ENVIROCore 201 EPD

SOUTH ISLAND – DUNEDIN– ENVIROCORE 201

In accordance with ISO 14025 and EN15804:2012+A2:2019/AC:2021

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Regional Program Operator: EPD Australasia Limited | www.epd-australasia.com

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Geographical Scope: New Zealand

HOLCIM

EPD INTERNATIONAL EPD SYSTEM

AUSTRALASIA EPD® INTERNATIONAL EPD SYSTEM

ECO PLATFORM EPD VERIFIED

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com.

PROGRAM-RELATED INFORMATION AND VERIFICATION

CEN standard EN 15804:2012+A2:2019/AC:2021 served as the core PCR

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Product category rules	c-PCR-001 Cement and Building Lime (EN16908), 2024-04-30 PCR 2019:14 Construction Products and Construction Services, Version 1.3.4, 2024-04-30	
PCR review was conducted by	The Technical Committee of the International EPD® System. Chair: Claudia A. Peña. Contact via info@environdec.com	
Independent third-party verification of the declaration and data, according to ISO 14025:2006:	☒ EPD process certification ☐ EPD verification	
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Programme-related information and verification

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Revision Number	Revision Date	Description of Changes
1.0	2025-06-13	N/A

INTRODUCTION

Cement is a key ingredient in the most commonly used building material in the world. Each year in New Zealand, over 1.5 million tonnes of traditional cement is used, generating 1.23 million tonnes of CO_2.[1]

This clearly demonstrates both the essential need for construction materials now and in the future, as well as the necessity for the construction materials industry to be a leading part of the solution addressing climate change.

With Aotearoa committed to net zero by 2050, Holcim New Zealand is building progress for a lower carbon footprint in the built environment.

For us, building progress means a complete range of green, high-performance, and specialty cement and cement binders suitable for Aotearoa's homes, buildings, and infrastructure. It means advice, tools and resources to help you specify your next project with confidence. It means solutions that are right for you each and every time.

Together, we can build better to help decarbonise Aotearoa.

[1] International Energy Agency (IEA) report *"The Future of Cement in a Carbon-Constrained World"* (2018); Cement and Concrete Association of New Zealand - Key Facts and Figures; The International Energy Agency (IEA) Cement Technology Roadmap 2009 estimates that the production of 1 tonne of cement results in the emission of approximately 0.82 tonnes of CO_2. Using the conversion factor of 0.82 tonnes of CO_2 per tonne of cement, the production of 1.5 million tonnes of cement in New Zealand would result in the emission of approximately 1.23 million tonnes of CO_2. The actual amount of CO_2 emissions may vary.

ABOUT HOLCIM NEW ZEALAND

BUILDING PROGRESS

Holcim New Zealand (NZ) is a leading solutions provider for your design and construction needs in New Zealand, dating back to 1888. Today, we supply essential construction materials from import terminals, depots, and quarries to customers. Our cement and aggregates are used in ready-mix concrete, engineered precast concrete, and prestressed concrete solutions for various projects throughout the country.

This EPD provides our stakeholders with confidence about the environmental impact of our products.

Globally, Holcim is 60,000 people around the world who are passionate about building progress for people and the planet through four business segments: Cement, Ready-Mix Concrete, Aggregates and Solutions & Products.

Sustainability is at the core of our global strategy, with our industry's first 2030 and 2050 net-zero targets validated by the Science Based Targets initiative for all scopes. We are leading the transition towards low-carbon construction and driving a circular economy by providing materials and solutions that are re-shaping the way our industry builds. Holcim NZ has developed a range of green cements and cement replacements specifically for the New Zealand market.

HOLCIM NZ'S CEMENT AT A GLANCE

Holcim NZ provides project-specific, on-demand Environmental Product Declarations (EPDs) to customers. This capability represents a significant step in Holcim NZ's sustainability journey and embodies our multi-disciplinary approach to embedding sustainability into our organisation and operations. With the introduction of our cement blends, third-party verified data will underpin our capability to work with our customers from tender through to design and construction to optimise sustainability performance.

