st marys
cement

# Environmental Product Declaration

## St Marys Cement, St. Marys Plant

# An Environmental Product Declaration
## In accordance with ISO 14025 and 21930

## About this EPD

This document is a Type III Environmental Product Declaration (EPD) describing various bulk cements produced by Votorantim Cimentos North America (VCNA) - St Marys Cement at its St. Mary's, ON cement plant. The results of the underlying LCA are computed with the North American (N.A.) version of the Global Cement and Concrete Association (GCCA) Industry EPD tool for cement and concrete [1]. This tool and the underlying LCA model and database have been previously verified to conform to the prevailing sub-product category rule (PCR) [2], ISO 21930:2017 (the core PCR) [3] as well as ISO 14025:2006 [4] and ISO 14040/44:2006 LCA standards [5], [6]. This Environmental Product Declaration (EPD) is intended for business-to-business audiences.

## General Summary

**EPD Commissioner and Owner**

**VCNA - St Marys Cement**
55 Industrial St.
Toronto, ON M4G 3W9
http://www.stmaryscement.com

St Marys provided both LCI and meta-data for clinker production and cement manufacture for reference year 2024. St Marys also completed the LCA modeling within the GCCA EPD tool. The owner of the declaration is liable for the underlying information and evidence.

Product Group and Name

*Cement, UN CPC 3744.*

Product Definition

***Blended cement*** is a hydraulic cement consisting of two or more inorganic constituents (at least one of which is not portland cement or portland cement clinker) which separately or in combination contribute to the strength gaining properties of the cement, (made with or without other constituents, processing additions and functional additions, by intergrinding or other blending) (ASTM C595, AASHTO M 240, CSA A3001) [7].

- Type IL GUL - is a Portland-limestone cement (PLC) and is a hydraulic cement in which the interground limestone content is more than 5% but less than or equal to 15% by mass of the blended cement.
- Type IL (HE) / HEL - is a hydraulic high early cement in which the interground limestone content is more than 5% but less than or equal to 15% by mass of the blended cement.
- GULb-S - is a blended hydraulic Portland-limestone cement in which the limestone content is more than 5% but less or equal to 15% by mass of the Portland-limestone constituent containing interground slag cement.
- Type IT (S) (L) - is a ternary blended hydraulic Portland-limestone cement in which the limestone content is more than 5% but less or equal to 15% by mass containing interground slag cement.
- Type IP / GUbSF – is a blended hydraulic Portland silica fume cement in which the silica fume content is 8% by mass of the blended cement.

***Masonry cement*** is hydraulic cement manufactured for use in mortars for masonry construction or in plasters, or both, which contains a plasticizing material and, possibly, other performance-enhancing addition(s).

- Types N, S, M (ASTM C91, CSA A3002) [8].

| | |
|---|---|
| Product Category Rules (PCR) | NSF International, Product Category Rules for Preparing an Environmental Product Declaration for Portland, Blended Hydraulic, Masonry, Mortar, and Plastic (Stucco) Cements, V3.2, September 2021 [2]. |
| Date of Issue & Validity Period | 12/31/2025 – 5 years through 12/30/2030 |
| Declared Unit | 1 metric ton of cement |

## EPD and Project Report Information

| | |
|---|---|
| Program Operator | National Ready Mixed Concrete Association (NRMCA)<br>66 Canal Center Plaza, Suite 250<br>Alexandria, VA 22314<br>https://www.nrmca.org |
| Declaration Number | NRMCAEPD: 20277 |
| Declaration Type | Cradle-to-gate (modules A1 to A3). Facility and product-specific. |
| Applicable Countries | United States and Canada. |
| Product Applicability | Portland cement is the basic ingredient of concrete. Concrete, one of the most widely used construction materials in the world, is formed when portland cement creates a paste with water that binds with sand and rock to harden. |
| Content of the Declaration | This declaration follows Section 9; Content of an EPD, NSF International, Product Category Rules for Preparing an Environmental Product Declaration for Portland, Blended Hydraulic, Masonry, Mortar, and Plastic (Stucco) Cements, V3.2, September 2021 [2]. |
| Additional Explanatory Material | Manufacture Representative: Shawn Kalyn (shawn.kalyn@vcimentos.com).<br>This EPD was prepared using the pre-verified GCCA EPD Tool. |
| This EPD was independently verified by NRMCA in accordance with ISO 14025 and the reference PCR:<br><br>Internal __ External X | Joseph Geibig,<br>joseph@ecoform.com<br>Ecoform |

