



VCS VERIFICATION REPORT

METHANE CAPTURE, FLARE AND UTILIZATION AT TYSON WASTEWATER TREATMENT FACILITIES

MONITORING PERIOD:

1 JANUARY 2012 TO 31 DECEMBER 2012

REPORT N°2013-9230

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Summary:

Det Norske Veritas (U.S.A.), Inc. (DNV) has performed the verification of the emission reductions reported for the “Methane Capture, Flare and Utilization at Tyson Wastewater Treatment Facilities” (VCS Project ID: 14, 15, 16, 17) for the period 1 January 2012 to 31 December 2012, to review and confirm the monitored reductions in GHG emissions that have occurred as a result of the project activity.

The verification was performed on the basis of VCSA Programme Guidelines & Standard version 3 for the VCS projects, as well as criteria given to provide for consistent project operations, monitoring and reporting. The verification was conducted by means of document review, follow-up interviews and site inspection, and the resolution of outstanding issues.

In our opinion, the GHG emission reductions reported for the project in the monitoring report (version 2.4) of 24 April 2013) are fairly stated. The GHG emission reductions were calculated correctly on the basis of approved methodology ACM0014 (version 1) and the monitoring plan contained in the VCS PD of 29 March 2009.

Hence, Det Norske Veritas (U.S.A.), Inc. is able to certify that the emission reductions from the “Methane Capture, Flare and Utilization at Tyson Wastewater Treatment Facilities” during the period amount to 272 779 tonnes CO₂ equivalent.

DNV does not assume any responsibility towards the issuance and utilization of the VCUs hereby verified and certified. Request for issuance of VCUs shall be made by the project proponent to an approved VCS Program Registry based on the requirements set out under the most recent version of the VCS Program Guidelines clause on VCS Registration.

The verification of reported emission reductions is based on the information made available to DNV and the engagement conditions detailed in this report. DNV cannot be held liable by any party for decisions made or not made based on this report.

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1 INTRODUCTION

Blue Source has commissioned Det Norske Veritas (U.S.A.), Inc. (DNV) to carry out the verification and certification of emission reductions reported for the “Methane Capture, Flare and Utilization at Tyson Wastewater Treatment Facilities” (the project) in the period 1 January 2012 to 31 December 2012. This report contains the findings from the verification and includes a verification statement for the verified carbon units.

1.1 Objective

Verification is the periodic independent review and ex-post determination by an accredited verification body of the monitored reductions in GHG emissions that have occurred as a result of the registered VCS project activity during a defined verification period.

A verification statement is the written assurance by a verification body that, during a specific period in time, a project activity achieved the emission reductions as verified.

The objective of this verification was to verify and provide a verification statement of emission reductions reported for the “Methane Capture, Flare and Utilization at Tyson Wastewater Treatment Facilities” for the period 1 January 2012 to 31 December 2012.

1.2 Scope and Criteria

The scope of the verification is:

- The project activity has been implemented and operated in accordance with the registered VCS PD.
- To verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan.
- To evaluate the GHG emission reduction data and express a conclusion with a reasonable level of assurance about whether the reported GHG emissions reduction data is free from material misstatement.
- To verify that reported GHG emissions data is sufficiently supported by evidence.

The criteria of the verification are:

- VCS Program Guide version 3.4/55/
- VCS Standard version 3.3 and other relevant requirements defined by VCSA./56/
- The approved methodology ACM0014 (version 1)/45/.

The verification shall ensure that reported emission reductions are complete and accurate in order to be verified.

1.3 Level of assurance

The verification report expresses a conclusion with a reasonable level of assurance about whether the reported GHG emissions reduction data is free from material misstatement. The emission reduction estimates for the “Methane Capture, Flare and Utilization at Tyson Wastewater Treatment Facilities”,

projects is less than 300 000 for each project activity. DNV applied a materiality threshold of 5% with respect to omission or misstatements concerning reported quantities as per VCS standard.

1.4 Summary Description of the Project

The Project was developed by Tyson at meat processing facilities within the mid-western United States. There are four such sites located in Joslin, IL, Amarillo, TX, Storm Lake, IA, and Lexington, NE (hereafter sites will be referred to by city name only) with adjoining waste water treatment facilities. All locations contain storage lagoons for the primary treatment of wastewater through the anaerobic decomposition process.

Project implementation at the sites has taken the form of two phases; phase 1 (December, 2000- April, 2001) was the covering of the lagoons and capturing of the biogas for flaring purposes, phase 2 (March, 2004 – October, 2005) was the capturing of the biogas and transporting this to the adjacent Tyson processing facility for use in the boiler, which results in the displacement of pipeline natural gas. Phases 1 and 2 have been implemented at three sites with the lone exception of Storm Lake, where only gas flaring has been implemented /1/. The project reduces GHG emissions through the capture of the biogas that would have been emitted into the atmosphere and by replacing natural gas with biogas as fuel in the boilers.

2 VALIDATION PROCESS, FINDINGS AND CONCLUSION

The scope of this verification does not include a validation or gap validation of this project. Hence, this section has been intentionally left blank.

