
VERIFICATION AND CERTIFICATION REPORT

**South Pole Carbon Asset Management
Limited**

***Wastewater Treatment with Biogas
Production (UASB) and Heat
Utilization at General Starch Co.
Ltd.***

SGS Climate Change Programme

SGS United Kingdom Ltd
SGS House
217-221 London Road
Camberley Surrey
GU15 3EY
United Kingdom

Date of Issue:		Project Number:	
22/08/2008		CCP.VOL305	
Project Title:			
Wastewater Treatment with Biogas production (UASB) and heat utilization at General Starch Co Ltd.			
Organisation:		Client:	
SGS United Kingdom Limited		South Pole Carbon Asset Management Limited.	
Summary:			
SGS United Kingdom Ltd has performed the Voluntary Emission Reduction verification of the project 'Wastewater Treatment with Biogas production (UASB) and heat utilization at General Starch Co Ltd'. The verification includes confirming the implementation of the monitoring plan of the PDD (dated 19/06/2007) which was validated by TÜV Nord (report number: 8000349679-07/63, dated 31/08/2007) and the application of the monitoring methodology as per AM0022 version 04, dated 26/12/2006. A site visit was conducted to verify the data submitted in the monitoring report. The project site is a 600 TPD (tonnes per day) tapioca based starch manufacturing plant owned by M/s General Starch Co. Ltd. The mill generates about 5000 m³ waste water per day. The project plant activity is a wastewater treatment facility based on the Upflow Anaerobic Sludge Blanket (UASB) technology operated by M/s PAPOP. The organic wastewater of the tapioca starch plant is treated in two parallel UASB reactors (UASB 1 and UASB 2) and the generated biogas is flared and converted into heat for on-site usage. The biogas is not used for onsite electricity generation. The partially treated wastewater is discharged into an existing lagoon system (which is the pre-project treatment facility). The routes for the destruction of methane are: Biogas flaring and biogas use in on-site heating facilities. SGS confirms that the project is implemented in accordance with the Project Design Document validated on VCS 1 by TÜV. The monitoring system is in place and the emission reductions are calculated without material misstatements. Our opinion relates to the projects GHG emissions and the resulting GHG emission reductions reported and related to the valid and registered project baseline and monitoring and its associated documents. Based on the information seen and evaluated we confirm that the implementation of the project has resulted in 110,601 tCO₂e during period 01/06/2007 up to 31/03/2008.			
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VCS 2007 Verification			
Voluntary Team:		☒ No Distribution (without permission from the Client or responsible organisational unit)	
Kaviraj Singh – Lead Assessor Thunsiri Duangporn – Local Assessor Pitipoom Tungsirisuteekul – Local Assessor (Trainee)			
Technical Review:		Trainee Technical Reviewer:	
Name: Irma Lubrecht		Name: N/A	
Date: 16/09/2008 & 27/09/2008		☐ Limited Distribution	
Authorised Signatory:		☐ Unrestricted Distribution	
Name: Siddharth Yadav Date: 29 th September 2008			
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Abbreviations

CAR	Corrective Action Request
CO ₂	Carbon Dioxide
CO ₂ e	Carbon Dioxide Equivalent
DNA	Designated National Authority
DOE	Designated Operational Entity
GHG	Green House Gas(es)
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MR	Monitoring Report
NIR	New Information Requests
PDD	Project Design Document
VCS	Voluntary Carbon Standard
VCUs	Voluntary Carbon Units

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1. Introduction

1.1 Objective

South Pole Carbon Asset Management Limited has commissioned an independent verification by SGS United Kingdom Limited of its reported greenhouse gas emission reductions from the wastewater treatment with biogas production (UASB) and heat requirement at General Starch project. The verifiers have reviewed the GHG data collected to date for the period between 01/06/2007 to 31/03/2008.

The purpose of this verification exercise is to independently review the objective evidence:

- Whether the project has resulted in emission reductions as declared by the organisation or GHG project's GHG assertion;
- The data reported is accurate, complete, consistent, transparent and free of material error or omission.

1.2 Scope and Criteria

This engagement covers verification of emission reductions from anthropogenic sources of greenhouse gases included within the project boundary of the 'Wastewater Treatment with Biogas production (UASB) and heat utilization at General Starch Co Ltd.' project.

