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Verification Report

Prepared for:

Duke University

Project Name:	Duke Carbon Offsets Initiative - Loyd Ray Farms
Project ID:	CAR893
Reporting Period:	September 23, 2011 through June 30, 2012
Report Date:	December 2012
Lead Verifier:	Heather Moore
LRQA office:	LRQA Americas Sustainability, Inc.

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1. Introduction

LRQA Americas Sustainability, Inc. (LRQA) was contracted by Duke University (Duke) to conduct an independent verification of the Duke Carbon Offsets Initiative – Loyd Ray Farms project – CAR893 (the Project) located in Yadkin County, North Carolina. This verification covers the reporting period of September 23, 2011 through June 30, 2012. LRQA conducted the verification from June to September of 2012.

This verification report describes the verification activities conducted by LRQA. The report discusses the scope of the verification activities, the standards used, the emissions sources identified, the verification methods used, and the results of the verification activities.

2. Objectives

The verification process is intended to provide the Climate Action Reserve (CAR) participant with an independent review of the data and information being submitted to CAR. The verification process is used to verify that the participant's greenhouse gas (GHG) project data has met a minimum quality standard and has complied with CAR procedures and protocols for calculating and reporting project emissions and emission reductions.

The purpose of this verification was to establish that the project and GHG emissions data submitted to CAR conform to the requirements of CAR's protocols, including all eligibility requirements. Project information was reviewed to determine that the reported emission reductions were calculated in a complete, consistent, transparent, accurate and conservative manner. The data were reviewed to determine with a reasonable level of assurance that the GHG emissions calculations were free of material misstatements.

3. Verification Scope

The scope of the verification is outlined in Table 1.

Table 1 – Scope of Verification Activities

Project Developer	Duke University
Geographic Boundaries	Loyd Ray Farms, Yadkinville, North Carolina
Reporting Periods Submitted for Verification	September 23, 2011 through June 30, 2012
Greenhouse Gases Verified	• Carbon dioxide (CO_2) • Methane (CH_4)
Project-Specific Information	• Documentation of project eligibility • Monitoring records and other supporting documentation for all parameters associated with GHG emission reduction calculations • Meters Data and Emission Reduction Calculations

4. Project Description

The Project consists of the installation and operation of a synthetically lined and covered anaerobic digester at the Loyd Ray Farms in Yadkinville, North Carolina. The Loyd Ray Farms raises approximately 8,640 feeder-to-finish swine housed in nine barns. The swine stand on a grated surface over approximately two feet of flush water. Manure is flushed weekly from the nine barns directly into the digester. Prior to the project implementation, the Loyd Ray Farms operated an open lagoon and spray-field system to dispose of the manure once flushed.

The biogas created from the digestion process is either captured and used to generate electricity or is combusted in an on-site open flare. The Project currently operates one 65kW Capstone C65 MicroTurbine for power generation and an open flare for the extra biogas that is collected from the digester. The electricity produced in the MicroTurbine is used to power the project's pumps. When the power generation is more than required by the project's pumps, electricity is routed to serve the farm's power demand. If biogas production exceeds the capacity of the MicroTurbine or if the MicroTurbine is not operational, the biogas is automatically routed to and combusted in the flare. The flare uses a solar-powered electric spark-igniter and is equipped with an automatic flow shut-off valve that monitors the thermocouple temperature and ensures biogas is not vented through the flare. The digestate is sent to a synthetically lined aeration basin for nitrification, BOD reduction, and further treatment. The treated liquid is then sent back to the barns and used as flush water.

5. Verification Criteria

The Criteria by which the verification activities were conducted are listed in Table 2.

Table 2 – Criteria for Verification Activities

Standard of Verification	• Climate Action Reserve's U.S. Livestock Project Protocol Version 3.0, September 29, 2010 (CAR Protocol) • Errata and Clarifications to the Livestock Project Protocol, July 19, 2012 • Climate Action Reserve Program Manual (October 26, 2011)
Verification Process	• Section 8, Climate Action Reserve's U.S. Livestock Project Protocol Version 3.0, September 29, 2010 • Errata and Clarifications to the Livestock Project Protocol, July 19, 2012 • Climate Action Reserve's Verification Program Manual, December 20, 2010 • ISO 14064-3:2006: Specification with guidance for the validation and verification of greenhouse gas assertions, 2006
Approved Variances	Yes, one variance approved on December 13, 2012 for the demonstration of the hourly operation of the flare during the period of September 23, 2011 through February 29, 2012.
Notification of Planned Verification Activities and Request for Evaluation of Potential for Conflict of Interest	Filed with the Climate Action Reserve on June 7, 2012 Response dated June 11, 2012
Level of Assurance	Reasonable Assurance
Materiality Threshold	• Quantitative misstatements greater than 5% of the Project's emission reduction assertion for vintage years 2011 and 2012; and • Non-conformances with the requirements of the CAR Protocol are also considered material.