2.1 Validation Process

2.1.1 Method and Criteria

2.1.2 Document Review

2.1.3 Interviews

2.1.4 Site Inspections

2.1.5 Resolution of Any Material Discrepancy

2.2 Validation Findings

2.2.1 Gap Validation

2.2.2 Methodology Deviations

2.2.3 New Project Activity Instances

2.3 Validation Conclusion

3 VERIFICATION PROCESS

3.1 Method and Criteria

The verification was performed through means of the following three phases in accordance with the requirement of the registered VCS PD, the applied methodology, and the VCS Standard version 3.3 and other relevant VCS requirements.

- A desk review of the monitoring report and all support documents.
- Follow-up interviews with project stakeholders and site inspection.
- The resolution of outstanding issues and the issuance of the verification report and statement.

The following sections outline each step in more detail.

The verification of the emission reductions has assessed all factors and issues that constitute the basis for emission reductions from the project. These include:

- The emission reduction calculations and the relevant data records.
- The calibration and maintenance records for the monitoring instruments.
- The management systems to support the project operation and monitoring.

Verification team

Role	Last Name	First Name	Country	Type of involvement					
				Desk review	Site visit	Reporting	Supervision of work	Technical review	Waste water treatment
Team leader (Verifier)	Bachamanda	Shruthi	USA	✓	✓	✓	✓		✓
Assessor under training	Weldy	Robin	USA	✓	✓	✓			
Technical reviewer	Yang	Weidong	USA					✓	✓

Duration of verification

Preparations: From 29 November 2012 to 13 December 2012
On-site verification: 14 December 2012 and 18 December 2012
Reporting, calculation checks and QA/QC: From 19 December 2012 to 25 April 2013

3.2 Document Review

DNV conducted the desk review during the period of 3 December to 13 December 2012. Blue Source submitted the monitoring report, emission reduction calculation worksheet, waste water summary data sheets and all supporting documentation including monitored data, calibration records, lab analysis data etc. to DNV prior to the start of the desk review. DNV conducted a quantitative verification of numbers in the data sheets with the numbers used as input values for the calculation; monitored data was checked for missing values; the calibration records for meters at the frequency provided in the monitoring plan; the lab analysis data with input values etc. DNV conducted a qualitative verification of Tyson GHG Management systems, calculation procedures, procedures for transfer of emissions reports prior to the site visit.

In addition to the monitoring documentation provided by the project participants, DNV reviewed:

- (a) The registered VCS-PD, including the VCS-monitoring plan and the corresponding validation report /1//2//38/;
- (b) Previous verification reports /39/ - /45/;
- (c) The applied monitoring methodology /46/;
- (d) Relevant decisions, clarifications and guidance from the VCSA /47/; and

(e) Relevant tools from CDM relevant to this project verification activity **Error! Reference source not found.** - /51/.

3.3 Interviews

DNV conducted interviews for the verification as part of the site visit process. The site visit was conducted in the Tyson facilities in Amarillo, TX and Joslin, NE. The implementation and data for the Lexington and Storm Lake facility were reviewed using supporting documentation. The following personnel from Tyson and Kevin Townsend were interviewed for the monitoring period of 1 January 2012 to 31 December 2012.

Name of person	Title/Role	Name of Organisation	Location
Kevin Judge	WWTP Superintendent	Tyson Fresh Meats, Inc	Joslin, Illinois
Chris Knotts	WWTP Superintendent	Tyson Fresh Meats, Inc	Amarillo, Texas
Kevin Townsend	Chief Commercial Officer	Blue Source	Phone

See detail requirement in the below Section 3.4

3.4 Site Inspections

Site visits were conducted on December 14, 2012 at the facility in Joslin, IL and on December 18, 2012 at the facility in Amarillo, TX. The verification of the emission reductions assessed all factors and issues that constitute the basis for emission reductions from the project. The people interviewed as part of the site visit have been listed above in Section 3.3. The on-site assessment involved:

- (i) Assessment of the implementation and operation of the VCS project activity as per the registered VCS-PD;
- (ii) Review of information flows for generating, aggregating and reporting the monitoring parameters;
- (iii) Interviews with relevant personnel to confirm that the operational and data collection procedures are implemented in accordance with the monitoring plan in the VCS-PD;
- (iv) A cross-check between information provided in the monitoring report and data from other sources such as plant log books, inventories, purchase records or similar data sources;
- (v) A check of the monitoring equipment including calibration performance and observations of monitoring practices against the requirements of the PDD and the selected methodology;
- (vi) Review of calculations and assumptions made in determining the GHG data and emission reductions;
- (vii) Identification of quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters.
- (viii) A walk around survey to verify the location of the meter the data sampling points. Review of the meter model and date of installation.

3.5 Resolution of Any Material Discrepancy

A corrective action request (CAR) is issued, where:

- i. Non-conformities with the monitoring plan or methodology are found in monitoring and reporting, or if the evidence provided to prove conformity is insufficient;
- ii. Mistakes have been made in applying assumptions, data or calculations of emission reductions which will impair the estimate of emission reductions;
- iii. Issues identified in a FAR during validation to be verified during verification have not been resolved by the project participants.

A clarification request (CL) shall be raised if information is insufficient or not clear enough to determine whether the applicable VCS requirements have been met.

A forward action request (FAR) is issued for actions if the monitoring and reporting require attention and/or adjustment for the next monitoring period.