SGS' approach is risk-based, drawing on an understanding of the risks associated with reporting GHG emissions data and the controls in place to mitigate these. SGS' examination includes assessment, on a test basis, of evidence relevant to the amounts and disclosures in relation to the project's GHG emission reductions for the defined reporting period.

1.3 VCS Project Description

The project site is a 600 TPD (tonnes per day) tapioca based starch manufacturing plant owned by M/s General Starch Co. Ltd. The plant generates about 5000 m3 of wastewater every day. The project plant activity is a wastewater treatment facility based on the Upflow Anaerobic Sludge Blanket (UASB) technology operated by M/s PAPOP. The organic wastewater of the tapioca starch plant is treated in two parallel UASB reactors (UASB 1 and UASB 2) and the generated biogas is flared and converted into heat for on-site usage. The biogas is not used for onsite electricity generation. The partially treated wastewater is discharged into an existing lagoon system (which is the pre-project treatment facility). The routes for the destruction of methane are: Biogas flaring and biogas use in on-site heating facilities.

1.4 Level of Assurance

The parameters and values presented in the monitoring report were assessed through detailed review of project documentation and production records, interviews with personnel at General Starch Co Limited, check of log books, and collection of fuel analyses reports, observations of established monitoring and reporting practices and assessment of the reliability of measuring equipment.

Information which was not available during site visit was reported as New Information Request (NIR), following submission of additional information, monitoring and operational records, and the reconsolidation of all reported data was assessed again.

1.5 Project Activity and Period Covered

This engagement covers emissions and emission reductions from anthropogenic sources of greenhouse gases included within the project boundary of the following project and period.

Title of Project Activity: 'Wastewater Treatment with Biogas production (UASB) and heat utilization at General Starch Co Ltd'

UNFCCC Registration Number: The project applies for VCS2007 only.



Monitoring Period Covered in this Report:

01/06/2007 up to 31/03/2008.

Project Participants:

South Pole Carbon Asset Management Limited

Location of the Project Activity:

Thailand/Nakhon Ratchasima/No.99, Chock Chai

2. Methodology

2.1 General Approach

SGS' approach to the verification is a two-stage process.

In the first stage, SGS completed a strategic review and risk assessment of the projects activities and processes in order to gain a full understanding of:

- Activities associated with all the sources contributing to the project emissions and emission reductions, including leakage if relevant;
- Protocols used to estimate or measure GHG emissions from these sources;
- Collection and handling of data;
- Controls on the collection and handling of data;
- Means of verifying reported data; and
- Compilation of the monitoring report.

At the end of this stage, SGS produced a Periodic Verification Checklist which, based on the risk assessment of the parameters, data collection and handling processes for each of those parameters, describes the verification approach and the sampling plan.

Using the Periodic Verification checklist, SGS verified the implementation of the monitoring plan and the data presented in the Monitoring Report for the period in question. This involved a site visit and a desk review of the monitoring report. This verification report describes the findings of this assessment.

2.2 Verification Team for this Assessment

Name	Role	SGS Office
Kaviraj Singh	Lead Assessor	SGS IN
Thunsiri Duangporn	Local Assessor	SGS TH
Pitipoom Tungsirisuteekul	Local Assessor (Trainee)	SGS TH

2.3 Means of Verification

2.3.1 Review of Project Documentation

The validated PDD, 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 in section 1 of this report.

2.3.2 Onsite Inspections

As part of the verification, the following on-site inspections have been performed

Location: Thailand/Nakhon Ratchasima/No.99, Chock Chai	Date: 09/04/2008
Coverage	Source of Information / Persons Interviewed
Management Approach to GHG commitment	Patrick Burgi
VCS monitoring & reporting documentation	Martchamadol Jutamanee
Quality Assurance – Management and operating system & Emergency procedures	Martchamadol Jutamanee

2.3.3 Review of Monitoring Results and Verification of the Correct Application of Monitoring Methodology

Flow of waste water, going into two USAB, is being monitored by two separate flow meters (FM3 and FM5). The serial number of meters (FM:3 S/N 6B00EB20000 & FM:5 S/N 6B00E920000) was checked and recorded at site. The calibration certificates of the used flow meters was checked and found in order. The readings recorded in totalizers, are automatically and continuously recorded in SCADA in m³/hr then at the end of day SCADA has the total flow/day. The flow of waste water is monitored in m³/hr and then converted into m³/yr by putting the values into an spreadsheet and then finally used for emission reduction calculations.

