures can be expected to occur in the following fields of action:</p> <ol style="list-style-type: none"> raw data collection calculation methods data transfer <p>Key source data applicable to the project assessed are hereby:</p> <ul style="list-style-type: none"> Metering records (for landfill gas flow) 	<p>Regarding the potential reporting risks identified in the left column the following mitigation measures have been observed during the document review and the on site mission:</p> <p>Raw data collection:</p> <p>All data are metered twice and cross checked regularly. The meters are purchased from well-known international companies.</p> <p>Key source data for this parameter are:</p>	<p>Additional random testing</p>

Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
<p>Appropriate calibration and maintenance of equipment resulting in a high accuracy of data supplied should be in place.</p> <p>It is hereby needed to focus on those risks that impact the accuracy, completeness and consistency of the reported data. Risks are weakness in the GHG calculation systems and may include:</p> <ul style="list-style-type: none"> ➤ manual transfer of data/manual calculations, ➤ position of metering equipment ➤ unclear origins of data, ➤ accuracy due to technological limitations 	<ul style="list-style-type: none"> • Main & backup meter readings <p>The allocation of responsibilities should be documented in a written form, see CAR6 and CAR3.</p> <p>The necessary procedures have been defined in the internal documents, but see also CAR1</p> <p>Calculation methods:</p> <p>The reporting procedures reflect the monitoring plan content and the calculation of the emission reduction is applied correctly.</p> <p>Data transfer:</p> <p>It has been verified that the data transfer is applied according to the described procedures.</p>	

Table 4: Detailed audit testing of residual risk areas and random testing


Areas of residual risks	Additional verification testing performed	Conclusions and Areas Requiring Improvement (including <i>Forward Action Requests</i>)
Additional random testing	<ul style="list-style-type: none"> • Sample cross checking of manual transfers of data: <p>All data which were used in the "workbook data" sheet of the workbook file were explicitly checked. On a random basis data were checked at their primary source.</p> <ul style="list-style-type: none"> • Recalculation <p>Recalculation of the workbook files was performed.</p>	<p>There were no findings. All entry data and all results could be confirmed.</p> <p>Having investigated the residual risks, the audit team comes to the following conclusion:</p> <p><u>Forward Action Request #2</u></p> <p>The datasheet of Borg El Arab should be updated in order to be ready to receive the datas coming from the leachate evaporator which will be commissioned soon.</p>

Final Report	2007-11-26	Initial and First Periodic Verification of the "Alexandria Landfill Gas Capture and Flaring Project"	Page 43 of 50	 Industrie Service
--------------	------------	--	---------------	---


Areas of residual risks	Additional verification testing performed	Conclusions and Areas Requiring Improvement (including <i>Forward Action Requests</i>)
	<ul style="list-style-type: none"> Spreadsheet 'walk throughs' to check links and equations All equations and algorithms used in the different workbook sheets were checked. <ul style="list-style-type: none"> Inspection of calibration and maintenance records for key equipment The seals and the documents for the key equipment was inspected.	

Table 5: Compilation of open issues

Draft report corrective and forward action requests by audit team	Summary of project owner response	Audit team conclusion
<p><u>Corrective Action Request #1</u></p> <p>In the PDD and in the Monitoring Report it is stated that on Borg El Arab site only one leachate evaporator is present, none of them was working though. During the on site visit 2 evaporator were present. This should be corrected in the MR.</p>	A mention on the second leachate evaporator has been included in the MR.	<input checked="" type="checkbox"/>
<p><u>Corrective Action Request #2</u></p> <p>The monitoring methodology requires that the recording frequency of the data should be continuous or periodical; in the monitoring plan annexed to the registered PDD it has been decided to use a periodical frequency of data recording. The switch between continuous recording to manual reading in March 2007 for Burg El Harab, due to the malfunctioning of the datalogger is anyway in compliance with the methodology. Hence in the Monitoring Report it should better mentioned that the new monitoring system has been commissioned to assure a continuous recording frequency even if it is not required by the methodology and in order to have a better accuracy and reliability of the data readings.</p>	A chapter to explain the decision to implement a new monitoring system has been included in the MR.	<input checked="" type="checkbox"/>
<p><u>Corrective Action Request #3</u></p> <p>There should be a clear and documented structure of instruction documents. All the reporting procedures together with the responsibilities, the necessary training, the list of instruments and their calibration and troubleshooting procedures should be organized in a specific procedure to better systematize the monitoring system. This procedure should be later included in the company management system.</p>	A clear "Monitoring & Reporting Procedure plan" has been prepared and documented in the company management system. The Plan includes all the Personnel, Responsibilities, Monitoring, Reporting & Maintenance Procedures, along with the Emergency Scenario. The manual has been provided	<input checked="" type="checkbox"/>