6. Verification Process

6.1 Overview

The verification process included the following activities:

1. Conflict of Interest (COI) Review

   A COI assessment was conducted to identify any potential conflicts of interest for this verification. No potential conflicts were identified by LRQA and a determination of low potential for COI was received from CAR prior to the commencement of verification activities.

2. Verification Team Selection

   The LRQA team selected for this project was as follows:
   Lead Verifier: Heather Moore
   Support Verifiers: Derek Markolf
   Internal Reviewer: Christina Magerkurth

3. Kick-off meeting and Initial Data Review

   The verification was initiated with a kick-off meeting on June 21, 2012 with the project developer. The meeting focused on confirming the scope, schedule, and data required for verification.

4. Risk Assessment and Verification Plan Development

   Upon review of the data and documentation provided, LRQA performed a risk assessment and developed a risk-based sampling plan which identified the key areas for review.

5. Site Visit

   Heather Moore and Derek Markolf conducted a site visit on July 31, 2012 to assess the Projects' data management systems and interview personnel relevant to the Project's operations.

6. Verification Review of Project Eligibility, Data and GHG Management Systems

   LRQA reviewed the project for conformance to the CAR Protocol project eligibility requirements, performed a comprehensive desk review of the project documentation, and calculated the emission estimates to determine if there were any misstatements.

7. Verification Results

   Based on the project eligibility review and data analysis, LRQA identified corrective actions and clarification requests. Duke provided sufficient responses to all corrective actions and clarification requests.

8. Verification Statement

   LRQA confirmed the project's conformance to the protocol and ultimate lack of material misstatement and issued Duke a favorable verification statement.

6.2 Eligibility Assessment

The Project meets the eligibility requirements set forth in the CAR Protocol, as described below.

Location

Projects located within the United States and its territories are eligible to register reductions with CAR. Loyd Ray Farms is located in the state of North Carolina, and therefore satisfies this eligibility criterion.

Project Start Date

The Project was completed on May 24, 2011 and became operational on September 23, 2011 after the completion of the initial start-up period. LRQA reviewed the MicroTurbine Startup Certification to confirm that the Project meets CAR's start date requirements.

Anaerobic Baseline

LRQA confirmed that the pre-project anaerobic lagoon was approximately 13 feet (3.96 meters) in depth, preventing algal oxygen production and creating an oxygen-free bottom layer. In order to confirm the pre-project scenario and anaerobic lagoon depth, LRQA reviewed engineering drawings and aerial photographs.

Additionality – Performance Standard Test

CAR uses a technology-specific threshold (sometimes referred to as a practice-based threshold) to determine if a livestock project meets the Performance Standard. The technology-specific threshold serves as a "better than business-as-usual" strategy for manure management. A project passes the Performance Standard Test by installing a biogas control system (BCS).

As discussed previously in this report, the Project meets CAR's Performance Standard Test by the installation of a BCS that collects and destroys biogas created from the manure treatment system.

Additionality – Legal Requirement Test

The CAR Protocol states that all projects are subject to a Legal Requirement Test to ensure that the GHG reductions achieved by a project would not otherwise have occurred due to federal, state or local regulations, or other legally binding mandates. Project developers must submit the Attestation of Voluntary Implementation form confirming that the project was implemented and established voluntarily and continues to operate as such.

LRQA reviewed the project's Nutrient Management Plan, the Innovative Animal Waste Treatment System Permit administered by the North Carolina Division of Water Quality, and the Air Quality Registration Form NCDAQ R01 submitted to the North Carolina Division of Air Quality. Based on this review and the Attestation of Voluntary Implementation (Appendix A), LRQA confirmed with reasonable assurance that there are currently no specific regulations requiring the project's installation.

Regulatory Compliance

As a final eligibility requirement, the project must be in material compliance with all applicable laws (e.g. air, water quality, safety, etc.). The project developer must attest to this compliance and disclose in writing any non-compliances.

To ensure that the Project met the requirements of the Regulatory Test, LRQA reviewed the Environmental Protection Agency's (EPA's) Enforcement and Compliance History Online (ECHO) database and interviewed site personnel during the site visit.

Based on this review and the Attestation of Regulatory Compliance (Appendix B), LRQA determined that the project and its associated emission reduction credits meet the regulatory compliance eligibility criteria.