Athena Sustainable Materials Institute

| | |
|---|---|
| EPD Prepared by: | Athena Sustainable Materials Institute<br>280 Albert Street, Suite 404<br>Ottawa, Ontario, Canada K1P 5G8<br>info@athenasmi.org<br>www.athenasmi.org |

st marys cement

# An Environmental Product Declaration
## In accordance with ISO 14025 and 21930

NRMCA CERTIFIED EPD

## PCR Information

| | |
|---|---|
| Program Operator | NSF International |
| Reference PCR | Product Category Rules for Preparing an Environmental Product Declaration for Portland, Blended Hydraulic, Masonry, Mortar, and Plastic (Stucco) Cements, V3.2, September 2021 [2]. |
| PCR review was conducted by: | Thomas P. Gloria, PhD (Chair), Industrial Ecology Consultants,<br>Mr. Jack Geibig, EcoForm<br>Mr. Bill Stough, Sustainable Research Group |

## St Marys Cement & Production Facility

St Marys Cement plant is part of the North American operations of international building materials supplier, Votorantim Cimentos. As one of the top cement producers in the world, Votorantim Cimentos operates in 9 countries in North America, South America, Europe, Asia, and Africa, with over 30 million tons of cement sold per annum globally. Votorantim Cimentos and St Marys Cement symbolize a long heritage of excellence and commitment to both the construction industry and a sustainable future. St Marys Cement manufactures a variety of cement for different purposes - normal, high-early strength, low heat hydration, and sulphate-resisting as well as other supplementary cementitious products - in bulk and as bagged product. St Marys Cement supplies cement to customers across the Great Lakes region through an integrated, intermodal distribution network serviced by barge, rail and truck. St Marys Cement plant was founded in 1912 in the town of St. Marys, Ontario. Today, the plant is using Alternative Low Carbon Fuels (ALCF) and Supplementary Cementitious Materials (SCM) in the manufacturing of hydraulic cements.

Facility Name: St. Marys Cement Plant
585 Water St
St. Mary's, Ontario
N4X 1B6

## Product Description

This EPD reports environmental transparency information for High Early Cement, Portland Limestone Cement, Blended Cement, and Masonry Cement produced by VCNA - St Marys Cement at its St. Mary's ON plant. Cements are hydraulic binders and are manufactured by grinding cement clinker and other main or minor constituents into a finely ground, usually grey colored mineral powder. When mixed with water, cement acts as a glue to bind together the sand, gravel or crushed stone to form concrete, one of the most durable, resilient and widely used construction materials in the world. The Table below sets out each cement type constituents and applicable standards.

st marys cement

# An Environmental Product Declaration
## In accordance with ISO 14025 and 21930

NRMCA CERTIFIED EPD

## Products and Standard

| Inputs | PLC Type IL, GUL | Blended Type IT(S15)(L10), GULb-15S | Blended Type IP, GUbSF | Blended Type IL(8)(HE), HEL | Masonry Type N | Masonry Type S |
|---|---|---|---|---|---|---|
| Clinker | 80% | 70% | 86% | 87% | 39% | 56% |
| Gypsum | 4% | 4% | 4% | 5% | 4% | 5% |
| Limestone/ IPA* | 16% | 11% | 3% | 8% | 57% | 39% |
| Silica Fume | 0% | 0% | 7% | 0% | 0% | 0% |
| Slag | 0% | 15% | 0% | 0% | 0% | 0% |
| Others | <1% | <1% | <1% | <1% | <1% | <1% |
| **Total** | 100% | 100% | 100% | 100% | 100% | 100% |

