UNFCCC
Clean Development Mechanism
Monitoring Report

AWMS GHG Mitigation Project
MX05-B-09, Nuevo León, México

Monitoring Period: 1 October 2005 – 28 February 2006

CDM Registration number: UNFCCC000000163CDMP

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CLEAN DEVELOPMENT MECHANISM
PROJECT ACTIVITY MONITORING REPORT

CONTENTS

A. General description of project activity

B. Monitoring of a CDM project activity

C. Equations and calculation methods

D. Emission reductions

Annexes

Annex 1: Key Parameters Monitored

Annex 2: Definitions and Acronyms

Section A General Project Activity Information

A.1 Title of the project activity:

AWMS GHG Mitigation Project, MX05-B-09, Nuevo León, México

A.2 Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
México (host)	• AgCert International plc • AgCert México Servicios Ambientales, S. de R.L. de C.V.	No

A.3 Crediting period:

A.3.1 Crediting period:

The crediting period for this project activity is from 1 October 2005 through 30 September 2015.

A.3.2 Total estimated emission reductions over the crediting period:

The total estimated emissions reduction over the 10 year project period as documented in the PDD is 209,846 Tonnes of CO_2 equivalent.

A.4 Project activity description and background:

The AWMS GHG Mitigation Project, MX05-B-09, Nuevo León, México began in October 2004, when AgCert and farm owners executed activities to undertake a Clean Development Mechanism project. The details of the project are described in the Project Design Document, Version 2.0, dated 28 November 2005. The PDD is available and can be downloaded from the UNFCCC website -- Link to PDD. This project applies to multiple swine Confined Animal Feeding Operations (located in northwest México) a GHG mitigation methodology which is applicable to intensive livestock operations. The project activities mitigate AWMS GHG emissions in an economically sustainable manner, and result in other environmental benefits, such as greatly reduced risk of water table contamination and reduced odour. In simple terms, the project moves the designated farms from a high-GHG AWMS practice; an open air lagoon, to a lower-GHG AWMS practice; an ambient temperature anaerobic digester with capture and combustion of resulting biogas.

This project activity was validated by TUV-SÜD in December 2005 and approved by the Mexican Government in October 2005.

DATE	ACTIVITY
Jan 2003	AgCert establishes locations worldwide to perform CDM environmental projects in the agricultural industry
Mar 2003	AgCert begins development of proposed new methodology for CDM activities
May 2004	AgCert opens discussions with candidate project participants the potential for conducting subject CDM Project Activity
Oct – Aug 2005	Site Survey, Data Collection, Baseline Analysis, PDD preparation
Oct 2005	Project start date. AgCert and farm owners execute activities to undertake a Clean Development Mechanism project. Initiated construction engineering and planning activities.
Jul 2005	Broke ground at first construction site
May 16, 2005	Stakeholders' meetings held at the Hotel City Express Monterrey, Santa Catarina, Nuevo León.
Oct 2005	AgCert receives Mexican LOA, Link to Report
Oct 2005	Crediting Period Start Date
Dec 2005	TÜV SÜD validates project activity, Link to Report
Feb 10, 2006	Project Registered

Table A1, Project Activity Timeline

Table A1 presents major project activity milestones. Operations, maintenance, and monitoring training were performed by AgCert and manufacturer representatives. Monitoring activities, in accordance with the approved monitoring methodology, began in October 2005. Construction of all sites was completed and monitoring commenced as indicated in Table A2.

Site			Monitoring Start Date
Legal Entity	ID	Name	
Aldabi	23642	Granja El Chancho	9-Oct-05
	23652	Los Tres Cochinitos	14-Nov-05
Granja Porcicola Ana Margarita	23612	Granja Ana Margarita	01-Oct-05
Jesus G. Serna-Uribe	23662	Granja La Prietita	16-Oct-05
Mario Humberto Quintanilla-Gonzalez	23672	Las Tortolas	n/a
	23682	Granja El Milagro	n/a

Table A2, Monitoring Start Dates for Individual Sites

Section B Monitoring of a CDM project activity

B.1 Monitoring report:

B.1.1 Monitoring reports associated with this project activity:

This is the first monitoring report associated with this project activity.

Report Number	Dates		Resulting emission reductions	Verifying DOE
	From	To		
MR01-MX05-B-09	1 Oct 2005	28 Feb 2006	See B.1.3	DNV

Table B1, Monitoring reports submitted for project activity

B.1.2 Monitoring report period:

The period covered in this monitoring report is from 1 October 2005 through 28 February 2006. The monitoring report period is within the bounds of the crediting period noted in paragraph A.3.1.

