Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

PKS CIVIL
PE100 Spiral Wound Pipe

EPD of multiple products, based on a representative product. The products covered in the EPD are listed on pages 15-16.

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Programme:	The International EPD® System, www.environdec.com
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PKS CIVIL

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ABOUT US

PKS CIVIL
PIPE & STRUCTURES

PKS Civil NZ is a manufacturing division of Waters and Farr, and a part of the Hynds Group of Companies. Our state of the art manufacturing facility manufactures HDPE and PP pipe up to 4.2 m in diameter (project specific), along with manhole and pipeline structures for water storage, wet wells and intake manifold needs.

The PKS system allows for uniform, permanently tight sewage, retention and attenuation structures - with pipes of all conventional dimensions. The leakage integrity, chemical resistance and flexibility of our product protects the environment.

Spiral pipe technology has been manufactured and used successfully throughout Europe since the 1960s. PKS Civil is supported by Frank GMBH who are one of the pioneers and world leading spiral wound pipe manufacturers. PKS Civil is the leading manufacturer and supplier of certified PE100 spiral wound pipe in New Zealand for drainage, stormwater and wastewater applications.

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Commitment to Quality:

- *PKS Civil maintains a quality management system certification to ISO9001. 'S' mark certification to AS/NZS 4130 and AS/NZS 5065 is maintained via independent third party verification. The certifications can be found online at pkscivil.co.nz/our-company/#certificates.*
- *Pipe Test NZ, a division of the Hynds Group, was established as an independent IANZ accredited testing laboratory. Pipe Test NZ conducts a comprehensive range of pipe and fusion joint testing on pipeline products for PKS Civil and external parties.*

