SPECIFIED GAS EMITTERS REGULATION

QUANTIFICATION PROTOCOL FOR REDUCING DAYS ON FEED OF CATTLE

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Version 1

Alberta ENVIRONMENT

ALBERTANS CLIMATE CHANGE

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1.0 Project and Methodology Scope and Description

This quantification protocol is written for the beef farm operator or project developer. This protocol is written assuming the reader has some familiarity with, or general understanding of, the operation of a beef farm and associated practices.

The opportunity for generating carbon offsets with this protocol arises from the direct and indirect reductions of greenhouse gas (GHG) emissions from reducing the days of feed for cattle being finished on feed lots.

1.1 Protocol Scope and Description

This protocol quantifies enteric methane emissions from cattle; and emissions from manure handling, storage and application during the period the animal is being finished on feed lots. **FIGURE 1.1** offers a process flow diagram for a typical project.

The Days on Feed Protocol does not prescribe the genetics of the animals or feeding practices for beef production. Rather, this protocol serves as a generic 'recipe' for project proponents to follow in order to meet the measurement, monitoring and GHG quantification requirements.

Protocol Approach:

The Days on Feed Protocol quantifies emissions reductions on the basis of the reduction of days required for finishing for groupings of cattle. Records with respect to the number of cattle, incoming and outgoing weights, diets (quantity and composition), and days on feed, among others, are required.

In Canada, beef cattle are slaughtered within a range of between 14 and 21 months. During a finishing period of this life cycle, the cattle may spend time on a feedlot. The baseline condition for projects applying this protocol is defined as the operating conditions at the project farm prior to the change in practises that resulted in the reduction in days on feed. The baseline condition would be defined as the average number of days on feed for animals within weight groupings at the project proponent's beef production operation for the three years prior to project implementation. **FIGURE 1.2** offers a process flow diagram for a typical baseline configuration.

The boundary of the Days on Feed Protocol includes the feedlot barn where the cattle are finished, the facility where manure is stored and the land where the manure is spread.

FIGURE 1.1: Process Flow Diagram for Project Condition

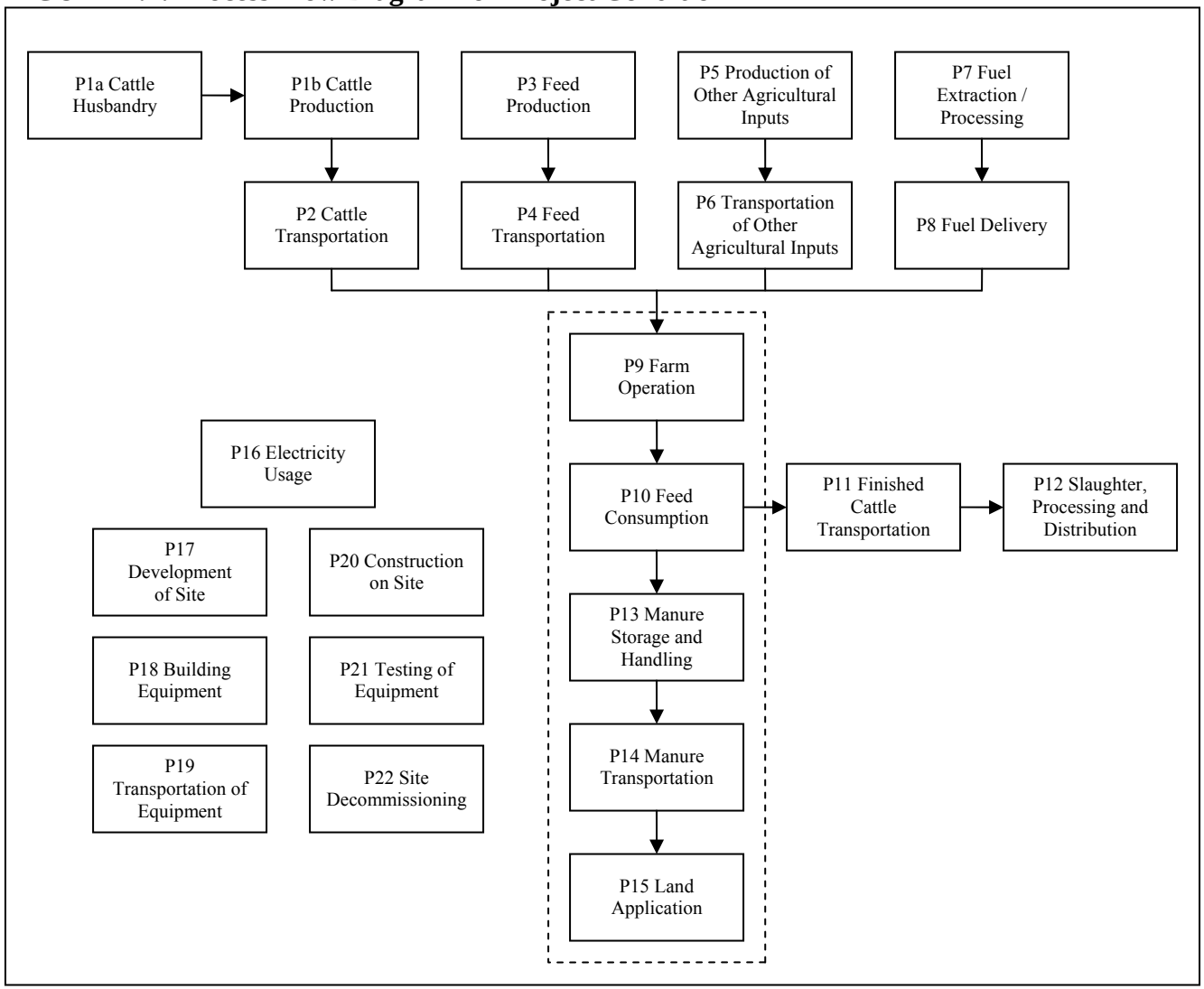
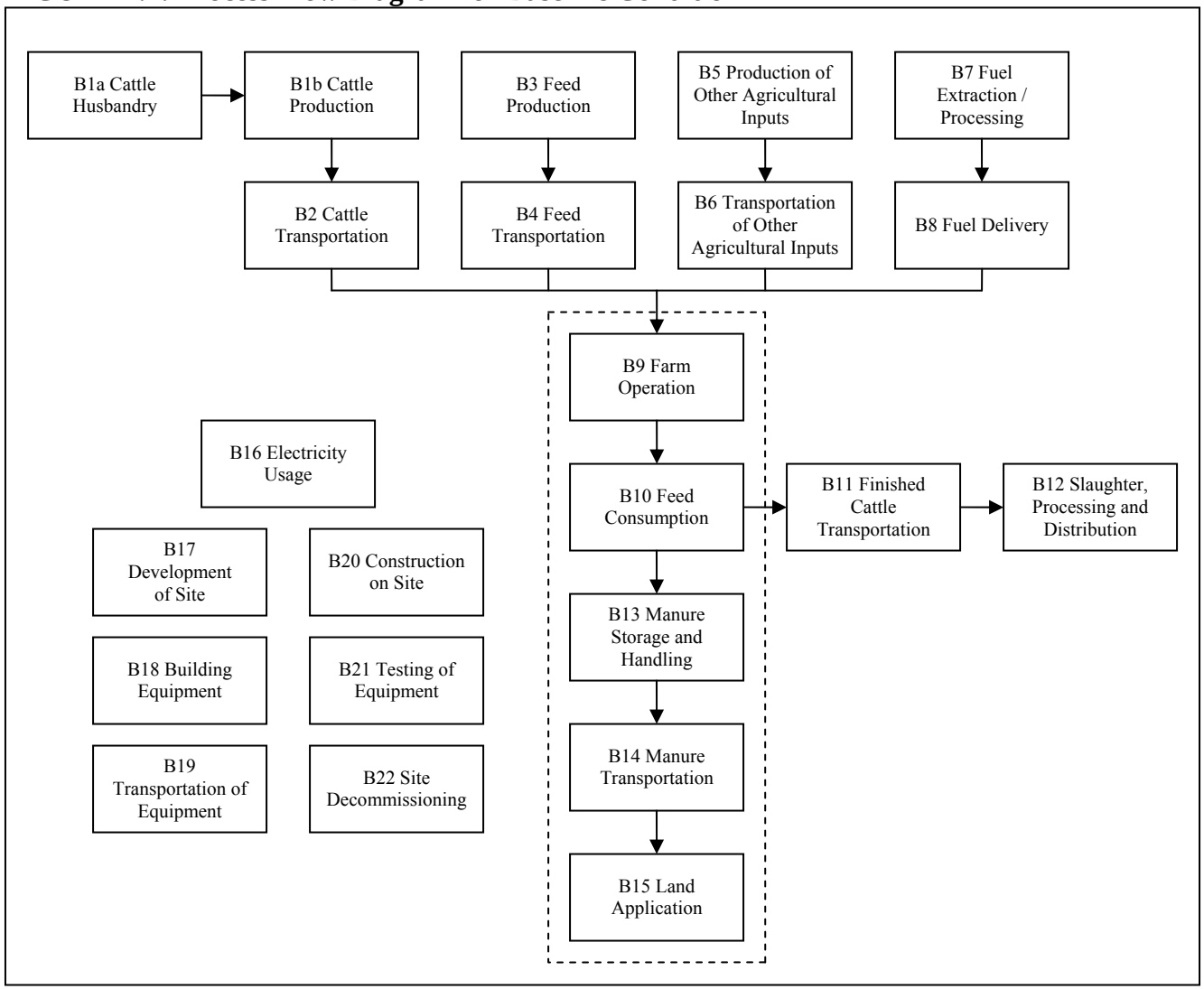