The list of CARs and CLs issued by DNV and the response provided by the Project Participant has been provided in Appendix A of this report.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

As part of the site visit in Amarillo and Joslin, DNV was able to confirm that the project implementation is in accordance with the project description contained in registered VCS PD of 29 March 2009, and that the monitoring has been carried out in accordance with the monitoring plan contained in the registered VCS PD of 29 March 2009. DNV visited only two of the facilities this year, as DNV conducted site visits on December 7-9, 2011 at Joslin, IL, Storm Lake, IA and Amarillo, TX for the verification of the 2011 monitoring period.

Table 1: Project Implementation Dates by Site

Location	Stage 1 – Flaring Effective Date	Stage 2 - Biogas Utilization Effective Date
Joslin, IL	06/2001	03/2004
Lexington, NE	05/2001	12/2004
Amarillo, TX	04/2001	10/2005
Storm Lake, IA	12/2000	N/A

The parameters monitored during the period of 1 January 2012 to 31 December 2012 are listed below:

Table 2: Amarillo Monitoring

Parameter	Method of estimation	Sampling Frequency and Technique	Reporting Unit	Calibration Frequency
Wastewater influent flow into anaerobic	flow meter	continuous	Mgal/d	Annual /7/

lagoon (East Beam House, West Beam House, Raw lift flow) /3/ /4/ /5/ /6/				
BOD concentration at inlet to the anaerobic lagoon /8/	BOD ₅ test	2/ week grab sample	mg/l	Lab Certification /9/
Wastewater effluent flow out of anaerobic lagoon /3/ /10/	flow meter	continuous	Mgal/d	Annual /7/
BOD concentration at outlet of anaerobic lagoon /8/	BOD ₅ test	2/ week grab sample	mg/l	Lab Certification /9/
Biogas CH ₄ content /11/	Daniel BTU Chromatograph	continuous	volumetric fraction	Daily Auto Calibration
Biogas flow rate to flare /11/	flow rate	continuous	ft ³ /min	Quarterly /12/
Biogas flow rate to boiler /11/	flow rate	continuous	ft ³ /min	Quarterly /13/
Propane consumption /14/	Receipts	Monthly	Gallons	NA

Table 3: Joslin Monitoring

Parameter	Method of estimation	Sampling Frequency and Technique	Reporting Unit	Calibration Frequency
Wastewater influent flow into anaerobic lagoon /15/	flow meter	continuous	Mgal/d	Annual /16/
BOD concentration at inlet to the anaerobic lagoon /22/ Error! Reference source not found.	BOD ₅ test	2/week grab.	mg/l	Lab Certification /17/
Wastewater effluent flow out of anaerobic lagoon /15/	flow meter	continuous	Mgal/d	Annual /16/
BOD concentration at outlet of anaerobic lagoon /22/ Error! Reference source not found.	BOD ₅ test	2/week grab.	mg/l	Lab Certification /17/
Biogas CH ₄ content /18/	third party analysis	quarterly	volumetric fraction	Lab Certification /19/
Biogas flow rate to flare /21/	flow meter	continuous	ft ³ /min	Quarterly /20/
Biogas flow rate to boiler /21/	flow meter	continuous	ft ³ /min	Quarterly /23/
Propane /24/	Receipts	Monthly	Gallons	NA

Table 4: Storm Lake Monitoring

Parameter	Method of estimation	Sampling Frequency and Technique	Reporting Unit	Calibration Frequency
Wastewater influent flow into	flow meter	Continuous	Mgal/d	Annual /27/

anaerobic lagoon /25/				
BOD concentration at inlet to the anaerobic lagoon /26/	BOD ₅ test	15 minute grab composited for 24 hours; 7 day/week	mg/l	Lab Certification /26/
Wastewater effluent flow out of anaerobic lagoon /25/	flow meter	Continuous	Mgal/d	Annual /27/
BOD concentration at outlet of anaerobic lagoon /26/	BOD ₅ test	3/week grab	mg/l	Lab Certification /26/
Biogas CH ₄ content /28/	third party analysis	Quarterly	volumetric fraction	Lab Certification /28/
Biogas flow rate to flare /30/	flow meter	continuous	ft ³ /min	Quarterly /29/

Table 5: Lexington Monitoring

Parameter	Method of estimation	Sampling Frequency and Technique	Reporting Unit	Calibration Frequency
Wastewater influent flow into anaerobic lagoon /31/	flow meter	continuous	Mgal/d	Annual /32/
BOD concentration at inlet to the anaerobic lagoon /31/	BOD ₅ test	15 minute grab. composited for 24 hours ; during production days	mg/l	Lab Certification/26/
Wastewater effluent flow out of anaerobic lagoon /31/	flow meter	continuous	Mgal/d	Annual /32/
BOD concentration at outlet of anaerobic lagoon /31/	BOD ₅ test	2-3 day/week grab	mg/l	Lab Certification/26/
Biogas CH ₄ content /33/	third party analysis	quarterly	volumetric fraction	Lab Certification/26/

Biogas flow rate to flare /34/	flow meter	continuous	ft ³ /min	Quarterly /35/ /37/
Biogas flow rate to boiler /34/	flow meter	continuous	ft ³ /min	Quarterly /36/

Monitoring Plan Deviation

The monitoring plan deviation identified has been described below.