This monitoring report does not cover any period of time covered by a previous monitoring report.

B.1.3 Emission reductions achieved over the monitored period:

THE EMISSIONS REDUCTION ACHIEVED OVER THE DESIGNATED MONITORING PERIOD IS 2,345 TONNES OF CO_2 EQUIVALENT

B.2 Methodologies applied:

B.2.1 Baseline methodology applied during monitoring period:

This project activity utilized the CDM approved baseline methodology AM0016/Version 02 entitled "*Greenhouse gas mitigation from improved Animal Waste Management Systems in confined animal feeding operations*."

B.2.2 Monitoring methodology applied during monitoring period:

The project activity utilized the CDM approved monitoring methodology AM0016/Version 02 entitled "*Greenhouse gas mitigation from improved Animal Waste Management Systems in confined animal feeding operations."*

AM0016 monitoring methodology is a broad based methodology that can be applied to various animal categories, waste management systems, and data types. As such, the methodology defines a superset of ID numbered parameters available for application at individual project activity scenarios. Individual projects will not require monitoring of the entire superset of parameters. The selection of such parameters is dependent on the result of the data characterization and emission factor determination test (Figure 2 in AM0016). The subset of parameters which were identified, validated, and applied to this project activity is shown in Table B4.

B.3 Monitoring plan:

B.3.1 Development and appropriateness of the monitoring plan:

The monitoring plan "AWMS GHG Mitigation Project, Operations & Maintenance Plan, MS004" was developed based on the approved monitoring methodology identified in paragraph B.2.2.

B.3.2 Implementation of the monitoring plan:

During the monitoring period identified in paragraph A.3, the project participants implemented a validated monitoring plan that was part of the registered project design document, document ID: MX05-B-09.

B.3.3 Revisions to the monitoring plan:

The monitoring plan "AWMS GHG Mitigation Project, Operations & Maintenance Plan, MS004" revision date 25 Feb 05 was submitted to the designated operational entity (DOE) for validation. The document was revised on 23 May 05 based on comments in the validation protocol presented by TÜV-SÜD. The 23 May 05 version of the monitoring plan was validated along with the entire project activity.

B.3.4 Key monitoring activities:

The key parameters monitored at the project activity are listed in Annex 1 and the monitoring plan.

B.4 Data characterization and parameter determination:

B.4.1 Data characterization:

The farm sites included in this project activity were characterized as shown in Table B2.

Project Activity Sites	AWPS		AWMS		Region - Climate[1]
	Animal Category	Genetics Source	Baseline	Project	
AWMS GHG Mitigation Project MX05-B-09 Nuevo León, México	Swine	Annex 1 country	Anaerobic Lagoon	Anaerobic Digester	Latin America – Temperate

Table B2, Farm site data characterization

B.4.2 Emission factor determination test:

The Emission Factor Determination Test, Table B3, is used to identify and select the appropriate emission factors for use in calculation of baseline and project activity emissions.[2]

Project Activity Sites	EFD Test Question				Result
	1	2	3	4	
AWMS GHG Mitigation Project MX05-B-09 Nuevo León, México	No	Yes	Yes	Yes	Use developed nation default EFs

Table B3, Emission factor determination test for sites included in this project activity

B.4.3 Selection of parameters, emission factors and references for calculations:

Values for all parameters, emission factors, and their associated references are available in the PDD associated with this project. All of the parameters noted in Table B4, Table B5, and Table B6 were previously validated by TÜV-SÜD during the validation period of the project activity.

Parameters, Emission Factors, and References for Baseline Calculations		
Parameter/Factor	**Value**	**Source/Comment**

[1] Based on data collected for ID 9.
[2] Obtained from AM0016/Version 2, Figure 2, page 8.

Parameters, Emission Factors, and References for Baseline Calculations		
Parameter/Factor	**Value**	**Source/Comment**
CH_4 GWP	21	Intergovernmental Panel on Climate Change, *Climate Change 1995: The Science of Climate Change* (Cambridge, UK: Cambridge University Press, 1996)
MS%j	100%	Percent of effluent used in system.
V_S	variable	Based on standard animal class weights and obtained from 1996 IPCC, Appendix B, Table B-6, p. 4.46, adjusted via equation 1 of AM0016 capped at 0.5.
B_o	0.45	Obtained from 1996 IPCC, Appendix B, Table B-6, p. 4.46
MCF_{month}	0.90	Obtained from 1996 IPCC, Appendix B, Table B-6, p. 4.46
N_2O GWP	310	Intergovernmental Panel on Climate Change, *Climate Change 1995: The Science of Climate Change* (Cambridge, UK: Cambridge University Press, 1996)
C_m	1.5714	Conversion factor from [N_2O – N] to N_2O (Cm=44/28)
F_{gasm}	0.2	Obtained from 1996 IPCC, Table 4-19, p. 4.94
EF_3	0.001	Obtained from IPCC 2000 Table 4.12, Section 4.4.1.2, p. 4.43
EF_4	0.01	Obtained from IPCC 2000 Table 4.18 Section 4.8.1.2, p. 4.73
N_{ex}	20	Obtained from 1996 IPCC, Table 4-20, p. 4.99