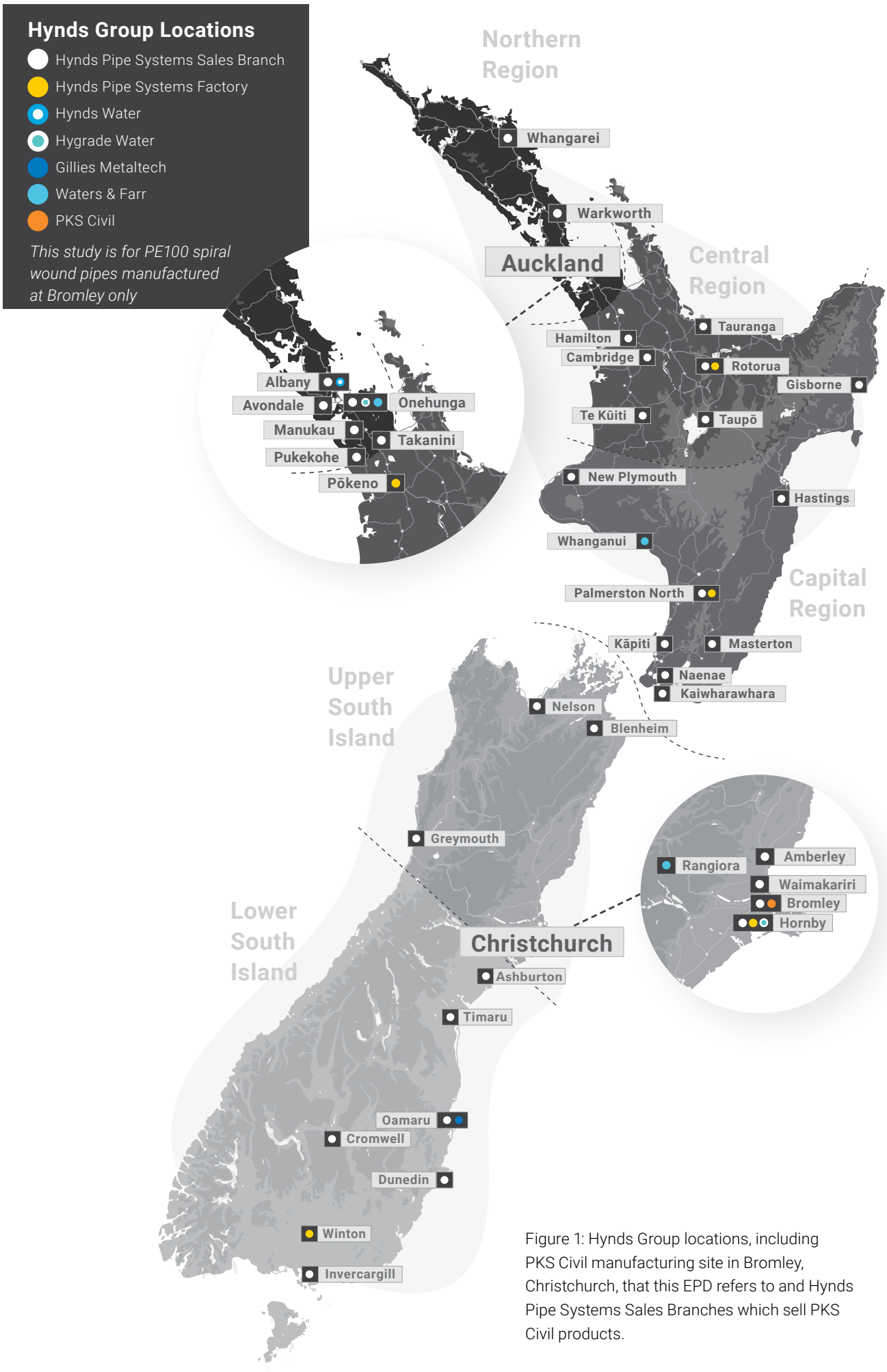

Figure 1: Hynds Group locations, including PKS Civil manufacturing site in Bromley, Christchurch, that this EPD refers to and Hynds Pipe Systems Sales Branches which sell PKS Civil products.

PKS CIVIL SUSTAINABILITY

PKS Civil is a division of the Hynds Group which was built around finding sustainable solutions to support the three waters (drinking water, wastewater and stormwater infrastructure services).

PKS Civil has adopted a sustainability framework which focuses on three strategic pillars; the planet (our natural environment), people (our people but also our wider communities and stakeholders) and products (innovating and building resilience into what we do to meet the needs of future generations).

Addressing the effects of climate change is a huge challenge that we all face. PKS Civil believes that addressing climate change will make us better off and is committed to New Zealand's transition to a low-emissions economy. PKS Civil (as part of the Hynds Group) has committed to a 42% reduction in Scope 1 (direct) and Scope 2 (indirect) carbon emissions by 2032.

For more information on PKS Civil sustainability framework, visit **watersandfarr.co.nz/sustainability/**

PRODUCT INFORMATION

Products Covered by EPD

This EPD covers one type of product, PE100 spiral wound pipes, manufactured by PKS Civil in Bromley, Christchurch. There are 46 individual products which are represented by a representative product - PKS ID 1660 5.8m SUPADUCT SN4 DRR Black (hereafter "PK1660SUPA.SN4"). See page 10 for details regarding the choice of representative product. The full range of products covered by this EPD is given in Table 17.

Product Description

PKS Civil PE100 spiral wound pipes are produced using polyethylene (PE)100, a high density polyethylene (HDPE) compound, and polypropylene (PP). These pipes can be used for a variety of functions within construction sector such as civil, water and infrastructure. The primary function for the pipe products is for drainage, stormwater and wastewater applications.

The purpose of these products is to supply site-specific underground infrastructure systems to store and move waters. These pipes rely on the pressure from the surrounding soils to maintain their strength and stiffness. They are not designed to be used above ground.

Declared Unit

The declared unit for the EPD is 1 kg of pipe.

Design Standard

PKS Civil PE100 spiral wound pipes are manufactured in accordance with AS/NZS 5065:2005 Polyethylene and polypropylene pipes and fittings for drainage and sewage applications, and are intended to last 100 years when correctly installed to, AS/NZS 2566.2:2022 Buried flexible pipelines-installation and AS/NZS 2033:2008 Installation of polyethylene pipe systems.

Packaging

The product is generally transported loose or in a wooden crate. Where possible, pipes of varying size are nested to increase the number of pipes that can be fit on a truck. Any strapping or wrap which may be used during transport has been excluded in line with mass-based cut-off criteria.