The Amarillo facility conducted annual calibration instead of quarterly calibration as described in Monitoring plan of meters that monitor the flow of gas to the flare and boiler.

Amarillo

Flare: Annual flare meter check found that the meter was underreporting by a max error of 7.31%. Flows have been increased by this amount for all 12 months.

Boiler: Annual boiler meter check found that the meter was within the specified accuracy range. Flows have been reduced by 2% (max. instrument error) for all 12 months.

The increase flow to flare increases the project emissions and the decreased flow to boiler results in lower baseline emissions. DNV considers this to be conservative and reasonable.

Joslin

Calibrations were completed quarterly. Flows have been adjusted according to the response in CL1 (already closed).

Lexington

The calibration was conducted quarterly. However, the Q4 calibration was missed. The volumes were adjusted conservatively by 2% (higher for flare and lower for boiler)

Storm Lake

The calibration was conducted quarterly.

DNV considers the deviation to the monitoring plan reasonable and conservative.

4.2 Accuracy of GHG Emission Reduction or Removal Calculations

The project uses the approved CDM methodologies and tools for emission reduction calculations,

- “Avoided methane emissions from wastewater treatment” ACM0014 (Version 1) /46/**Error! Reference source not found.**,

- “Tool to determine project emissions from flaring gases containing methane” (Version 1) /48/,
- “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion” (Version 01) /49/,
- “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (Version 01)/50/ **Error! Reference source not found.** and
- “Tool to calculate the emission factor for an electricity system” (Version 1) /50/.

Appropriate IPCC default values were used for the global warming potential and density of methane. Project monitoring data for biogas collected and destroyed by the project, flare efficiency and methane fraction, and parameters of measuring BOD concentrations are used to calculate the amount of methane destroyed by the project activity.

Electricity data and the carbon emission factor from ACM0014 **Error! Reference source not found.** were used to determine the project emissions from the amount of electricity consumed for the project activity. Estimation for total electricity consumption is based upon the maximum load usage by model type for gas handling equipment as well as a 7.2% transmission and distribution loss associated with the US electricity grid /1/.

For a complete list of default and constant values used for emission reduction estimates, see table 6 below.

Table 6:Default and Constant Values for Emission Reduction Estimates

Parmeter	Value	Source
EF _{GRID}	1.3 mtCO ₂ /MWh	Tool to calculate the emission factor for an electricity system /51/
Transmission and Distribution Loss	7.20%	U.S. Climate Change Technology Program /52/
B _o	0.21 lbsCH ₄ /lbsCOD	ACM0014, Version 01/46/
f _{COD,aer}	92.7 mtCOD/ha month	ACM0014, Version 01/46/
EF _{CO2FF,Boiler}	0.05919 mtCO ₂ /MMBtu	IPCC /53/
NCV _{CH4}	922.45 Btu/ft ³	IPCC /53/
η _{Boiler}	100%	Validated in VCS PD/1/
COD/BOD	2.4 lbs COD/ lbs BOD	IPCC /53/
W _S	231 mg/L	On-Site measurements/1/
R _S	1.3333 lbs COD /lbs Sulfate	Engineering design factors for sulfide to sulfate conversion /1/
nL	5	PDD /1/
EF _{Propane}	0.00574 mtCO ₂ e/gallon	U.S. EPA /54/
WC _{Propane}	17.20 kg C/ MMBtu	U.S. EPA /54/

EC _{Propane}	3.824 MMBtu/ barrel	U.S. EPA /54/
nFlare	%	
Amarillo, TX	98.0%	Validated in VCS PD /1/
Joslin, IL	96.3%	Validated in VCS PD /1/
Lexington, NE	98.0%	Validated in VCS PD /1/
Storm Lake, IA	98.0%	Validated in VCS PD /1/

4.3 Quality of Evidence to Determine GHG Emission Reductions or Removals

All necessary documentation is collected, referenced and aggregated and is easily accessible in hard-copy or electronic format. The sampling plan for the four facilities for the monitoring period 1 January 2012 to 31 December 2012 included the review of all the following types of documentation: 1) calibration documents of all meters and equipment, the certification of all the labs/companies conducting calibration or lab analysis 3) calculation spread-sheets and 4) weekly monitored/collated data. The random sample was taken for data that was monitored continuously or daily which included waste water flow rate (influent and effluent), biogas flow rate to flare or boiler and BOD concentration (influent and effluent). The sample set included data for the second full week in January, April, October, and December 2012 for all four sites Amarillo, TX, Joslin, IL, Lexington, NE and Storm Lake, IA. DNV conducted a desk review to verify the following documents to confirm the emission reduction during the period of 1 January 2012 to 31 December 2012.

Calibration Records for all flow meter for all sites were verified. Lab Certificates were verified to establish accuracy of the BOD concentration at influent and effluent.

