GHG Emissions Scope 1 and 2 Inventory Management Plan (IMP)

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Nutrien Ltd.
Suite 1700
211 19th Street East
Saskatoon SK S7K 5R6
Canada

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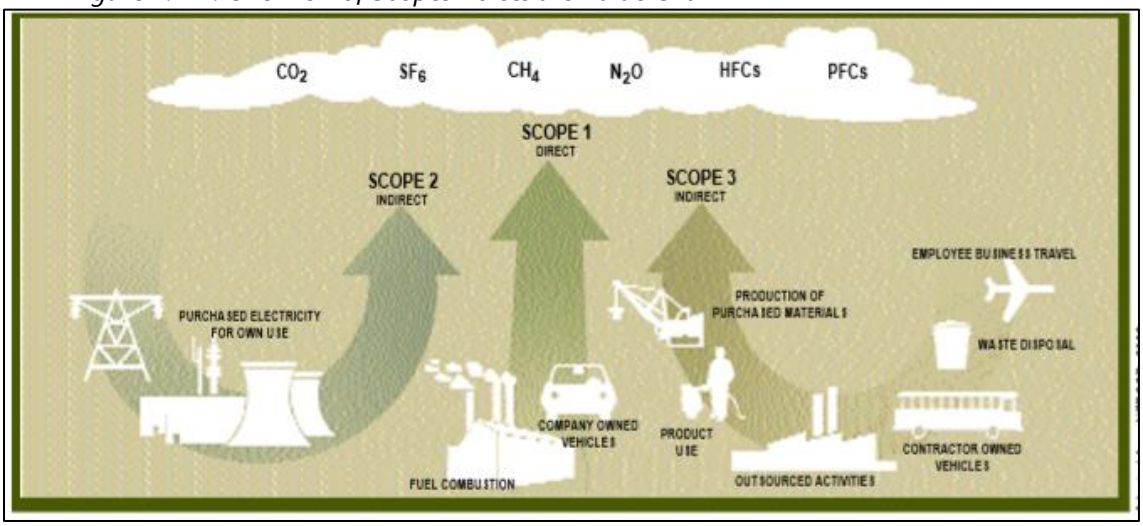
1.0 OVERVIEW

This GHG Emissions Inventory Management Plan (IMP) describes the processes and procedures implemented by Nutrien to prepare a corporate-wide greenhouse gas (GHG) emissions inventory for Scope 1 and Scope 2 emissions following methods aligned with *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard*[1] (GHG Protocol) and its annexes. It also describes procedures established to deal with estimation of emissions when primary data is missing, as well as variable timeframes and equipment. Scope 3 emissions are excluded from this IMP. This document, along with the GHG Protocol, provides the criteria applied by Nutrien in quantifying annual Scope 1 and 2 emissions and for obtaining limited assurance.

Nutrien uses the GHG Protocol for the preparation of the GHG inventory using the definitions for scope as shown in Figure 1.1-1 below:

Figure 1.1-1: Overview of Scopes Across the Value Chain



Source: The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard

Generally, an inventory should aim to meet the following principles presented in the GHG Protocol:

> **Relevance**: Prepare an inventory that contains information helpful for both internal and external stakeholder to make decisions. A key aspect of this is the selection of an appropriate inventory boundary.

[1] N, R & Ranganathan, Janet & Corbier, Laurent & Schmitz, Simon & Oren, Kjell & Dawson, Brian & Spannagle, Matt & Bp, Mike & Boileau, Pierre & Canada, Environment & Frederick, Rob & Vanderborght, Bruno & Thomson, Holcim & Koichi, Kitamura & Kansai, & Woo, Chi & Naseem, & Kpmg, Pankhida & Miner, Reid & Cook, Elizabeth. (2004). WBCSD/WRI, 2004. *Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard, Revised Edition*. 10.13140/RG.2.2.34895.33443. https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf

Completeness: Account for and disclose all relevant emission sources and gases within the chosen inventory boundary. Lack of data may be a limiting factor in the estimation of a full inventory. Please see Section 1.2 Materiality Threshold for information on determination of emission materiality.

Consistency: Prepare an inventory with consistent application of accounting approach, inventory boundary and calculation methodology that generates comparable GHG emissions and inventories over time.

Transparency: Disclose data, assumptions, procedures, methodologies, and limitations in a clear, neutral, and factual manner.

Accuracy: Calculate the inventory with enough precision to enable users to make informed decisions. The inventory should reduce uncertainties as much as possible.

1.1 Organizational Boundary Approach

Nutrien uses the operational control approach for the estimation of GHG emission data. This IMP aims to account for all material emissions from operations of Nutrien Ltd. and its wholly owned and controlled subsidiaries for the applicable reporting year (calendar year). These sources include owned properties, which include manufacturing operations, office spaces, warehouses and distribution terminals, light manufacturing facilities, equipment, and vehicles.

1.1.1. Nutrien Operations

Nutrien is the world's largest provider of crop inputs and services. Nutrien's operations span four primary operating segments (Nitrogen, Potash, Phosphate and Retail) with global operations in 13 countries. For greenhouse gas emission tracking and quantification purposes, facilities and operations have been divided into seven operational groupings:

1. Nitrogen Manufacturing
2. Potash Manufacturing
3. Phosphate Manufacturing
4. Retail
5. Specialty Products
6. Transportation, Distribution & Logistics (TD&L)
7. Corporate Offices

1.1.1.1 Nitrogen Manufacturing

Nitrogen manufacturing operations consists of 10 manufacturing facilities in Canada, U.S., and Trinidad and Tobago.

Augusta, GA	Borger, TX
Carseland, AB	Fort Saskatchewan, AB
Geismar, LA	Joffre, AB
Kennewick, WA	Lima, OH
Redwater, AB	Point Lisas, Trinidad & Tobago

The Standard and Granum, AB urea ammonium nitrate (UAN) blending and distribution facilities that are part of Nutrien's Nitrogen business unit are included in the TD&L grouping. The New Madrid, MO ESN coating facility that is part of the Nitrogen business unit is included in the Specialty Products grouping.

1.1.1.2 Potash Manufacturing

Nutrien has six potash mines in Saskatchewan, Canada.

Allan, SK	Cory, SK
Lanigan, SK	Patience Lake, SK
Rocanville, SK	Vanscoy, SK

1.1.1.3 Phosphate Manufacturing

Phosphate manufacturing operations consists of two U.S. based integrated mining and processing facilities.

Aurora, NC	White Springs, FL

The Cincinnati Phosphate facility, which produces blended purified acid products, is also included in the Phosphate Manufacturing operational group. The Joplin, MO, Weeping Water, NE and Marseilles, IL phosphate animal feed facilities are included in the Specialty Products category.

1.1.1.4 Retail

The Retail business unit consists of four manufacturing plants in the U.S., two manufacturing plants in South America, and more than 2,000 Retail locations in the U.S., Canada, South America, and Australia. The specific retail locations can be found in Nutrien's Fact Book that is published annually (https://www.nutrien.com/nutrien-fact-book). For greenhouse gas inventory reporting, the Retail Loveland Products Inc. manufacturing plants are included in the Specialty Products grouping.

1.1.1.5 Specialty Products

Specialty product facilities include operations that upgrade or blend nutrient products, or manufacture crop enhancement and protection products. This includes three Loveland Products Inc. facilities, three animal feed phosphate supplement facilities, and an ESN coating facility. Nutrien formerly operated two Rainbow fertilizer granulation operations. The Florence, AL facility was closed in July 2019, and the Americus, GA facility was divested in December 2021.

Loveland Products Inc.	Feed Phosphate	ESN Coating	Rainbow Granulation
Fairbury, NE Greeley, CO Greenville, MS Billings, MT (ceased manufacturing operations in 2020)	Joplin, MO Marseilles, IL Weeping Water, NE	New Madrid, MO	Americus, GA (divested in December 2021) Florence, AL (ceased operation in July 2019)

1.1.1.6 Transportation, Distribution & Logistics (TD&L)

The Transportation and Distribution & Logistics (TD&L) terminals support manufacturing and retail operations through regional storage and distribution of nutrient products.