Table 1: Industry classification

Product	Classification	Code	Category
PE Pipe	UN CPC Ver.2	36230	Tubes, pipes and hoses, and fittings therefore, of plastic
	ANZSIC 2006	19120	Rigid and semi-rigid polymer product manufacturing

Content Declaration

Table 2: Composition of PKS Civil PE100 Spiral Wound Pipe products (per 1 kg)

Product components	Weight, kg*	Post-consumer recycled material, weight-% of product	Biogenic material, weight-% of product	Biogenic material, kg C/declared unit
HDPE resin (Compounded)	0.75 (0.75 – 0.95)	0	0	0
PP resin (compounded)	0.25 (0.05 – 0.25)	0	0	0
Total	1.0	0	0	0

**The composition is for the representative product - PK1660SUPA.SN4. The compositions across all 46 products are presented in the parentheses.*

Table 3: Composition of packaging (per 1 kg product)

Packaging materials	Weight, kg	Weight-% (versus the product)	Weight biogenic carbon, kg C/declared unit
Timber dunnage	0.152	15.2	0.0679
Total	0.152	15.2	0.0679

No products declared within this EPD contain substances exceeding the limits for registration according to the European Chemicals Agency's "Candidate List of Substances of Very High Concern for authorisation" (European Union, 2024). Solid PE/PP pipes are not classified as dangerous goods according to the Land Transport Rule: Dangerous Goods 2005.