Table 7: Quality of Evidence

Parameter	Evidence Supplied
BOD Concentration of Influent	Weekly Reports and Lab result print outs
BOD Concentration of Effluent	Weekly Reports and Lab result print outs
Biogas flow rate	Daily reports with average ft ³ /min
Monitoring equipment maintenance	Third Party Calibration Certificates
Effluent rate at inlet and outlet	Flow meter readings - central data system.
CH ₄ content in Biogas	Record of third party analysis for all sites except Amarillo and Lexington. Amarillo and Lexington - Daniel Gas Chromatography data

4.4 Management and Operational System

For all sites in the project, the general reporting procedures involve the collection of data on site, where it is then transferred once a month to a central Tyson location for archiving. The Project Developer Blue Source is supplied with weekly totals/averages for all data./31/

BOD Sampling:

BOD sampling responsibilities are delegated to state certified licensed wastewater operators at all sites. Once samples have been collected they are then transported to State certified labs where professionally trained chemists test for BOD concentrations and several other water quality measurements found in the anaerobic influent and effluent. From this process, computer print outs are produced with BOD concentrations that are ultimately used for emission reduction estimates.

Water Flow:

Continuous flow meters are used to monitor anaerobic influent/effluent, with slight variations in positioning and monitoring at each site. The water flow in all sites are monitored electronically with daily totals being produced on a print out which is then migrated by hand by staff to a central Excel file.

Gas Production:

All facilities have continuous gas monitoring equipment that produces hourly totals in daily standard cubic feet. From this output, the staff then migrate by hand, the data to an Excel spreadsheet where daily totals are produced. Monitoring of gas that flows to the flares and boilers is also done from the same system and accounted for in the data migration.

Calibration:

All facilities have third party quarterly calibration of the flow meters monitoring the flow of gas to the flare and boiler. The Amarillo facility the flow meters monitoring the flow of gas to the flare and boiler have been calibrated annually. The flow meters monitoring the waste water flow at influent and effluent of the anaerobic digester is calibrated at a minimum frequency of once a year. Certified in-house or external labs conduct the BOD₅ analysis. This documentation is provided to Blue Source for record keeping.

5 VERIFICATION CONCLUSION

Det Norske Veritas (U.S.A.), Inc. (DNV) has performed the verification of the emission reductions that have been reported for the “Methane Capture, Flare and Utilization at Tyson Wastewater Treatment Facilities” (VCS Registration No. 14, 15, 16, 17) project for the period 1 January 2012 to 31 December 2012.

The project participants are responsible for the collection of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the project.

It is DNV’s responsibility to express an independent verification statement on the reported GHG emission reductions from the project.

DNV conducted the verification on the basis of the approved methodology ACM0014 (version 1), the monitoring plan contained in the registered VCS PD of 29 March 2009 and the monitoring report (version 2.4) dated 24 April 2013/2/. The verification included i) checking whether the provisions of the monitoring methodology and the monitoring plan were consistently and appropriately applied and ii) the collection of evidence supporting the reported data.

DNV’s verification approach draws on an understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. DNV planned and performed the verification by obtaining evidence and other information and explanations that DNV considers necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.

In our opinion the GHG emissions reductions of the “Methane Capture, Flare and Utilization at Tyson Wastewater Treatment Facilities” (VCS Project ID 14, 15, 16, 17) project for the period 1 January 2012 to 31 December 2012 are fairly stated in the monitoring report (version 2.4) dated 24 April 2013.

The GHG emission reductions were calculated correctly on the basis of the approved methodology ACM0014 (version 1) and the monitoring plan contained in the registered VCS PD of 29 March 2009.

Det Norske Veritas (U.S.A), Inc is able to certify that the emission reductions from the “Methane Capture, Flare and Utilization at Tyson Wastewater Treatment Facilities” during the period 1 January 2012 to 31 December 2012 amount to 272 779 tonnes of CO₂ equivalent, detailed as below.

Reporting period: 1 January 2012 to 31 December 2012

Amarillo - Emission reduction for the period 1 January 2012 to 31 December 2012:

GHG Emission Reductions or Removals	tCO ₂ e
Baseline Emissions	102 350.10
Project Emissions	4 223.66
Net GHG emission reductions or removals	98 126

Joslin - Emission reduction for the period 1 January 2012 to 31 December 2012:

GHG Emission Reductions or Removals	tCO ₂ e
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Baseline Emissions	39 208.43
Project Emissions	2 238.77
Net GHG emission reductions or removals	36 970

Lexington - Emission reduction for the period 1 January 2012 to 31 December 2012:

GHG Emission Reductions or Removals	tCO ₂ e
Baseline Emissions	108 837.89
Project Emissions	3 008.99
Net GHG emission reductions or removals	105 829

Storm Lake - Emission reduction for the period 1 January 2012 to 31 December 2012:

GHG Emission Reductions or Removals	tCO ₂ e
Baseline Emissions	33 396.68
Project Emissions	1 802.68
Net GHG emission reductions or removals	31 594

Summary of Emission Reductions for the period of 1 January 2012 to 31 December 2012 for all four Tyson facilities:

GHG Emission Reductions or Removals	tCO ₂ e
Baseline Emissions	283 793
Project Emissions	11 274
Net GHG emission reductions or removals	272 519

DNV does not assume any responsibility towards the issuance and utilization of the VCU's hereby verified and certified. Request for issuance of VCU's shall be made by the project proponent to an approved VCS Program Registry based on the requirements set out under the most recent version of the VCS Program Guidelines clause on VCS Registration.

The verification of reported emission reductions is based on the information made available to DNV and the engagement conditions detailed in this report. DNV cannot be held liable by any party for decisions made or not made based on this report.

6 REFERENCES

Documents provided by the Project Participants that relate directly to the GHG components of the project. These have been used as direct sources of evidence for the periodic verification conclusions, and are usually further checked through interviews with key personnel.