Ownership

LRQA reviewed two different agreements, one between Duke University, Duke Energy, and Loyd Ray Farms and the other between Duke University and Google Inc. Both agreements indicated Duke University's ownership of 100 percent of all carbon offsets generated by the Project. Further evidence of the title to emission reduction credits is provided in the Project Developer's Attestation of Title (Appendix C).

LRQA concluded with reasonable assurance that the project developer (Duke University) is the sole owner of the full, legal, and beneficial title to the carbon offset credits being issued as a result of the collection and combustion of biogas at the farm.

6.3 Assessment of Sources

LRQA assessed the project's reported emissions sources, sinks and reservoirs (SSRs) to ensure that all are identified, and to confirm their completeness and relevance within the GHG Assessment Boundary as defined by the CAR Protocol.

LRQA identified the following Project sources of GHG emissions:

- Electricity
- Venting Events
- Biogas Control System
- BCS Effluent Pond
- Uncombusted biogas

These project emission sources are discussed in detail in Section 6.5. There are also several mobile and stationary fuel combustion sources used at the farm that did not directly relate to the Project activities.

LRQA reviewed all relevant operations while considering any SSRs that had not been identified, and determined that all necessary and appropriate SSRs have been included in the emission reduction calculations.

6.4 Assessment of Protocol Conformance

CAR requires all projects to be in conformance with specific monitoring requirements outlined in the CAR Protocol. Duke University developed a written Monitoring Plan, including the Project Diagram, to track relevant project parameters and data sources. The requirements for the Monitoring Plan were reviewed in detail by LRQA and are discussed below.

Monitoring Plan

The Monitoring Plan was checked for inclusion of the following elements, as required by the CAR Protocol:

- frequency of data acquisition
- a record keeping plan
- frequency of instrument field check and calibration activities
- the role of the individual performing each specific monitoring activity
- QA/QC provisions to ensure that data acquisition and meter calibration are carried out consistently and with precision
- Measurement frequencies for the applicable parameters in Table 6.1

Additionally, the project developer was able to demonstrate that they have applied the Monitoring Plan's criteria and procedures on a regular basis during project implementation. LRQA concluded that the Monitoring Plan contains all the elements required by the CAR Protocol, and that the data collection was conducted in accordance with the Monitoring Plan.

Project Monitoring

Biogas flow to the MicroTurbine is continuously measured using a Rosemount 8800D Vortex flow meter. The flow data is automatically corrected from ambient conditions to a standard temperature and pressure of 60˚F and one atmosphere of pressure. Biogas flow to the open flare is continuously measured by a Fluid Components International, LLC (FCI) ST75 flow meter that corrects the flow from ambient conditions to a standard temperature and pressure of 70˚F and one atmosphere of pressure. The FCI flow meter was installed in June 18, 2012, so no emission reductions are included from biogas combusted in the flare until that time.

Initially, methane concentration was determined from quarterly samples taken by Duke University personnel and analyzed in the laboratory of Dr. Marc Deshusses, Professor of Engineering at Duke University. On June 18, 2012, a Bluesens BCP-CH4 continuous methane analyzer was installed and is used to determine the methane concentration of the biogas. The table below shows the method used to determine the methane concentration for each quarter:

Quarter	Methane Concentration Source
First Quarter	Manual sample
Second Quarter	Manual Sample
Third Quarter (before June 18, 2012)	Average of continuous gas analyzer values from June 18, 2012 through June 23, 2012

Quarter	Methane Concentration Source
Third Quarter (after June 18, 2012)	Continuous methane analyzer

The hourly operation of the MicroTurbine is tracked by the electricity output recorded by the MicroTurbine. The hourly operation of the open flare is documented by the temperature of the thermocouple from March 1, 2012 through June 30, 2012. Before March 1, 2012, a CAR approved variance, as described more fully below, was applied to fulfill the monitoring requirement.

An on-site SCADA system records the flow to both destruction devices, methane concentration, and evidence of hourly operation of the destruction devices in 15 minute intervals, stores the data on an on-site computer and also emails a weekly spreadsheet to the Project Developers. In addition, the Project Developers have a real-time view of the Project's status through the SCADA system using an internet connection from any location.

The Project Developer also monitors several site-specific variables used in the modeled emission reduction calculations. Animal populations and weights are tracked from data provided by the Integrator, L&H Farms, who is responsible for the shipments of the swine into and out of Loyd Ray Farms. Venting events are noted in the Project's daily operator log book.

Maintenance of Meters

Duke University's instrument quality assurance/quality control (QA/QC) procedures for the Project's monitoring equipment complies with CAR's requirements.

The MicroTurbine flow meter was cleaned and examined every quarter during the reporting period and field checked within two months of the end of the reporting period. Because the manufacturer does not stipulate specific guidance on calibration frequency, the flow meters will be calibrated every 5 years per the requirements of the CAR Protocol. The field check performed showed the flow meter to be reading accurately.