TD&L includes seven Canadian and eleven U.S. facilities:

Canada	United States
Granum, AB	Lake City, FL
Roma, AB	Tifton, GA
Standard, AB	Marseilles, IL
Kamloops, BC	Hammond, IN
Bloom, MB	Mt. Vernon, IN
Clavet, SK	Early, IA
Watson, SK	Fort Dodge, IA
	Baltimore, MD
	Homestead, NE
	Leal, ND
	Lynchburg, VA

The Standard and Granum terminals also blend manufactured products to produce liquid fertilizer products, such as urea ammonium nitrate (UAN).

1.1.1.7 Corporate Offices

Emissions associated with corporate offices are also tracked for the Saskatoon, Calgary, and Loveland offices. Nutrien also maintained a smaller corporate office in Northbrook, IL. This office, referred to as the Chicago Sales office, relocated to Deerfield, IL in 2021.

Nutrien's geographic locations are found here: https://www.nutrien.com/locations/maps.

1.1.2. Excluded Facilities and Operations

Emissions are quantified within Nutrien's organizational boundary, where quality data is readily available, and where emission contributions are material. Nutrien's investments

and jointly owned assets are part of Scope 3 emissions. The following operations are not included in emission inventory reporting:

- European Wholesale distribution network, which includes product storage and sales offices in four countries (Belgium, France, Germany, and Italy). Emissions from activities associated with storage and sales offices are not material.
- Nutrien owned facilities in Kenai, AK, Kapuskasing, ON, and New Brunswick potash operations as these facilities are not operating.
- Small retail division or corporate offices in Regina, SK, Northbrook/Deerfield, IL, South America, and Australia. These office locations do not house manufacturing or distribution operations. Emissions are not material.

1.2 Materiality Threshold

According to the GHG Protocol, information is material if, by its inclusion or exclusion, it can be seen to influence any decisions or actions taken by users of it. A material discrepancy is an error (for example, from an oversight, omission, or miscalculation) that results in a reported quantity or statement being significantly different to the true value or meaning.

In the context of the IMP, while the concept of materiality involves a value judgment, the point at which a discrepancy becomes material (materiality threshold) is usually pre-defined. Nutrien has defined materiality to be discrepancies or errors exceeding 5 percent of the total inventory for the scope being verified and reported.

2.0 QUANTIFICATION METHODOLOGY

The U.S. and Canadian Nitrogen facilities, the U.S. Phosphate facilities, and the Potash facilities are subject to provincial and/or federal regulatory emission reporting requirements. These regulatory requirements mandate the quantification methodologies that must be used for reporting direct (Scope 1) emissions. To ensure consistency between regulatory and corporate reported emissions, the regulatory quantification methods are used to quantify Nutrien's Scope 1 emissions. These methods are aligned with the principles of the GHG Protocol methods and are based on quantification methods in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.[2]

The six potash facilities in Saskatchewan and four nitrogen facilities in Alberta are subject to provincial regulatory emission reporting under *The Management and Reduction of Greenhouse Gases (Standards and Compliance) Regulations* in Saskatchewan, and the *Technology Innovation and Emissions Reduction (TIER) Regulation* in Alberta. These regulations require annual third-party reasonable assurance of direct (i.e., Scope 1) emissions in accordance with ISO 14064-3 prior to regulatory submission. In addition, each facility regulated under a provincial reporting scheme is required to maintain a site-specific quantification methodology document that meets provincial regulatory requirements. Scope 1 emissions from these ten facilities are typically responsible for more than 25 percent of Nutrien's annual Scope 1 emissions. Regulatory third-party verifications do not include assessment of Scope 2 emissions.

2.1 Greenhouse Gas List

There are typically seven Kyoto GHGs that are reported in accordance with GHG Protocol Corporate Accounting and Principles and include: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulphur hexafluoride (SF_6), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and nitrogen trifluoride (NF_3).

Nutrien currently reports emissions for three out of the seven GHGs - carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Hydrofluorocarbons (HFCs), such as R-410A (GWP 2,088), are only used in building air conditioning equipment and are not routinely released. Infrequent releases due to leaks from building air conditioning equipment are tracked in Nutrien's *EtQ Reliance* incident tracking database but are not included in the emission inventory as release quantities from air conditioners are typically immaterial.

Nutrien Potash facilities have gas insulated electrical switchgear that contain sulphur hexafluoride (SF_6, GWP 22,800). Like HFCs, releases of SF_6 are not included in the emission

[2] Eggleston, H S, Buendia, L, Miwa, K, Ngara, T, & Tanabe, K. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Japan. https://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

inventory as releases are extremely infrequent and are not material. Nutrien does not use PFCs or NF_3 in any operating processes.

2.2 Global Warming Potentials

Greenhouse gases are characterized in terms of their Global Warming Potential (GWP). The GWP is a measure of how much energy the emission of a metric ton of gas will absorb over a specified period, relative to the emission of one metric ton of CO_2. This metric is normalized in terms of carbon dioxide equivalents (CO_2e) and expressed with a time horizon. The time horizon of 100 years is the one that was adopted by the United Nations Framework Convention on Climate Change (UNFCCC) to guide all the national inventories preparation, negotiations and targets settings and is reflected in regulatory reporting. Therefore, this is the time horizon adopted by Nutrien.

The GWPs are sourced from *The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report* (AR4)[3] and align with GWPs associated with U.S. EPA, Environment and Climate Change Canada, and UNFCCC reporting requirements. The GWPs from AR4 for the 100-year time-frame horizon are shown in Table 2.2-1.

Table 2.2-1: Global Warming Potentials (AR4)

Greenhouse Gas	Global Warming Potential (AR4)
CO_2	1
CH_4	25
N_2O	298

2.3 Scope 1 Emission Sources

Sources of Scope 1 emissions at each manufacturing facility vary depending on operating processes at the facility. The GHG Protocol lists the following emission source categories for calculating emissions:

- Stationary combustion
- Mobile combustion
- Process emissions
- Fugitive emissions and venting

[3] Solomon, S., D. Qin, M. Manning, R.B. Alley, T. Berntsen, N.L. Bindoff, Z. Chen, A. Chidthaisong, J.M. Gregory, G.C. Hegerl, M. Heimann, B. Hewitson, B.J. Hoskins, F. Joos, J. Jouzel, V. Kattsov, U. Lohmann, T. Matsuno, M. Molina, N. Nicholls, J. Overpeck, G. Raga, V. Ramaswamy, J. Ren, M. Rusticucci, R. Somerville, T.F. Stocker, P. Whetton, R.A. Wood and D. Wratt, 2007: Technical Summary. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. (https://archive.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html)

- Domestic wastewater treatment

Table 2.3-1 below lists the applicable emission category for each of the seven operational groupings. Note that not all indicated emission sources apply to every facility in each facility grouping.

Table 2.3-1: Scope 1 Emission Sources by Facility Grouping

	Nitrogen	Potash	Phosphate	Retail	Specialty	TD&L	Corporate
Scope 1 Emissions							
Stationary Combustion							
Natural gas	●	●	●	●	●	●	●
Diesel	●	●	●		●	●	
Propane	●	●	●	●	●	●	
Subbituminous coal			●				
No. 2 Fuel Oil			●				
No. 6 Fuel Oil			●				
Process Emissions							
Ammonia Manufacturing	●						
Nitric Acid Manufacturing	●						
Phosphoric Acid Manufacturing			●				
Carbonate Calcination			●		●		
Urea Production (Sink)	●						
Mobile Combustion							
Diesel	●	●	●	●	●	●	
Gasoline	●	●	●	●	●	●	
Miscellaneous Fuels*				●			
Fugitive Emissions and Venting							
Fugitive Emissions	●						
Venting	●						
Wastewater							
Domestic Wastewater Treatment		●					

*Miscellaneous fuels include a variety of assorted fuels used in certain retail and corporate support applications, including liquid petroleum gas, marine fuels, and aviation fuel.