Holcim NZ's cement blend is backed by an EPD Process Certification. Our EPD Process Certification is a stamp of approval to produce compliant EPDs in-house, opening up significant capability and flexibility in producing and using life cycle impact data to inform our operations and our customers.

To gain our EPD Process Certification, Holcim invested in embedding Life Cycle Assessment (LCA) into our systems and processes. We have satisfied a rigorous, third-party evaluation in accordance with the relevant ISO standards and guidelines of the International EPD Program and EPD Australasia.[2]

This EPD has been developed using our EPD Process Certification for ENVIROCore 201 with production occurring at Dunedin.

[2] 5-6 and 8-12 in the References section.

LCA INFORMATION

Declared Unit

1 tonne of Supplementary Cementitious Material (SCM) - Fly Ash.

Manufacturing Location

Dunedin Depot, Dunedin, New Zealand.

Reference Service Life (RSL)

The RSL is not specified as the scope is from cradle to gate (modules A1-A3).

Time Representativeness

The plant data for the LCA is based on 2021 calendar year production data. The mix data for the LCA is based on 2023 calendar year production data.

Databases and LCA Software Used

SimaPro® LCA software (v 10.2) was used for the LCA modelling which developed the LCA Calculator, used as per the certified EPD Process. It uses background data from:

- Ecoinvent 3.11 (2024) database was used as the primary source for inventory data. At the time of this report, this ecoinvent database version is less than 1 year old.

The environmental impacts modelled from the existing EPDs do not include impacts for the additional Green Star (v1.3) impact categories included in the environmental impact tables. The following impact categories were calculated manually for the foreground data:

- Use of renewable primary energy resources used as raw materials
- Use of non-renewable primary energy, excluding non-renewable primary energy resources used as raw materials
- Use of secondary materials
- Use of renewable secondary fuels
- Use of non-renewable secondary fuels

LCA Methodology

This EPD has been produced in conformance with the requirements of:

- c-PCR-001 Cement and Building Lime (EN16908)
- Product Category Rules (PCR) 2019:14 v1.3.4
- EN 15804+A2
- General Program Instructions (GPI) v5.0
- Instructions of EPD Australasia v4.2
- EN 14040 and EN 14044

Allocation

Allocation was necessary to proportion inputs and outputs to intermediate flows and processes at the plant level. As much as possible, intermediate flows were allocated physically based on the weight of cement.

Fly ash and ground granulated blast furnace slag were allocated economically. Please refer to the “Recycled Material” section for further detail.

Cut-Off Criteria

No flows were excluded on the basis of cut-off criteria except for the infrastructure and personnel-related impacts.

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Data Quality

Schemes for data quality assessment of generic and specific data from EN 15804+A2 are used to perform this data quality assessment activity.

Data quality for the foreground data was assessed in terms of geographic, technical and temporal representativeness. All data sources were scored good or very good. Background data sources were also assessed with respect to their timeliness, with all data sources being updated within the 10 years required under PCR 2019:14.

Upstream processes

The upstream processes include those involved in Module A1 – raw material supply. This module includes:

- Extraction, transport, and manufacturing of raw materials.
- Generation of electricity from primary and secondary energy resources, also including their extraction, refining and transport for Modules A1.

Core processes

The core processes include those involved in Module A2 and Module A3 – upstream raw material transport and manufacturing. They include:

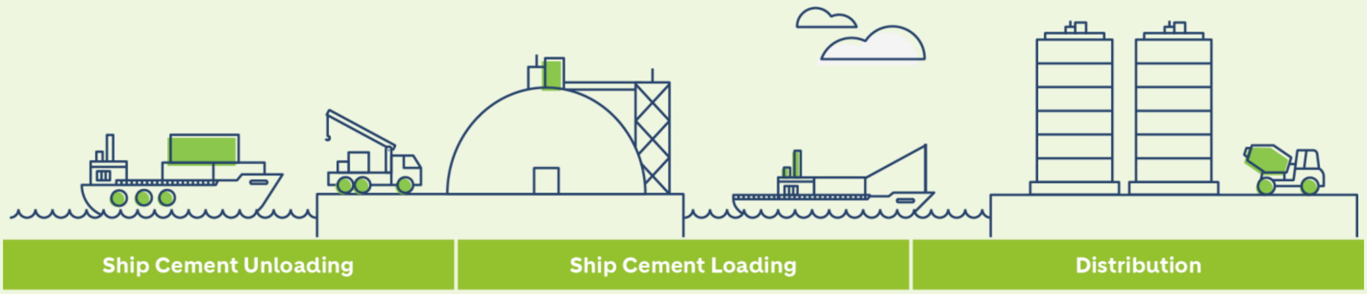
- External transportation of materials to the core processes and internal transport, via truck and ship.
- Manufacturing of cement, and packaging if needed.
- Transportation of materials for recycling and landfilling externally
- Treatment of waste and wastewater generated from the manufacturing processes.

Cement manufacturing is undertaken at two plants and seven depots. GP cement is imported from Japan to Auckland and Timaru plants and can be sold directly to the customers in bulk. Seven depots are used for packaging. Holcim NZ provided data on the consumption of electricity, diesel, and natural gas at each plant and depot. Site specific manufacturing data was collected during FY21.

The electricity for manufacturing process is from the electricity grid in New Zealand, which comprises 58% of hydropower, 18% of geothermal, 12% of natural gas, 6% of wind power, and 6% of other energy sources. The GWP-GHG is 0.137 kg CO_2 eq./kWh of electricity.

SYSTEM DIAGRAM

The processes included in the LCA are presented in a process diagram in the figure below.



DESCRIPTION OF SYSTEM BOUNDARIES AND EXCLUDED LIFECYCLE STAGES

The scope of the LCA and EPD is from cradle to gate with options, including A1-A3 and additional module A4. Emissions from distribution (A4) and construction installation (A5) were excluded as this EPD does not include site-specific delivery and Holcim does not have operational control over the installation of products at the construction site. In addition, the following life cycle stages were also excluded: use stages (B1-B7), end of life stage (C1-C4), and benefits and loads beyond the system boundary (D)

Environmental impacts relating to personnel, infrastructure and production equipment not directly consumed in the process are excluded from the system boundary as per the Product Category Rules (2019:14 Construction Production and Construction Services).

	Product Stage			Construction Stage		Use Stage							End of Life Stage				Benefits & loads for the next product system
	Raw Material Supply	Transport	Manufacturing	Transport	Construction/Installation process	Use	Maintenance incl. transport	Repair incl. transport	Replacement incl. transport	Refurbishment incl. transport	Operational Energy Use	Operational Water Use	De-construction & Demolition	Transport	Re-use Recycling	Final Disposal	Reuse, Recovery Recycling potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Geography	GLO	GLO	NZ	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Share of specific data	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation - sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

ND: Not declared

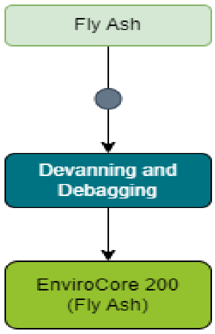
EPD PRODUCT DESCRIPTION AND USE

HOLCIM NZ'S CEMENTITIOUS PRODUCTS SOUTH ISLAND – DUNEDIN– ENVIROCORE 201

A detailed breakdown of the functional properties of the cement included in this EPD are provided below. Product environmental information should only be compared with consideration of the product's requisite function.

ENVIROCore 201 is a Fly Ash compliant with AS/NZS 3582.1 Supplementary Cementitious materials Part1: Fly Ash.

Manufacturing process and flow diagram



Content Declaration

The following table provides a summary of the materials included in Holcim's cement and their relative composition by weight. The gross weight of this declared material makes up a minimum of 99% of the products covered by this EPD.

Packaging

ENVIROCore 201 is delivered in bulk.