Table B4, Parameter/Factor Values and References for baseline calculations

Parameters, Emission Factors, and References for Project Activity Calculations		
Parameter/Factor	**Value**	**Source/Comment**
CH_4 GWP	21	Intergovernmental Panel on Climate Change, *Climate Change 1995: The Science of Climate Change* (Cambridge, UK: Cambridge University Press, 1996)
ID14	100%	AWMS operation status
MS%j	100%	Percent of effluent used in system
V_S	variable	Based on standard animal class weights and obtained from 1996 IPCC, Appendix B, Table B-6, p. 4.46, adjusted via equation 1 of AM0016 capped at 0.5.
B_o	0.45	Obtained from 1996 IPCC, Appendix B, Table B6, p. 4.46
MCF_{month}	0.10	Obtained from 1996 IPCC Appendix B, Table B-6, p. 4.46
N_2O GWP	310	Intergovernmental Panel on Climate Change, *Climate Change 1995: The Science of Climate Change* (Cambridge, UK: Cambridge University Press, 1996)
C_m	1.5714	Conversion factor from [N_2O – N] to N_2O (Cm=44/28)
F_{gasm}	0.2	Obtained from 1996 IPCC, Table 4-19, p. 4.94
EF_3	0.001	Obtained from IPCC 2000 Table 4.12, Section 4.4.1.2, p. 4.43

Parameters, Emission Factors, and References for Project Activity Calculations		
Parameter/Factor	**Value**	**Source/Comment**
EF_4	0.01	Obtained from IPCC 2000 Table 4.18 Section 4.8.1.2, p. 4.73
N_{ex}	20	Obtained from 1996 IPCC, Table 4-20, p. 4.99

Table B5, Parameter Factor Values and References for project activity calculations

Parameters, Emission Factors, and References for Leakage Calculations		
Parameter/Factor	**Value**	**Source/Comment**
N_{ex}	20	Obtained from 1996 IPCC, Table 4-20, p. 4.99
F_{gasm}	0.2	Obtained from IPCC 1996, Table 4-19, p. 4.94
EF_1	0.0125	Obtained from IPCC 1996, Table 4-18, p. 4.39
C_m	1.5714	Conversion factor from [N_2O – N] to N_2O (Cm=44/28)
F_{leach}	0.3	Obtained from IPCC 1996, Table 4-24, p. 4.106
EF_5	0.025	Obtained from IPCC 1996, Table 4-23, p. 4.105
EF_4	0.01	Obtained from IPCC 2000 Table 4.18 Section 4.8.1.2, p. 4.73
$ECy_{(baseline)}$	0.523kg CO2 / kwh	The GHG Indicator: UNEP Guidelines for Calculating Greenhouse Gas Emissions for Businesses and Non-Commercial Organisations, Appendix 8.2, Table 12 (1990 calculation**)** http://www.uneptie.org/energy/tools/ghgin/docs/GHG_Indicator.pdf
$ECy_{(project\ activity)}$	0.508kg CO2 / kwh	The GHG Indicator: UNEP Guidelines for Calculating Greenhouse Gas Emissions for Businesses and Non-Commercial Organisations, Appendix 8.2, Table 12 (1990 calculation**)** http://www.uneptie.org/energy/tools/ghgin/docs/GHG_Indicator.pdf

Table B6, Parameter/Emission Factor Values and References for leakage calculations

B.5 Monitored baseline data:

The baseline data collected in accordance with the registered PDD and approved monitoring methodology, AM0016, is provided in the following table:

Baseline Data										
		ID1					ID 6	ID 9		ID 14
Year	Month	Boar	Finisher	Gilt	Nurser	Sow	AWMS Type	Temp °C	Rain cm	Status
2005	10	39	7,710	50	3,714	1,708	AL	22.4	17	Oper.
2005	11	61	9,320	102	3,814	2,285	AL	19.4	0.5	Oper.
2005	12	67	9,154	103	4,011	2,351	AL	15.5	1.1	Oper.
2006	1	67	8,928	223	4,012	2,317	AL	18.6	7.6	Oper.
2006	2	66	9,561	202	4,198	2,333	AL	15.6	7.8	Oper.