FIGURE 1.2: Process Flow Diagram for Baseline Condition



Protocol Applicability:

To meet the requirements under this protocol, the project developer must supply sufficient evidence to demonstrate that:

1. All farms in the project are currently storing manure and applying manure or custom applying manure to land as confirmed by an affirmation from the project developer;
2. All farms in the project can demonstrate a change in practice in terms of the number of days their cattle were on feed as confirmed by operational records; and
3. The quantification of reductions achieved by the project is based on actual measurement and monitoring (except where indicated in this protocol) as indicated by the proper application of this protocol.

Protocol Flexibility:

Flexibility in applying the quantification protocol is provided to project developers in two ways:

1. Farms that do not have three years of baseline data as per the days on feed for cattle of specific incoming weights may establish a baseline condition based on a combination of available data and industry practise in their region or operation;
2. Farms that are including edible oils (between 4% and 6%) within some or all of the feeding periods during finishing may also apply the Edible Oils protocol in parallel with this protocol should it be applicable;
3. Farms where the incoming weights and days on feed vary across groups of animals, these animals can be grouped in discreet units and tracked individually. In this case, the baseline condition may need to be calculated relative to the groups of animals with similar characteristics of incoming and finishing weights; and
4. Site specific emission factors may be substituted for the generic emission factors indicated in this protocol document. The methodology for generation of these emission factors must ensure reasonable accuracy.

If applicable, the proponent must indicate and justify why flexibility provisions have been used.

1.2 Glossary of New Terms

Concentrates:	A broad classification of feedstuffs which are high in energy and low in crude fibre (<18% Crude Fibre). This can include grains and protein supplements, but excludes feedstuffs like hay or silage or other roughage.

Edible Oils:	Oils derived from plants that are composed primarily of triglycerides. Although many different parts of plants may yield oil, in commercial practice oil is extracted primarily from the seeds of oilseed plants. Whole seeds can be applied as a feed ingredient so long as the oil content is calculated on a dry matter basis to achieve the 4% to 6% content in the diet.
Enteric Emissions:	Emissions of methane from the cattle as part of the digestion of the feed materials.
Land Application:	The beneficial use of the agricultural material and/or digestate applied to cropland based upon crop needs and the composition of agricultural material as a source of soil amendment and/or fertility.
Weight Groupings:	Animals are considered to be in specific weight groupings based on incoming and outgoing weights. Within a specified class, each of the ranges of incoming and outgoing weights must be within 25 kg intervals. As an example, animals coming on feed between 225 and 250 kgs, leaving between 600 and 625 may be a weight class for a given project site. However, another project site may use an incoming weight range of 210 to 235 kgs, and outgoing weight range of 575 to 600kgs as a weight class.

2.0 Quantification Development and Justification

The following sections outline the quantification development and justification.

2.1 Identification of Sources and Sinks (SS's) for the Project

SS's were identified for the project by reviewing the seed documents and relevant process flow diagram developed by the Beef Technical Working Group (BTWG) under the National Offset Quantification Team (NOQT). This process confirmed that the SS's in the process flow diagrams covered the full scope of eligible project activities under the protocol.

Based on the process flow diagrams provided in **FIGURE 1.1**, the project SS's were organized into life cycle categories in **FIGURE 2.1**. Descriptions of each of the SS's and their classification as controlled, related or affected are provided in **TABLE 2.1.**