Recycled Material

The following materials relevant to the study are considered as co-products of their production process and the impacts for their production process are allocated according to PCR 2019:14 Construction Products and Construction Services (co-produced goods, multi-output allocation):

- Fly ash; and
- Ground granulated blast furnace slag

Economic allocation method was used to model the above co-products:

- Fly ash: fly ash in the modelling process only includes transport impacts. It is sourced directly from coal fired electricity generation, with no further processing required. Given its relatively low market value compared to the primary energy product, the environmental impacts of coal combustion allocated via economic allocation are negligible.
- Ground granulated blast furnace slag: No environmental impact is allocated to the granulated blast furnace slag at the point of its generation from steel production as a by-product. However, the specific energy and processing impacts associated with grinding the slag into GGBFS are included.

Product component(s)	Hazardous content	Weight (%)	Post-consumer material (%)	Biogenic material (%)	Biogenic material (kg C/tonne of product)
Fly Ash	✓	100	0	0	0

The product does not contain one or more substances that are listed in the "Candidate List of Substances of Very High Concern For Authorisation".

ENVIRONMENTAL PERFORMANCE

The environmental impacts considered in this EPD are listed in the table below. They are aligned to and adopted from EN15804+A2 version of Environmental Footprint 3.1. All further tables from this point will contain abbreviation only. The potential environmental performance is calculated based on the input data and the emission factors from ecoinvent v3.11. The LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds and safety margins or risks.

The results generated by module A1-A3 should not be used in isolation. It is strongly advised that the outcomes produced by modules A1-A3 are considered alongside the results derived from module C to ensure comprehensiveness and accurate analysis.

Impact Category	Abbreviation	Measurement	Assessment Method and Implementation
Potential Environmental Impacts			
Total global warming potential	GWPT	kg CO_2 equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021
Global warming potential (fossil)	GWPF	kg CO_2 equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021
Global warming potential (biogenic)	GWPB	kg CO_2 equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021
Global warming potential (land use/ land transformation)	GWPL	kg CO_2 equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021
Ozone depletion potential	ODP	kg CFC 11 equivalents	Steady-state ODPs, WMO 2014
Acidification potential	AP	mol H+ eq.	Accumulated Exceedance, Seppälä et al. 2006, Posch et al., 2008
Eutrophication – aquatic freshwater	EP - freshwater	kg P equivalent	EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe
Eutrophication – aquatic marine	EP - marine	kg N equivalent	EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe
Eutrophication – terrestrial	EP – terrestrial	mol N equivalent	Accumulated Exceedance, Seppälä et al. 2006, Posch et al.
Photochemical ozone creation potential	POCP	kg NMVOC equivalents	LOTOS-EUROS, Van Zelm et al., 2008, as applied in ReCiPe
Abiotic depletion potential (elements)*	ADPE	kg Sb equivalents	CML (v4.8)
Abiotic depletion potential (fossil fuels)*	ADPF	MJ net calorific value	CML (v4.8)
Water Depletion Potential**	WDP	m3 equivalent deprived	Available Water Remaining (AWARE) Boulay et al., 2016
Resource use			
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ, net calorific value	Manual for direct inputs
Use of renewable primary energy resources used as raw materials	PERM	MJ, net calorific value	Manual for direct inputs[3]
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	PERT	MJ, net calorific value	ecoinvent version 3.11 and expanded by PRé Consultants[4]
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ, net calorific value	Manual for direct inputs

[3] Calculated based on the lower heating value (LHV) of renewable raw materials. LHV is taken from https://phyllis.nl/, as recommended by SimaPro in compliance with EN15804+A2: https://support.simapro.com/s/article/How-to-calculate-EN-15804-A2-indicators-in- desktop-SimaPro

[4] Calculated as sum of renewable, biomass; renewable, wind, solar and geothermal, and renewable, water.