Table B7, Baseline data (ID6[3], ID9[4])

B.6 Monitored project activity data:

The project activity data collected in accordance with the registered PDD and approved monitoring methodology, AM0016. The data shown in the following table is a summation or average of all sites included in the project. Individual site specific data has been presented to the DOE for verification.

Project Activity Data												
		ID 1					ID 6	ID9		ID 12	ID 13	ID 14
Year	Month	Boar	Finisher	Gilt	Nurser	Sow	AWMS Type	Temp °C	Rain cm	Biogas m3	CO2 %	Status
2005	10	39	7,710	50	3,714	1,708	AD	22.4	17	21,360	31	Oper.
2005	11	61	9,320	102	3,814	2,285	AD	19.4	0.5	36,530		Oper.
2005	12	67	9,154	103	4,011	2,351	AD	15.5	1.1	49,648		Oper.
2006	1	67	8,928	223	4,012	2,317	AD	18.6	7.6	55,473	31	Oper.
2006	2	66	9,561	202	4,198	2,333	AD	15.6	7.8	68,429		Oper.

Table B8, Project activity data (ID6[5], ID9[6], ID12[7])

B.7 Monitored leakage data:

The leakage data collected in accordance with the registered PDD and approved monitoring methodology, AM0016, is provided in Table B9.

[3] SS: Solid Storage; DL: Dry Lot; LS: Liquid Slurry; AL: Anaerobic Lagoon; PC: Pit Storage below Confinements; AD: Anaerobic Digester; DL: Deep Litter; CP: Composting; AT: Aerobic Treatment

[4] http://www7.ncdc.noaa.gov/IPS/MCDWPubs?action=getpublication

[5] SS: Solid Storage; DL: Dry Lot; LS: Liquid Slurry; AL: Anaerobic Lagoon; PC: Pit Storage below Confinements; AD: Anaerobic Digester; DL: Deep Litter; CP: Composting; AT: Aerobic Treatment

[6] http://www7.ncdc.noaa.gov/IPS/MCDWPubs?action=getpublication

[7] Total monthly biogas (not cumulative). For a limited period of time meters were serviced using a higher viscosity oil than recommended; this may caused some biogas measurments to read lower during that period.

Leakage Data		
Period	**ID 16[8] Energy Consumed kWh**	**ID 19 Energy produced kWh**
Oct 05 – Feb 06	10,782.8	0

Table B9, Leakage data collected during the monitoring period

B.8 Quality Control and Quality Assurance:

AgCert employs a software system to manage all data used in the creation of CERs. The system is named the EnviroCert™ Integrated GHG ER Data Management System, also known simply as EnviroCert. Data collected is screened by AgCert Quality Assurance (QA) personnel prior to and after entry into EnviroCert™.

[8] The components which contribute to project activity leakage include a 2HP blower and electronic controls

Data ID	Item	UL[9]	Comment
ID 1	Population	L	The animal inventory is recorded during normal production operations. AgCert personnel collect the records in accordance with the Monitoring Plan and enter the data into EnviroCert™. Periodic audits are performed by AgCert personnel to ensure the efficiency of the data collection process and the accuracy and the data collected and used to create ERs.
ID 6	AWMS	L	The AWMS that was in use prior to the project activity and the proposed improved AWMS was validated by AgCert personnel and TUV-SUD. This information will not change and is entered into EnviroCert™.
ID 9	Climatic Conditions	L	Average monthly temperature data for each month was obtained from a reference site (http://www7.ncdc.noaa.gov/IPS/MCDWPubs?action=getpublication) that gives actual reported data from observation sites worldwide.
ID 12	Biogas Produced	L	The measurement of Biogas produced is periodically documented in accordance with the Monitoring Plan. This measurement, along with ID 13 is used to monitor trends in the health of the anaerobic digester.
ID 13	CO_2 Concentration	L	CO_2 Concentration is periodically documented in accordance with the Monitoring Plan. This measurement, along with ID 12 is used to monitor trends in the health of the anaerobic digester. Personnel are trained in the use of the gas analyzer equipment.
ID 14	Operational Status	L	The operational status of the project activity AWMS is monitored by the local site personnel. Any changes in status are immediately reported to AgCert O&M personnel. The operational status is entered into the EnviroCert system.
ID 16	Energy Consumed	L	Energy consumed by equipment used in the project activity is calculated and based on manufacturers' technical data.
ID 19	Energy Produced	L	Energy produced by renewable energy equipment used in the project activity is measured and the data is entered into EnviroCert. Sample audits are performed by Agcert personnel to ensure the accuracy of the data collected.