*IPA, Inorganic Process Addition

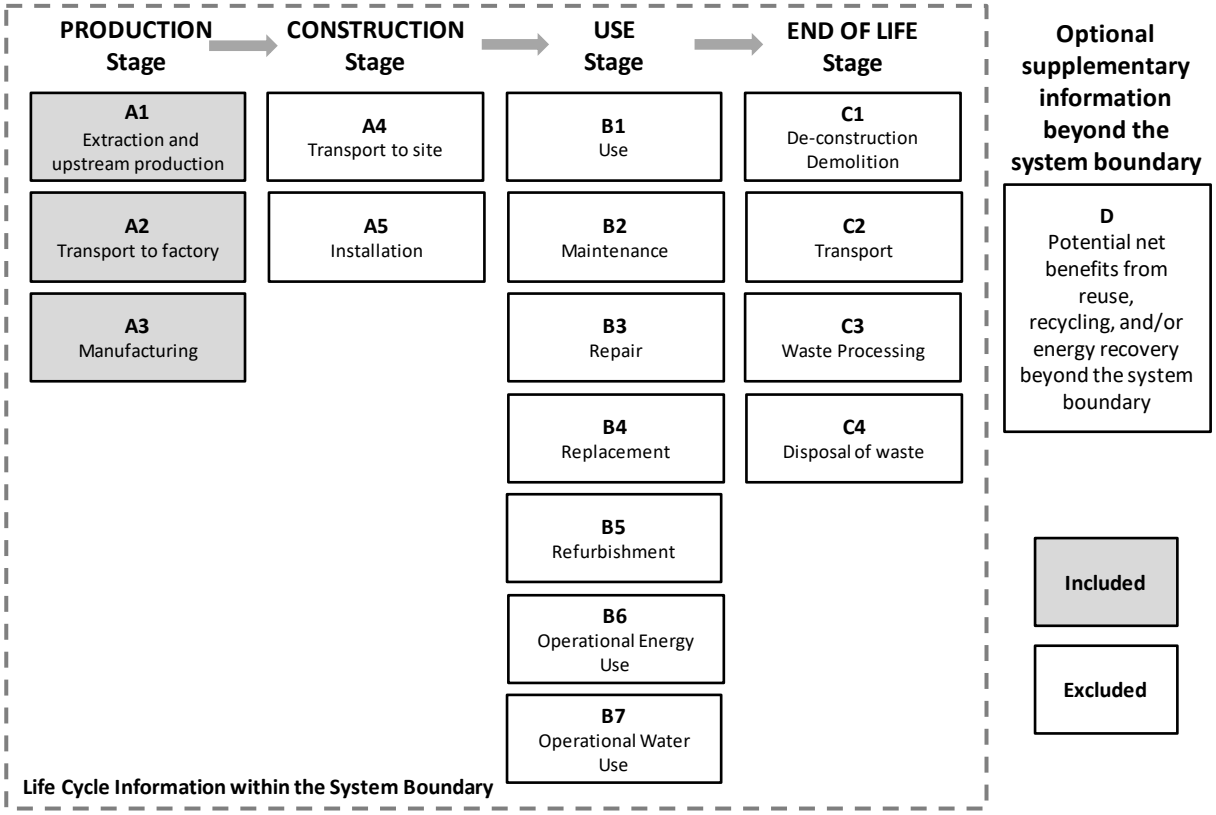
**Applicable Standards:**
ASTM C595 / C595M, AASHTO M240, CSA A3001– Standard Specification for Blended Hydraulic Cement.
ASTM C91, CSA A3002 – Standard Specification for Masonry Cement.

## Declared Unit

The declared unit is one metric tonne of cement.

## System Boundary

This EPD is a cradle-to-gate EPD covering the production stage (A1-A3) as depicted in the figure below. The production stage includes extraction of raw materials (cradle) through the manufacture of cements ready for shipment (gate). The St Marys cement plant ships its cement products in bulk or packaged in paper bags.




**Items *excluded* from the system boundary include**:

- Production, manufacture, and construction of manufacturing capital goods and infrastructure
- Production and manufacture of production equipment, delivery vehicles, and laboratory equipment
- Personnel-related activities (travel, furniture, and office supplies)
- Energy and water use related to company management and sales activities that may be located either within the factory site or at another location

**Cut-off Criteria**

The cut-off criteria for all activity stage flows considered within the system boundary conform with section 7.1.8 of 21930. Specifically, all known mass and energy flows are included in the analysis. Material or energy flows within the product boundary that are less than 1% were included where sufficient data were available, and the material was considered to pose significant environmental impact. No collected core process data are intentionally excluded from the study. Cumulative excluded material inputs and energy flows did not exceed 5% of the total. All input/output data required were collected and included in the LCI modelling. No substances with hazardous and toxic properties that pose a concern for human health and/or the environment were identified in the framework of this EPD.