FIGURE 2.1: Project Element Life Cycle Chart

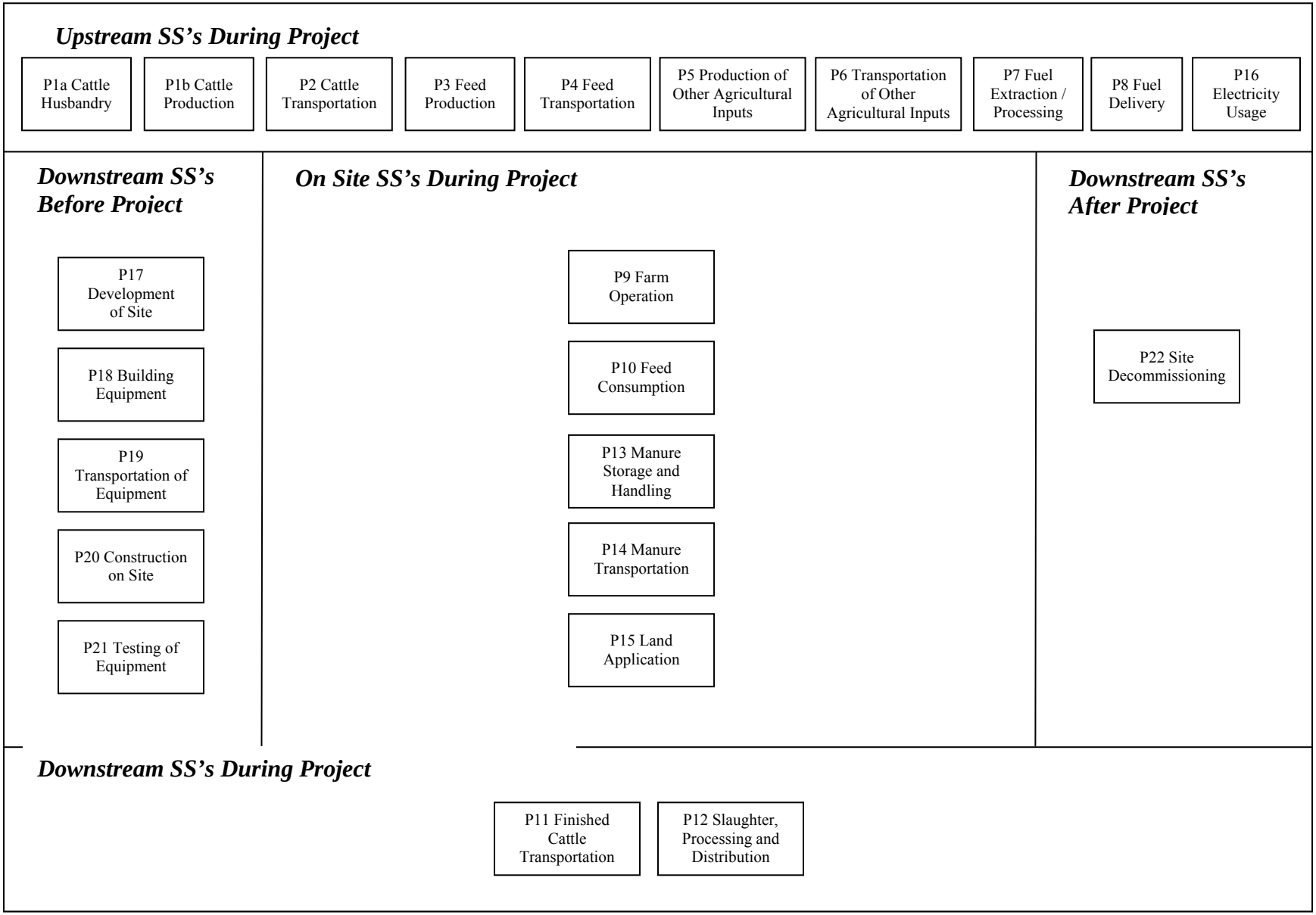


TABLE 2.1: Project SS's

1. SS	2. Description	3. Controlled, Related or Affected
Upstream SS's during Project Operation		
P1a Cattle Husbandry	Cattle husbandry may include insemination and all other practices prior to the birth of the calf. Quantities and types for each of the energy inputs would be contemplated to evaluate functional equivalence with the baseline condition.	Related
P1b Cattle Production	Cattle production may include raising calves, including time in pasture, that are input to the enterprise. Feed consumption includes the enteric emissions from the cattle and related manure production. The feed composition would need to be tracked to ensure functional equivalence with the baseline condition. Length of each type of feeding cycle would need to be tracked.	Related
P2 Cattle Transportation	Cattle may be transported to the project site by truck, barge and/or train. The related energy inputs for fuelling this equipment are captured under this SS, for the purposes of calculating the resulting greenhouse gas emissions. Type of equipment, number of loads and distance travelled would be used to evaluate functional equivalence with the baseline condition.	Related
P3 Feed Production	Feed may be produced from agricultural materials and amendments. The processing of the feed may include a number of chemical and mechanical amendment processes. This requires several energy inputs such as natural gas, diesel and electricity. Quantities and types for each of the energy inputs would be tracked to evaluate functional equivalence with the baseline condition.	Related
P4 Feed Transportation	Feed may be transported to the project site by truck, barge and/or train. The related energy inputs for fuelling this equipment are captured under this SS, for the purposes of calculating the resulting greenhouse gas emissions. Type of equipment, number of loads and distance travelled would be used to evaluate functional equivalence with the baseline condition.	Related
P5 Production of Other Agricultural Inputs	Other agricultural inputs, such as feed supplements, bedding, etc., may be produced from agricultural materials and amendments. The processing of these inputs may include a number of chemical, mechanical and amendment processes. This requires several energy inputs such as natural gas, diesel and electricity. Quantities and types for each of the energy inputs would be tracked to evaluate functional equivalence with the baseline condition.	Related
P6 Transportation of Other Agricultural Inputs	Feed may be transported to the project site by truck, barge and/or train. The related energy inputs for fuelling this equipment are captured under this SS, for the purposes of calculating the resulting greenhouse gas emissions. Type of equipment, number of loads and distance travelled would be used to evaluate functional equivalence with the baseline condition.	Related
P7 Fuel Extraction and Processing	Each of the fuels used throughout the on-site component of the project will need to sourced and processed. This will allow for the calculation of the greenhouse gas emissions from the various processes involved in the production, refinement and storage of the fuels. The total volumes of fuel for each of the on-site SS's are considered under this SS. Volumes and types of fuels are the important characteristics to be tracked.	Related

P8 Fuel Delivery	Each of the fuels used throughout the on-site component of the project will need to be transported to the site. This may include shipments by tanker or by pipeline, resulting in the emissions of greenhouse gases. It is reasonable to exclude fuel sourced by taking equipment to an existing commercial fuelling station as the fuel used to take the equipment to the site is captured under other SS's and there is no other delivery.	Related
P16 Electricity Usage	Electricity may be required for operating the facility. This power may be sourced either from internal generation, connected facilities or the local electricity grid. Metering of electricity may be netted in terms of the power going to and from the grid. Quantity and source of power are the important characteristics to be tracked as they directly relate to the quantity of greenhouse gas emissions.	Related
Onsite SS's during Project Operation		
P9 Farm Operation	Greenhouse gas emissions may occur that are associated with the operation and maintenance of the cattle feeding facility operations. This may include running vehicles and facilities at the project site for the distribution of the various inputs. Quantities and types for each of the energy inputs would be tracked.	Controlled
P10 Feed Consumption	Feed consumption includes the enteric emissions from the cattle and related manure production. The feed composition would need to be tracked to as would the length of each type of feeding cycle.	Controlled
P13 Manure Storage and Handling	Greenhouse gas emissions can result from the operation of manure storage and handling facilities. This could include emissions from energy use, and from the emissions of methane and nitrous oxide from the manure being stored and processed. Operational aspects of the manure storage and handling systems may need to be tracked.	Controlled
P14 Manure Transportation	Manure may need to be transported to the field for land application from storage. Transportation equipment would be fuelled by diesel, gas or natural gas. Quantities for each of the energy inputs would be contemplated to evaluate functional equivalence with the baseline condition.	Controlled
P15 Land Application	Manure may then be land applied. This may require the use of heavy equipment and mechanical systems. This could include emissions from energy use, and from the emissions of methane and nitrous oxide from the manure being stored and processed. Operational aspects of the manure land application systems may need to be tracked.	Controlled
Downstream SS's during Project Operation		
P11 Finished Cattle Transportation	Finished cattle may be transported from the project site by truck, barge and/or train. The related energy inputs for fuelling this equipment are captured under this SS, for the purposes of calculating the resulting greenhouse gas emissions. Type of equipment, number of loads and distance travelled would need to be tracked.	Related
P12 Slaughter, Processing and Distribution	Greenhouse gas emissions may occur that are associated with the slaughter, processing and distribution components downstream of the cattle finishing facility operations. This may include running vehicles and facilities at other sites. Quantities and types for each of the energy inputs would be tracked.	Related

Other		
P17 Development of Site	The site of the facility may need to be developed. This could include civil infrastructure such as access to electricity, gas and water supply, as well as sewer etc. This may also include clearing, grading, building access roads, etc. There will also need to be some building of structures for the facility such as storage areas, storm water drainage, offices, vent stacks, firefighting water storage lagoons, etc., as well as structures to enclose, support and house the equipment. Greenhouse gas emissions would be primarily attributed to the use of fossil fuels and electricity used to power equipment required to develop the site such as graders, backhoes, trenching machines, etc.	Related
P18 Building Equipment	Equipment may need to be built either on-site or off-site. This includes all of the components of the storage, handling, processing, combustion, air quality control, system control and safety systems. These may be sourced as pre-made standard equipment or custom built to specification. Greenhouse gas emissions would be primarily attributed to the use of fossil fuels and electricity used to power equipment for the extraction of the raw materials, processing, fabricating and assembly.	Related
P19 Transportation of Equipment	Equipment built off-site and the materials to build equipment on-site, will all need to be delivered to the site. Transportation may be completed by truck, barge and/or train. Greenhouse gas emissions would be primarily attributed to the use of fossil fuels to power the equipment delivering the equipment to the site.	Related
P20 Construction on Site	The process of construction at the site will require a variety of heavy equipment, smaller power tools, cranes and generators. The operation of this equipment will have associated greenhouse gas emission from the use of fossil fuels and electricity.	Related
P21 Testing of Equipment	Equipment may need to be tested to ensure that it is operational. This may result in running the equipment using fossil fuels in order to ensure that the equipment runs properly. These activities will result in greenhouse gas emissions associated with the combustion of fossil fuels and the use of electricity.	Related
P22 Site Decommissioning	Once the facility is no longer operational, the site may need to be decommissioned. This may involve the disassembly of the equipment, demolition of on-site structures, disposal of some materials, environmental restoration, re-grading, planting or seeding, and transportation of materials off-site. Greenhouse gas emissions would be primarily attributed to the use of fossil fuels and electricity used to power equipment required to decommission the site.	Related

2.2 Identification of Baseline

The baseline condition for projects applying this protocol is defined as the operating conditions at the project farm prior to the change practises that result in the reduction in the slaughter age. The baseline condition would be defined as the average slaughter age within individual weight groupings at the project proponent's beef production operation for the three years prior to project implementation.

The approach to quantifying the baseline will be primarily projection based as there are suitable models for the applicable baseline condition that can provide reasonable certainty. The baseline scenario for this protocol is dynamic as the emissions profile for the baseline activities would be expected to change materially relative to the production of cattle at the project farm, and the baseline condition may vary from project to project.

The baseline condition is defined, including the relevant SS's and processes, as shown in **FIGURE 1.2**. More detail on each of these SS's is provided in Section 2.3, below.