Final Report	2007-11-26	Initial and First Periodic Verification of the "Alexandria Landfill Gas Capture and Flaring Project"	Page 45 of 50	 Industrie Service
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Draft report corrective and forward action requests by audit team	Summary of project owner response	Audit team conclusion
	to the DOE.	
<u>Corrective Action Request #4</u> It should be better specified in the Monitoring Report that the Flare Temperature measured is the temperature of the exhaust gas of the flare.	The sentence has been clarified and corrected in the updated MR.	☑
<u>Corrective Action Request #5</u> In the Monitoring Report it is stated that the flow meters have been set up to provide a correct reading in normal condition at 20°C and the formula to normalize the temperature in the gas flow shall only be applied between 20 and 45°C, this is not correct, please solve this inconsistency.	The sentence has been canceled in the MR. The flow meters have been set up to provide a correct reading in normal condition at 20°C.	☑
<u>Corrective Action Request #6</u> The allocation of responsibilities is not documented in a written form. The document should be provided to the verifier.	Responsibilities & Authorities have been clearly illustrated in a Manual that also includes each job's Description & Qualifications. The manual has been provided to the DOE.	☑
<u>Corrective Action Request #7</u> Some inconsistencies due to malfunctioning of the datalogger were found in the calculations in the Monitoring Datasheet submitted to the verifier, and they should be verified and corrected. Updated datasheets and Monitoring Report should be submitted to the DOE.	Updated datasheets and Monitoring Report has been prepared and sent to the DOE.	☑
<u>Corrective Action Request #8</u> The fuel consumption included in the Monitoring Datasheet for the calculation of the project emissions in Borg El Arab landfill site are not correct and should be revised; moreover for both landfill sites the calculation for the project emission should take into account the adjustment factor of 20% due to the baseline.	Updated datasheets and Monitoring Report has been prepared and provided to the DOE.	☑
<u>Forward Action Request #1</u> Relevant evidence of the training that is provided to all level of people involved in the CDM system should be stored.	This has been arranged. Training Certificates will be provided by the new monitoring system supplier to Verify	☑

Final Report	2007-11-26	Initial and First Periodic Verification of the "Alexandria Landfill Gas Capture and Flaring Project"	Page 46 of 50	 Industrie Service
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Draft report corrective and forward action requests by audit team	Summary of project owner response	Audit team conclusion
	the Training that took place. A training form has also been prepared for further activities.	
<u>Forward Action Request #2</u> The datasheet of Borg El Arab should be updated in order to be ready to receive the data coming from the leachate evaporator which will be commissioned soon.	The Data Sheet has been updated and a form is prepared to receive data from the Leachate Evaporator as soon as it's commissioned. The manual has been provided to the DOE.	<input checked="" type="checkbox"/>