**Data Collection**

Gate-to-gate input/output flow data were collected for the following processes for the reference year 2024:

- clinker production and cement manufacture – St. Mary's, ON

## Allocation Rules

Allocation of inventory flows and subsequently environmental impact is relevant when assets are shared between product systems. The allocation method prescribed by the PCR [2] is applied in the underlying LCA model. The sub-category PCR recognizes fly ash, furnace bottom ash, bypass dust, mill scale, polluted soils, spent catalyst, aluminum oxide waste, silica fume, granulated blast furnace slag, iron rich waste, cement kiln dust (CKD), flue gas desulfurization (FGD) gypsum, calcium fluoride rich waste and postconsumer gypsum as recovered materials and thus, the environmental impacts allocated to these materials are limited to the treatment and transportation required to use as a cement material input. Further, used tires, plastics, solvents, used oil and oily waste, coal/carbon waste, roofing asphalt, household refuse-derived waste, non-hazardous liquid waste, industrial sludge, and agricultural waste are considered non-renewable and/or renewable secondary fuels. Only the materials, water, energy, emissions, and other elemental flows associated with reprocessing, handling, sorting and transportation from the point of the generating industrial process to their use in the production process are considered. All emissions from combustion at the point of use are considered. For co-products, no credit is considered, and no allocation is applied. See the LCA model and LCA database reports of the N.A. version of GCCA's Industry Tool for EPDs of cement and concrete for more information [12 &13].

## Data Quality Assessment

| Data Quality Requirements | Description |
|---|---|
| **Technology Coverage** | LCI data represents the prevailing technology in use at the St. Mary's, ON facility.<br>The St. Mary's, ON plant utilizes *a dry with preheater kiln technology*.<br>*Technological representativeness is characterized as "high".* |
| **Geographic Coverage** | The geographic region considered is the U.S and Canada.<br>*Geographical representativeness is characterized as "high".* |
| **Time Coverage** | Activity (primary) data are representative of 2024 calendar year (12 months).<br>- St. Mary's, ON clinker production,<br>- St. Mary's, ON cement manufacturing,<br>- In-bound/ out-bound transportation data - primary data collected for St. Mary's, ON cement manufacturing plant.<br>*Temporal representativeness is characterized as "high".* |
| **Completeness** | All relevant, specific processes, including inputs (raw materials, energy and ancillary materials) and outputs (emissions and production volume) were considered and modeled in the GCCA Tool to complete production profile for St. Mary's, ON cement products. St. Mary's, ON operates an emissions monitoring system and reports emissions to the National Pollution Release Inventory. The data for 2024 were drawn on in the completion of this EPD. The completeness of the foreground process chain in terms of process steps is rigorously assessed. |
| **Consistency** | To ensure consistency, cross checks of the energy demand and the calculated raw meal to clinker ratio against ranges reported in the WBCSD Cement Sustainability Initiative, Cement CO2 and Energy Protocol, v3.1 December, 2013 were conducted [14]. The LCA team conducted mass and energy balances at the facility level and selected process levels to maintain a high level of consistency. |

| | |
|---|---|
| **Reproducibility** | External reproducibility is not possible as the background report is confidential. |
| **Transparency** | Activity datasets are disclosed in the project LCI compilation, and the background reports generated by the GCCA Tool. |
| **Uncertainty** | A *sensitivity check* was conducted relative to the ACA industry average. The variation across significant inputs were found to be well within the expected range and hence, there is high degree of confidence in the results. |

## Life Cycle Impact Assessment Results: St. Mary's, ON Cements

This section summarizes the production stage life cycle impact assessment (LCIA) results including resource use and waste generated metrics based on the cradle-to-gate life cycle inventory inputs and outputs analysis. The results are calculated based on 1 metric ton of each cement type as produced at the St. Marys plant. *It should be noted that LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks [2], [3]. Further, a large number of LCA impact categories and inventory items are still emerging or under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting results for these categories – identified with an "*"* [2].

Only EPDs prepared from cradle-to-grave life-cycle results and based on the same function, quantified by the same functional unit, and taking account of replacement based on the product reference service life (RSL) relative to an assumed building service life, can be used to assist purchasers and users in making informed comparisons between products [3]. Environmental declarations from different programs may not be comparable [6]. EPDs are comparable only if they comply with ISO 21930, use the same, sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works [2].