2.3 Identification of SS's for the Baseline

Based on the process flow diagrams provided in **FIGURE 1.2**, the project SS's were organized into life cycle categories in **FIGURE 2.2**. Descriptions of each of the SS's and their classification as either 'controlled', 'related' or 'affected' is provided in **TABLE 2.2.**

FIGURE 2.2: Baseline Element Life Cycle Chart

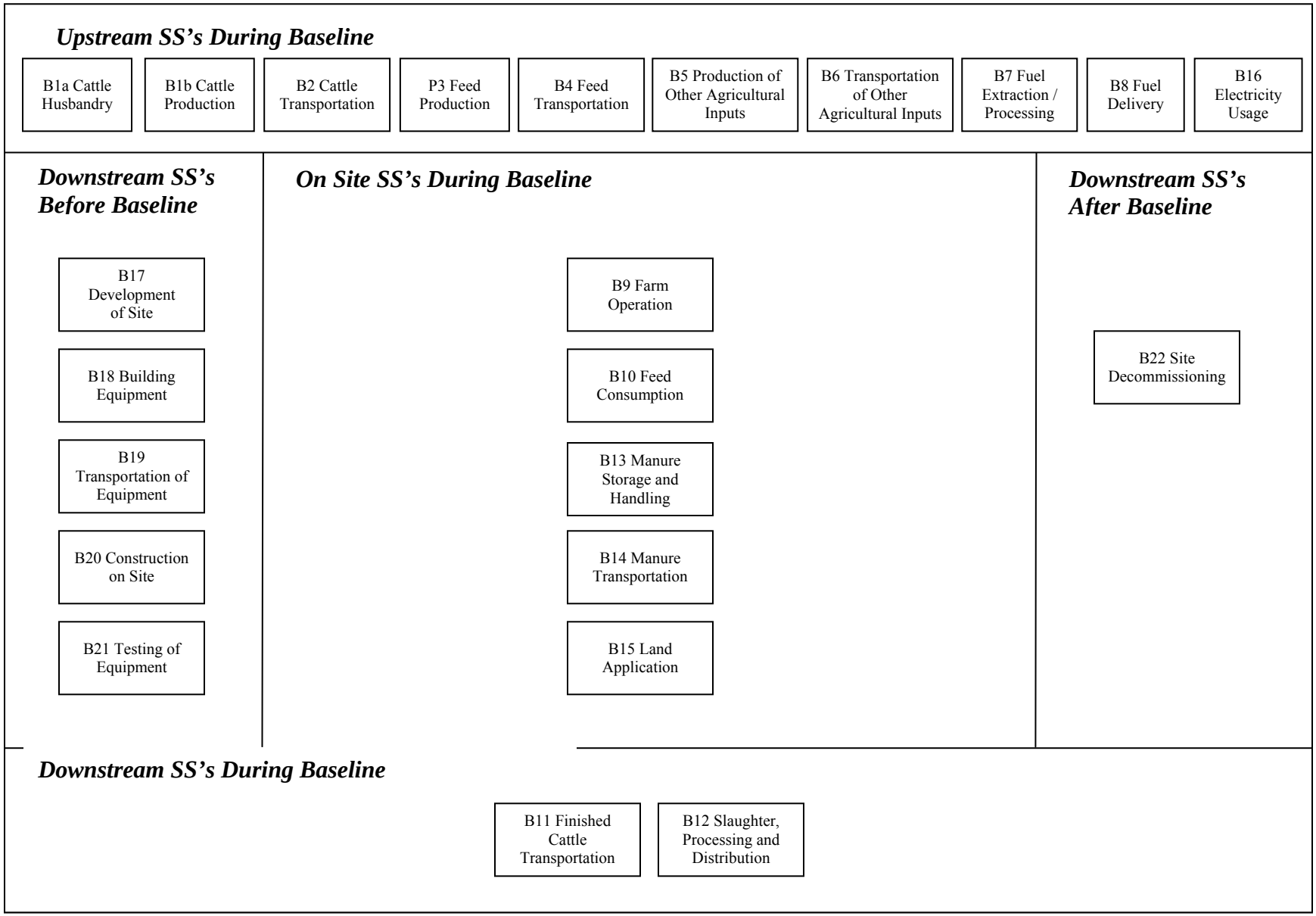


TABLE 2.2: Baseline SS's

1. SS	2. Description	3. Controlled, Related or Affected
Upstream SS's during Baseline Operation		
B1a Cattle Production	Cattle husbandry may include insemination and all other practices prior to the birth of the calf. Quantities and types for each of the energy inputs would be contemplated to evaluate functional equivalence with the project condition.	Related
B1b Cattle Production	Cattle production may include raising calves, including time in pasture, that are input to the enterprise. Feed consumption includes the enteric emissions from the cattle and related manure production. The feed composition would need to be tracked to ensure functional equivalence with the project condition. Length of each type of feeding cycle would need to be tracked.	Related
B2 Cattle Transportation	Cattle may be transported to the project site by truck, barge and/or train. The related energy inputs for fuelling this equipment are captured under this SS, for the purposes of calculating the resulting greenhouse gas emissions. Type of equipment, number of loads and distance travelled would be used to evaluate functional equivalence with the project condition.	Related
B3 Feed Production	Feed may be produced from agricultural materials and amendments. The processing of the feed may include a number of chemical, mechanical and amendment processes. This requires several energy inputs such as natural gas, diesel and electricity. Quantities and types for each of the energy inputs would be contemplated to evaluate functional equivalence with the project condition.	Related
B4 Feed Transportation	Feed may be transported to the project site by truck, barge and/or train. The related energy inputs for fuelling this equipment are captured under this SS, for the purposes of calculating the resulting greenhouse gas emissions. Type of equipment, number of loads and distance travelled would be used to evaluate functional equivalence with the project condition.	Related
B5 Production of Other Agricultural Inputs	Other agricultural inputs, such as feed supplements, bedding, etc., may be produced from agricultural materials and amendments. The processing of the feed may include a number of chemical, mechanical and amendment processes. This requires several energy inputs such as natural gas, diesel and electricity. Quantities and types for each of the energy inputs would be contemplated to evaluate functional equivalence with the project condition.	Related
B6 Transportation of Other Agricultural Inputs	Feed may be transported to the project site by truck, barge and/or train. The related energy inputs for fuelling this equipment are captured under this SS, for the purposes of calculating the resulting greenhouse gas emissions. Type of equipment, number of loads and distance travelled would be used to evaluate functional equivalence with the project condition.	Related
B7 Fuel Extraction and Processing	Each of the fuels used throughout the on-site component of the project will need to sourced and processed. This will allow for the calculation of the greenhouse gas emissions from the various processes involved in the production, refinement and storage of the fuels. The total volumes of fuel for each of the on-site SS's are considered under this SS. Volumes and types of fuels are the important characteristics to be tracked.	Related

B8 Fuel Delivery	Each of the fuels used throughout the on-site component of the project will need to be transported to the site. This may include shipments by tanker or by pipeline, resulting in the emissions of greenhouse gases. It is reasonable to exclude fuel sourced by taking equipment to an existing commercial fuelling station as the fuel used to take the equipment to the site is captured under other SS's and there is no other delivery.	Related
B16 Electricity Usage	Electricity may be required for operating the facility. This power may be sourced either from internal generation, connected facilities or the local electricity grid. Metering of electricity may be netted in terms of the power going to and from the grid. Quantity and source of power are the important characteristics to be tracked as they directly relate to the quantity of greenhouse gas emissions.	Related
Onsite SS's during Project Operation		
B9 Farm Operation	Greenhouse gas emissions may occur that are associated with the operation and maintenance of the beef production facility operations. This may include running vehicles and facilities at the project site for the distribution of the various inputs. Quantities and types for each of the energy inputs would be tracked.	Controlled
B10 Feed Consumption	Feed consumption includes the enteric emissions from the cattle and related manure production. The feed composition would need to be tracked to as would the length of each type of feeding cycle.	Controlled
B13 Manure Storage and Handling	Greenhouse gas emissions can result from the operation of manure storage and handling facilities. This could include emissions from energy use, and from the emissions of methane and nitrous oxide from the manure being stored and processed. Operational aspects of the manure storage and handling systems may need to be tracked.	Controlled
B14 Manure Transportation	Manure may need to be transported to the field for land application from storage. Transportation equipment would be fuelled by diesel, gas or natural gas. Quantities for each of the energy inputs would be tracked to evaluate functional equivalence with the project condition.	Controlled
B15 Land Application	Manure may then be land applied. This may require the use of heavy equipment and mechanical systems. This could include emissions from energy use, and from the emissions of methane and nitrous oxide from the manure being stored and processed. Operational aspects of the manure land application systems may need to be tracked..	Controlled
Downstream SS's during Project Operation		
B11 Finished Cattle Transportation	Finished cattle may be transported from the project site by truck, barge and/or train. The related energy inputs for fuelling this equipment are captured under this SS, for the purposes of calculating the resulting greenhouse gas emissions. Type of equipment, number of loads and distance travelled would need to be tracked.	Related
B12 Slaughter, Processing and Distribution	Greenhouse gas emissions may occur that are associated with the slaughter, processing and distribution components downstream of the cattle finishing facility operations. This may include running vehicles and facilities at other sites. Quantities and types for each of the energy inputs would be tracked.	Related