Table B10, Quality control

Section C Equations and calculation methods

C.1 Baseline equations and calculation methods:

Equations 1, 9, 10, 11, 13, 14, 15, and 16 from Approved Methodology AM0016 are used to determine baseline emissions.

[9] Uncertainty Level: H = High; M = Moderate; L= Low

Four options are available for determining the volatile solids (V_s) excretion rate used with equation 11. Two of the four originate from lookup tables, IPCC and country-specific. If lookup references were not available, then the V_s could have been determined via calculation based on feed nutrition content and/or animal weight, e.g., equations 1 and 2 in AM0016. Values for V_s were calculated for use at the project activity sites based on standard North American animal group weights. Furthermore, country specific factors are not available.

Two options are available for the determination of methane conversion factors (MCF) used with equation 11. One originates from IPCC lookup tables and the other can be calculated using equation 8 in AM0016. IPCC default values were selected for use at the project activity sites.

Four options are available for determining the nitrogen excretion (N_{ex}) rate used with equations 15 and 16. Two of the four originate from lookup tables, IPCC and country-specific. If lookup references were not available, then the N_{ex} could have been determined via calculation based on feed nutrition content and animal weight, e.g., equations 3 and 4 in AM0016. IPCC default values were selected for use at the project activity sites. Furthermore, country specific factors are not available.

C.1.1 Equation 1, Volatile Solids excretion rate (V_s):

$$V_s = (W_{site}/W_{default}) * V_{sIPCC}$$

C.1.2 Equation 9, Baseline methane (CH_4) emissions in CO_2e:

$$CO_{2eq\ methane} = CH_{4\ annual} * GWP_{CH4}/1000$$

C.1.3 Equation 10, Baseline methane (CH_4) annual emissions:

$$CH_{4\ annual} = \sum_{mj} EF_{month} * Population_{month} * MS\%j$$

C.1.4 Equation 11, Animal group emission factor:

$$EF_{month} = V_s * n_m * B_0 * 0.67kg/m^3 * MCF_{month}$$

C.1.5 Equation 13, Baseline nitrous oxide (N_2O) emissions in CO_2e:

$$CO_{2equiv\ N2O} = GWP_{N2O} * N_2O_{total\ annual}/1000$$

C.1.6 Equation 14, Baseline nitrous oxide (N_2O) annual emissions:

$$N_2O_{total\ annual} = \sum_{mj} (N_2O_d + N_2O_i) * Population_{month} * MS\%j$$

C.1.7 Equation 15, Direct nitrous oxide (N_2O) emissions:

$$N_2O_d = N_{ex\ month} * EF_3 * (1- F_{gasm}) * C_m$$

C.1.8 Equation 16, Indirect nitrous oxide (N_2O) emissions:

$$N_2O_i = N_{ex\ month} * EF_4 * F_{gasm} * C_m$$

C.2 Project Activity equations and calculation methods:

Equations 1, 9, 10, 11, 13, 14, 15, and 16 from Approved Methodology AM0016 are used to determine project activity emissions.

Four options are available for determining the volatile solids (V_s) excretion rate used with equation 11. Two of the four originate from lookup tables, IPCC and country-specific. If lookup references were not available, then the V_s could have been determined via calculation based on feed nutrition content and/or animal weight, e.g., equations 1 and 2 in AM0016. Values for V_s were calculated for use at the project activity sites based on standard North American animal group weights. Furthermore, country specific factors are not available.

Two options are available for the determination of methane conversion factors (MCF) used with equation 11. One originates from IPCC lookup tables and the other can be calculated using equation 8 in AM0016. IPCC default values were selected for use at the project activity sites.

Four options are available for determining the nitrogen excretion (N_{ex}) rate used with equations 15 and 16. Two of the four originate from lookup tables, IPCC and country-specific. If lookup references were not available, then the N_{ex} could have been determined via calculation based on feed nutrition content and animal weight, e.g., equations 3 and 4 in AM0016. IPCC default values were selected for use at the project activity sites. Furthermore, country specific factors are not available.