**Production stage EPD Results (Table 1 of 2): St. Mary's, ON – per Metric Ton**

| Impact category and inventory indicators | Unit | PLC Type IL, GUL | Blended Type IP, GUbSF | Blended Type IT (S) (L), GULb-S |
|---|---|---|---|---|
| Global warming potential, GWP 100, IPCC 2013 (AR5) | kg $CO_2$ eq | **727.4** | **780.90** | **641.10** |
| Ozone depletion potential, ODP | kg CFC-11 eq | **2.27E-05** | **2.71E-5** | **2.16E-5** |
| Acidification potential, AP | kg $SO_2$ eq | **2.48** | **2.66** | **2.20** |
| Eutrophication potential, EP | kg N eq | **0.15** | **0.17** | **0.15** |
| Smog formation potential, SFP | kg $O_3$ eq | **41.24** | **43.95** | **36.26** |
| Abiotic depletion potential for non-fossil mineral resources, ADP elements* | kg Sb eq | **1.56E-04** | **1.92E-04** | **1.51E-04** |
| Abiotic depletion potential for fossil resources, ADP fossil* | MJ, net calorific value | **4053** | **4591** | **3720** |
| Renewable primary resources used as an energy carrier (fuel), $RPR_E$* | MJ, net calorific value | **231.50** | **284.90** | **224.80** |
| Renewable primary resources with energy content used as material, $RPR_M$* | MJ, net calorific value | **6.85** | **0.60** | **1.72E-02** |
| Non-renewable primary resources used as an energy carrier (fuel), $NRPR_E$* | MJ, net calorific value | **4069** | **4607** | **3734** |

| | | | | |
|---|---|---|---|---|
| Non-renewable primary resources with energy content used as material, $NRPR_M$* | MJ, net calorific value | **0.97** | **0.08** | **2.39E-03** |
| Secondary materials, SM* | kg | **143.10** | **190.70** | **290.90** |
| Renewable secondary fuels, RSF* | MJ, net calorific value | **0** | **0** | **0** |
| Non-renewable secondary fuels, NRSF* | MJ, net calorific value | **334.20** | **356.0** | **290.50** |
| Net use of freshwater, NFW* | $m^3$ | **0.79** | **0.94** | **0.75** |
| Hazardous waste disposed, HWD* | kg | **0** | **0** | **0** |
| Non-hazardous waste disposed, NHWD* | kg | **0.11** | **0.11** | **0.049** |
| High-level radioactive waste, conditioned, to final repository, HLRW* | kg | **x[1])** | **x[1])** | **x[1])** |
| Intermediate- and low-level radioactive waste, conditioned, to final repository, ILLRW* | kg | **x[1])** | **x[1])** | **x[1])** |
| Components for re-use, CRU* | kg | **0** | **0** | **0** |
| Materials for recycling, MFR* | kg | **7.92E-02** | **8.18E-02** | **7.39E-02** |
| Materials for energy recovery, MER* | kg | **0** | **0** | **0** |
| Recovered energy exported from the product system, EE* | kg | **0** | **0** | **0** |
| Global warming potential - biogenic, $GWP_{bio}$* | kg $CO_2$ eq | **0.56** | **0.70** | **0.53** |
| Emissions from calcination* | kg $CO_2$ eq | **454.90** | **484.90** | **395.40** |
| Emissions from combustion of waste from renewable sources* | kg $CO_2$ eq | **0** | **0** | **0** |
| Emissions from combustion of waste from non-renewable sources* | kg $CO_2$ eq | **0** | **0** | **0** |

[1)] x – The GCCA EPD Tool does not support these indicators.

*) Use caution when interpreting results for these categories

**Production stage EPD Results (Table 2 of 2): St. Mary's, ON – per Metric Ton**

| Impact category and inventory indicators | Unit | Blended Type IL (HE), HEL | Masonry Type N | Masonry Type S |
|---|---|---|---|---|
| Global warming potential, GWP 100, IPCC 2013 (AR5) | kg $CO_2$ eq | **786.50** | **377.80** | **524.00** |
| Ozone depletion potential, ODP | kg CFC-11 eq | **2.58E-5** | **1.54E-05** | **1.91E-05** |
| Acidification potential, AP | kg $SO_2$ eq | **2.71** | **1.38** | **1.83** |
| Eutrophication potential, EP | kg N eq | **0.18** | **0.14** | **0.15** |
| Smog formation potential, SFP | kg $O_3$ eq | **44.61** | **22.55** | **30.21** |
| Abiotic depletion potential for non-fossil mineral resources, ADP elements* | kg Sb eq | **1.78E-4** | **1.56E-04** | **1.80E-04** |