- /1/ Blue Source: "Emission Reduction Protocol for Methane Capture, Flare and Utilization at Tyson Wastewater Treatment Facilities" (VCS PD), March 2009.
- /2/ Blue Source: Monitoring Report for the "Methane Capture, Flare and Utilization at Tyson Wastewater Treatment Facilities" project for the period 1 January 2012 – 31 December 2012, Version 2.4, 24 April 2013.
- /3/ Tyson Foods, Inc: Amarillo anaerobic lagoon flow and loading 2012, 1 January 2012 – 31 December 2012
- /4/ Tyson Foods, Inc: Amarillo Beam House Daily Flow, 1 January 2012 – 31 December 2012
- /5/ Tyson Foods, Inc: Amarillo Clarifier Daily Flow, 1 January 2012 – 31 December 2012
- /6/ Tyson Foods, Inc: Amarillo Lift Station Daily Flow, 1 January 2012 – 31 December 2012
- /7/ Flow Control, Inc: Calibration service report for east beam house, west beam house, raw lift flow, anaerobic effluent recycle flow and anaerobic effluent flow meter, 26 October 2012
- /8/ Tyson Foods, Inc: Amarillo Wastewater Report – Weekly report for waste water flow, BOD and biogas flow. 1 January 2012 – 31 December 2012.
- /9/ American association for lab accreditation, Tyson Lab certificate, Valid to June 2014
- /10/ Tyson Foods, Inc: Amarillo Anaerobic Effluent Flow, 1 January 2012 – 31 December 2012
- /11/ Tyson Food, Inc: Amarillo Biogas to flare, Biogas to boiler, 1 January 2012 – 31 December 2012.
- /12/ EPI, product quality certificate of conformance –product inspection and quality statement, July 10, 2012
- /13/ GE Industrial Sensing: Boiler gas flow meter periodic field verification acceptance report,10/1/2012.
- /14/ Tyson Fresh Meats Inc: Amarillo Propane Usage, 1 January 2012 to 31 December 2012
- /15/ Tyson, inc: Joslin waste water weekly flows, 1 January 2012 – 31 December 2012.
- /16/ Instrument Direct, Inc.: Certificate of Completion for Richard Watkins from Flow Control, Joslin, 20 September 2011
- /17/ American association for lab accreditation, Tyson Lab certificate, Valid to June 2014
- /18/ GTI, Major component gas analysis by Gas chromatography (ASTM D1946), 27 Jan 2012, 30 April 2012, 7 Aug 2012
- /19/ Mostardi Platt. Confirmation of ASTM D 7036-4 standard practice. 23 March 2013.
- /20/ Mostardi platt, Calibration of flow meter for biogas to flare, January 12, 2012, April 9, 2012, Sept 7, 2012 and November 7, 2012,
- /21/ Tyson: Joslin Biogas Scrubbing Worksheet, January 2012, April 2012, October 2012, December 2012.
- /22/ Tyson Foods, Inc: Wastewater Report – Weekly data report for waste water flow (influent and effluent) and BOD, Joslin, January, April, October, December 2012.
- /23/ Mostardi Platt, calibration of flow meter for biogas to boiler, January 12, 2012, April 9, 2012, July 9, 2012 and Nov 7, 2012

- /24/ Tyson Fresh Meats Inc: Joslin Propane Consumption excel, 1 January 2012 to 31 December 2012
- /25/ Tyson foods, Inc laboratory, Tyson waste water report, January, April, October, December 2012.
- /26/ State of Iowa, Iowa Environmental Lab Certified, Storm Lake Waste Water Analysis Report January, April, October, December 2012.
- /27/ Hutcheson Engineering Products: Hutcheson Engineering products field report, Storm Lake, 8 May 2012
- /28/ Platt Environmental Services/GTI: major Component Gas Analysis by Gas chromatography (ASTM D1946), Storm Lake, 27 January 2012, 7 May 2012, 24 July 2012, 19 October 2012
- /29/ Platt Environmental: Flue Gas volumetric flow audit report, Calibration Report, Storm Lake, 9 January 2012, 24-25 April 2012, 10 July 2012 and 11 October 2012.
- /30/ Tyson Storm Lake: Storm lake weekly data, 1 January 2012 – 31 December 2012.
- /31/ Tyson Foods, Inc: Wastewater Report – Weekly data report for waste water flow (influent and effluent) and BOD, Lexington, January, April, October, December 2012.
- /32/ Flow Control Inc. Annual Flow Meter Verification, Lexington, 13 February 2012.
- /33/ Innova Data: Biogas Content, Lexington, Weekly Data 1 January 2012 – 31 December 2012.
- /34/ Tyson Foods, Inc: Biogas daily meter reading, Lexington, January, April, October, December 2012.
- /35/ Mostardi Platt: Flue Gas Volumetric Flow Audit and Cylinder Gas Audit Test Report, Tyson Fresh Meats, Inc. Lexington Facility Biogas Scrubber Fuel Duct and Biogas Scrubber Flare Duct, 11 January 2012.
- /36/ Mostardi Platt: Flue Gas Volumetric Flow Audit Test Report, Tyson Fresh Meats, Inc. Lexington Facility Biogas Scrubber Boiler Fuel Gas Duct, 17 April 2012.
- /37/ Mostardi Platt: Flue Gas Volumetric Flow Audit and Cylinder Gas Audit Test Report, Tyson Fresh Meats, Inc. Lexington Facility Biogas Scrubber Fuel Duct and Biogas Scrubber Flare Duct, 11 July 2012.