Other		
B17 Development of Site	The site of the facility may need to be developed. This could include civil infrastructure such as access to electricity, gas and water supply, as well as sewer etc. This may also include clearing, grading, building access roads, etc. There will also need to be some building of structures for the facility such as storage areas, storm water drainage, offices, vent stacks, firefighting water storage lagoons, etc., as well as structures to enclose, support and house the equipment. Greenhouse gas emissions would be primarily attributed to the use of fossil fuels and electricity used to power equipment required to develop the site such as graders, backhoes, trenching machines, etc.	Related
B18 Building Equipment	Equipment may need to be built either on-site or off-site. This includes all of the components of the storage, handling, processing, combustion, air quality control, system control and safety systems. These may be sourced as pre-made standard equipment or custom built to specification. Greenhouse gas emissions would be primarily attributed to the use of fossil fuels and electricity used to power equipment for the extraction of the raw materials, processing, fabricating and assembly.	Related
B19 Transportation of Equipment	Equipment built off-site and the materials to build equipment on-site, will all need to be delivered to the site. Transportation may be completed by train, truck, by some combination, or even by courier. Greenhouse gas emissions would be primarily attributed to the use of fossil fuels to power the equipment delivering the equipment to the site.	Related
B20 Construction on Site	The process of construction at the site will require a variety of heavy equipment, smaller power tools, cranes and generators. The operation of this equipment will have associated greenhouse gas emission from the use of fossil fuels and electricity.	Related
B21 Testing of Equipment	Equipment may need to be tested to ensure that it is operational. This may result in running the equipment using fossil fuels in order to ensure that the equipment runs properly. These activities will result in greenhouse gas emissions associated with the combustion of fossil fuels and the use of electricity.	Related
B22 Site Decommissioning	Once the facility is no longer operational, the site may need to be decommissioned. This may involve the disassembly of the equipment, demolition of on-site structures, disposal of some materials, environmental restoration, re-grading, planting or seeding, and transportation of materials off-site. Greenhouse gas emissions would be primarily attributed to the use of fossil fuels and electricity used to power equipment required to decommission the site.	Related

2.4 Selection of Relevant Project and Baseline SS's

Each of the SS's from the project and baseline condition were compared and evaluated as to their relevancy using the guidance provided in Annex VI of the "Guide to Quantification Methodologies and Protocols: Draft", dated March 2006 (Environment Canada). The justification for the exclusion or conditions upon which SS's may be excluded is provided in **TABLE 2.3** below. All other SS's listed previously are included.

TABLE 2.3: Comparison of SS's

1. Identified SS	2. Baseline (C, R, A)	3. Project (C, R, A)	4. Include or Exclude from Quantification	5. Justification for Exclusion
Upstream SS's				
P1a Cattle Husbandry	N/A	Related	Exclude	Excluded as animal husbandry is functionally equivalent to the baseline scenario.
B1a Cattle Husbandry	Related	N/A	Exclude	
P1b Cattle Production	N/A	Related	Exclude	Excluded as cattle production upstream of the feedlot is functionally equivalent to the baseline scenario.
B1b Cattle Production	Related	N/A	Exclude	
P2 Cattle Transportation	N/A	Related	Exclude	Excluded as the emissions from transportation are likely functionally equivalent to the baseline scenario.
B2 Cattle Transportation	Related	N/A	Exclude	
P3 Feed Production	N/A	Related	Exclude	Excluded as upstream production of other agricultural inputs are not impacted by the implementation of the project and as such the baseline and project conditions will be functionally equivalent.
B3 Feed Production	Related	N/A	Exclude	
P4 Feed Transportation	N/A	Related	Exclude	Excluded as the emissions from transportation are likely functionally equivalent to the baseline scenario.
B4 Feed Transportation	Related	N/A	Exclude	
P5 Production of Other Agricultural Inputs	N/A	Related	Exclude	Excluded as upstream production of other agricultural inputs are not impacted by the implementation of the project and as such the baseline and project conditions will be functionally equivalent.
B5 Production of Other Agricultural Inputs	Related	N/A	Exclude	
P6 Transportation of Other Agricultural Inputs	N/A	Related	Exclude	Excluded as the emissions from transportation are likely functionally equivalent to the baseline scenario.
B6 Transportation of Other Agricultural Inputs	Related	N/A	Exclude	
P7 Fuel Extraction and Processing	N/A	Related	Exclude	Excluded as these SS's are not relevant to the project as the emissions from these practises are covered under proposed greenhouse gas regulations.
B7 Fuel Extraction and Processing	Related	N/A	Exclude	
P8 Fuel Delivery	N/A	Related	Exclude	Excluded as these SS's are not relevant to the project as the emissions from these practises are covered under proposed greenhouse gas regulations.
B8 Fuel Delivery	Related	N/A	Exclude	
P16 Electricity Usage	N/A	Related	Exclude	Excluded as these SS's are not relevant to the project as the emissions from these practises are covered under proposed greenhouse gas regulations.
B16 Electricity Usage	Related	N/A	Exclude	
Onsite SS's				
P9 Farm Operation	N/A	Controlled	Exclude	Excluded as farm operation for beef production is not materially impacted by the implementation of the project as feed transportation and delivery is only modified to a negligible degree. As such the baseline and project conditions will be functionally equivalent.
B9 Farm Operation	Controlled	N/A	Exclude	

P10 Feed Consumption	N/A	Controlled	Include	N/A
B10 Feed Consumption	Controlled	N/A	Include	
P13 Manure Storage and Handling	N/A	Controlled	Include	N/A
B13 Manure Storage and Handling	Controlled	N/A	Include	
P14 Manure Transportation	N/A	Controlled	Exclude	Excluded as the emissions from transportation are likely functionally equivalent to the baseline scenario.
B14 Manure Transportation	Controlled	N/A	Exclude	
P15 Land Application	N/A	Controlled	Include	N/A
B15 Land Application	Controlled	N/A	Include	
Downstream SS's				
P11 Finished Cattle Transportation	N/A	Related	Exclude	Excluded as the emissions from transportation are likely functionally equivalent to the baseline scenario.
B11 Finished Cattle Transportation	Related	N/A	Exclude	
P12 Slaughter, Processing and Distribution	N/A	Related	Exclude	Excluded as the emissions from slaughter, processing and distribution are likely functionally equivalent to the baseline scenario.
B12 Slaughter, Processing and Distribution	Related	N/A	Exclude	
Other				
P17 Development of Site	N/A	Related	Exclude	Emissions from site development are not material given the long project life, and the minimal site development typically required.
B17 Development of Site	Related	N/A	Exclude	Emissions from site development are not material for the baseline condition given the minimal site development typically required.
P18 Building Equipment	N/A	Related	Exclude	Emissions from building equipment are not material given the long project life, and the minimal building equipment typically required.
B18 Building Equipment	Related	N/A	Exclude	Emissions from building equipment are not material for the baseline condition given the minimal building equipment typically required.
P19 Transportation of Equipment	N/A	Related	Exclude	Emissions from transportation of equipment are not material given the long project life, and the minimal transportation of equipment typically required.
B19 Transportation of Equipment	Related	N/A	Exclude	Emissions from transportation of equipment are not material for the baseline condition given the minimal transportation of equipment typically required.
P20 Construction on Site	N/A	Related	Exclude	Emissions from construction on site are not material given the long project life, and the minimal construction on site typically required.

B20 Construction on Site	Related	N/A	Exclude	Emissions from construction on site are not material for the baseline condition given the minimal construction on site typically required.
P21 Testing of Equipment	N/A	Related	Exclude	Emissions from testing of equipment are not material given the long project life, and the minimal testing of equipment typically required.
B21 Testing of Equipment	Related	N/A	Exclude	Emissions from testing of equipment are not material for the baseline condition given the minimal testing of equipment typically required.
P22 Site Decommissioning	N/A	Related	Exclude	Emissions from decommissioning are not material given the long project life, and the minimal decommissioning typically required.
B22 Site Decommissioning	Related	N/A	Exclude	Emissions from decommissioning are not material for the baseline condition given the minimal decommissioning typically required.