| | | | | |
|---|---|---|---|---|
| Abiotic depletion potential for fossil resources, ADP fossil* | MJ, net calorific value | **4509** | **2684** | **3421** |
| Renewable primary resources used as an energy carrier (fuel), $RPR_E$* | MJ, net calorific value | **270.70** | **319.90** | **292.70** |
| Renewable primary resources with energy content used as material, $RPR_M$* | MJ, net calorific value | **0** | **323.10** | **170.70** |
| Non-renewable primary resources used as an energy carrier (fuel), $NRPR_E$* | MJ, net calorific value | **4526** | **2653** | **3412** |
| Non-renewable primary resources with energy content used as material, $NRPR_M$* | MJ, net calorific value | **0** | **45.65** | **24.14** |
| Secondary materials, SM* | kg | **137.40** | **82.47** | **107.00** |
| Renewable secondary fuels, RSF* | MJ, net calorific value | **0** | **0** | **0** |
| Non-renewable secondary fuels, NRSF* | MJ, net calorific value | **360.50** | **162.70** | **232.10** |
| Net use of freshwater, NFW* | $m^3$ | **0.91** | **0.75** | **0.86** |
| Hazardous waste disposed, HWD* | kg | **0** | **0** | **0** |
| Non-hazardous waste disposed, NHWD* | kg | **0.06** | **0.08** | **0.09** |
| High-level radioactive waste, conditioned, to final repository, HLRW* | kg | **x[1])** | **x[1])** | **x[1])** |
| Intermediate- and low-level radioactive waste, conditioned, to final repository, ILLRW* | kg | **x[1])** | **x[1])** | **x[1])** |
| Components for re-use, CRU* | kg | **0** | **0** | **0** |
| Materials for recycling, MFR* | kg | **0.04** | **0.06** | **0.07** |
| Materials for energy recovery, MER* | kg | **0** | **0** | **0** |
| Recovered energy exported from the product system, EE* | kg | **0** | **0** | **0** |
| Global warming potential - biogenic, $GWP_{bio}$* | kg $CO_2$ eq | **0.66** | **0.46** | **0.55** |
| Emissions from calcination* | kg $CO_2$ eq | **490.70** | **221.40** | **316.00** |
| Emissions from combustion of waste from renewable sources* | kg $CO_2$ eq | **0** | **0** | **0** |
| Emissions from combustion of waste from non-renewable sources* | kg $CO_2$ eq | **0** | **0** | **0** |

[1]) x – The GCCA EPD Tool does not support these indicators.

*) Use caution when interpreting results for these categories

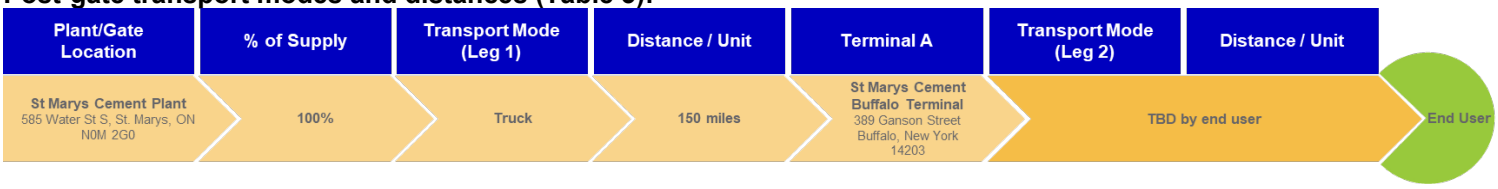
## LCA Interpretation

The Manufacturing module (A3) drives most of the potential environmental impacts. Manufacturing impacts are primarily driven by energy use (electricity and thermal fuels) used during the pyroprocessing of limestone in the production of clinker. Clinker content in cement similarly defines the relative environmental profile of the final cement product. Raw material extraction (A1) is the second largest contributor to the Production stage EPD results, followed by transportation (A2).

## Additional Environmental Information

St Marys Cement Plant has two locations for distribution. The first is the plant itself at St. Mary's, ON which has all products listed on this EPD. The second distribution location is the Buffalo Terminal, in Buffalo, NY which supplies bulk PLC Type IL, GUL and Blended Type IT (S) (L), GULb-S. Alternative Terminals not listed here can be provided upon request. Table 3 shows the St Marys Cement Plant, St. Mary's, ON, post-gate transport mode(s) and distances to terminal(s).