Background documents related to the design and/or methodologies employed in the design or other reference documents.

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- /39/ DNV: VCS Verification Report for “Emission Reduction Protocol for Methane Capture, Flare and Utilization at Tyson Wastewater Treatment Facilities – January 1, 2004 to December 31, 2008,” March 2009
- /40/ DNV: VCS Verification Report for “Emission Reduction Protocol for Methane Capture, Flare and Utilization at Tyson Wastewater Treatment Facilities – January 1, 2009 to September 30, 2009,” December 2009
- /41/ DNV: VCS Verification Report for “Emission Reduction Protocol for Methane Capture, Flare and Utilization at Tyson Wastewater Treatment Facilities – October 1, 2009 to December 31, 2009,” February 2010
- /42/ DNV: VCS Verification Report for “Emission Reduction Protocol for Methane Capture, Flare and Utilization at Tyson Wastewater Treatment Facilities – January 1, 2010 to October 31,

2010,” 27 December 2010

- /43/ DNV: VCS Verification Report for “Emission Reduction Protocol for Methane Capture, Flare and Utilization at Tyson Wastewater Treatment Facilities – November 1, 2010 to December 31”, 2010”. March 3, 2011
- /44/ DNV: VCS Verification Report for “Emission Reduction Protocol for Methane Capture, Flare and Utilization at Tyson Wastewater Treatment Facilities – January 1, 2011 to September 30, 2011,” 29 December, 2011
- /45/ DNV: VCS Verification Report for “Emission Reduction Protocol for Methane Capture, Flare and Utilization at Tyson Wastewater Treatment Facilities – October 1, 2011 to December 31, 2011,” 31 May, 2012
- /46/ CDM Executive Board: Approved Baseline and Monitoring Methodology ACM0014: “Avoided methane emissions from wastewater treatment systems”. Version 01, 30 November 2007
- /47/ Verified Carbon Standard, Version 3.3, date 4 October 2012
- /48/ CDM Executive Board: “Tool to determine project emissions from flaring gases containing methane”, version 1, 15 December 2006
- /49/ CDM Executive Board: “Tool to calculate project or leakage CO2 emissions from fossil fuel combustion” (Version 01)/
- /50/ CDM Executive Board: “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (Version 01)
- /51/ CDM Executive Board: “Tool to calculate the emission factor for an electricity system” (Version 1)
- /52/ United States Climate Change Technology Program, Technology Options for the Near and Long Term, Page 34
- /53/ 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5 – Waste, Chapter 6 – Wastewater Treatment and Discharge, Page 6.12
<http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>
- /54/ U.S. EPA’s eGRID2006 Version 2.1 (April 30, 2007),
<http://www.epa.gov/cleanenergy/egrid/index.htm>
- /55/ VCS: VCS Program Guide version 3.4, 4 October 2012
- /56/ VCS: VCS Standard version 3.3 and other relevant requirements defined by VCSA, 4 October 2012

APPENDIX A

CORRECTIVE ACTION REQUESTS, CLARIFICATION REQUESTS AND FORWARD ACTION REQUESTS

Corrective action requests

CAR ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
CAR 1	The biogas volume to the boiler at the Joslin facility for week ending 20 October 2012 is incorrect. The value in the calculation spreadsheet does not match the value in the source data checked on site.	The sum of the flare and boiler was mistakenly recorded as the boiler total. Correct value for total flow to the boiler has replaced and factored into the calculations.	The gas to boiler volume has been updated in the latest version of the calculation spreadsheet. CAR 1 is closed.
CAR 2	The procedure for when the influent flow totalizer counter at Amarillo is reset has not been standardized. The value is based on an estimation and the actual procedure used to calculate the value is not clear.	For most instances, the prior week ending date flow is subtracted from the accumulated flow from the current week ending date. If the meter was reset during the week, the flow meter value from the day prior to the reset is noted. Then the value from the week prior ending flow is subtracted, while the value of the current week ending date flow (which will have accumulated from zero) is added. This method is conservative because any flow occurring between the time the totalizer value was last recorded and the time the meter was reset is unaccounted for, thereby understating anaerobic influent flows.	Reset procedure has been explained. Please add description to Monitoring Report for reference. Response: Description has been added to the $F_{PJ,m}$ parameter. The totalizer reset procedure has been described in the Monitoring Report. CAR 2 is closed.
CAR 3	Wastewater influent amount at Amarillo according to the source data does not match the amounts used in the calculation spreadsheet for January, February, March, May, June, and August.	Errors corrected. Source of errors was inclusion of storm water in the influent and manual transcription errors. Flow values have been corrected, and "Flow and Loadings Spreadsheet" now automatically pulls data instead of relying on hand-entered values.	The volume of influent has been updated in the calculation spreadsheets to reflect accurate data. CAR 3 is closed.