CAR02 was raised to provide the calibration certificate for flow meter FM03, covering the crediting period 01/06/2007 to 31/03/2008 since the provided calibration certificates for meter FM05 do not cover the crediting period from 13/08/2007 to 31/03/2008. The flow meter FM05 was calibrated first on 12/08/2004 and then again calibrated on 18/03/2008. With reference to the guidelines in EB35, Annex 35 meter calibration should happen at least in 3 years if not defined in methodology. However, the meter was without calibration for at least 7 months of verification monitoring period but the meter was found correct subject to the checked parameters at the time of calibration on 18/03/2008. So it is assumed that during that 7 month period, when calibrating certificates were missing, the meter was working well. In addition to this the flow meter specifications (VC0A1AA0A4AA) does not talk about any desired frequency of calibration. So this was accepted. The meter FM03 was calibrated on 18/03/2008 (calibration certificate ref. no. 6B00E92000) and found well in working condition so it was assumed that it was working with in accuracy in past covering this monitoring period. However, on a conservative basis, maximum possible error that may be up to 0.5% has been accounted by applying a correction factor of 0.5% to the taken readings from meter FM03. The meter specification from Endress and Hauser, Promag, electromagnetic flow meter was also checked and maximum possible figure of error that is 0.5% was verified. The taken approach is conservative so CAR02 was closed out.

Waste water leaving the treatment facility. The monitored values of USAB inlet of waste water have been used for outlet as well assuming that the same quantity of waste water will come out as go in because it is a closed system.

COD inlet is estimated by calorimeter and COD samples are taken at 8 AM every day and immediately brought to the lab for COD analysis. CAR03 was raised so justify how the QA/QC for COD analysis was followed. The Reactor Digestion method USEPA approved for reporting waste water analysis Method 8000. The used photometer for COD estimation was calibrated and found correct. Calibration certificate No. 179/2008 dated 22/05/2008 was checked and it was found that all the readings given by photometer are under the permissible limit.

COD outlet is carried out by the same calorimeter in the same way as discussed above.

Biogas sent to facility heater and flare and gen set is monitored continuously by flow meters. The biogas generated from two USAB (1&2) is monitored by two online flow meters (GM1: EJ 10214 and GM2: F8-12093). The gas flow meters give the reading in m³/hr and these readings are recorded continuously in SCADA and also recorded in totalizers. The totalizer readings for every day are recorded in plant log sheet at 8 AM every day. Then the final day reading minus the previous day reading gives the total flow of biogas for that day. NIR04 was raised to submit calibration certificate for master calibrator and also the internal

calibration certificates/records for all three gas meters (generation, combustion and flared) covering this monitoring period. The calibration certificate for the meter GM1: EJ-10214 (calibration cert. ref number-3959/2729 dated 12/01/2007) was provided and found in order. The biogas production flow meter (GM2: F8-12093) was calibrated on 30/01/2007 and on 11/01/2008. The flow meter (GM3: F8-12093) for biogas consumed in boiler was calibrated on 07/02/2006 and 28/03/2007. The flow meter for biogas flared was installed on 29th January 2008 and calibration certificate dated 29/11/2007 was checked. However, in absence of gas flow meter for biogas flaring the quantity of biogas is calculated from subtracting the biogas flow of boiler from the total gas produced. The meter for accounting the gas flared was installed on 29th January 2008 and then the calculated values for gas flaring (as stated above) was compared with the monitored values. It was noted that the monitored values are generally higher than the calculated values so it was assumed that the taken approach for calculating the flow of biogas flared was conservative in absence to flow meter. So the requirement of applicable methodology AM0022 version 04 i.e. monitoring of flow of biogas flared are met by calculating and as discuss the approach is conservative. NIR04 was closed out. The biogas flared was not monitored for initial period of methodology so CAR06 was raised to have the explanation about the calculation for the quantity of flared gas and conservativeness. The flow meter for biogas flared was installed on 29th January 2008 and calibration certificate dated 29/11/2007 was checked. However, in absence of gas flow meter for biogas flaring the quantity of biogas is calculated from subtracting the biogas flow of boiler from the total gas produced. The meter for accounting the gas flared was installed on 29th January 2008 and then the calculated values for gas flaring were compared with the monitored values. It was noted that the monitored values are generally higher than the calculated values so it was assumed that the taken approach for calculating the flow of biogas flared was conservative in absence of the flow meter. So the requirement of applicable methodology AM0022 version 04 i.e. monitoring of flow of biogas flared are met by calculating and as discussed the approach is conservative. This was accepted and hence CAR06 closed.