C.2.1 Equation 1, Project Activity Volatile solids excreation rate (V_s):

$$V_s = (W_{site}/W_{default}) * V_{sIPCC}$$

C.2.2 Equation 9, Project activity methane (CH_4) emissions in CO_2e:

$$CO_{2eq\ methane} = CH_{4\ annual} * GWP_{CH4}/1000$$

C.2.3 Equation 10, Project activity methane (CH_4) annual emissions:

$$CH_{4\ annual} = \sum_{mj} EF_{month} * Population_{month} * MS\%j$$

C.2.4 Equation 11, Animal group emission factor:

$$EF_{month} = V_s * n_m * B_0 * 0.67kg/m^3 * MCF_{month}$$

C.2.5 Equation 13, Project activity nitrous oxide (N_2O) emissions in CO_2e:

$$CO_{2equiv\ N2O} = GWP_{N2O} * N_2O_{total\ annual}/1000$$

C.2.6 Equation 14, Project activity nitrous oxide (N_2O) annual emissions:

$$N_2O_{total\ annual} = \sum_{mj} (N_2O_d + N_2O_i) * Population_{month} * MS\%j$$

C.2.7 Equation 15, Direct nitrous oxide (N_2O) emissions:

$$N_2O_d = N_{ex\ month} * EF_3 * (1- F_{gasm}) * C_m$$

C.2.8 Equation 16, Indirect nitrous oxide (N_2O) emissions:

$$N_2O_i = N_{ex\ month} * EF_4 * F_{gasm} * C_m$$

C.3 Leakage equations and calculation methods:

Equations 17 to 23 from Approved Methodology AM0016 are used to determine project activity leakage.

Equation 17 will be used to determine electrical leakage on a continual basis.

The project developer used equations 18 through 23 in a one-time analysis to confirm that the change in AWMS (project activity) did not adversely affect GHG emissions due to land application, runoff and ammonia volatilization. The results of the analysis show that there is no change in GHG emissions in these areas by incorporation an anaerobic digester.

C.3.1 Equation 17, Project activity electricity emissions in CO_2e:

$$EE_y = (EP_{y\text{-}project} – EP_{p\text{-}project} - EP_{y\text{-}baseline}) * EC_y / 1000$$

C.3.2 Equation 18, Land leakage:

$$Land\ Leakage = Project\ activity\ land\ emissions – Baseline\ land\ emissions$$

C.3.3 Equation 19, Direct nitrous oxide (N_2O) emissions from land application:

$$N_2O_{land} = N_{ex} * N * (1-F_{gasm}) * EF_1 * C_m$$

C.3.4 Equation 20, Indirect nitrous oxide (N_2O) emissions from runoff:

$$N_2O_{runoff} = N_{ex} * N * (1-F_{gasm}) * F_{leach} * EF_5 * C_m$$

C.3.5 Equation 21, Indirect nitrous oxide (N_2O) emissions from ammonia volatilization:

$$N_2O_i = N_{ex} * N * EF_4 * F_{gasm} * C_m$$

C.3.6 Equation 22, Total nitrous oxide (N_2O) emissions:

$$N_2O_{total} = (N_2O_{land} + N_2O_i + N_2O_{runoff}) / 1000$$

C.3.7 Equation 23, Total nitrous oxide (N_2O) emissions in CO_2 equivalent:

$$N_2O_{CO2\text{-}equiv} = GWP_{N2O} * N_2O_{total}$$

C.3.8 Equation used to sum the land application and electricity leakage:

$$L_o = EE_y + N_2O_{CO2\text{-}equiv}$$

C.4 Total emission reductions equations and calculation methods:

Equations 24 and 26 from Approved Methodology AM0016 are used to determine project activity emission reductions:

C.4.1 Equation 24, Total emissions in metric tonnes CO_2e:

$$Total\ Emissions_{mt} = CO_{2eq\ methane} + CO_{2equiv\ N2O}$$

C.4.2 Equation 26, Net emission reductions:

$$ER_{net} = BE - PE - L_o$$

Section D Emission reductions

D.1 Project activity emissions:

The **methane (CH_4)** emissions for the project activity were calculated using AM0016 equations 1, 9, 10, and 11. Within these equations several key parameters and emission factors were utilized.

The **nitrous oxide (N_2O)** emissions for the project activity were calculated using Equations 13, 14, 15, and 16. Within these equations several key parameters and emission factors were utilized.

The **carbon dioxide (CO_2)** emissions for the project activity were calculated using Equation 17. Within this equation coefficient factors were utilized.

The following is a table of GHG emissions during the monitoring period by source in CO_2 Equivalents:

D.1 - Project Activity Emissions during the Monitoring Period			
Source	**GHG Emissions (CO_2e)** *metric tonnes*		
	CH_4	**N_2O**	
AWMS GHG Mitigation Project, MX05-B-09, Nuevo Leon, Mexico	435	172	**607**

D.2 Leakage

The leakage for the project activity was calculated using Equations 21, 22 and 23 from the *Emission Reductions* section of AM0016 and paragraph C.3 of this document, as well as increased power consumption:

Increased Power Consumption

Electrical demand as a consequence of the project activity is not expected to increase significantly. Additional electrical power will run low voltage sensors, and meters. The total power increase is expected to be less than one kWh/year. However power consumption will be monitored to determine if any leakage occurs as a result of the project activity.