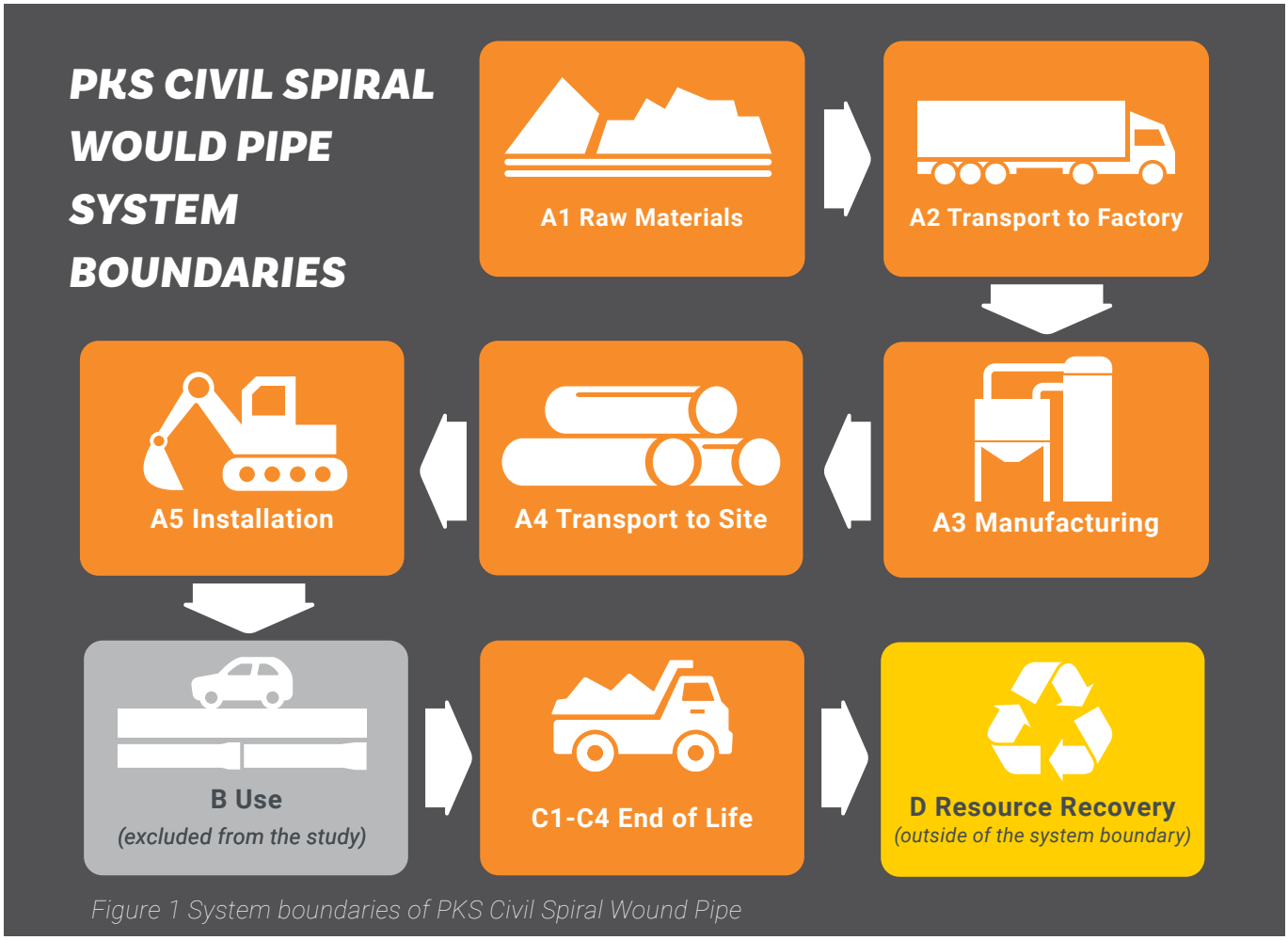

Figure 1 System boundaries of PKS Civil Spiral Wound Pipe

System Boundaries

As shown in the table below, this EPD has a scope of cradle-to-gate with options, modules C1-C4, module D and with additional modules (type b). The additional modules are A4 and A5.

Table 4: Modules included in the scope of the EPD

	Product stage			Construction process stage		Use stage							End-of-life stage				Recovery stage
	Raw material supply	Transport of raw materials	Manufacturing	Transport to customer	Construction / Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport to waste processing	Waste processing	Disposal	Future reuse, recycling or energy recovery potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	GLO	GLO	NZ	NZ	NZ	-	-	-	-	-	-	-	NZ	NZ	NZ	NZ	NZ
Share of specific data	19%*			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation: products	<5%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation: sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

X = included in the EPD; ND = Module not declared

**Share of specific data is calculated based on the GWP-GHG results and A1-A3 processes. Energy data is specific, however all value chain data is not specific.*

Manufacturing Process

PKS Civil spiral wound pipes are made from fully precompounded PE100 (HDPE) and Polypropylene (PP) resins in our Bromley manufacturing facility. The PE resins are imported from a range of overseas supplies and delivered to PKS Civil sites by truck.

PKS Civil spiral wound pipes are manufactured using a profile pipe extrusion method. The extrusion process starts with the extrusion of a PP coretube which is cooled and coiled on site. A layer of heated HDPE is then extruded as a ground layer around a mandrel at the required diameter while the PP coretube is coextruded on top to form a strengthening rib layer.

The use of a coextruded rib layer allows for a reduction of HDPE by up to 40%, compared to solid wall HDPE non-pressure pipes, whilst maintaining its stiffness rating. The pipes can also be made to an exact length, reducing the need for installers to cut pipes to length on site.

Any off-cuts or reject pipes are ground on site and sent to a third-party for repelletization. HDPE pellets are then returned for use in PKS Civil rural or temporary pipe solution where approved. Mixed HDPE and PP offcuts are externally recycled for use in other products.

Production (Modules A1-A3)

Upstream raw material extraction and polyethene granulate production is achieved mainly by obtaining ethylene gas from natural gas. This is used in steam cracking to produce ethylene, which is then polymerised into chains of polyethylene. PP is made mainly via chain-growth polymerisation of propylene gas.

These resins are transported to New Zealand from international suppliers for production into the twin-wall pipes.

The production process requires consumable resources including solvent, lubricant, various chemicals, thermal energy and electricity.

Construction (Modules A4-A5)

Distribution includes the transport of products to the final customer. This was calculated as an average distance within New Zealand, for PKS Civil sites. A transport distance of 571 km by truck and 65 km by ship is assumed.

Installation (module A5) includes trenching, laying of pipe system, fixing of pipe sections together and backfilling. Manufacture and transportation of additional components (e.g. crushed aggregate), and any energy required for installation.

It should be noted that PKS Civil spiral wound pipes have a wide range of uses, installation types and installation variables. These pipes come in variety of nominal diameters (DNs) and pressure nominal/standard dimension ratio (PN/SDR) ratings, which may yield a wide range of installation impact results, in module A5, per 1 kg of pipe.

The pipe nominal diameter/outer diameter (DN/OD) has a dominant control on the trench geometry and resulting environmental impacts. Therefore, impacts are calculated on a "per m^2" basis and converted to "per kg" – the declared unit of this study – based on the pipe mass (kg).

Note that module A5 results presented in this study are for the representative product - PK1660SUPA.SN4.

For the calculation of module A5, the following assumptions were made:

- Open trench installation in alignment with AS/NZ 2033
- 0.825 m height to fill above pipe
- Trench width as required by AS/NZ 2033
- Imported aggregate used for pipe surround and excavated material used for backfill
- 50 km distance to site from quarry and no material removal needed
- Impact from trench excavation is doubled to account for installation and backfilling
- The fate of the packaging of the product (dunnage) is unknown – hence, assumed and modelled as landfilled. The dunnage transport to landfill is also accounted for (50 km).