CAR ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
CAR 4	Wastewater effluent amount at Amarillo according to the source data does not match the amounts used in the calculation spreadsheet for April.	Errors corrected. Source of errors was manual transcription. "Flow and Loadings Spreadsheet" now automatically pulls data instead of relying on hand-entered values.	Effluent amount has been updated in the calculation spreadsheet to reflect accurate data. CAR 4 is closed.
CAR 5	The calibration period of the gas flow meters at Amarillo is specified as quarterly in the monitoring report but has only been performed annually.	The monitoring report specifies that meters are to be calibrated quarterly or in accordance with manufacturer's recommendations. This is a deviation from the original PDD and is documented in section 2.2 of the monitoring report. This deviation was also utilized in the previous monitoring period.	Annual calibration frequency is in accordance with Deviation described in the Monitoring Report. CAR 5 is closed.
CAR 6	At Amarillo, the gas flow meter to the flare did not pass its calibration in June/July but this has not been taken into consideration.	During the June 29 calibration, the flare flow meter was found to be underreporting by an average of 5.74% (see "Amarillo Flare Flow Meter % Error Calculation.xls."). Since underreporting of flare flow rates would overstate emission reductions, all flare volume values from January through June have been increased by 5.74%.	The calibration showed that % error varies by flow rate (7.3% at 2400scfm/1.4% at 150scfm). Project participant should provide evidence that the normal flow rate in the meter to the flare is relevant to the % error adjustment. Response: The error ranges identified don't appear to be very correlative to flow rates, so the error adjustment has been increased to 7.31% (the maximum error identified) for conservativeness. Calculations have been updated. Meter error discovered during calibration has been conservatively accounted for. CAR 6 is closed.

CAR ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
CAR 7	At Amarillo, the monitoring report specifies that cover inspections are done daily but there are no records of checks or repairs prior to November 2012 even though 5-6 cracks have been repaired.	Covers are in fact inspected daily. Any issues are recorded on the MMS form which is filled out on a weekly basis (called "Cover Height."). Small cracks that can become evident at welds are repaired for precautionary purposes but do not indicate leaks.	The lagoon covers are checked daily for cover height. CAR 7 is closed.

Clarification requests

CL ID	Clarification request	Response by Project Participants	DNV's assessment of response by Project Participants
CL 1	Please clarify the acceptable error for gas flow rate meter calibration at Joslin.	Based on the flow audit reports, the acceptable range of error for the Joslin meters is +/-20%.	Industry best practice is 5% error. Please provide evidence from the manufacturer of the flow meter's error range. Please adjust data accordingly. Response: The 20% allowable error range noted in the quarterly biogas audits is based on state and federal accuracy requirements. The manufacturer-specified accuracy range of the instruments is +/-2% of reading. It is anticipated that the errors shown in the quarterly reports are attributable in large part to the error of the pitot tube tests rather than the flow meters themselves. Nevertheless, overstatements on the part of the boiler flow meter are adjusted down by the amount of the full reported error, while understatements on

			the part of the flare flow meter are adjusted up by the full reported error for conservativeness. In Q1-12, the flare flow meter was found to be underreporting by 5.80%, so values have been adjusted upward. The boiler flow meter was found to be underreporting by 6.28%, so no adjustment is necessary. In Q2-12, the flare flow meter was found to be underreporting by 6.07%, so values have been adjusted upward. The boiler flow meter was found to be over reporting by 4.81%, so values have been adjusted downward. In Q3-12, the flare flow meter was found to be underreporting by 5.30%, so values have been adjusted upward. The boiler flow meter was found to be over reporting by 7.45%, so values have been adjusted downward. In Q4-12, the flare flow meter was found to be over reporting by 4.36%, so no adjustment is necessary. The boiler flow meter was found to be underreporting by 1.91%, so no adjustment is necessary. It is also noted that the above adjustments alter emission reduction calculations by
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			only 0.65%. Project participant has adjusted flow amounts to match the meter errors. CL 1 is closed.
CL 2	Please clarify the certification for the calibrations performed on behalf of Mostardi/Platt.	Is DNV requesting a lab certificate for Mostardi Platt? If so, one can be provided. If something else is being requested, please provide further clarification.	DNV is requesting the certification for Mostardi Platt to perform calibrations. Response: All procedures followed by Mostardi Platt are stipulated by USEPA and are self-validating methods. Mostardi Platt has provided a letter of self-certification. Mostardi Platt also ensures that instruments used to perform the tests are properly calibrated. In the case of the volumetric flow RATAs, the pitot tubes are calibrated as are the thermocouples. Project participant has provided a statement of confirmation from Mostardi Platt that all relevant standards have been followed. CL 2 is closed.
CL 3	The calibration report for west beam and east beam meters show an error greater than 5%. How is this taken into account?	The meters were found to be in spec on 9/20/12. A second flow meter verification then recorded the meters as out of spec on 10/26/12. It is unknown why the second verification had the results it did, but both meters in the latter case were shown to be under-reporting, which would be conservative since both meters contribute	Data is shown to be conservative and has been left as measured. CL 3 is closed.

		to influent flow. Therefore, no correction is necessary.	
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Forward action requests from previous verification

FAR ID	Forward action request	Summary of how FAR has been addressed in this reporting period	Assessment of how FAR has been addressed
N/A			

Forward action requests from this verification

FAR ID	Forward action request	Response by Project Participants	DNV's assessment of response by Project Participants
N/A			