2.4 Scope 2 Emissions

Scope 2 emissions are estimated for the processes in Table 2.4-1: Scope 2 Emission Sources by Facility Grouping. Note that not all indicated emission sources apply to every facility in each facility grouping.

Table 2.4-1: Scope 2 Emission Sources by Facility Grouping

	Nitrogen	Potash	Phosphate	Retail	Specialty	TD&L	Corporate
Scope 2 Emissions							
Imported Electricity	●	●	●	●	●	●	●
Imported Steam / Heat	●	●					

2.5 Base Year

A baseline for a GHG inventory can be a year, multiple years (in sequence or not) or any figure that properly represents the performance of a company and is useful to establish a reference for comparison.

The base year selected by Nutrien for direct and indirect emissions is 2018 as it was the first full year of operation following the merger of Agrium Inc. and Potash Corporation of Saskatchewan (PCS).

Base year GHG emissions should be recalculated when there have been significant changes to the boundary, calculation methods or emission data. Examples where a base year recalculation will be triggered include:

- Structural changes with significant emission impacts, including mergers, acquisitions, divestitures, or outsourcing / insourcing of major emitting activities;
- Changes or improvements in calculation methodologies or emission factors that are applicable to the base year;
- Discovery of a significant error or several cumulative errors that are collectively significant.

Whether base year emissions are recalculated depends on the significance of the changes. Determining a significant change may require accounting for the cumulative effect on base year emissions of several small acquisitions or divestments. The GHG Protocol Corporate standard makes no specific recommendations as to what constitutes "significant," however some GHG programs do specify numerical significance thresholds, such as the California Climate Action Registry, where the threshold is a 10 percent change relative to base year emissions. Nutrien's base year emissions will be recalculated if structural changes or corrections affect the historical Scope 1 and Scope 2 emission profile by 10 percent or more.

In accordance with the GHG Protocol, if an acquisition or divestment with significant emissions implications occurs in the middle of the year, base year emissions should be recalculated for the entire year. If an acquisition or divestiture that would materially impact emission totals occurs at the beginning or end of a year, the base year should be recalculated for the entire year to avoid having to recalculate base year emissions in the succeeding year. In addition, the most current inventory year should include the changes from an acquisition or divestiture applied to the full year.

Base year emissions will not be recalculated due to changes in product lines, product mix, production output, recommissioning of operations that were not operating during the base year, or for acquisition, construction, or insourcing of facilities or activities that did not exist in the base year. In addition, base year emissions do not need to be recalculated for insourcing of activities that result in emission transfers between Scope 1 and Scope 2 (e.g., transitioning from purchased electricity to self-generation).

2.5.1. Operation Changes Since Baseline

After the establishment of the 2018 base year emissions, the facilities or manufacturing processes listed in Table 2.5-1 have changed. None of the changes materially impact the established base year emissions.

Table 2.5-1: Operational changes since base year

Facility	Included in 2018 Baseline?	Currently included in Nutrien Inventory Reporting	Approximate Contribution of Nutrien Annual Scope 1 + Scope 2 Emission Inventory	Comments
Geismar, LA Phosphate Manufacturing	Yes	No	~ -0.03%	Facility ceased phosphate production in December 2018. Any emissions associated with auxiliary and mobile equipment still operating in the Phosphate Unit are being accounted for under Geismar Nitrogen facility.
Redwater, AB Phosphate Manufacturing	Yes	No	~ -0.3%	Phosphate production was discontinued at the Redwater facility in May 2019. The phosphoric acid production process was discontinued. The East Train ammonium phosphate granulation facility was converted to a second ammonium sulphate production unit. All Redwater emissions are accounted for under the Redwater Nitrogen facility.
Florence, AL	Yes	No	~ -0.02%	Facility ceased production in June 2019 and has been demolished.
Legacy PCS TD&L Facilities (Lake City, FL; Baltimore, MD; Ft. Dodge, IA; Hammond, IN	No	Yes	~ +0.05%	Prior to 2019, Legacy PCS TD&L facilities did not maintain the records required to be included in the baseline. In 2019, these locations are now included in Nutrien's inventory reporting.
Marseilles, IL (TD&L)	Indirectly	Yes	~ +0.35%	Emissions associated with the Marseilles TD&L Facility were previously accounted for under the Retail Business Unit estimate. In January 2020, the site joined Nutrien Wholesale as a TD&L facility and emissions are now tracked directly.
LPI Billings	Yes	No	~0.02%	The LPI Billings facility is no longer manufacturing agricultural products and is effectively operating as a warehouse facility.
Garner Terminal	Yes	No	<0.01%	The Garner TD&L facility discontinued operations in 2020.
Brazil stationary combustion	No	Yes	<0.01%	Emissions from stationary combustion of propane and wood for heating / drying operations at Brazil retail locations have been added.
Cincinnati Phosphate	No	Yes	< +0.02%	Facility emission data was not available during the baseline period.

2.6 Reporting Period

The inventory will represent emissions for the calendar year that begins on January 1 through December 31.

3.0 EMISSION CALCULATION METHODS

3.1 Scope 1 Emissions

3.1.1. Nitrogen Manufacturing

Nutrien operates nine ammonia manufacturing production facilities in Canada, the U.S. and Trinidad. In addition, the Kennewick facility manufactures nitric acid and upgrades ammonia and urea products. Nitrogen facilities produce a variety of nitrogen-based fertilizer products, including ammonia, urea, nitric acid, ammonium nitrate, urea ammonium nitrate solutions, calcium ammonium nitrate and ammonium sulphate.

Relevant emission sources in manufacturing processes include stationary combustion in primary reformers, boilers, dryers and heaters, industrial process emissions of carbon dioxide from ammonia manufacturing, industrial process emissions of nitrous oxide from nitric acid manufacturing, and emissions from mobile equipment. In addition, Alberta nitrogen facilities quantify emissions from venting of process gases containing methane and carbon dioxide. Table 3.1-1 shows the emission sources quantified for each facility.

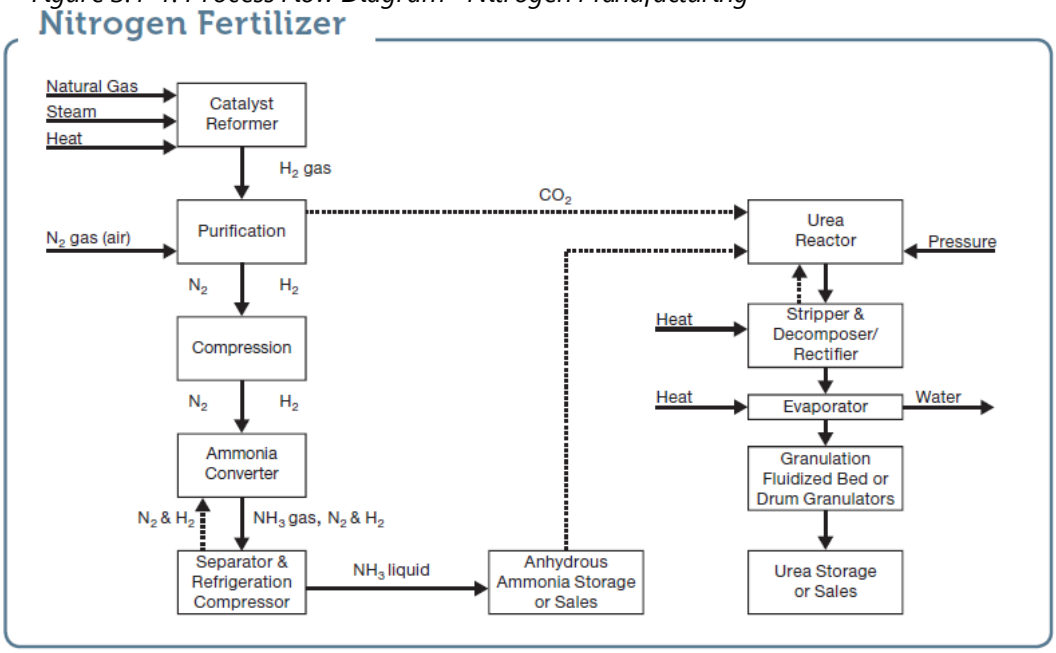
Table 3.1-1: Scope 1 Emission Sources - Nitrogen Manufacturing