End-of-Life (Modules C1-C4)

When infrastructure reaches the end of its functional life, it is typically demolished and disposed of making way for new infrastructure. Pipes are a special case since they are typically buried and are often simply abandoned. Other options are for the pipes to be exhumed and sent for recycling or exhumed and sent to landfill.

Scenarios shall be realistic and representative of one of the most probable alternatives and shall not include processes or procedures that are not in current use, or which have not been demonstrated to be practical.

This study assumes that the most likely scenario is that the pipes will be abandoned. It is not economically feasible to remove and recover pipes at the end of their service life, according to Hynds decommissioned pipes are usually left in ground. No additional processes are included at end-of-life to model the decommissioning of a pipe.

Recovery and Recycling Potential (Module D)

Module D declares a potential credit or burden for the net scrap associated with HDPE and PP pipes life cycle. HDPE and PP pipes do not contain secondary materials and there is no material recovered at the end-of-life. Therefore there is no impact in module D. Default factors from PEF R2 values are therefore not being used and are replaced with 0 (European Commission, 2020).

Life Cycle Inventory (LCI) Data and Assumptions

Specific data were used for all manufacturing operations up to the factory gate. Specific data for PKS Civil operations was sourced from the period 2023-07-01 to 2024-06-30. Background data was used for input materials sourced from other suppliers including HDPE and PP.

All data in the background system were from the Managed LCA Content (MLC) database hosted in the LCAFE software version 2024.2 (Sphera 2024). Datasets have a reference year between 2019 - 2023.

Table 5: Distribution distance and calculation assumptions for module A4

Parameter	Truck	Ship	DQI
Vehicle Type	Truck, Euro 0-6, 20 t - 26t gross weight, 17.3t payload capacity	Container ship, 5,000 to 200,000 dwt payload capacity, deep sea	Estimated
Fuel used	Diesel	Heavy fuel oil	Estimated
Distance Truck (km)	571	65	Calculated
Capacity utilisation (%)	22.9	22	Estimated
Volume capacity (m^3)	140	n.a	Estimated
Bulk density of transported products (kg/m^3)	28.3	28.3	Calculated

Table 6: End-of-life scenario processes and parameters per 1 kg of PE100 spiral wound pipe

Scenario / Module	Parameter	Left in ground
Deconstruction (C1)	Process and assumptions	n/a
	kg collected	0
Transport (C2)	Process and assumptions	n/a
	kg transported	0
Waste processing (C3)	Process and assumptions	n/a
	kg for re-use	0
	kg for recycling	0
	kg for energy recovery	0
Disposal (C4)	Process and assumptions	Pipe considered to be left in ground and 'abandoned'
	kg material for disposed	0
Assumptions for scenario development		No action is taken thus no impact. Assumes plastic pipe will remain in ground without decomposition for more than 100 years.

Upstream data

Data for upstream raw materials and unit processes were obtained from MLC database (Sphera, 2024). The most relevant LCI datasets used in modelling the HDPE resin is taken from Polyethylene high density granulate with Carbon black (furnace black; deep black) as compounding agent.

Electricity

National averages for fuel inputs and electricity grid mixes were obtained from the MLC database. PCR v1.3.4 section 4.8.1 states that:

"The EPD shall declare the energy source behind electricity used in the manufacturing process in A3 and its climate impact as kg CO_2 eq./kWh (using the GWP-GHG indicator)."

The PCR v1.3.4 section 4.8.1 requires that LCI data for the generation of electricity used in A1-A3 (A1-A5 for services) shall be chosen in this priority:

- *Specific electricity mix as generated/purchased from an electricity supplier*
- *Residual electricity mix of the electricity supplier on the market.*
- *Residual electricity mix on the market.*
- *Electricity consumption mix on the market. This option shall not be used for electricity used in processes over which the manufacturer (EPD owner) has direct control.*

Purchased electricity accounts for 100% of manufacturing electricity use at the Christchurch manufacturing site. Therefore, the residual electricity mix on the market is used for the A3 processes that the manufacturing facility has control over.

The composition of the residual electricity grid mix of New Zealand is modelled in LCA FE based on published data for the year 2021-04-01 to 2022-03-31 (BraveTrace, 2023). The New Zealand residual electricity mix is made up of hydro (56.6%), geothermal (19.7%) natural gas (12.5%), wind (6.55%), coal (4.25%), biomass (0.266%) and biogas (0.160%).