**Post-gate transport modes and distances (Table 3):**




Recognizing that sustainability is a journey, we are taking another step toward building an increasingly sustainable company and thereby creating long-term value for our stakeholders. This important step is now encapsulated in the publication of our 2030 commitments. In addition to being aligned with our way of being, our 2030 commitments also encompass our climate ambition for 2050. Their development considered an in-depth assessment of megatrends such as demographic changes; globalization and future markets; climate change challenges; and innovation and technology dynamics and their impact on the building materials industry. These commitments aim to align our entire operation with the current and future needs of society, thereby generating shared value and producing a positive impact on the value chain. Please read more about our 2030 commitments at our 2024 Integrated Report at: https://www.votorantimcimentos.com/integrated-report/?origin=search Please note our integrated report is updated every year.

*Environmental Protection Manufacture and Equipment*
St Marys manufacturing facilities comply with both U.S. and Canadian environmental regulations. The St. Mary's plant monitors its emissions and report these emissions to the National Pollution Release Inventory managed by Environment and Climate Change Canada - https://www.canada.ca/en/environment-climate-change/services/national-pollutant-release-inventory/report.html

ISO 9001 Certified. ISO 9001 certification means that this plant conforms to an international standard primarily concerned with Quality Management. The St. Mary's Plant adheres to these high standards with regard to fulfilling our customer's quality requirements, following applicable regulatory requirements, while aiming to enhance customer satisfaction and achieve continual improvement of its performance in pursuit of these objectives.

ISO 14001 Certified. ISO 14001 is the internationally recognized standard for environmental management of businesses. Certification to this system provides order and consistency for managing activities at the St. Mary's Plant that may have an impact on the environment. ISO 14001 ensures the effectiveness of prescribed controls; through the allocation of resources, assignment of responsibility and ongoing evaluation of environmental practices, procedures and processes.

ISO 45001 Certified. ISO 45001 is an Occupational Health and Safety Management System. Certification to this standard ensures that the St. Mary's Plant is able to control occupational health and safety risks which ensure the well-being of our most valuable asset – our people.

ISO 50001 Certified. ISO 50001 is an Energy Management Standard. This standard is built on the same continual improvement model as the other high-profile ISO Systems. The St Marys Cement Plant uses its certification to ISO 50001 as

the framework for establishing the systems and processes necessary to improve energy performance and efficiency while reducing or optimizing energy consumption.

Energy Star Certified. The St Marys Cement Plant received ENERGY STAR® for Industry Certification in 2023 and 2024. This certification recognizes facilities that rank in the top quartile for energy performance within the cement manufacturing sector across Canada and the United States. https://natural-resources.canada.ca/energy-efficiency/energy-star/industry/energy-star-industry#registered

## References

1. Global Cement and Concrete Association (GCCA) 2023. *N.A. version of Industry EPD tool for Cement and Concrete*. https://concrete-epd-tool.org/
2. NSF International, Product Category Rule Environmental Product Declarations, PCR for Portland, Blended, Masonry, Mortar, and Plastic (Stucco) Cements, V3.2, September 2021.
3. ISO 21930:2017 Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services.
4. ISO 14025:2006 Environmental labeling and declarations - Type III environmental declarations - Principles and procedures.
5. ISO 14040:2006/Amd1:2020 Environmental management - Life cycle assessment - Principles and framework.
6. ISO 14044:2006/Amd1:2017/Amd2:2020 Environmental management - Life cycle assessment - Requirements and guidelines.
7. ASTM C595 / C595M, AASHTO M 85, CSA A3001– Standard Specification for Blended Hydraulic Cement.
8. ASTM C91, CSA A3002 – Standard Specification for Masonry Cement.
9. NSF International, Product Category Rule Environmental Product Declarations, PCR for Concrete, February 2020.
10. ISO 14020:2000 Environmental labels and declarations - General Principles.
11. ISO 14021:2016 Environmental labels and declarations - Self-declared environmental claims (Type II environmental labelling).
12. GCCA and PCA, *GCCA Industry EPD Tool for Cement and Concrete (v4.2), LCA Model, North American version*, Prepared by Quantis, December 2023.
13. Global Cement and Concrete Association (GCCA). *LCA Database, North American version*, Prepared by Quantis, December, 2023.
14. WBCSD CSI 2013: $CO_2$ and Energy Protocol Version 3.1 of 9 December 2013. https://www.cement-co2-protocol.org/en/
15. GCCA and PCA, GCCA Industry EPD Tool for Cement and Concrete (v4.2), *Users Manual, North American version*, Prepared by Quantis, December 2023.