The amount of fossil fuel consumed are calculated values based on the monitored parameters and standard values. CAR05 was raised for explanation how the volume of the fossil fuel replaced by biogas has been calculated? With reference to the monitoring methodology AM0022, the CO₂ emission corresponding to the fossil fuel displacement should be calculated as per equation 09 on page 11 where ECO_{2, heat} should be calculated by using average specific fuel consumption for the output of the facility, estimated using 3 years historical data. In the project activity the amount of fossil fuel (HFO here) displaced was calculated based on the energy content of biogas supplied to boiler. The NCV value of methane has been determined according to national energy statistics http://www.dede.go.th/dede/fileadmin/usr/wpd/static/thai_oil_2005/50Conversion.pdf and other values are taken from the IPCC (IPCC 2006 Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 1: Introduction, Table 1.2, value for "Residual fuel oil") The taken approach is conservative so raised NIR05 was closed out.

Biogas methane concentration is monitored and the average value 63.6% has used now for emission reduction calculations. The infrared gas meter calibration certificate (Ref. number 01/2007) was provided and found in order so raised CAR07 was closed out.

Project emissions from the flaring of the residual stream are the calculative conservative figure based on the monitored values and default values taken from applied methodology (AM 0022 version 04) and IPCC.

Heating system efficiency is a calculated value. CAR 08 was raised to justify how efficiency of heating systems combustion is calculated and used for estimating the fossil fuel displaced by biogas, as per the requirement of the applicable methodology. The amount of heavy fuel oil (HFO) displaced by biogas is calculated on the basis of the energy content of the biogas delivered to the boilers. It is assumed that the same amount of energy would be delivered by HFO in the absence of the project activity, relying on the fact that energy conversion efficiency of HFO and biogas is the same since the boiler systems have not been replaced after implementation of the project activity. However, the combustion efficiency of gas fired system is generally higher then oil fired system. So the taken figure for boiler combustion efficiency looks fine and conservative. CAR08 was closed out.

Flow of wastewater directly to the current water treatment system, bypassing the new wastewater treatment facility, is not monitored in the project activity because (actually) there is no bypass of the wastewater. CAR09 was raised for clarification. There is no bypass of waste water because all the waste water is sent to the USAB reactor and then sent to the anaerobic lagoon. It was physically verified at the site that there are no bypass flows of waste water away from the USAB and that all waste water goes to the USAB first. After finding these issues in line during site visit the raised CAR09 was closed out.

Loss of biogas from pipeline has been accounted as nil so CAR10 was raised for justification. The length of pipelines is less than 2 km and UASB reactor gas collection system of this project consists of a gas-tight concrete, coated gas dome and pipeline system is made of High Density Polyethylene (HDPE). It was checked at site that the USAB reactor is made up of gas tight concrete and the length of pipeline is less than 2 km . The pipes are made up of High Density Polyethylene (HDPE) and the chances for leakages are almost negligible. Moreover there is a cross-check for total gas produced and combust or flared to make a cross-check for any type of leakages in the pipeline. The taken approach is in line with the applied methodology so raised CAR10 was closed out.

Organic material removed from wastewater facility is calculated based on the monitored COD_{in} and COD_{out}. CAR11 was raised because the discussion about this parameter was missing in Monitoring Report version 01. MR version 02 was revised inserting the discussion about organic material removed so CAR11 was closed out.

Biogas calorific values is calculated based on the measured methane content of the biogas and default NCV values for natural gas from national energy statistics. This approach is deemed to be accurate given the fact that once the methane content of the biogas is known, the remaining portion is assumed not to have any calorific value, which is conservative so CAR12 was raised and closed after proper justification.

Apart from monitoring parameters few more CARs/NIRs were raised for more clarity and justification and discussed hereafter.