2.5 Quantification of Reductions, Removals and Reversals of Relevant SS's

2.5.1 Quantification Approaches

Quantification of the reductions, removals and reversals of relevant SS's for each of the greenhouse gases will be completed using the methodologies outlined in **TABLE 2.4**, below. These calculation methodologies serve to complete the following three equations for calculating the emission reductions from the comparison of the baseline and project conditions.

$$\text{Emission Reduction} = \text{Emissions}_{\text{Baseline}} - \text{Emissions}_{\text{Project}}$$

$$\text{Emissions}_{\text{Baseline}} = \text{Emissions}_{\text{Cattle}} + \text{Emissions}_{\text{Manure}}$$

$$\text{Emissions}_{\text{Project}} = \text{Emissions}_{\text{Cattle}} + \text{Emissions}_{\text{Manure}}$$

Where:

$\text{Emissions}_{\text{Baseline}}$ = sum of the emissions under the baseline condition.
$\text{Emissions}_{\text{Cattle}}$ = emissions under SS B10 Feed Consumption
$\text{Emissions}_{\text{Manure}}$ = emissions under SS B13 Manure Storage and Handling and B15 land Application

$\text{Emissions}_{\text{Project}}$ = sum of the emissions under the project condition.
$\text{Emissions}_{\text{Cattle}}$ = emissions under SS P10 Feed Consumption
$\text{Emissions}_{\text{Manure}}$ = emissions under SS P13 Manure Storage and Handling and P15 land Application

TABLE 2.4: Quantification Procedures

1.0 Project/ Baseline SS	2. Parameter / Variable	3. Unit	4. Measured / Estimated	5. Method	6. Frequency	7. Justify measurement or estimation and frequency
Project SS's						
P10 Feed Consumption	$Emissions_{Cattle} = \Sigma (Number_{Production\ i} * DOF_{i} * DMI_{i} * GE_{Diet} * (EF_{Enteric\ i} / 100\%) / EC_{Methane})$					
	Enteric Emissions from Cattle for each feed regime within each weight grouping / $Emissions_{Cattle}$	kg CH_4 / day / per weight grouping	N/A	N/A	N/A	Quantity being calculated.
	Number of Cattle in Grouping i / $Number_{Production\ i}$	Head	Measured	Direct measurement of number of head sent to slaughter within each grouping of animals.	Continuous	Direct measurement is the highest level possible.
	Days on Feed for Each Feed Regime for Cattle in Grouping i / DOF_{i}	Days	Measured	Direct measurement of days at the feedlot.	Continuous	Direct measurement is the highest level possible.
	Dry Matter Intake for Each Feed Regime for Cattle in Grouping i / DMI_{i}	kg $_{dry\ matter}$ / head / day	Estimated	Estimated based on average mass of feed provided to cattle during period on diet.	Continuous	Based on actual feed delivery records to each pen.
	Default value Gross energy content (GE) of the diet GE_{Diet}	MJ / kg $_{dry\ matter}$	Estimated	18.45 MJ / kg $_{dry\ matter}$	Annual	Default value taken from IPCC, 2006 guidance (Section 10.4.2).
	Emission Factor for Enteric Emissions for Each Feed Regime in Grouping i / $EF_{Enteric\ i}$	%	Estimated	4.0 % for diets with greater than 90 % concentrates. 6.5 % for diets with less than 90 % concentrates.	Continuous	Set based on best available science and in reference to the IPCC, 2006 guidance.
	Energy Content of Methane / $EC_{Methane}$	MJ / kg $_{methane}$	Estimated	55.65 MJ / kg $_{methane}$	Annual	Conversion factor taken from IPCC, 2006 guidance (Section 10.3.2).
P13 Manure	$VS_{i} = [(DMI_{i} * GE_{Diet} * (1 – (TDN_{i} / 100\%))) + (UE * DMI_{I} * GE_{Diet})] * ((1 – (Ash / 100\%)) / GE_{Diet})$					

Storage and P15 Land Application	Daily Volatile Solid Excreted for Livestock in Grouping i and Each Feed Regime / VS_i	kg / head / day	N/A	N/A	N/A	Quantity being calculated.
	Dry Matter Intake for Each Feed Regime for Cattle in Grouping i / DMI_i	kg $_{dry\ matter}$ / head / day	Estimated	Estimated based on average mass of feed provided to cattle during period on diet.	Continuous	Based on actual feed delivery records to each pen.
	Default value Gross energy content (GE) of the diet GE_{Diet}	MJ / kg $_{dry\ matter}$	Estimated	18.45 MJ / kg $_{dry\ matter}$	Annual	Conversion factor taken from IPCC, 2006 guidance (Section 10.4.2).
	Total Digestible Nutrients for Each Feed Regime for Cattle in Grouping i / TDN_i	%	Estimated	Estimated based on composition of feed provided to cattle during period on diet.	Continuous	Estimation based on diet composition and/or from direct analysis of the total mixed ration.
	Urinary Energy / UE	-	Estimated	0.04 for diets with less than 90 % concentrates. 0.02 for diets with greater than 90 % concentrates.	Annual	Set based on best available science and in reference to the IPCC, 2006 guidance (Section 10.4.2).
	Ash Content of Manure Calculated as a Fraction of the Dry Matter Feed Intake for Cattle / Ash	%	Estimated	2 %	Annual	Set based on best available science and in reference to the IPCC, 2006 guidance.
	$Emissions_{Manure\ CH4} = \Sigma\ (Number_{Production\ i} * DOF_i * VS_i * Bo * \rho_{Methane} * (MCF / 100\%))$					
	Methane Emissions from Manure Handling, Storage and Land Application for each feed regime within each weight grouping / $Emissions_{Manure\ CH4}$	kg CH_4 / day / per weight grouping	N/A	N/A	N/A	Quantity being calculated.

	Number of Cattle in Grouping i / Number $_{Production\ i}$	Head	Measured	Direct measurement of number of head sent to slaughter within each grouping of animals.	Continuous	Direct measurement is the highest level possible.
	Days on Feed for Each Feed Regime for Cattle in Grouping i / DOF_i	days	Measured	Direct measurement of days at the feed lot.	Continuous	Direct measurement is the highest level possible.
	Maximum Methane Producing Capacity for Manure Produced / Bo	m^3_{CH4} / kg $_{VS\ Excreted}$	Estimated	0.19 m^3_{CH4} / kg $_{VS\ Excreted}$	Annual	Conversion factor taken from IPCC, 2006 guidance (Table 10A-5).
	Density of Methane / $\rho_{Methane}$	m^3 / kg	Estimated	0.67 m^3 / kg	Annual	Physical property of methane at standard temperature and pressure.
	Methane Conversion Factor / MCF	%	Estimated	1.6 %	Annual	Set based on best available science and in reference to the IPCC, 2006 guidance.
	$Nitrogen_{Excreted\ i} = DMI_i * (CP_i / 100\%) / CF_{Protein} * (1 - Nitrogen_{Retention})$					
	Nitrogen Excreted by the Livestock in Grouping i / $Nitrogen_{Excreted\ i}$	kg / head / day	N/A	N/A	N/A	Quantity being calculated.
	Dry Matter Intake for Each Feed Regime for Cattle in Grouping i / DMI_i	kg $_{dry\ matter}$ / head / day	Estimated	Estimated based on average mass of feed provided to cattle during period on diet.	Continuous	Based on actual feed delivery records to each pen.
	Percent Crude Protein in Diet for Each Feed Regime in Cattle in Grouping i / CP_i	%	Estimated	Estimated based on composition of feed provided to cattle during period on diet.	Continuous	Estimation based on diet composition and/or from direct analysis of the total mixed ration.
	Conversion from Mass of Dietary Protein to Mass of Dietary Nitrogen	kg $_{feed\ protein}$ / kg $_{nitrogen}$	Estimated	6.25 kg $_{feed\ protein}$ / kg $_{nitrogen}$	Annual	Conversion factor taken from IPCC, 2006 guidance (Section 10.5.2).
	Fraction of Annual Nitrogen Intake Retained / $Nitrogen_{Retention}$	kg $_{retained}$ / kg $_{intake}$	Estimated	0.07 kg $_{retained}$ / kg $_{intake}$	Annual	Factor taken from IPCC, 2006 guidance (Table 10.20).
	$Emissions_{Direct\ Nitrous\ Oxide} = \Sigma\ (Number_{Production\ i} * DOF_i * Nitrogen_{Excreted\ I} * CF_{Manure}) * 44 / 28$					