Annex 2: Information Reference List

Final Report 2007-11-26	Initial Verification and Verification of the First Monitoring Period of the Onyx "Alexandria Landfill Gas Capture and Flaring Project" Information Reference List	Page 50 of 50	 Industrie Service
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Reference No.	Document or Type of Information
1	Final Project Design Document for CDM project "Onyx Alexandria Landfill Gas Capture and Flaring Project" April 2006, version 4
2	Validation Protocol and Finding Overview issued by SGS
3	Consolidated baseline methodology for ACM0001 "Landfill gas project activities", version 2
4	<p>Validation team:</p> <p>Mr. Werner Betzenbichler GHG ATL - TÜV SÜD Industrie Service GmbH Mr. Luciano Grugni GHG auditor - TÜV Italia Srl – TÜV SÜD Group</p> <p>On-site interviews and inspection at the project site conducted on October 28-29, 2007 by auditing team of TÜV SÜD.</p> <p>Interviewed persons:</p> <p>Mr Lionel Bondoio Project manager, Veolia Environmental Services Mr Patrick Brisset Treatment Director, Onyx Alexandria Mr Mohammed Abdel Rahman Site coordinator, Onyx Alexandria Ms May Hafez CDM Responsible, Onyx Alexandria Mr Assem Sabry Biogas Engineer, Onyx Alexandria Mr Mohammed Gaber Maintenance Technician, Onyx Alexandria, Borg El Arab Mr Abdel Fayz Maintenance Technician, Onyx Alexandria, El Hammam</p>
5	Participant list of on-site interview, signed on Oct. 29 th , 2007
6	Initial Monitoring Report "Onyx Alexandria Landfill Gas Capture and Flaring Project – CDM registration number 508" for the period Dec. 15, 2006 until Sept. 30, 2007, submitted Oct., 2007.
7	Monitoring Data rev.0 El Hammam landfill site for the period Dec. 15, 2006 until Sept. 30, 2007, by Veolia Environmental Services submitted on Oct. 2007
8	Monitoring Data rev.0 Borg El Arab landfill site for the period Dec. 15, 2006 until Sept. 30, 2007, by Veolia Environmental Services submitted on Oct. 2007
9	Monthly Activity Reports for the period Dec. 15, 2006 until Sept. 30, 2007, El Hammam and Borg El Arab landfill sites by Veolia Environmental Services submitted on Oct. 2007

Final Report 2007-11-26	Initial Verification and Verification of the First Monitoring Period of the Onyx "Alexandria Landfill Gas Capture and Flaring Project" Information Reference List	Page 50 of 50	 Industrie Service
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Reference No.	Document or Type of Information
10	Monitoring & Measurement Record of the Gas Flow, Flare Temperature and Methane Fraction, Borg El Arab and El Hammam landfill sites, submitted on Oct. 2007
11	Calibration Certificates for Methane Fraction Meters and Flow Meters, El Hammam and Borg El Arab landfill sites, submitted on Oct. 2007
12	Manual readings sheets for gas flow, flare temperature and methane fraction for El Hammam and Borg El Arab landfill sites, submitted on Oct, 2007
13	Operation and Maintenance Manual for flow meters ST98 Fluids Component Intl, submitted on Oct, 2007
14	QHSE Manual rev. 3 dated 1/08/07 and procedures
15	Borg El Arab and El Hammam Flare TOR-BG2500 Flare Technical Manual DOC OE BOR 5.11.140 Use and Maintenance Instruction; Borg El Arab Flare STA-BG-2000 Description use and maintenance instruction
16	Final Monitoring Report "Onyx Alexandria Landfill Gas Capture and Flaring Project – CDM registration number 508" for the period Dec. 15, 2006 until Sept. 30, 2007, Version 1 submitted Nov., 2007.
17	Monitoring Data rev.1 El Hammam landfill site for the period Dec. 15, 2006 until Sept. 30, 2007, Veolia Environmental Services, submitted on Nov. 2007
18	Monitoring Data rev.1 Borg El Arab landfill site for the period Dec. 15, 2006 until Sept. 30, 2007, Veolia Environmental Services, submitted on Nov. 2007
19	Bio-Gas Monitoring & Reporting Procedure, Revised 31 st October 2007, version 1