	Stationary Combustion	Process Emissions - Ammonia Manufacturing	Process Emissions - Nitric Acid Manufacturing	Process Emissions - Urea Manufacturing (CO_2 Sink)	Mobile Combustion	Fugitive Emissions & Venting*
Augusta, GA	●	●	●	●	●	
Borger, TX	●	●		●	●	
Carseland, AB	●	●		●	●	●
Fort Saskatchewan, AB	●	●		●	●	●
Geismar, LA	●	●	●	●	●	
Joffre, AB	●				●	
Kennewick, WA	●		●		●	
Lima, OH	●	●	●	●	●	
Redwater, AB	●	●	●	●	●	●
Point Lisas, Trinidad	●	●		●	●	

*Alberta facilities regulated under the *Technology Innovation and Emissions Reduction (TIER) Regulation* are mandated to quantify and report emissions of carbon dioxide and methane vented during ammonia plant startup and shutdown events, or process upsets. U.S. and Trinidad facilities are not required by regulation to report venting emissions, so are not quantified. These emissions are not material in quantity.

Figure 3.1-1 shows a simplified ammonia and urea manufacturing process flow diagram.

Figure 3.1-1: Process Flow Diagram - Nitrogen Manufacturing



Source: Nutrien Fact Book

Alberta nitrogen facilities are subject to annual greenhouse gas quantification and reporting requirements under the Canadian Greenhouse Gas Reporting Program (GHGRP) in addition to provincial reporting requirements under *The Technology Innovation and Emissions Reduction (TIER) Regulation*. Emission quantification for the Alberta nitrogen manufacturing facilities follows the *Alberta Greenhouse Gas Quantification Methodologies* (as updated)[4]. Alberta quantification methodologies are based on Intergovernmental Panel on Climate Change (IPCC) quantification methods (http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html) but modified to meet the needs of Alberta sectors. Each Alberta facility has developed a detailed site-specific quantification methodology document that outlines all site-specific calculations and sources of data. Where emission factors are used, factors are as published in the latest version of the *Alberta Greenhouse Gas Quantification Methodologies*.[4]

U.S. manufacturing facilities report specified emissions subject to the *Code of Federal Regulations (CFR) Title 40 Part 98 – Mandatory Greenhouse Gas Reporting*. Applicable Subparts for each facility are listed in Table 3.1-2.

[4] https://open.alberta.ca/publications/alberta-greenhouse-gas-quantification-methodologies

Table 3.1-2: U.S. Nitrogen Facility 40 CFR Part 98 mandatory reporting requirements.

Facility	Subpart C – General Stationary Fuel Combustion Sources	Subpart G – Ammonia Manufacturing	Subpart V – Nitric Acid Production	Subpart PP – Suppliers of Carbon Dioxide
Augusta, GA	●	●	●	●
Borger, TX	●	●		●
Geismar, LA	●	●	●	●
Kennewick, WA	●		●	
Lima, OH	●	●	●	●

Mobile combustion emissions and stationary combustion emissions from flares, backup generators or emergency equipment are not reported under 40 CFR Part 98, however they are included in the Nutrien emission inventory. Emission factors for mobile equipment at U.S. Nitrogen facilities are as published at the *EPA Center for Corporate Climate Leadership GHG Emission Factors Hub.*[5]

The Point Lisas, Trinidad nitrogen facility is not subject to regulatory greenhouse gas reporting. For Nutrien's emission inventory, the Trinidad facility follows the same U.S. 40 CFR Part 98 quantification methodologies as the U.S. nitrogen facilities.

Reported Scope 1 emissions at nitrogen manufacturing facilities exclude carbon dioxide that is captured for industrial sales or consumed as feedstock in urea production, which are considered Scope 3 emissions. It also excludes carbon dioxide captured and transferred to third parties for enhanced oil recovery (EOR) activities at Redwater and Geismar.

3.1.2. Potash Manufacturing

Nutrien operates six potash facilities in Saskatchewan. Relevant emission sources include stationary combustion in boilers and heaters and combustion in onsite mobile equipment. Table 3.1-3 shows the emission sources quantified for each facility.

Table 3.1-3: Scope 1 Emission Sources - Potash Manufacturing

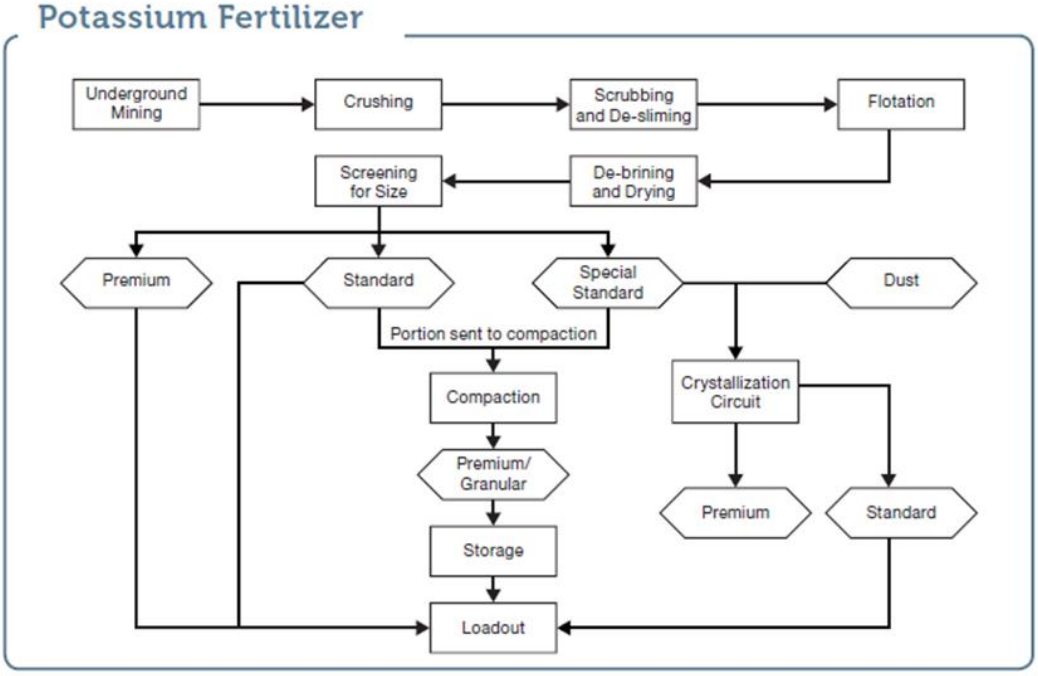
	Stationary Combustion	**Process Emissions**	**Mobile Combustion**	**Fugitive Emissions & Venting**	**Domestic Wastewater Treatment***
Allan	●		●		●
Cory	●		●		●
Lanigan	●		●		
Patience Lake	●		●		●
Rocanville	●		●		●
Vanscoy	●		●		●

*Five potash facilities operate domestic wastewater lagoons. Emissions from the lagoons are negligible.

Figure 3.1-2 shows a simplified potash manufacturing process flow diagram.