Onsite consumption (3.00%), and the low voltage (<1kV) grid's transmission and distribution losses (6.73%) are calculated based on data from the Ministry of Business, Innovation & Employment (MBIE, 2023). The emission factor for the New Zealand residual grid mix for the GWP-GHG indicator is 0.151 kg CO_2-eq./kWh (based on EF3.1).

Transport

Average transportation distances and modes of transport are included for the transport of the raw materials, operating materials, and auxiliary materials to production and assembly facilities. Transportation was modelled using the global transportation datasets from the MLC database (Sphera, 2024). Fuels were modelled using the geographically appropriate datasets from the MLC database (Sphera 2024).

Explanation of Representative Product & Variation

This study covers 46 individual products; the full product list is available in Table 17 on Page 15 . Our reasoning around the choice of option is provided below:

- PKS Civil have production/sales data for their pipe products for 2023 financial year (2023-07-01 to 2024-06-30). However, some products are not produced during this period.
- The projected production/sales volumes during the EPD validity period are highly uncertain due to potential demand variations.
- Use of "sales weighted average" option is therefore not possible.
- Hence, the "representative product" option was chosen in this study.
- The choice of one specific product (with the highest sales volume) over other products is difficult and uncertain, due to the same reasons described above: zero production of some products during 2023 financial year and uncertainty around future production/sales volumes.
- As a result, the product with the highest GWP-GHG impacts was chosen as the representative product. This is a conservative approach.
- The chosen representative product is PK1660SUPA.SN4. This product has the highest PP:PE ratio (1:4), among all products. Note that PP resin has a higher GWP-GHG impacts compared with PE.

The variation across all products considered in this EPD is 1.45% for the GWP-GHG indicator, for modules A1-A3.

Cut-off Criteria

thinkstep consistently exclude impacts from infrastructure, construction, production equipment, and tools that are not directly consumed in the foreground production process, ('capital goods') regardless of potential significance.

Infrastructure/capital goods are excluded from all MLC datasets. An important exception is the inclusion of capital goods for electricity generation, where the capital goods are very important for modelling of changes towards more renewable generation. Capital goods related to electricity generation are included in all MLC electricity datasets.

Note: The system boundaries on manufacturing of equipment and for employees are not regarded as limiting the scope of the inventory or as an incomplete inventory (i.e. a cut-off).

Cut-off was applied to to the packaging of raw materials and the packaging materials which accompany the wooden dunnage (included) in minor quantities. Raw materials are delivered in bulk and represents a proportion below 1% of cumulative mass and environmental relevance of inputs to the product.

Allocation

PE100 spiral wound pipes are the main product produced and sold by PKS Civil. Plastic losses during manufacture are wastes with an economic value that are re-pelletised for recycling outside of the product system. This is therefore considered a co-product, to which economic allocation of A1-A3 impacts is applied. Based on the total annual value of the PKS pipes versus the total annual value of the pellets sold, 99.9% of the total environmental impacts are allocated to the pipes while the rest are allocated to the plastic wastes (0.005%). Transport to repalletizing is consequently not accounted for in this life cycle, as the material is considered to have reached its end-of-waste state and it is sold to the plastic recycler.

Waste data and packaging (dunnage) data are not product specific and hence are allocated per product based on mass allocation (i.e. as a factor of specific product mass and total mass of products manufactured at the facility).

Allocation of background data (energy and materials) taken from the MLC database. This documentation can be found in the Sphera Product Sustainability Gabi Data Search engine (Sphera, 2024).

End-of-life allocation generally follows the requirements of ISO 14044, section 4.3.4.3. The end-of-life scenario for these pipes assumed the most likely scenario of pipes being left in the ground 'abandoned' thus no impacts are modelled in modules C1-C4.

It was not possible to discern the specific quantities of energy, water, consumables, dunnage and wastes per PE100/PP compound. All pipes have a low difference in the revenue thus physical properties were used to guide allocation. Data was available at the site level only. Inputs have been allocated to the products based on mass of PE100/PP compound used per the declared unit of the pipe:

- Allocation of energy (natural gas, electricity and diesel).
- Inputs such as consumables (data collected at site-wide level).

RESULTS

Assessment Indicators

The results tables describe the different environmental indicators for each product per declared unit, for each declared module. The EN 15804 reference package based on EF 3.1 is used.