Because the flare flow meter and BlueSens gas analyzer were installed in June 2012, the factory calibration and installation served as the cleaning/inspection and field check for both instruments. Duke University has developed cleaning/inspection forms that will be used to track the QA/QC measures going forward.

LRQA also reviewed calibration documentation of the equipment and the calculation methodology used to determine the methane concentration by Dr. Marc Deshusses, Professor of Engineering at Duke University. Based on the evidence provided, LRQA determined that the equipment QA/QC and calculation methodology were adequate to provide accurate results.

Based on the review of the evidence provided, LRQA concluded that the instrumentation maintenance requirements of the CAR Protocol were being met throughout this reporting period.

Data Management Procedures

LRQA performed a review of the data acquisition and data management systems. The path of the data movement is outlined within the Monitoring Plan. Each of the meters continuously monitor flow, and the output readings are recorded by the SCADA system.

Other data parameters used in this Project include animal population and weights, climactic data, and methane concentration samples before the continuous gas analyzer was installed in June 2012. In addition, the Project personnel maintain a daily log book which contains notes regarding the daily operation of the project, venting events, equipment checks, and other relevant information.

Based on interviews performed at the site visit, it was apparent to LRQA that all staff performing data collection and calculations were competent and had a clear understanding of the equipment and of the procedures outlined in the Monitoring Plan and CAR Protocol.

Approved Variance or Deviations

Duke University requested a variance from CAR to employ the daily log of flare operation from September 23, 2011 through February 29, 2012 because demonstration of the hourly operation of the flare was not available. When the flare was operating during this period, the flow rate of biogas to the flare was assumed to be 10 scfm, of which 20 percent was assumed to be vented through the flare. CAR approved the variance request pursuant to four conditions, as follows:

- The recorded flow of biogas to the flare without the operation of the blower averages less than 10 scfm over a 24 hour period, as confirmed by the verifier.
- The verifier confirms that the average weekly amount of biogas sent to the microturbine during the period of missing flare monitoring data (9/23/2011 – 2/29/2012) is greater than the average weekly amount sent during the remainder of the reporting period (3/1/2012 – 6/30/2012).
- The verifier confirms that no instances of re-lighting the flare were recorded in the Operations Log between 9/23/2011 and 2/29/2012.
- The flare temperature recorded by the thermocouple after the spark igniter was replaced was greater than or equal to 125°F at least 90% of the time that biogas was flowing to the flare between 10/4/2012 and 12/14/2012, as confirmed by the verifier.

LRQA reviewed the biogas flow calculations and confirmed the four conditions required by CAR.

6.5 Calculations

In order to calculate the emission reductions associated with this methane reduction project, Duke University utilized the CAR Livestock Calculation Tool, Beta Version 3.0b (CLCT). The use of version 3.0b has been approved by CAR in communications with LRQA on August 21, 2012.

LRQA checked that calculations and equations had been applied in accordance with the protocol requirements and reviewed 100 percent of the parameters and data to confirm the accuracy of the calculated emission reductions. As a result of the assessment, LRQA determined all parameters were free of material misstatement. In addition, LRQA entered data into an independent CLCT to determine the overall materiality for each vintage year.

Modeled Baseline Methane Calculations

The baseline scenario emissions were modeled in accordance with the equations in the CAR Protocol using the CLCT. The sources of the main parameters used in the modeled baseline calculation are:

- Population – P_L: Swine Inventory spreadsheet from the farm's integrator, L&H Farms
- Volatile Solids - VS_L: Table B.3 of the CAR Protocol, livestock category grow/finish swine.
- Mass – $Mass_L$: Average based on swine inventory spreadsheet from the farm's integrator, L&H Farms
- Maximum methane production – $B_{0,L}$: Table B.3 of the CAR Protocol, livestock category grow/finish swine.
- MS: Determined from site specific conditions
- Methane Conversion Factor from the effluent pond – MCF_{ep}: Because the effluent pond is operated both anaerobically and aerobically, Duke University sampled methane emissions from the effluent pond and calculated a site-specific MCF_{ep}.

The MS value is determined from site-specific conditions depending on the manure management system, which remained the same both in the baseline and project scenarios. As described above, the waste falls directly into the water storage beneath the animals in the barns. On a weekly basis, the waste is flushed from the barns, through pipes and into the digester. The value assigned to both the $MS_{L,BCS}$ and $MS_{L,S}$ was verified during the site visit through the observations at the farm and interviews with the project personnel.

The primary storage lagoon in the baseline scenario has never been cleaned. The spray schedule is irregular, but is less often than every 30 days on average.