Total Leakage Emissions

Table D.2 presents project leakage:

D.2 - Total Leakage Emissisons										
Source	**GHG Emissions (CO_2e)** *metric tonnes*									
	Baseline			**Project**			**Change**			
	CH_4	**N_2O**	**CO_2**	**CH_4**	**N_2O**	**CO_2**	**CH_4**	**N_2O**	**CO_2**	
Land Application										
AWMS GHG Mitigation Project, MX05-B-09, Nuevo Leon, Mexico		984			984			0		
AWMS Electrical Power										
AWMS GHG Mitigation Project, MX05-B-09, Nuevo Leon, Mexico			0			5			5	
						Total:			5	**5**

AWMS Electrical Power project leakage is calculated using emission factors from The GHG Indicator: UNEP Guidelines for Calculating Greenhouse Gas Emissions for Businesses and Non-Commercial Organisations, Appendix 8.2, Table 12. As noted in methodology AM0016, project activity leakage may be offset by the "green" energy produced using the captured methane.

D.3 The sum of D.1 and D.2 representing the project activity emissions:

D.3 - Total Project Activity Emissions During the Monitoring Period				
Source	**GHG Emissions (CO_2e)** *metric tonnes*			
	CH_4	**N_2O**	**CO_2**	
D.1 - Project Emissions	435	172		
D.2 - Leakage			5	
Total:	435	172	5	**612**

D.4 Anthropogenic emissions by sources of greenhouse gases of the baseline:

The baseline was calculated using Equations 15, 16 and 17 for methane emissions and Equations 18, 19, and 20 for nitrous oxide emissions. These equations were customized from the *Emission Reductions* section of AM0016 and paragraph C.1of this document. Within these equations several key parameters and emission factors were utilized, as detailed in Table B4:

D.4 - Baseline Emissions During the Monitoring Period			
Source	**GHG Emissions (CO_2e)** *metric tonnes*		
	CH_4	**N_2O**	
AWMS GHG Mitigation Project, MX05-B-09, Nuevo Leon, Mexico	3,919	172	**4,091**

D.5 Difference between D.4 and D.3 representing the emission reductions of the project activity:

The project activity emission reductions for the monitoring period specified in paragraph B.1.2 under each scenario are obtained by differencing the totals listed in Tables D.4 and D.3, as shown in Table D.5.

D.5 - Total Project Activity Emission Reductions		
Source	**GHG Emissions (CO_2e)** *metric tonnes*	
D.4 - Baseline Emissions	4,091	
D.3 - Project Activity Emissions	612	
Total:	3,478	**3,478**

D.6 Metered project activity emission reductions:

Table D.6 below presents emissions reductions derived through monitored parameters.

D.6 - Metered Project Activity Emission Reductions	
Source	**GHG Emission Reductions (CO2e)** *metric tonnes*
AWMS GHG Mitigation Project, MX05-B-09, Nuevo Leon, Mexico	**2,345**

D.7 Lower of Calculated Project Activity ERs (D.5) and Metered Project Activity ERs (D.6):

Table D.7 presents the lower of calculated emissions reductions or derived through monitored parameters.

D.7 - Total Project Activity Emission Reductions	
Source	**GHG Emissions (CO_2e)** *metric tonnes*
D.5 - Total Project Activity Emission Reductions	3,478
D.6 - Metered Emission Reductions	2,345
The lower of D.5 and D.6 is:	**2,345**

ANNEX 1

KEY PARAMETERS MONITORED

ID	Item	Applies to Project	Monitored		ER Calculation Data		Performed by	AM0016 Referenced Equations	Comments
			Ex-ante	Ex-post	Primary	Secondary			
1	Population	✓	✓	✓	✓		FH, FM, RMT	10, 14	
2	Feed								
3	Flush								
4	H_2O In								
5	Effluent Out								
6[10]	AWMS	✓	✓	✓	✓		RMT	11, 15	Used to select IPCC lookup data
7	Application Method								
8	Combustion Method								
9[11]	Temperature	✓	✓	✓	✓		OP	11	Used to select appropriate parameters from lookup tables
10	Total Solids								
11	Avg. Weight								
12[12]	Biogas Produced	✓		✓	✓		FH, RMT		
13	CO2 Produced	✓		✓	✓		RMT		
14	Operational Status	✓		✓	✓		FH, RMT	10, 14	
15	Reference Data	✓	✓	✓	✓		OP	9, 11, 13, 15, 16	Collect parameters as needed from IPCC lookup tables referenced in AM0016. See Tables in Section B.4.3
16[13]	Project Electricity	✓		✓	✓		FM, RMT	17	Determines project activity electricity consumption
17	Effluent Disposal								