Impact Category	Abbreviation	Measurement	Assessment Method and Implementation
Use of non-renewable primary energy resources used as raw materials	PENRM	MJ, net calorific value	Manual for direct inputs[5]
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	PENRT	MJ, net calorific value	ecoinvent version 3.11 and expanded by PRé Consultants[6]
Use of secondary material	SM	kg	Manual for direct inputs
Use of renewable secondary fuels	RSF	MJ, net calorific value	Manual for direct inputs
Use of non-renewable secondary fuels	NRSF	MJ, net calorific value	Manual for direct inputs
Use of net fresh water	FW	m3	ReCiPe 2016
Waste categories and Output flows			
Hazardous waste disposed	HWD	kg	EDIP 2003 (v1.05)
Non-hazardous waste disposed	NHWD	kg	EDIP 2003 (v1.05)[7]
Radioactive waste disposed/stored	RWD	kg	EDIP 2003 (v1.05)
Components for reuse	CFR	kg	Manual for direct inputs
Materials for recycling	MFR	kg	Manual for direct inputs
Materials for energy recovery	MFEE	kg	Manual for direct inputs
Exported energy	EE - e	MJ per energy carrier	Manual for direct inputs
Exported energy, thermal	EE - t	MJ per energy carrier	Manual for direct inputs
Additional environmental impacts			
Global warming potential, excluding biogenic uptake, emissions and storage	GWP-GHG	kg CO_2 equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2021[8]
Particulate matter	PM	disease incidence	SETAC-UNEP, Fantke et al. 2016[9]
Ionising radiation - human health**	IRP	kBq U-235 eq	Human health effect model
Eco-toxicity (freshwater)*	ETP-fw	CTUe	Usetox
Human toxicity potential - cancer effects*	HTP-c	CTUh	Usetox
Human toxicity potential - non cancer effects*	HTP-nc	CTUh	Usetox
Soil quality*	SQP	dimensionless	Soil quality index based on LANCA
Global warming potential, aligned with the IPCC 2013 Fifth Assessment Report	GWP-GHG (AR5)	kg CO_2 equivalents (GWP100)	Baseline model of 100 years of the IPCC based on IPCC 2013 AR5

* Disclaimer 1 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.
** Disclaimer 2 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionising radiation from the soil, from radon and from some construction materials is also not measured by this indicator.[10]

[5] Calculated based on the lower heating value (LHV) of non-renewable raw materials. LHV is taken from https://phyllis.nl/, as recommended by SimaPro in compliance with EN15804+A2: https://support.simapro.com/s/article/How-to-calculate-EN-15804-A2- indicators-in-desktop-SimaPro
[6] Calculated as sum of non-renewable, fossil and non-renewable, nuclear.
[7] Calculated as sum of Bulk waste and Slags/ash.
[8] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.
[9] Fantke et al., Global Guidance for Life Cycle Impact Assessment Indicators: Volume 1. UNEP/SETAC Life Cycle Initiative, Paris, pp. 76-99
[10] Aligned with PCR 2019:14

SOUTH ISLAND – DUNEDIN– ENVIROCORE 201 – MODULE A1-A3

The interpretation of results is presented in the following sections. Note that the use of results of modules A1-A3 or A1-A5, without considering the results of module C may mislead the communication and decision-making. The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Primary indicators – 1 tonne of cement blend

Table 1 | Core environmental impacts per tonne of ENVIROCore 201 - Dunedin (results are in accordance with EN15804+A2:2019)

Indicator	Indicator	Unit	A1-A3	A4
Total global warming potential	GWP-Total	kg CO_2 eq.	1.02E+02	ND
Global warming potential (fossil)	GWP-Fossil	kg CO_2 eq.	1.02E+02	ND
Global warming potential (biogenic)	GWP-Biogenic	kg CO_2 eq.	4.70E-03	ND
Global warming potential (land use/ land transformation)	GWP-Luluc	kg CO_2 eq.	2.87E-03	ND
Ozone depletion potential	ODP	kg CFC 11 eq.	1.47E-06	ND
Acidification potential	AP	mol H+ eq.	2.81E+00	ND
Eutrophication – aquatic freshwater	EP-F	kg P eq.	1.66E-04	ND
Eutrophication – aquatic marine	EP-M	kg N eq.	6.43E-01	ND
Eutrophication – terrestrial	EP-T	mol N eq.	7.17E+00	ND
Photochemical ozone creation potential	POCP	kg NMVOC eq.	1.95E+00	ND
Abiotic depletion potential (elements)	ADPE	kg Sb eq.	1.17E-06	ND
Abiotic depletion potential (fossil fuels)	ADPF	MJ	1.25E+03	ND
Water Depletion Potential	WDP	m^3 eq deprived	1.04E+00	ND