Metered Methane Destruction Comparison

The amount of methane destroyed was also calculated based on the meter data collected from the flow meters during the reporting period and compared to the modeled baseline methane calculations.

Duke University performs quality assurance/quality control checks on the flow data recorded in 15 minute intervals in the Project's SCADA system and then inputs the data into a Microsoft Access database. Calculations performed in the database include:

- a correction to the flare flow data to 60˚F
- the flow-weighted average of the destruction efficiency
- total methane released during venting events
- methane destroyed calculated with continuous gas analyzer data.

Due to a problem with the MicroTurbine flow meter, Duke University applied missing data substitution methods for six days in February 2012. LRQA confirmed that the correct methodology was used to calculate the missing data.

Project Emission Calculations

Project emissions are actual GHG emissions that occur within the Project boundary after the installation of the BCS.

The project emission sources consisted of the following items:

- Electricity: Electricity consumed by the project's pumps was measured by an on-site meter separately from the farm's electricity demand. However, because the MicroTurbine generated more electricity than was needed to operate the Project's equipment, the electricity consumption was not accounted for in the project's emissions and was omitted in equation 5.11.
- Venting Events: Venting events occurred during the reporting period, were recorded in the Project's daily logbook, and were calculated in accordance to equation 5.7.
- Biogas Control System: Calculated according to equation 5.6.
- BCS Effluent Pond: Calculated according to equation 5.8, using a site-specific MCF_{ep}.

The flare start-up uses a solar-powered electric spark igniter, so no project emissions from fuel combustion are associated with a pilot light on the flare. LRQA confirmed during the site visit that the quantity of fuel combusted for manure management activities did not change in the project scenario. In addition, LRQA confirmed that the MCF value is appropriate.

Summary of Data Review

Consistent with the CAR Protocol, the modeled methane emission reductions for each vintage year were compared with the actual metered amount of methane that was destroyed in the biogas collection system over the same period. For both vintage years, the lesser of the two values was the metered emission reductions.

Project emission reduction calculations are summarized below in Figure 1 and Figure 2 which are taken from the CLCT for each vintage year. LRQA has recalculated and verified the total number of emission reductions generated and reported to CAR.

LRQA confirmed the accuracy of calculated emission reductions by independently completing the calculations. LRQA determined that all parameters were free of material misstatement, and that all applications of the calculation parameters were in conformance with the CAR Protocol.

Figure 1: Summary of Vintage 2011 Emission Reductions from CAR Livestock Calculation Tool

II.A.iii. Total Modeled Baseline Methane Emissions

BE_{CH4} (MT) =	53.679	tonnes CH_4 $year^{-1}$
BE_{CH4} (CO_2e) =	1,127.249	tonnes CO_2e $year^{-1}$

II.A.iv. Total Baseline Carbon Dioxide Emissions $CO_{2(MSC)}$ (CO2e)

	0.000	tonnes CO_2 $year^{-1}$

II.B. Total Project Emissions

II.B.i. Project Methane Emissions from the BCS

CH_4(BCS) (MT) =	2.941	tonnes CH_4 $year^{-1}$
CH_4(BCS) (CO_2e)	61.757	tonnes CO_2e $year^{-1}$

IIB.ii. Methane Emissions from Venting Events

$CH_{4,vent,i}$ (MT)	18.222	tonnes CH_4 $year^{-1}$
$CH_{4,vent,i}$ (CO_2e)	382.668	tonnes CO_2e $year^{-1}$

II.B.iii. Project Methane Emissions from the BCS Effluent Pond

CH_4(EP) (MT) =	1.185	tonnes CH_4 $year^{-1}$
CH_4(EP) (CO_2e)	24.887	tonnes CO_2e $year^{-1}$

II.B.iv. Project Methane Emissions from Non-BCS-Related Sources

CH_4(nonBCS sources) (MT) =	0.000	tonnes CH_4 $year^{-1}$
CH_4(nonBCS sources) (CO_2e)	0.000	tonnes CO_2e $year^{-1}$

II.B.v. Total Project Methane Emissions

PE_{CH4} (MT)	22.348	tonnes CH_4 $year^{-1}$
PE_{CH4}(CO_2e) =	469.312	tonnes CO_2e $year^{-1}$

II.B.vi. Total Project Carbon Dioxide Emissions $CO_{2(MSC)}$ (CO2e)

0.000	

II.C. Comparison of Modeled Methane Reductions to Total Quantity of Destroyed Methane

(BE_{CH4} (MT) - PE_{CH4} (MT)) =	31.330	tonnes CH_4 $year^{-1}$
$CH_{4,destroyed}$ (MT) =	21.948	tonnes CH_4 $year^{-1}$