- *Table 7 contains the core environmental impact indicators in accordance with EN 15804:2012+A2:2019, describing the potential environmental impacts of the product.*
- *Table 8 shows the life cycle inventory indicators for resource use.*
- *Table 9 displays the life cycle inventory indicators for waste and other outputs.*
- *Table10 provides additional environmental impact indicators in accordance with EN 15804:2012+A2:2019.*
- *Table 11 displays biogenic carbon content indicators.*

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.

Energy indicators (MJ) are always given as net calorific value. The use of primary energy is separated into energy used as raw material and energy used as energy carrier per option A in Annex 3 of the PCR (EPD International 2024).

Table 7: EN15804+A2 Core Environmental Impact Indicators

Impact category	Indicator	Unit
Climate change – total	GWP-total	kg CO_2-eq.
Climate change – fossil	GWP-fossil	kg CO_2-eq.
Climate change – biogenic	GWP-biogenic	kg CO_2-eq.
Climate change – land use and land use change	GWP-luluc	kg CO_2-eq.
Ozone depletion	ODP	kg CFC-11 eq.
Acidification	AP	Mole of H+ eq.
Eutrophication aquatic freshwater	EP-freshwater	kgP eq.
Eutrophication aquatic marine	EP-marine	kgN eq.
Eutrophication terrestrial	EP-terrestrial	Mole of N eq.
Photochemical ozone formation	POCP	kgNMVOC eq.
Depletion of abiotic resources – minerals and metals	ADP-m&m	kgSb eq.
Depletion of abiotic resources – fossil fuels	ADP-fossil	MJ
Water use	WDP	m^3 world equiv.

Table 8: Life cycle inventory indicators on use of resources

Indicator	Abbreviation	Unit
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ
Use of renewable primary energy resources used as raw materials	PERM	MJ
Total use of renewable primary energy resources	PERT	MJ
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ
Use of non-renewable primary energy resources used as raw materials	PENRM	MJ
Total use of non-renewable primary energy resources	PENRT	MJ
Use of secondary material	SM	kg
Use of renewable secondary fuels	RSF	MJ
Use of non-renewable secondary fuels	NRSF	MJ
Total use of net fresh water	FW	m^3

Table 9: Life cycle inventory indicators on waste categories and output flows

Indicator	Abbreviation	Unit
Hazardous waste disposed	HWD	kg
Non-hazardous waste disposed	NHWD	kg
Radioactive waste disposed	RWD	kg
Components for reuse	CRU	kg
Materials for energy recovery	MER	kg
Materials for recycling	MFR	kg
Exported electrical energy	EEE	MJ
Exported thermal energy	EET	MJ

Table 10: EN15804+A2 Additional Environmental Impact Indicators

Indicator	Abbreviation	Unit
Climate Change	GWP-GHG	kg CO_2-eq.
Particulate Matter emissions	PM	Disease incidences
Ionising Radiation – human health	IRP	kBq U235 eq.
Eco-toxicity (freshwater)	ETP-fw	CTUe
Human Toxicity, cancer	HTP-c	CTUh
Human Toxicity, non-cancer	HTP-nc	CTUh
Land use related impacts / soil quality	SQP	Dimensionless

Table 11: Biogenic carbon content indicators

Indicator	Abbreviation	Unit
Biogenic carbon content - product	BCC-prod	kg
Biogenic carbon content - packaging	BCC-pack	kg

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2

Results of the Environmental Performance Indicators

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.

Potential environmental impact: mandatory indicators according to EN15804+A2:2019

Table 12: EN15804 +A2 core environmental impact indicators for PE100 spiral wound pipe per declared unit of 1 kg

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D	A-C Variation
GWP-total	kg CO_2-eq.	3.18E+00	6.56E-01	2.42E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.55%
GWP-fossil	kg CO_2-eq.	3.42E+00	6.56E-01	2.17E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46%
GWP-biogenic	kg CO_2-eq.	-2.37E-01	1.17E-04	2.49E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.18%
GWP-luluc	kg CO_2-eq.	1.41E-03	1.70E-05	7.01E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.36%
ODP	kg CFC 11-eq.	3.19E-12	6.45E-14	2.78E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.72%
AP	Mole of H+ eq.	4.06E-02	1.61E-03	7.55E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.22%
EP-fw	kg P eq.	2.14E-06	9.91E-08	4.18E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.68%
EP-m	kg N eq.	5.00E-03	7.03E-04	3.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.69%
EP-tr	Mole of N eq.	5.56E-02	7.80E-03	3.68E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.68%
POCP	kg NMVOC eq.	1.72E-02	1.72E-03	9.36E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.17%
ADP-mm[1]	kg Sb-eq.	1.95E-07	8.48E-09	7.64E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.60%
ADP-fossil[1]	MJ	8.70E+01	8.53E+00	2.92E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.40%
WDP[1]	m^3 world eq.	7.34E-01	2.43E-03	1.25E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41%