[5] https://www.epa.gov/climateleadership/ghg-emission-factors-hub

Figure 3.1-2: Process Flow Diagram - Potash Manufacturing



Source: Nutrien Fact Book

All potash facilities are subject to annual greenhouse gas quantification and reporting requirements under the Canadian Greenhouse Gas Reporting Program (GHGRP) in addition to provincial reporting requirements under *The Management and Reduction of Greenhouse Gases (Standards and Compliance) Regulations*. Both the provincial and federal reporting regulations require emission quantification following *Canada's Greenhouse Gas Quantification Requirements* (as updated)[6].

Five potash facilities operate domestic wastewater lagoons. Emissions from the lagoons are estimated using quantification methods in Volume 5, Chapter 6: Wastewater Treatment and Discharge in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.[7] Emissions from domestic wastewater lagoons are negligible.

3.1.3. Phosphate Manufacturing

Nutrien operates two phosphate manufacturing facilities in the U.S. Relevant emission sources include stationary combustion in boilers, heaters and other fired equipment, process emissions from the release of carbon dioxide by-product from calcination of phosphate ore, process emissions from acid digestion of phosphate rock, combustion in onsite mobile equipment.

[6] https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/facility-reporting/reporting/quantification-requirements.html

[7] Eggleston, H S, Buendia, L, Miwa, K, Ngara, T, & Tanabe, K. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Japan. https://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

U.S. manufacturing facilities report specified emissions subject to the *Code of Federal Regulations (CFR) Title 40 Part 98 – Mandatory Greenhouse Gas Reporting*. Applicable Subparts for each facility are listed in Table 3.1-4.

Table 3.1-4: Scope 1 Emission Sources - Phosphate Manufacturing, Part 98 Reporting

Facility	Subpart C – General Stationary Fuel Combustion Sources	Subpart Z – Phosphoric Acid Manufacturing
Aurora, NC	•	•
White Springs, FL	•	•
Cincinnati, OH	•	

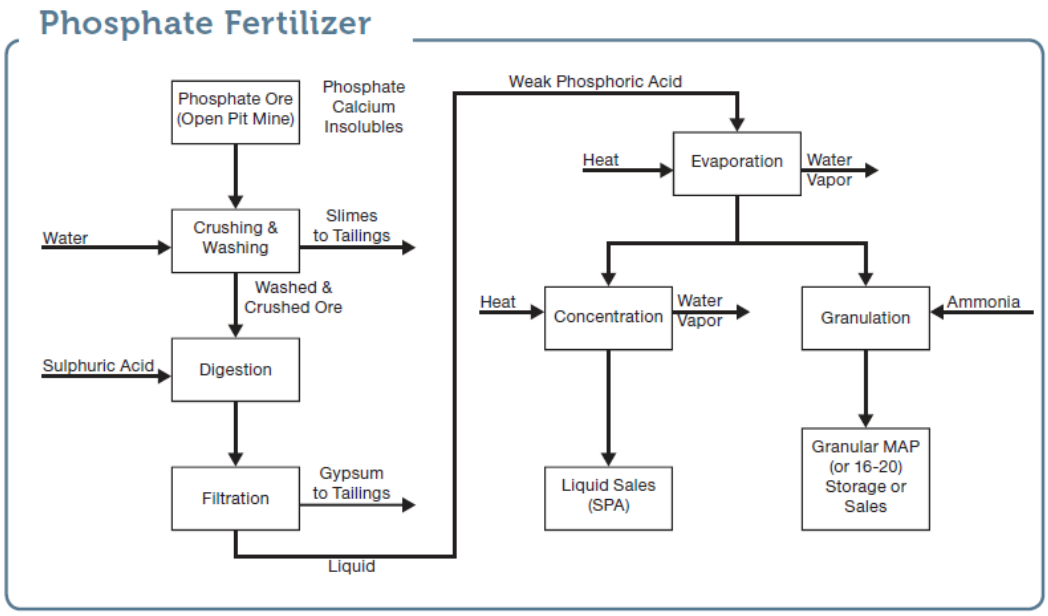
Nutrien also operates a blended acid products facility in Cincinnati, OH. This facility is not subject to regulatory reporting as it is a minor emitter that does not have the industrial operating processes of a regulated manufacturing facility. Emissions for stationary combustion for Cincinnati uses *EPA Center for Corporate Climate Leadership GHG Emission Factors Hub.*[8]

Emission factors for mobile equipment at U.S. Phosphate facilities are as published at the *EPA Center for Corporate Climate Leadership GHG Emission Factors Hub*.[8]

Figure 3.1-3 shows a simplified process flow diagram of the phosphate manufacturing process.

[8] https://www.epa.gov/climateleadership/ghg-emission-factors-hub

Figure 3.1-3: Process Flow Diagram - Phosphate Manufacturing



Source: Nutrien Fact Book

3.1.4. Retail and Fleet Operations

As previously described in Section 1.1.1.4, Nutrien operates Retail facilities throughout North America, South America, and Australia. In addition, the Retail business unit operates a large vehicle fleet. Due to this, Nutrien's overall emissions associated with operation of motor vehicles and the marine fleet have been included under the Retail business unit for the purposes of greenhouse gas inventory reporting. The most significant emission sources are related to combustion of fuels in mobile equipment. In addition, most sites also have stationary combustion in boilers and heaters, the majority of which is related to comfort heating.

Retail facilities combust natural gas and propane in stationary combustion processes. This consumption is primarily related to comfort heating except for two manufacturing facilities located in South America which consume natural gas as part of production.

Due to the number of Nutrien Ag Solutions facilities in North America and the lack of a centralized data system it is not currently possible to collect data individually from all facilities. Therefore, the Siemens Navigator application is used to aid in the collection of natural gas consumption. Siemens Navigator is a cloud-based energy and sustainability management tool used by facility managers to optimize energy, costs, and overall carbon footprint. A key feature of Navigator is it provides utility bill management services to process utility bills for payment and analyze the consumption, costs, and emissions through web-based dashboards and reporting capabilities. Those sites that do not report natural gas consumption in Siemens are assumed to use LPG/propane. A trimmed average natural gas consumption (in MMBtu) that excludes the 10% highest and lowest values is calculated using the Siemens Navigator data and this value is used

to estimate the LPG/propane energy consumption for those sites that are not in the Siemens system.

Emission factors for Scope 1 mobile combustion are from *EPA Center for Corporate Climate Leadership GHG Emission Factors Hub*[9] and IPCC.

3.1.5. Specialty Products

Nutrien operates nine Specialty Product facilities. Relevant emission sources at these locations include stationary combustion in boilers and heaters and combustion in onsite mobile equipment. Table 3.1-5 shows the emission sources quantified for each facility.

Table 3.1-5: Scope 1 Emission Sources – Specialty

	Stationary Combustion	Process Emissions	Mobile Combustion	Fugitive Emissions & Venting
Loveland Products, Inc. (LPI)				
Fairbury, NE	•		•	
Greeley, CO	•		•	
Greenville, MS	•		•	
Feed Phosphate				
Joplin, MO	•		•	
Marseilles, IL	•		•	
Weeping Water, NE	•		•	
ESN Coating				
New Madrid, MO	•		•	
Rainbow Granulation				
Americus, GA	•		•	

Specialty facilities are not subject to annual regulatory greenhouse gas quantification and reporting requirements. Emissions from these facilities are determined using invoiced energy consumptions and emission factors from the *EPA Center for Corporate Climate Leadership GHG Emission Factors Hub.*[9]

3.1.6. Transportation, Distribution & Logistics (TD&L)

Nutrien operates 18 distribution terminals in North America (7 Canada, 11 US). Relevant emission sources at these locations include stationary combustion in boilers and heaters and combustion in onsite mobile equipment. Table 3.1-6 shows the emission sources quantified for each facility.