Note: The Total Methane Reductions (below) will be equal to the lesser of the two values above.		
Total Methane Reductions (MT) =	21.948	tonnes CH_4 $year^{-1}$
Total Methane Reductions (CO2e) =	460.904	tonnes CO_2e $year^{-1}$

II.D. Total Emission Reductions (CH4 and CO2)

Total Emission Reductions (MT CO2e/yr) =	461	tonnes CO_2e $year^{-1}$

Figure 2: Summary of Vintage 2012 Emission Reductions from CAR Livestock Calculation Tool

II.A.iii. Total Modeled Baseline Methane Emissions

BE_{CH4} (MT) =	176.431	tonnes CH_4 $year^{-1}$
BE_{CH4} (CO_2e) =	3,705.041	tonnes CO_2e $year^{-1}$

II.A.iv. Total Baseline Carbon Dioxide Emissions $CO_{2(MSC)}$ (CO2e)

	0.000	tonnes CO_2 $year^{-1}$

II.B. Total Project Emissions

II.B.i. Project Methane Emissions from the BCS

CH_4(BCS) (MT) =	2.626	tonnes CH_4 $year^{-1}$
CH_4(BCS) (CO_2e)	55.152	tonnes CO_2e $year^{-1}$

IIB.ii. Methane Emissions from Venting Events

$CH_{4,vent,i}$ (MT)	0.000	tonnes CH_4 $year^{-1}$
$CH_{4,vent,i}$ (CO_2e)	0.000	tonnes CO_2e $year^{-1}$

II.B.iii. Project Methane Emissions from the BCS Effluent Pond

CH_4(EP) (MT) =	1.646	tonnes CH_4 $year^{-1}$
CH_4(EP) (CO_2e)	34.574	tonnes CO_2e $year^{-1}$

II.B.iv. Project Methane Emissions from Non-BCS-Related Sources

CH_4(nonBCS sources) (MT) =	0.000	tonnes CH_4 $year^{-1}$
CH_4(nonBCS sources) (CO_2e)	0.000	tonnes CO_2e $year^{-1}$

II.B.v. Total Project Methane Emissions

PE_{CH4} (MT)	4.273	tonnes CH_4 $year^{-1}$
PE_{CH4}(CO_2e) =	89.726	tonnes CO_2e $year^{-1}$

II.B.vi. Total Project Carbon Dioxide Emissions $CO_{2(MSC)}$ (CO2e)

0.000	

II.C. Comparison of Modeled Methane Reductions to Total Quantity of Destroyed Methane

(BE_{CH4} (MT) - PE_{CH4} (MT)) =	172.158	tonnes CH_4 $year^{-1}$
$CH_{4,destroyed}$ (MT) =	44.153	tonnes CH_4 $year^{-1}$

Note: The Total Methane Reductions (below) will be equal to the lesser of the two values above.		
Total Methane Reductions (MT) =	**44.153**	**tonnes CH_4 $year^{-1}$**
Total Methane Reductions (CO2e) =	**927.205**	**tonnes CO_2e $year^{-1}$**

7. Verification Results

The Loyd Ray Farms verification consisted of a thorough review of the project design, eligibility, conformance, and emissions data calculations. During the course of the verification, Duke University provided LRQA with all requested data and information.

During the verification activities, LRQA provided a List of Findings to Duke University. Duke University took corrective actions to address the material issues and non-conformances. The corrective actions taken were documented in the final List of Findings provided to Duke University.

After reviewing the revised emission reduction calculations and supporting documentation, LRQA has determined that the Loyd Ray Farms project and reported emission reductions for vintage year 2011 and 2012 reporting periods meet the requirements of the CAR program and CAR Protocol.

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8. Verification Statement

Based on the verification activities performed by LRQA and the supporting evidence provided by Duke University, LRQA has found the Duke Carbon Offsets Initiative – Loyd Ray Farms project and the reported GHG emission reductions to be in conformance with the Climate Action Reserve U.S. Livestock Project Protocol (Version 3.0) and its Errata and Clarifications. This project met all eligibility requirements, was conducted in accordance with all monitoring and record-keeping requirements, and applied appropriate calculation methodologies. There are no material non-conformances or misstatements associated with the reported data. The GHG emission reductions reported by Duke University for the period of September 23, 2011 through June 30, 2012 are considered to be accurate with a reasonable level of assurance.