CAR13 and NIR01 were raised for some typo errors in MR and mismatch in the reported values and monitored values. The identified errors were corrected in revised MR version 02 and found in order so CAR13 and NIR01 were closed out.

NIR14 was raised to clarify on the WW_{bypass} value that has been mentioned in the PDD as zero but in the spreadsheet stated as 12,362,872. This typo error was corrected.

NIR15 was raised for clarification on the calculation method of the average wastewater in UASB tank No.1, 2 and the average COD inlet of the water treatment process (Input Data worksheet Row G42-48). The actual monitored values are used for accounting the total waste water generation from USAB1 and USAB 2 in the project activity and the average COD is taken for emission reduction calculations. So NIR15 was closed out.

2.3.4 Determinations of the Reductions in GHG Emissions

<i>Parameter</i>	<i>Reported Value</i>	<i>Verified Value</i>
COD kg	23,585,954	23,585,954
Waste water flows entering system boundary (m ³)	1,281,351	1,281,351
Total Biogas production (Nm ³)	11,450,014	11,450,014
Biogas Sent to Boiler (Nm ³)	10,515,790	10,515,790
Biogas sent to flare (Nm ³)	662,127	662,127
Percent of methane in biogas (%)	63.60%	63.60%

Emission Reduction = 110,601 tCO₂

2.4 Reporting of Findings

As an outcome of the verification process, the team can raise different types of findings

In general, where insufficient or inaccurate information is available and clarification or new information is required the team shall raise a New Information Request (NIR) specifying what additional information is required.

Where a non-conformance arises the team shall raise a Corrective Action Request (CAR). A CAR is issued, where:

- I. the verification is not able to obtain sufficient evidence for the reported emission reductions or part of the reported emission reductions. In this case these emission reductions shall not be verified and certified;
- II. the verification has identified misstatements in the reported emission reductions. Emission reductions with misstatements shall be discounted based on the verifiers ex-post determination of the achieved emission reductions

The verification process may be halted until this information has been made available to the assessors' satisfaction. Failure to address a NIR may result in a CAR. Information or clarifications provided as a result of an NIR may also lead to a CAR.

Observations may be raised which are for the benefit of future projects and future verification actors. These have no impact upon the completion of the verification activity.

Corrective Action Requests and New Information Requests are detailed in Periodic Verification Checklist. The Project Developer is given the opportunity to "close" outstanding CARs and respond to NIRs and Observations.

2.5 Internal Quality Control

Following the completion of the assessment process and a recommendation by the Assessment Team, all documentation will be forwarded to a Technical Reviewer. The task of the Technical Reviewer is to check that all procedures have been followed and all conclusions are justified. The Technical Reviewer will either accept or reject the recommendation made by the assessment team.

3. Verification Findings

3.1 Remaining Issues, including any Material Discrepancy, FAR's from Previous Validation

There are no issues pending from the previous verification report.

3.2 Project Implementation

Project was implemented and equipment installed as described in the registered PDD;

The project was commissioned successfully on 01/01/2004, as evident from the PDD and earlier verification report by TÜV Nord. This monitoring period starts from 01/06/2007 to 31/03/2008.

3.3 Completeness of Monitoring

The monitoring of the project activity is found to be in conformity with monitoring methodology described in AM0022, version 04, 26/12/2006 and monitoring plan indicated in the registered PDD of project activity.

The required monitoring systems have been installed and operational. The meters comply with appropriate quality standards applicable for the used technology.

The sustaining records were sufficient to enable verification of emission reductions.

3.4 Accuracy of Emission Reduction Calculations

The calculation of emission reductions is found to be correct. No CARs/NIRs were raised. The details of the reported and the verified values for all parameters are listed above in section 2.3.4.

3.5 Quality of Evidence to Determine Emission Reductions

Critical parameters used for the determination of the Emission Reductions are discussed above in section 2.3.3 above. All the data recorded are in compliance with the monitoring report.

3.6 Management and Operational System

In order to verify data quality, the Companies involved in the project works in accordance with a quality assurance procedure (*Procedure for Monitoring Plan Implementation*), which establishes the operational and management structure implemented.