	Direct Emissions of Nitrous Oxide from Manure for each feed regime within each weight grouping / Emissions $_{\text{Direct Nitrous Oxide}}$	kg N_2O / day / per weight grouping	N/A	N/A	N/A	Quantity being calculated.
	CF_{Manure}	-	Estimated	0.02 kg $_{\text{N2O-N}}$ / kg $_{\text{Nitrogen Excreted}}$	Annual	Set based on best available science and in reference to the IPCC.
	$\text{Emissions}_{\text{Direct Storage}} = \Sigma (\text{Number}_{\text{Production i}} * \text{DOF}_{\text{i}} * \text{Nitrogen}_{\text{Excreted i}} * \text{Frac}_{\text{Storage}} * \text{EF}_{\text{Storage}}) * 44 / 28$					
	Direct Emissions of Nitrous Oxide from Manure Storage / Emissions $_{\text{Direct Storage}}$	kg N_2O / day / per weight grouping	N/A	N/A	N/A	Quantity being calculated.
	$\text{Frac}_{\text{Storage}}$	-	Estimated	0.8	Annual	Set based on best available science and in reference to the IPCC
	$\text{EF}_{\text{Storage}}$	kg $_{\text{N2O-N}}$ / kg $_{\text{Nitrogen Excreted}}$	Estimated	0.007 kg $_{\text{N2O-N}}$ / kg $_{\text{Nitrogen Excreted}}$	Annual	Set based on best available science and in reference to the IPCC
	$\text{Emissions}_{\text{Indirect Volatization}} = \Sigma (\text{Number}_{\text{Production i}} * \text{DOF}_{\text{i}} * \text{Nitrogen}_{\text{Excreted i}} * \text{Frac}_{\text{Volatization}} * \text{EF}_{\text{Volatization}}) * 44 / 28$					
	Indirect Emissions of Nitrous Oxide from Volatization for each feed regime within each weight grouping / Emissions $_{\text{Indirect Volatization}}$	kg N_2O / day / per weight grouping	N/A	N/A	N/A	Quantity being calculated.
	$\text{Frac}_{\text{Volatization}}$	-	Estimated	0.2	Annual	Set based on best available science and in reference to the IPCC
	$\text{EF}_{\text{Volatization}}$	kg $_{\text{N2O-N}}$ / kg $_{\text{Nitrogen Excreted}}$	Estimated	0.01 kg $_{\text{N2O-N}}$ / kg $_{\text{Nitrogen Excreted}}$	Annual	Set based on best available science and in reference to the IPCC
	$\text{Emissions}_{\text{Indirect Volatization}} = \Sigma (\text{Number}_{\text{Production i}} * \text{DOF}_{\text{i}} * \text{Nitrogen}_{\text{Excreted i}} * \text{Frac}_{\text{Leach}} * \text{EF}_{\text{Leach}}) * 44 / 28$					

	Indirect Emissions of Nitrous Oxide from Leaching for each feed regime within each weight grouping / Emissions $_{Indirect\ Leach}$	kg N_2O / day / per weight grouping	N/A	N/A	N/A	Quantity being calculated.
	Frac $_{Leach}$	-	Estimated	0.1	Annual	Set based on best available science and in reference to the IPCC
	EF $_{Leach}$	kg $_{N2O-N}$ / kg $_{Nitrogen\ Excreted}$	Estimated	0.0125 kg $_{N2O-N}$ / kg $_{Nitrogen\ Excreted}$	Annual	Set based on best available science and in reference to the IPCC
Baseline SS's						
B10 Feed Consumption	Emissions $_{Cattle}$ = Σ (Number $_{Production\ i}$ * DOF * DMI $_i$ * GE $_{Diet}$ * (EF $_{Enteric\ i}$ / 100%) / EC $_{Methane}$)					
	Enteric Emissions from Cattle for each feed regime within each weight grouping / Emissions $_{Cattle}$	kg CH_4 / day / per weight grouping	N/A	N/A	N/A	Quantity being calculated.
	Number of Cattle in Grouping i / Number $_{Production\ i}$	Head	Measured	Direct measurement of number of head sent to slaughter within each grouping of animals.	Continuous	Direct measurement is the highest level possible.
	Days on Feed for Each Feed Regime for Cattle in Grouping i / DOF $_i$	Days	Estimated	Average for cattle in weight grouping over the three years prior to the implementation of the project.	Annual	Based on available farm records.
	Dry Matter Intake for Each Feed Regime for Cattle in Grouping i / DMI $_i$	kg $_{dry\ matter}$ / head / day	Estimated	Estimated based on average mass of feed provided to cattle during period on diet.	Continuous	Based on actual feed delivery records to each pen.
	Default value Gross energy content (GE) of the diet GE $_{Diet}$	MJ / kg $_{dry\ matter}$	Estimated	18.45 MJ / kg $_{dry\ matter}$	Annual	Default value taken from IPCC, 2006 guidance (Section 10.4.2).

	Emission Factor for Enteric Emissions for Each Feed Regime in Grouping i / $EF_{Enteric\ i}$	%	Estimated	4 % for diets with greater than 90 % concentrates. 6.5 % for diets with less than 90 % concentrates.	Continuous	Set based on best available science and in reference to the IPCC, 2006 guidance.
	Energy Content of Methane / $EC_{Methane}$	MJ / kg $_{methane}$	Estimated	55.65 MJ / kg $_{methane}$	Annual	Conversion factor taken from IPCC, 2006 guidance (Section 10.3.2).
B13 Manure Storage and B15 Land Application	$VS_i = [(DMI_i * GE_{Diet} * (1 – (TDN_i / 100\%))) + (UE * DMI_I * GE_{Diet})] * ((1 – (Ash / 100\%)) / GE_{Diet})$					
	Daily Volatile Solid Excreted for Livestock in Grouping i and Each Feed Regime / VS_i	kg / head / day	N/A	N/A	N/A	Quantity being calculated.
	Dry Matter Intake for Each Feed Regime for Cattle in Grouping i / DMI_i	kg $_{dry\ matter}$ / head / day	Estimated	Estimated based on average mass of feed provided to cattle during period on diet.	Continuous	Based on actual feed delivery records to each pen.
	Default value Gross energy content (GE) of the diet GE_{Diet}	MJ / kg $_{dry\ matter}$	Estimated	18.45 MJ / kg $_{dry\ matter}$	Annual	Conversion factor taken from IPCC, 2006 guidance (Section 10.4.2).
	Total Digestible Nutrients for Each Feed Regime for Cattle in Grouping i / TDN_i	%	Estimated	Estimated based on composition of feed provided to cattle during period on diet.	Continuous	Estimation based on diet composition and/or from direct analysis of the total mixed ration.
	Urinary Energy / UE	-	Estimated	0.04 for diets with less than 90 % concentrates. 0.02 for diets with greater than 90 % concentrates.	Annual	Set based on best available science and in reference to the IPCC, 2006 guidance (Section 10.4.2).
	Ash Content of Manure Calculated as a Fraction of the Dry Matter Feed Intake for Cattle / Ash	%	Estimated	2 %	Annual	Set based on best available science and in reference to the IPCC, 2006 guidance.
	$Emissions_{Manure\ CH4} = \Sigma\Sigma (Number_{Production\ i} * DOF_i * VS_i * Bo * \rho_{Methane} * (MCF / 100\%))$					

	Methane Emissions from Manure Handling, Storage and Land Application for each feed regime within each weight grouping / $Emissions_{Manure\ CH4}$	kg CH_4 / day / per weight grouping	N/A	N/A	N/A	Quantity being calculated.
	Number of Cattle in Grouping i / $Number_{Production\ i}$	Head	Measured	Direct measurement of number of head sent to slaughter within each grouping of animals.	Continuous	Direct measurement is the highest level possible.
	Days on Feed for Each Feed Regime for Cattle in Grouping i / DOF_i	Days	Estimated	Average for cattle in weight grouping over the three years prior to the implementation of the project.	Annual	Based on available farm records.
	Maximum Methane Producing Capacity for Manure Produced / Bo	m^3_{CH4} / $kg_{VS\ Excreted}$	Estimated	0.19 m^3_{CH4} / $kg_{VS\ Excreted}$	Annual	Conversion factor taken from IPCC, 2006 guidance (Table 10A-5).
	Density of Methane / $\rho_{Methane}$	m^3 / kg	Estimated	0.67 m^3 / kg	Annual	Physical property of methane at standard temperature and pressure.
	Methane Conversion Factor / MCF	%	Estimated	1.6 %	Annual	Set based on best available science and in reference to the IPCC, 2006 guidance.
	$Nitrogen_{Excreted\ i} = DMI_i * (CP_i / 100\%) / CF_{Protein} * (1 - Nitrogen_{Retention})$					
	Nitrogen Excreted by the Livestock in Grouping i / $Nitrogen_{Excreted\ i}$	kg / head / day	N/A	N/A	N/A	Quantity being calculated.
	Dry Matter Intake for Each Feed Regime for Cattle in Grouping i / DMI_i	$kg_{dry\ matter}$ / head / day	Estimated	Estimated based on average mass of feed provided to cattle during period on diet.	Continuous	Estimation based on farm records.
	Percent Crude Protein in Diet for Each Feed Regime in Cattle in Grouping i / CP_i	%	Estimated	Estimated based on composition of feed provided to cattle during period on diet.	Continuous	Estimation based on diet composition and/or from direct analysis of the total mixed ration.