The verified emission reductions are listed below in Table 3:

Table 3 – Summary of Verified Emission Reductions, in tCO_2e

Vintage	BE_{CH4} (tCH_4) (Modeled)	PE_{CH4} (tCH_4)	$CH_{4,destroved}$ (tCH_4) (Measured)	GHG Reductions (CRTs)*
2011	53.679	22.348	21.948	461
2012	176.431	4.273	44.153	927

* Lesser of two results (modeled vs. measured) are used in emission reduction calculations

Authorized LRQA signatories to this Verification Report:

Lead Verifier

Heather Moore
Lead Verifier

12/27/2012
Date

Senior Internal Reviewer

Christina Magerkurth
Senior Internal Reviewer

12/27/2012
Date

Project Developer's Attestation of Voluntary Implementation

The undersigned, on behalf of [Duke University] (the "Project Developer"), in connection with [Duke Carbon Offsets Initiative - Loyd Ray Farms] [CAR # 893] (the "Project") located at [1948 Casstevens Rd., Yadkinville, NC 27011] (the "Property"), hereby attests, represents and warrants to the Climate Action Reserve (the "Reserve"), as of the date set forth below, as follows:

1. Except as otherwise expressly permitted under the protocol developed by the Reserve that applies to the Project, (i) the Project was implemented and established voluntarily and, at all times during the period beginning on [09/23/2011] and ending on [06/30/2012] (the "Reporting Period"), it was operated and conducted voluntarily; and (ii) none of such implementation or establishment of the Project, and none of such operation or conduct of the Project during the Reporting Period, was required by any law, statute, rule, regulation, ordinance, court order, governmental agency action, enforcement action, permitting condition, permit (including without limitation a Title V of 42 U.S.C. 7401, *et seq*. permit ("Title V Permit"), or Prevention of Significant Deterioration permit), or other legally binding mandate, including without limitation any of the foregoing issued, enacted or otherwise rendered effective by any federal, state, local or foreign governmental or regulatory agency, commission, department, board, court or other authority having jurisdiction over the Project ("Law").

2. Except as otherwise expressly permitted under the protocol developed by the Reserve that applies to the Project, the Project was not established or implemented, and was not at any time during the Reporting Period operated or conducted, in anticipation of, or to avoid or satisfy the anticipated requirements of, any Law that would require or would have required the Project Developer to use the Property in the manner contemplated by the Project.

3. The undersigned is a duly qualified and acting officer of the Project Developer holding the title indicated on the signature page hereof and is expressly authorized to execute and deliver this Attestation on behalf of the Project Developer, thereby rendering this Attestation binding on the Project Developer.

The Project Developer recognizes, acknowledges and agrees that (i) this Attestation may be relied upon by the Reserve and/or any user of the Reserve program, and each of their respective successors and assigns (including, without limitation, reliance in connection with the issuance and transfer of Climate Reserve Tonnes in respect of the Project); and (ii) in the event of any breach of any of any paragraphs 1 through 3 hereof, the Reserve shall be entitled to pursue any rights and remedies available at law or in equity (including, without limitation, rights to indemnification pursuant to the Reserve's Terms of Use, which incorporates this Attestation by reference) in any court of competent jurisdiction.

[Signature on Next Page]

IN WITNESS WHEREOF, the undersigned has executed this Project Developer's Attestation of Voluntary Implementation on behalf of the Project Developer this [9th] day of [~~June~~ JULY], 20[12].

PROJECT DEVELOPER[1]

By: _____

Name: Tatjana Vujic

Title: Director, Duke Carbon Offsets Initiative

Organization: Duke University

Address: 203 Allen Bldg, Box 90027

Durham, NC 27708

[1] If the Project Developer is a corporation, partnership or other legal entity, this Attestation must be executed by an officer of the Project Developer legally authorized to bind the entity. If the Project Developer is an individual, this Attestation must be executed by the individual and revised accordingly.

Project Developer's Attestation of Regulatory Compliance

The undersigned, on behalf of [Duke University] (the "Project Developer"), in connection with [Duke Carbon Offsets Initiative - Loyd Ray Farms] [CAR# 893] (the "Project"), hereby attests, represents and warrants to the Climate Action Reserve (the "Reserve"), as of the date set forth below, as follows:

1. For the period beginning on [09/23/2011] and ending on [06/30/2012](the "Reporting Period"), at all times during the date(s) indicated below, the Project was in material compliance with all Laws. For purposes hereof, "Laws" means any and all laws, statutes, rules, regulations, ordinances, court orders, governmental agency action, enforcement action, or other legally binding mandates, including without limitation any of the foregoing issued, enacted or otherwise rendered effective by any federal, state, local or foreign governmental or regulatory agency, commission, department, board, court or other authority having jurisdiction over the Project.

   Date(s) of material compliance 09/23/2011 - 06/30/2012

2. The Project Developer has disclosed to the Project Verifiers in writing any and all instances of non-compliance of the Project with any Law during the Reporting Period. For purposes hereof, "Project Verifiers" means any and all third party verifiers approved by the Reserve and assigned to the Project.