4. Verification Conclusion

SGS United Kingdom Ltd has been contracted by South Pole Carbon Asset Management Ltd. to examine the greenhouse gas (GHG) emission reductions reported from the 'Wastewater Treatment with Biogas production (UASB) and heat utilization at General Starch Co Ltd' for the period, 01/06/2007 up to 31/03/2008 equating to 110,601 tCO₂e tonnes of CO₂ equivalents. Our opinion relates to the project's GHG emissions and resulting GHG emissions reductions reported for the period and the verification testing conducted against the GHG Assertion.

The management of the South Pole Carbon Asset Management Ltd. is responsible for the preparation of the GHG emissions data and the reported GHG emissions reductions on the basis set out within the project Monitoring Report version 02 dated 12/08/2008. Calculation and determination of GHG emission reductions from the project is the responsibility of the management of the 'Wastewater Treatment with Biogas production (UASB) and heat utilization at General Starch Co Ltd'. The development and maintenance of records and reporting procedures are in accordance with the monitoring report.

It is SGS' responsibility to express an independent GHG verification opinion on the GHG emissions from the project for the period 01/06/2007 to 31/03/2008 and on the calculation of GHG emission reductions from the project based on the verified emissions for the same.

The verification approach was based on the requirements as defined in Voluntary Carbon Standard 2007. Our approach is risk-based, drawing on an understanding of the risks associated with reporting GHG emissions data and the controls in place to mitigate these. Our examination includes assessment, on a test basis, of evidence relevant to the amounts and disclosures in relation to the project's GHG emission reductions for the period 01/06/2007 to 31/03/2008. We planned and performed our work to obtain the information and explanations that we considered necessary to provide sufficient evidence for us to give reasonable assurance that the amount of GHG emission reductions for the period 01/06/2007 up to 31/03/2008, prepared on the basis of the Monitoring Report dated 12/08/2008, are fairly stated. We conducted our verification with regard to the client's GHG projects PDD and monitoring report which included 'Wastewater Treatment with Biogas production (UASB) and heat utilization at General Starch Co Ltd' project plan, baseline applied and baseline GHG emissions or removals, Monitoring and Verification Plan, GHG Emission reduction, removal enhancements. This assessment included collection of evidence supporting the reported data checking whether the provisions of the Monitoring and Verification Plan in the PDD were consistently and appropriately applied

We have verified whether the information included in the monitoring report representing the project baseline is current and has been extracted from the project site and the emission reduction achieved has been determined by correctly subtracting emissions for the monitoring period 01/06/2007 to 31/03/2008 from the baseline figures for the comparable

Reporting Period: From 01/06/2007 to 31/03/2008

Verified emission in the above reporting period:

Project Emissions:	7,038	tCO ₂ e equivalents
Baseline Emissions:	117,639	tCO ₂ e equivalents
Emission Reductions:	110,601	tCO ₂ equivalents

Based on process and procedures conducted, in our opinion, South Pole Carbon Asset Management Ltd. assertion on GHG emission reductions for the 'Wastewater Treatment with Biogas production (UASB) and heat utilization at General Starch Co Ltd' project during the reporting period 01/06/2007 to 31/03/2008 is materially correct and is a fair representation of the GHG data and information and the emission reductions are fairly stated. The GHG emission reductions were calculated correctly on the basis of approved monitoring methodology AM0022 version 04, dated 26/12/2006.

SGS confirms that the project is implemented as described in the validated and registered project design documents. Based on the information we have seen and evaluated, we confirm the following:

Project Title:	'Wastewater Treatment with Biogas production (UASB) and heat utilization at General Starch Co Ltd'
PDD Used for Verification:	PDD, version 01, dated 19/06/2007
Methodology Used for Verification:	AM0022 version 04, dated 26/12/2006
Applicable Period:	01/06/2007 to 31/03/2008
Total GHG Emission Reductions Verified:	110,601 tCO ₂

Signed on behalf of the Verification Body by Authorized Signatory

SGS United Kingdom Limited



Signature:

Name: Sidharth Yadav

Date: 29th September 2008

5. Document References

- /1/ Document "VCS 2007"
- /2/ Approved monitoring methodology AM0022 Version 04
- /3/ Project Design Documents version 04 dated 4th December 2006.
- /4/ Monitoring report, version 01, version 02 and version 03
- /5/ Calibration Certificates.
- /6/ Plant log books and records
- /7/ TÜV Nord (report number: 8000349679-07/63, dated 31/08/2007)

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