Table 2 | Additional mandatory environmental impacts per tonne of ENVIROCore 201 - Dunedin (results are in accordance with EN15804+A2:2019)

Indicator	Indicator	Unit	A1-A3	A4
Global warming potential, excluding biogenic uptake, emissions and storage	GWP-GHG	kg CO_2 eq.	1.02E+02	ND

SOUTH ISLAND – DUNEDIN– ENVIROCORE 201 – MODULE A1-A3

Additional indicators 1 tonne of cement blend

Table 3 | Additional voluntary environmental impacts per tonne of kg CO2 eq. (results are in accordance with EN15804+A2:2019)

Indicator	Indicator	Unit	A1-A3	A4
Particulate matter	PM	disease incidence	2.62E-06	ND
Ionising radiation - human health	IRP	kBq U-235 eq	1.01E-01	ND
Eco-toxicity (freshwater)	ETP-fw	CTUe	4.69E+01	ND
Human toxicity potential - cancer effects	HTP-c	CTUh	1.55E-08	ND
Human toxicity potential - non cancer effects	HTP-nc	CTUh	2.08E-07	ND
Soil quality	SQP	dimensionless	1.96E+00	ND
Global warming potential, aligned with the IPCC 2013 Fifth Assessment Report	GWP-GHG (AR5)	kg CO_2 eq.	1.02E+02	ND

SOUTH ISLAND – DUNEDIN– ENVIROCORE 201 – MODULE A1-A3

Resource use parameters - 1 tonne of cement blend

Table 4 | Resource use per tonne of ENVIROCore 201 - Dunedin (results are in accordance with EN15804+A2:2019)

Indicator	Indicator	Unit	A1-A3	A4
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ_{NCV}	5.51E+01	ND
Use of renewable primary energy resources used as raw materials	PERM	MJ_{NCV}	0.00E+00	ND
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	PERT	MJ_{NCV}	5.51E+01	ND
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ_{NCV}	1.22E+03	ND
Use of non-renewable primary energy resources used as raw materials	PENRM	MJ_{NCV}	0.00E+00	ND
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	PENRT	MJ_{NCV}	1.22E+03	ND
Use of secondary material	SM	kg	1.00E+03	ND
Use of renewable secondary fuels	RSF	MJ_{NCV}	0.00E+00	ND
Use of non-renewable secondary fuels	NRSF	MJ_{NCV}	0.00E+00	ND
Use of net fresh water	FW	m^3	2.60E-02	ND

SOUTH ISLAND – DUNEDIN– ENVIROCORE 201 – MODULE A1-A3

Waste categories and output flows - 1 tonne of cement blend

Table 5 | Waste generated and output flows per m3 of ENVIROCore 201 - Dunedin (results are in accordance with EN15804+A2:2019)

Indicator	Indicator	Unit	A1-A3	A4
Hazardous waste disposed	HWD	kg	0.00E+00	ND
Non-hazardous waste disposed	NHWD	kg	0.00E+00	ND
Radioactive waste disposed/stored	RWD	kg	0.00E+00	ND
Components for reuse	CRU	kg	0.00E+00	ND
Materials for recycling	MFR	kg	0.00E+00	ND
Materials for energy recovery	MFRE	kg	0.00E+00	ND
Exported energy	EE - e	MJ	0.00E+00	ND
Exported energy, thermal	EE - t	MJ	0.00E+00	ND

PREVIOUS VERSION

N/A

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