3. The undersigned is a duly qualified and acting officer of the Project Developer holding the title indicated on the signature page hereof and is expressly authorized to execute and deliver this Attestation on behalf of the Project Developer, thereby rendering this Attestation binding on the Project Developer.

The Project Developer recognizes, acknowledges and agrees that (i) this Attestation may be relied upon by the Reserve and/or any user of the Climate Action Reserve program, and each of their respective successors and assigns (including, without limitation, reliance in connection with the issuance and transfer of Climate Reserve Tonnes in respect of the Project); and (ii) in the event of any breach of any of any paragraphs 1 through 3 hereof, the Reserve shall be entitled to pursue any rights and remedies available at law or in equity (including, without limitation, rights to indemnification pursuant to the Reserve's Terms of Use, which incorporates this Attestation by reference) in any court of competent jurisdiction.

IN WITNESS WHEREOF, the undersigned has executed this Attestation on behalf of the Project Developer this [14th] day of [December], 20[12].

PROJECT DEVELOPER[1]

By: _____

Name: Tatjana Vujic

Title: Director, Duke Carbon Offsets Initiative

Organization: Duke University

Address: 203 Allen Bldg, Box 90027

Durham, NC 27708

[1] If the Project Developer is a corporation, partnership or other legal entity, this Attestation must be executed by an officer of the Project Developer who is legally authorized to bind the Project Developer. If the Project Developer is an individual, this Attestation must be executed by the individual and revised accordingly.

Project Developer's Attestation of Title

The undersigned, on behalf of [Duke University] (the "Project Developer"), in connection with [Duke Carbon Offsets Initiative - Loyd Ray Farms] [CAR # 893] (the "Project"), hereby attests, represents, warrants and covenants to the Climate Action Reserve (the "Reserve"), as of the date set forth below, as follows:

1. The Project Developer holds, free of any lien, charge, security interest or other encumbrance, legal title to and all beneficial ownership rights in the following (the "Project Reductions"): (i) any removal, limitation, reduction, avoidance, sequestration or mitigation of any greenhouse gas associated with the Project and arising during the period beginning on the Project start date (as defined under the protocol developed by the Reserve that applies to the Project) and ending on the date hereof, and (ii) any right, interest, credit, entitlement, benefit or allowance to emit (present or future) arising from or associated with any of the foregoing (except, with respect to both clauses (i) and (ii) above, for any failure to hold such legal title and beneficial ownership rights as may have resulted from one or more Permitted Transfers by the Project Developer or any predecessor in interest thereof).

   For purposes hereof, "Permitted Transfer" means any transfer of one or more Climate Reserve Tonnes representing Project Reductions ("Project CRTs"), or one or more carbon offset credits issued with the Reserve's express written permission upon the conversion, retirement or cancellation of one or more Project CRTs ("Other Project Credits"), provided that any such transfer of Project CRTs is in accordance with the Reserve's Terms of Use and Program Manual, each as may be amended from time to time.

2. The Project Developer has not effected, nor will it attempt or effect, any sale or other transfer of the Project Reductions except by way of one or more Permitted Transfers.

3. Neither the Project Reductions nor any Project CRTs have been or will be registered with, reported in, or held, transferred or retired via any emissions registry or inventory other than the Reserve (except as to Project Reductions represented by Other Project Credits) or registered with the Reserve under a different project title or location.

4. The Project Developer has not made or provided, and will not make or provide, knowingly false, fraudulent or misleading statements or information to the Reserve or any third party verifier.

5. The undersigned is a duly qualified and acting officer of the Project Developer holding the title indicated on the signature page hereof and is expressly authorized to execute and deliver this Attestation on behalf of the Project Developer, thereby rendering this Attestation binding on the Project Developer.

The Project Developer recognizes, acknowledges and agrees that (i) this Attestation may be relied upon by the Reserve and/or any user of the Reserve program, and each of their respective successors and assigns (including, without limitation, reliance in connection with the issuance and transfer of Project CRTs); and (ii) in the event of any breach of any of any paragraphs 1 through 5 hereof, the Reserve shall be entitled to pursue any rights and remedies available at law or in equity (including, without limitation, rights to indemnification pursuant to the Reserve's Terms of Use, which incorporates this Attestation by reference) in any court of competent jurisdiction.

IN WITNESS WHEREOF, the undersigned has executed this Attestation on behalf of the Project Developer this [24th] day of [August], 20[12].

PROJECT DEVELOPER[1]

Signature: _____

Name: Tatjana Vujic

Title: Director, Duke Carbon Offsets Initiative

Organization: Duke University

Address: 203 Allen Bldg, Box 90027

Durham, NC 27708

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