[10] SS: Solid Storage; DL: Dry Lot; LS: Liquid Slurry; AL: Anaerobic Lagoon; PC: Pit Storage below Confinements; AD: Anaerobic Digester; DL: Deep Litter; CP: Composting; AT: Aerobic Treatment

[11] http://www7.ncdc.noaa.gov/IPS/MCDWPubs?action=getpublication

[12] Total monthly biogas (not cumulative). For a limited period of time meters were serviced using a higher viscosity oil than recommended; this may caused some biogas measurments to read lower during that period.

[13] The components which contribute to project activity leakage include a 2HP blower and electronic controls

ID	Item	Applies to Project	Monitored		ER Calculation Data		Performed by	AM0016 Referenced Equations	Comments
			Ex-ante	Ex-post	Primary	Secondary			
18	Application Method								
19	Electricity Produced	✓		✓	✓		FH, RMT	17	
FH – Farm Hand; DP – Data Processor; FM – Farm Manager; AgCert: RMT – Regional Maintenance Technician, QA – Quality Assurance; OP – Operations, EN - Engineer									

ANNEX 2.

DEFINITIONS AND ACRONYMS

Definitions and Acronyms	
BE	Yearly baseline emissions in metric tonnes of CO2-e
B_0	Maximum methane production in M3/kg VS
$CH_{4\ annual}$	Annual methane produced in kg/year
C_m	Conversion factor N2O-N to N2O
$CO_{2eq\ methane}$	Methane carbon dioxide equivalent emission in metric tons per year
$CO_{2equiv\ N2O}$	Nitrous Oxide carbon dioxide equivalent emission in metric tons per year
EE_y	Electricity emission during any given year
EF_3	Direct emission factor for N2O-N from AWMS in kg N2O-N/kg N
EF_4	Indirect emission factor for N2O-N from AWMS in kg N2O-N/kg N
EF_5	Emission factor for indirect emission of N2O from runoff in Kg N2O-N / Kg N
EF_{month}	Emission factor in kg/head/month
ER_{net}	Net emission reductions in metric tonnes of CO2-e per year
$EP_{p\text{-}project}$	Electricity produced by the project activity during any given period
$EP_{y\text{-}project}$	Electricity used by project activity during any given period
$EP_{y\text{-}baseline}$	Electricity used during baseline operations in a given period
F_{gasm}	Fraction of animal manure N that volatilizes as NH3 and NOx in kg NH3-N + Nox-N per kg of N
F_{leach}	Non-volatilized runoff
GWP_{CH4}	Global Warming Potential of methane
GWP_{N2O}	Global Warming Potential of nitrous oxide
L_o	Lo = Lo-base - Lo-proj ; Yearly leakage losses outside the boundary in metric tonnes of CO2-e
$L\text{-}_{o\text{-}base}$	Yearly baseline leakage losses outside the boundary
$L_{o\text{-}proj}$	Yearly project leakage losses outside the boundary
MCF_{month}	Methane conversion factor for the month. See eq-mcf sheet for mcf calculations
$MS\%j$	Faction of animal manure handled in System j
N	Number of animals
N_{ex}	Average annual N excretion per head per category in kg – N/animal-year
$N_{ex\ month}$	Monthly average Nitrogen excretion rate per animal - kg/animal/month
$N_2O_{CO2\text{-}equiv}$	Nitrous Oxide CO2e emission in metric tons
N_2O_{land}	Direct land application nitrous oxide emission in Kg N2O / mo
N_2O_{runoff}	Indirect land application nitrous oxide emission in Kg N2O / mo

Definitions and Acronyms	
$N_2O_{total\ annual}$	Nitrous Oxide emissions annually in kg / year
N_2O_d	Direct nitrous oxide emission in kg/animal/month
N_2O_i	Indirect nitrous oxide emission in kg/animal/month
n_m	Number of days in the month the animals are in the barn
PE	Project emissions in metric tonnes of CO2-e
$Population_{month}$	Monthly average population of animals
$Total\ Emissions_{mt}$	The total project GHG emissions from AWMS in CO2-e per year
V_s	Volatile solids excreted in kg/day