[9] https://www.epa.gov/climateleadership/ghg-emission-factors-hub

Table 3.1-6: Scope 1 Emission Sources – TD&L

	Stationary Combustion	Process Emissions	Mobile Combustion	Fugitive Emissions & Venting
Canada				
Granum, AB	•		•	
Roma, AB	•		•	
Standard, AB	•		•	
Kamloops, BC	•		•	
Bloom, MB	•		•	
Clavet, SK	•		•	
Watson, SK	•		•	
United States				
Lake City, FL	•		•	
Tifton, GA	•		•	
Marseilles, IL	•		•	
Hammond, IN	•		•	
Mt. Vernon, IN	•		•	
Early, IA	•		•	
Fort Dodge, IA	•		•	
Baltimore, MD	•		•	
Homestead, NE	•		•	
Leal, ND	•		•	
Lynchburg, VA	•		•	

TD&L facilities are not subject to annual regulatory greenhouse gas quantification and reporting requirements. Emission factors for mobile equipment at U.S. TD&L facilities are as published at the *EPA Center for Corporate Climate Leadership GHG Emission Factors Hub.*[10] Emission factors for mobile equipment at Canadian TD&L facilities are as published in *Canada's Greenhouse Gas Quantification Requirements* (as updated)[11].

3.1.7. Corporate Offices

Nutrien operates four corporate offices in North America (Loveland, CO; Saskatoon, SK; Calgary, AB; Deerfield, IL). There are no manufacturing related emissions associated with these facilities. The only emission sources at these locations are stationary combustion in boilers and heaters for the purposes of comfort heating. Scope 1 emissions from these facilities are de minimis; however, are tracked as availability of invoices allow.

3.2 Scope 2 Emissions

3.2.1. Purchased Electricity Emissions – Location-Based

Location based Scope 2 emissions for Canadian facilities in all operational groupings are determined using provincial grid factors published in the most recent Canada National Inventory Report (NIR) submission to the United Nations Framework

[10] https://www.epa.gov/climateleadership/ghg-emission-factors-hub

[11] https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/facility-reporting/reporting/quantification-requirements.html

Convention on Climate Change (UNFCC)[12]. Published emission factors are typically available in April of each year and are offset by two years. For example, the most recent grid factors in the 2021 NIR submission are based on 2019 emission data. These 2019 factors are used for quantifying Nutrien's 2021 Scope 2 emissions. In accordance with Section 5.3 of the *GHG Protocol Scope 2 Guidance,*[13] only the Generation Intensity factor is used. Consumption Intensity, which includes emissions associated with the processing of upstream fuels, emissions associated with transmission or distribution of energy within a grid, are excluded from Scope 2. Emission factors will be updated annually as published, however NIR updates of emission factors prior to the latest factors will not be updated in Nutrien's inventory to re-quantify previously reported Scope 2 emissions.

For U.S. facilities, the latest published U.S. EPA eGRID[14] subregional emission factors are used to quantify Scope 2 emissions from purchased electricity. The eGRID subregions for Nutrien Nitrogen, Potash, Phosphate, Specialty, and TD&L facilities are listed in Table 3.2-1.

Table 3.2-1: Facility eGRID Regions

Americus, GA	SRSO	Hammond, IN	RFCW	LPI Greeley, CO	RMPA
Augusta, GA	SRSO	Homestead, NE	MROW	LPI Greenville, MS	SRMV
Aurora, NC	SRVC	Joplin, MO	SPNO	Lynchburg, VA	RFCW
Baltimore, MD	RFCE	Kennewick, WA	NWPP	Marseilles, IL	SRMW
Borger, TX	SPSO	Lake City, FL	FRCC	Mt. Vernon, IN	RFCW
Cincinnati, OH	RFCW	Leal, ND	MROW	New Madrid, MO	SRMW
Early, IA	MROW	Lima, OH	RFCW	Tifton, GA	SRSO
Ft. Dodge, IA	MROW	LPI Fairbury, NE	MROW	Weeping Water, NE	MROW
Geismar, LA	SRMV			White Springs, FL	FRCC

Baseline Scope 2 emissions for the Trinidad facility were determined using emission factors published in *The World Bank Group Greenhouse Gas Emissions: Inventory Management Plan for Internal Business Operations 2017 (English)*.[15] Beginning in 2021, Trinidad Scope 2 emission factors are from the *International Financial Institutions (IFI) Technical Working Group on Greenhouse Gas Accounting Harmonized Default Grid Factors 2021 (V3.1)*.[16]

The Trinidad, Aurora and White Springs facilities self-generate a portion of their consumed electricity from waste heat recovery processes. No self-generated electricity is exported to the grid or other third-party consumers. All electricity consumption, from both self-generated and purchased sources, are tracked. No Scope 2 emissions are

[12] https://unfccc.int/ghg-inventories-annex-i-parties/2021

[13] https://ghgprotocol.org/sites/default/files/standards/Scope%202%20Guidance_Final_Sept26.pdf

[14] https://www.epa.gov/egrid/download-data

[15] https://documents.worldbank.org/en/publication/documents-reports/documentdetail/603571540925509108/the-world-bank-group-greenhouse-gas-emissions-inventory-management-plan-for-internal-business-operations-2017

[16] https://unfccc.int/sites/default/files/resource/IFI%20Default%20Grid%20Factors%202021%20v3.1_unfccc.xlsx

reported for self-generated electricity as any emissions associated with the generated energy that is converted to electricity is reported as a Scope 1 emission.

3.2.2. Purchased Electricity Emissions – Market-Based

Market-based emissions will be determined when contractual instruments are in place for the purchase of electricity or attribute certificates, or supplier specific emission intensities are available. Guidance for determining Market-based scope 2 emissions from the *GHG Protocol Scope 2 Guidance* is shown in Figure 3.2-1.

Figure 3.2-1: GHG Protocol Market-based Scope 2 data hierarchy

Table 6.3 Market-based scope 2 data hierarchy examples

Data forms listed here should convey combustion-only (direct) GHG emission rates, expressed in metric tons per MWh or kWh. Reporting entities should ensure that market-based method data sources meet Scope 2 Quality Criteria. Instruments listed here are not guaranteed to meet Scope 2 Quality Criteria, but are indicative of instrument type.

Emission factors	Indicative examples	Precision
Energy attribute certificates or equivalent instruments (unbundled, bundled with electricity, conveyed in a contract for electricity, or delivered by a utility)	• Renewable Energy Certificates (U.S., Canada, Australia and others) • Generator Declarations (U.K.) for fuel mix disclosure • Guarantees of Origin (EU) • Electricity contracts (e.g. PPAs) that also convey RECs or GOs • Any other certificate instruments meeting the Scope 2 Quality Criteria	Higher
Contracts for electricity, such as power purchase agreements (PPAs)[a] and contracts from specified sources, where electricity attribute certificates do not exist or are not required for a usage claim	• In the U.S., contracts for electricity from specified nonrenewable sources like coal in regions other than NEPOOL and PJM • Contracts that convey attributes to the entity consuming the power where certificates do not exist • Contracts for power that are silent on attributes, but where attributes are not otherwise tracked or claimed	
Supplier/Utility emission rates, such as standard product offer or a different product (e.g. a renewable energy product or tariff), and that are disclosed (preferably publicly) according to best available information	• Emission rate allocated and disclosed to retail electricity users, representing the entire delivered energy product (not only the supplier's owned assets) • Green energy tariffs • Voluntary renewable electricity program or product	
Residual mix (subnational or national) that uses energy production data and factors out voluntary purchases	• Calculated by EU country under RE-DISS project [b, c]	
Other grid-average emission factors (subnational or national) – see location-based data	• eGRID total output emission rates (U.S.).[d] In many regions this approximates a consumption-boundary, as eGRID regions are drawn to minimize imports/exports • Defra annual grid average emission factor (UK) • IEA national electricity emission factors[e]	Lower

Notes:

a Because PPAs are the primary example of this type of instrument used in the markets consulted in this TWG process, this class of instrument may be referred to in shorthand as "PPAs" with the recognition that other types of contracts that fulfill a similar function may go by different names.

b See: http://www.reliable-disclosure.org/static/media/docs/RE-DISS_2012_Residual_Mix_Results_v1_0.pdf.

c The Norwegian authority also publishes a residual mix emission factor that can be found here: http://www.nve.no/en/Electricity-market/Electricity-disclosure-2011/.

d See: http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html.

e See: http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html.