	Conversion from Mass of Dietary Protein to Mass of Dietary Nitrogen	kg $_{\text{feed protein}}$ / kg $_{\text{nitrogen}}$	Estimated	6.25 kg $_{\text{feed protein}}$ / kg $_{\text{nitrogen}}$	Annual	Conversion factor taken from IPCC, 2006 guidance (Section 10.5.2).
	Fraction of Annual Nitrogen Intake Retained / Nitrogen Retention	kg $_{\text{retained}}$ / kg $_{\text{intake}}$	Estimated	0.07 kg $_{\text{retained}}$ / kg $_{\text{intake}}$	Annual	Factor taken from IPCC, 2006 guidance (Table 10.20).

	Emissions $_{\text{Direct Nitrous Oxide}}$ = ΣΣ (Number $_{\text{Production i}}$ * DOF $_{\text{i}}$ * Nitrogen $_{\text{Excreted i}}$ * CF $_{\text{Manure}}$) * 44 / 28					
	Direct Emissions of Nitrous Oxide from Manure for each feed regime within each weight grouping / Emissions $_{\text{Direct Nitrous Oxide}}$	Kg N_2O / day / per weight grouping	N/A	N/A	N/A	Quantity being calculated.
	CF $_{\text{Manure}}$	-	Estimated	0.02 kg $_{\text{N2O-N}}$ / kg $_{\text{Nitrogen Excreted}}$	Annual	Set based on best available science and in reference to the IPCC.
	Emissions $_{\text{Direct Storage}}$ = ΣΣ (Number $_{\text{Production i}}$ * DOF $_{\text{i}}$ * Nitrogen $_{\text{Excreted i}}$ * Frac $_{\text{Storage}}$ * EF $_{\text{Storage}}$) * 44 / 28					
	Direct Emissions of Nitrous Oxide from Manure Storage for each feed regime within each weight grouping / Emissions $_{\text{Direct Storage}}$	kg N_2O / day / per weight grouping	N/A	N/A	N/A	Quantity being calculated.
	Frac $_{\text{Storage}}$	-	Estimated	0.8	Annual	Set based on best available science and in reference to the IPCC
	EF $_{\text{Storage}}$	kg $_{\text{N2O-N}}$ / kg $_{\text{Nitrogen Excreted}}$	Estimated	0.007 kg $_{\text{N2O-N}}$ / kg $_{\text{Nitrogen Excreted}}$	Annual	Set based on best available science and in reference to the IPCC
	Emissions $_{\text{Indirect Volatization}}$ = ΣΣ (Number $_{\text{Production i}}$ * DOF $_{\text{i}}$ * Nitrogen $_{\text{Excreted i}}$ * Frac $_{\text{Volatizaton}}$ * EF $_{\text{Volatization}}$) * 44 / 28					
	Indirect Emissions of Nitrous Oxide from Volatization for each feed regime within each weight grouping / Emissions $_{\text{Indirect Volatization}}$	kg N_2O / day / per weight grouping	N/A	N/A	N/A	Quantity being calculated.
	Frac $_{\text{Volatization}}$	-	Estimated	0.2	Annual	Set based on best available science and in reference to the IPCC

	$EF_{Volatization}$	kg_{N2O-N} / $kg_{Nitrogen\ Excreted}$	Estimated	0.01 kg_{N2O-N} / $kg_{Nitrogen\ Excreted}$	Annual	Set based on best available science and in reference to the IPCC
	$Emissions_{Indirect\ Leach} = \Sigma\Sigma\ (Number_{Production\ i} * DOF_{i} * Nitrogen_{Excreted\ i} * Frac_{Leach} * EF_{Leach}) * 44 / 28$					
	Indirect Emissions of Nitrous Oxide from Leaching for each feed regime within each weight grouping / $Emissions_{Indirect\ Leach}$	kg N_2O / day / per weight grouping	N/A	N/A	N/A	Quantity being calculated.
	$Frac_{Leach}$	-	Estimated	0.1	Annual	Set based on best available science and in reference to the IPCC
	EF_{Leach}	kg_{N2O-N} / $kg_{Nitrogen\ Excreted}$	Estimated	0.0125 kg_{N2O-N} / $kg_{Nitrogen\ Excreted}$	Annual	Set based on best available science and in reference to the IPCC

Notes: 1) 44 / 28 represents the conversion factor from N_2O-N to N_2O
2) The diet characteristics (DMI, TDN and CP) are to be the same in the baseline and project condition.

2.5.2. Contingent Data Approaches

Contingent means for calculating or estimating the required data for the equations outlined in section 2.5.1 are summarized in **TABLE 2.5**, below.

2.6 Management of Data Quality

In general, data quality management must include sufficient data capture such that the mass and energy balances may be easily performed with the need for minimal assumptions and use of contingency procedures. The data should be of sufficient quality to fulfill the quantification requirements and be substantiated by company records for the purpose of verification.

The project proponent shall establish and apply quality management procedures to manage data and information. Written procedures should be established for each measurement task outlining responsibility, timing and record location requirements. The greater the rigour of the management system for the data, the more easily an audit will be to conduct for the project.

2.6.1 Record Keeping

Record keeping practises should include:

a. Electronic recording of values of logged primary parameters for each measurement interval;
b. Printing of monthly back-up hard copies of all logged data;
c. Written logs of operations and maintenance of the project system including notation of all shut-downs, start-ups and process adjustments;
d. Retention of copies of logs and all logged data for a period of 7 years; and
e. Keeping all records available for review by a verification body.

2.6.2 Quality Assurance/Quality Control (QA/QC)

QA/QC can also be applied to add confidence that all measurements and calculations have been made correctly. These include, but are not limited to:

Protecting monitoring equipment (sealed meters and data loggers);

a. Protecting records of monitored data (hard copy and electronic storage);
b. Checking data integrity on a regular and periodic basis (manual assessment, comparing redundant metered data, and detection of outstanding data/records);
c. Comparing current estimates with previous estimates as a ‘reality check’;
d. Provide sufficient training to operators to perform maintenance and calibration of monitoring devices;
e. Establish minimum experience and requirements for operators in charge of project and monitoring; and
f. Performing recalculations to make sure no mathematical errors have been made.

TABLE 2.5: Contingent Data Collection Procedures

1.0 Project / Baseline SS	2. Parameter / Variable	3. Unit	4. Measured / Estimated	5. Contingency Method	6. Frequency	7. Justify measurement or estimation and frequency
Project SS's						
P10 Feed Consumption - and - P13 Manure Storage and P15 Land Application	Number of Cattle in Grouping i / Number $_{Production\ i}$	head	Estimated	Estimation based details from sales or shipping records.	Monthly	Provides a reasonable estimate.
	Days on Feed for Each Feed Regime for Cattle in Grouping i / DOF_i	days	Estimated	Estimation based details from sales or shipping records.	Monthly	Provides a reasonable estimate.
	Dry Matter Intake for Each Feed Regime for Cattle in Grouping i / DMI_i	kg $_{dry\ matter}$ / head / day	Estimated	Estimation based details from sales or shipping records.	Monthly	Provides a reasonable estimate.
	Total Digestible Nutrients for Each Feed Regime for Cattle in Grouping i / TDN_i	%	Estimated	Estimation based details from sales or shipping records.	Monthly	Provides a reasonable estimate.
	Percent Crude Protein in Diet for Each Feed Regime in Cattle in Grouping i / CP_i	%	Estimated	Estimation based details from sales or shipping records.	Monthly	Provides a reasonable estimate.
Baseline SS's						
None						