Source: https://ghgprotocol.org/sites/default/files/standards/Scope%202%20Guidance_Final_Sept26.pdf

Nutrien purchases a portion of the electricity demand for the Alberta based Nitrogen

Facilities from the TransCanada Energy Carseland cogeneration facility. A facility specific factor is used to estimate market-based emissions for the Carseland cogen supplied electricity.

For reporting years 2018 to 2021, Nutrien did not have contractual instruments in place for the purchase of renewable electricity. As such, market-based emissions are estimated following the *GHG Protocol Scope 2 Guidance* Residual Mix method using published regional residual mix emission factors which represent emissions associated with untracked or unclaimed energy (i.e., grid electricity that has not been allocated to or purchased by another customer). Green-e® residual mix emission rates[17] are one source for U.S. residual mix emission intensities for estimating market-based emissions at U.S. facilities.

For all other Canadian and Trinidad facilities, as there are no similar residual mix data sources available, location-based emission grid factors are used to quantify market-based emissions.

In 2021, market-based emissions were estimated to be approximately 2.54 million tonnes CO_2e, approximately 0.14 million tonnes less than the location-based emissions.

3.2.3. Purchased Steam Emissions

The Carseland Nitrogen facility and Cory Potash facility import steam from neighboring third-party cogeneration facilities as shown in Table 3.2-2.

Table 3.2-2: Cogeneration Facilities

Facility	Cogeneration Plant Owner	Link
Carseland Nitrogen	TC Energy	https://www.tcenergy.com/operations/power/carseland-cogeneration-plant/
Cory Potash	SaskPower	https://www.saskpower.com/our-power-future/our-electricity/electrical-system/system-map/cory-cogeneration-station

For the Carseland facility, Scope 2 emissions associated with net steam and heat transfers between Nutrien and the cogeneration facility, and Nutrien and an industrial neighbor are quantified following the Alberta TIER *Alberta Greenhouse Gas Quantification Methodologies* (as updated)[18].

Scope 2 emissions associated with imported steam for the Cory Potash facility are determined using the calculated emissions from combustion of the natural gas equivalent for net imported steam factoring in the cogen steam efficiency factor outlined in the Energy Services agreement between the Cory facility and the cogen facility.

[17] https://www.green-e.org/2021-residual-mix

[18] https://open.alberta.ca/publications/alberta-greenhouse-gas-quantification-methodologies

3.2.4. Renewable Energy and RECs

Nutrien does not currently purchase renewable energy or renewable energy certificates (RECs).

4.0 DATA MANAGEMENT

4.1 Data Collection

4.1.1. SAP EC

Except for Retail and Corporate facilities, all Consumption, Measurement and Emission data required to quantify Scope 1 and 2 emissions is collected in Nutrien's SAP EC (Environmental Compliance) data management system. Environmental managers or engineers at each Nitrogen, Potash, Phosphate, Specialty, and TD&L facility enter site-specific energy and emission data monthly. The deadline for entering monthly data is the end of the month following the month in which the emissions occurred (e.g., January Consumptions, Measurements and Emissions are due to be entered by the end of February). This allows time for facilities to receive monthly invoices or supplier reports.

In addition to collecting Consumption, Measurement and Emission information, SAP EC performs site-specific intermediate calculations (e.g., calculation of site-specific emission factors from measurement data) and final emission calculations. By having SAP EC perform emission calculations and manage calculation methods and emission factors, emission calculations can be controlled for consistency. All SAP EC data entry and calculation changes must be approved by the Nutrien Environmental Footprint team before being implemented by Nutrien's Information Technology Enterprise Applications Safety, Health and Environment team.

The specific information that is collected in SAP EC varies from site to site depending on site-specific operations, equipment, and data collection processes. Generally, it includes, but is not limited to:

- Natural gas volumes, energies, and heat values;
- Equipment fuel consumptions from plant data historians;
- Liquid fuel (diesel, gasoline, propane) purchase volumes;
- Invoiced electricity volumes;
- Calculated site-specific CO_2 emission factors;
- Reconciled production quantities;
- Fuel gas and process gas composition;
- Plant operating hours;
- Steam import / export quantities.

Where natural gas is metered at multiple pieces of equipment at a facility, facilities are to ensure the sum of individual metered natural gas consumptions total to supplier reported consumption volumes to ensure a full accounting of fuel consumption and associated emissions. Where natural gas consumption is not tracked by equipment, the invoiced natural gas volume is used to calculate combustion emissions.

Emissions associated with combustion of liquid fuels, such as diesel, gasoline, and propane, are based on monthly supplier invoices or delivery reports. Unless there is a regulatory requirement, facilities do not meter liquid fuel consumption or perform month-end inventory control reconciliations. As such, fuel consumption may not necessarily occur in the same month or calendar year the fuel was delivered. As this reporting process is consistently applied year to year, any possible discrepancies where fuel may be delivered in one reporting period but consumed in another, would not be material.

4.1.2. Emission factors

Emission factors used in SAP EC, as detailed in Section 3.1: Scope 1 Emissions above, are tracked and managed by the Environmental Footprint team. Emission factors in SAP EC are aligned with each facility's regulatory reporting requirements, and in the absence of regulatory reporting requirements, using the most relevant published federal, provincial, or state emission factors.

Emission factors will be updated in SAP EC by the Environmental Footprint team as needed. For facilities with regulatory reporting requirements, factors will only be updated when mandated by the applicable regulatory authority. For facilities that have regulatory reporting obligations against a stated regulatory baseline (e.g., Saskatchewan potash facilities), published emission factors will only be updated in SAP EC if the facility regulatory baseline is restated using updated emission factors.

Location-based grid electricity factors will be updated by the Environmental Footprint team as new factors are published. The Canada National Inventory Report (NIR) is typically published each April, after Nutrien's sustainability reporting deadline in Q1 of each year. As such, the most current factors in the 2021 NIR (published in April 2021) are used for quantifying 2021 reporting year emissions. These grid factors are based on 2019 emission data. U.S. EPA eGRID factors are updated as applicable using the latest published factor set.

4.1.3. Retail & Corporate Data Management

Emissions from corporate offices and the Retail locations (excluding North America manufacturing) are not subject to regulatory reporting requirements and data is not collected in SAP EC. Currently, this data is requested on an as-needed basis by the Environmental Footprint team directly from corporate office and retail facility managers. Emission sources, and data management for the corporate functions and retail locations are illustrated in Table 4.1-1 below.

Table 4.1-1: Data Management - Retail and Corporate Facilities

Emission Source	Activity Data Required	Data Source	Description
Scope 1 Emissions			
Stationary Combustion	Annual volume and type of fuel used	Siemens Navigator application (North American facilities), Fuel invoices	Nutrien stationary combustion includes fuel used for backup generators and seed drying in Brazil and as part of manufacturing process in Argentina.
Retail Fleet	Annual volume and type of fuel used.	FleetWave, fuel cards and invoices.	The Retail business has a mobile fleet comprised of on-road vehicles (i.e., SUVs, pick-up trucks) and equipment (sprayers, etc.). Fuel use from on-road vehicles is primarily tracked through FleetWave software. Fuel consumption from equipment is tracked using a variety of methods including but not limited to fuel cards and invoices. Retail's South American fleet fuel consumption invoices are tracked by individual country. To account for Retail business fleet fuel purchases that are made outside of the FleetWave system, emissions are marked up 15%.
Other Owned Mobile Combustion	Annual volume and type of fuel used.	Fuel –Invoices	Nutrien operates other fleet including corporate jets, tugs, and marine ocean-going vessels. These are tracked using fuel invoices.
Scope 2 Emissions			
Purchased Electricity	Annual electricity (kWh) usage	Siemens Navigator application, Utility Bills	Nutrien purchases electricity for its corporate offices and Retail locations. For sites where electricity consumption is not available in the Siemens Navigator application, Scope 2 emissions are estimated using the per site average as taken from Siemens Navigator.

4.2 Quality Control and Assurance

Data is entered into SAP EC ADL tables by facility Environmental Mangers, Engineers or Administrators each month. Data entry tables contain the full year of monthly data which allows for visual comparison to previous months to identify inconsistencies and errors. In addition, SAP EC ADL data entry is designed to facilitate copying and pasting of data from the data source or a data aggregation template, rather than manual entry to reduce the risk of data entry errors.

By February 15th of each year, facility data providers conduct a final review of the ADL entered data and 'Validate/Finalize' the data, locking it from further unauthorized changes.

Once the full reporting year of entered data has been validated by the facility data providers, the Environmental Footprint team will collect and review data in preparation for expected Environment, Social and Governance (ESG) reporting and other applicable disclosures. SAP EC data will be reviewed for completeness to confirm there are 12 monthly data points for each key GHG metric. Emissions will be compared with previous annual emission totals and production rates to identify anomalies and errors. In addition, SAP EC emission reports may be compared to regulatory submissions where applicable to ensure consistency.

On an annual basis, Nutrien will seek third-party limited assurance for the corporate Scope 1 and Scope 2 emissions.

4.2.1. Missing Data Quantification Methods

To the extent possible, Nutrien uses primary activity data when available. There may be exceptional periods where data is not available and therefore estimations are required. If a monthly data point or multiple data points are missing, the data providers will estimate the missing data based on process knowledge and best judgement using the most reasonable estimation method described below:

1. Use the mean of the data point immediately prior to and after the missing data point(s);
2. If engineering or operational judgement determines one of the data points immediately prior to or immediately after the missing data would not be representative, use the most representative data point immediately prior to OR immediately following the missing data point(s);
3. If engineering or operational judgement determines neither of the data points immediately prior to and immediately following the missing data is representative, use an average of representative past data expected to represent the operating conditions most closely during the period of missing data;
4. Use best engineering or operational judgement to estimate the missing data point(s) based on historical information and known operating conditions at the time of the missing data.

When engineering or operational judgement is unable to identify a single, best estimation method, the most conservative (i.e., highest emission) estimation will be used. Comments will be entered in the SAP EC ADL comment box if any data is required to be estimated.

4.2.2. Year-end Estimation

Where annual reporting deadlines require December data to be provided prior to the receipt of supplier reports, invoices, or other supporting information typically used to quantify emissions, December emissions will be estimated. Estimations will be based on recent production-based emission coefficients, or an 11-month year to date average emission. Specific estimation methodologies by operational grouping are described below. These methods are intended provide a reasonable estimate that will be representative of the true emissions.

4.2.2.1 Nitrogen Manufacturing

December Nitrogen manufacturing stationary combustion and process emission estimates will be made separately for nitric acid manufacturing emissions and

ammonia plus upgraded products manufacturing emissions. Estimates of December's emissions from these two nitrogen manufacturing processes will preferentially use November's emission coefficient (mass of GHG emission per mass of production) for each facility, and the Production Accounting verified December production volumes of ammonia and nitric acid for each production unit. Using November data for the reference coefficient will best approximate the operating conditions for that facility during the month of December. If the operating conditions during the reference month of November are not representative of operations in December (i.e., the difference in monthly production volumes between November and December is greater than 10%, potentially indicating reduced production or a production outage in one of the months), the 11-month year to date average emission coefficient will be used with the December production volume to estimate a December emission quantity for each facility. This estimation methodology will be used for both Scope 1 and Scope 2 emissions.

As mobile equipment emissions, fugitive emissions and venting, and wastewater emissions contribute less than 1% of Nitrogen manufacturing Scope 1 emissions, and are less dependent on production rates, the December emission estimate for these categories will be estimated using the 11-month year to date average monthly emission quantity.

4.2.2.2 Potash Manufacturing

The December Potash manufacturing emission estimate will preferentially use November's emission coefficient (mass of GHG emission per mass of production) for each facility, and the Production Accounting verified December potash production volumes for each Potash facility. Using November data for the reference coefficient will best approximate the operating conditions for that facility during the month of December. If the operating conditions during the reference month of November are not representative of operations in December (i.e., the difference in monthly production volumes between November and December is greater than 10%, potentially indicating reduced production or a production outage in one of the months), the 11-month year to date average emission coefficient will be used with the December potash production volume to estimate a December emission quantity for each facility. This estimation methodology will be used for both Scope 1 and Scope 2 emissions.

4.2.2.3 Phosphate Manufacturing

The December Phosphate manufacturing emission estimate will preferentially use November's emission coefficient (mass of GHG emission per mass of production) for each facility, and the Production Accounting verified December phosphoric acid / P_2O_5 production volumes for each Phosphate facility. Using November data for the reference coefficient will best approximate the operating conditions for that facility

during the month of December. If the operating conditions during the reference month of November are not representative of operations in December (i.e., the difference in monthly production volumes between November and December is greater than 10%, potentially indicating reduced production or a production outage in one of the months), the 11-month year to date average emission coefficient will be used with the December phosphoric acid production volume to estimate a December emission quantity for each facility. This estimation methodology will be used for both Scope 1 and Scope 2 emissions.

4.2.2.4 Other Operations

December Scope 1 and Scope 2 emissions for Specialty Products, TD&L, Corporate and Retail operations will use the 11-month year to date average emission quantity as the estimated December emission for these operational groupings. Combined, emissions from these operations contribute less than 4% of Nutrien's total Scope 1 and Scope 2 emissions as they have a much smaller emission footprint than the manufacturing operations.

4.2.3. Uncertainty

Emission quantification is conducted in a manner to minimize uncertainty. In addition to the quality assurance controls referenced above, the following measures are in place to ensure accuracy of stated emissions:

- Where applicable, energy consumptions are reconciled to invoice quantities, which are typically based on metering equipment subject to regulatory custody transfer standards. This will minimize uncertainties associated with input parameters.
- Nutrien's Canadian and U.S. Nitrogen manufacturing facilities, Saskatchewan Potash facilities and U.S. Phosphate operations at Aurora, NC and White Springs, FL are subject to annual federal regulatory reporting requirements. Canadian facilities that emit over 10 kilotonnes of CO_2e per year must report emissions under the Greenhouse Gas Regulatory Reporting Program (GHGRP). U.S. facilities that emit over 25 kilotonnes of CO_2e per year must report specified emissions under the 40 CFR Part 98 Greenhouse Gas Reporting Program. In both jurisdictions, regulations mandate the emission quantification methods and record keeping requirements for annual emission reports ensuring emissions are quantified accurately and consistently. More than 65 percent of Nutrien's Scope 1 emissions are subject to jurisdictional regulatory reporting requirements.
- The Alberta Nitrogen manufacturing facilities and Saskatchewan Potash facilities, representing more than 25 percent of Nutrien's total Scope 1 emissions, are subject to provincially legislated emission pricing and trading regulations,

including annual third-party verification of Scope 1 emissions to a Reasonable Level of Assurance.

- Inventory parameters are collected, and emissions are calculated using monthly data, which allows trending of monthly as well as annual emissions and energy consumptions to identify anomalous data points. Production-based intensities can be studied to further identify anomalous trends.

5.0 REVISION LOG

Revision	Date	Author	Change Notes
0	25-March-21	Footprint Team	Executive Summary - Initial Issue
1	05-February-2022	Footprint Team	Updated Section 3.1.4.to include new Retail methodology and Table 4.11 to include use of Siemens Navigator application. Added Section 4.2.2 describing the year-end December emission estimation methodology. General updates for currency of external references.