Table 13: EN15804 +A2 additional environmental impact indicators for PE100 spiral wound pipe per declared unit of 1 kg

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-GHG[2]	kg CO_2-eq.	3.43E+00	6.56E-01	2.05E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PM	Disease incidences	4.09E-07	1.70E-08	1.09E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
IRP[3]	kBq U235 eq.	7.19E-03	1.78E-04	1.44E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ETP-fw[1]	CTUe	8.86E+01	3.77E+00	1.20E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HTPc[1]	CTUh	1.78E-09	6.29E-11	6.73E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HTPnc[1]	CTUh	4.80E-08	2.32E-09	9.01E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SQP[1]	Pt	6.43E+00	1.74E-02	6.47E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

[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 experience with the indicator.

[2]This indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero. It has been included in the EPD following the PCR.

[3]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 ionizing radiation from the soil, from radon and some construction materials, is also not measured by this indicator.

Use of resources

Table 14: EN15804 +A2 resource use indicators for PE100 spiral wound pipe per declared unit of 1 kg

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	1.34E+01	3.68E-02	2.72E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERM	MJ	2.58E+00	0.00E+00	-2.58E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	1.59E+01	3.68E-02	1.39E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRE	MJ	8.70E+01	8.53E+00	2.82E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRM	MJ	4.31E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	1.30E+02	8.53E+00	2.82E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	3.22E-02	4.94E-05	2.91E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Since Module C is included in the EPD, the use of Module A1-A3 results without considering the results of Module C is discouraged.

Waste production and output flows

Table 15: EN15804 +A2 waste material and output flows for PE100 spiral wound pipe per declared unit of 1 kg

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	4.68E-09	1.37E-10	1.89E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NHWD	kg	5.24E-02	2.10E-04	1.55E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RWD	kg	1.07E-04	1.67E-06	6.05E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 16: EN15804 +A2 biogenic carbon content for PE100 spiral wound pipe per declared unit of 1 kg

Biogenic carbon content	Unit	A1-A3
BCC-prod	kg	0.00E+00
BCC-pack	kg	6.61E-02

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2

Since Module C is included in the EPD, the use of Module A1-A3 results without considering the results of Module C is discouraged.

WEIGHT CONVERSION TABLES

Table 17: ***Weight conversion table***

Product code	Product description	Product weight (kg/m)
PK03CIVDRR.SN16	DN300x5.8mxSN16 DRR CIVIL PIPE	9.93
PK04CIVDRR.SN16	DN400x5.8mxSN16 DRR CIVIL PIPE	12.88
PK05CIVDRR.SN16	DN500x5.8mxSN16 DRR CIVIL PIPE	20.63
PK05CIVDRR.SN8	DN500x5.8mxSN8 DRR CIVIL PIPE	15.95
PK06CIVDRR.SN16	DN600x5.8mxSN16 DRR CIVIL PIPE	28.43
PK06CIVDRR.SN8	DN600x5.8mxSN8 DRR CIVIL PIPE	22.39
PK07CIVDRR.SN16	DN700x5.8mxSN16 DRR CIVIL PIPE	42.16
PK07CIVDRR.SN8	DN700x5.8mxSN8 DRR CIVIL PIPE	28.82
PK08CIVDRR.SN16	DN800x5.8mxSN16 DRR CIVIL PIPE	47.69
PK08CIVDRR.SN8	DN800x5.8mxSN8 DRR CIVIL PIPE	40.60
PK09CIVDRR.SN16	DN900x5.8mxSN16 DRR CIVIL PIPE	68.99
PK09CIVDRR.SN8	DN900x5.8mxSN8 DRR CIVIL PIPE	54.28
PK1000SUPA.SN4	PKS ID 1000 5.8m SUPADUCT SN4 DRR Black	50.19
PK10CIVDRR.SN16	DN1000x5.8mxSN16 DRR CIVIL PIPE	78.63
PK10CIVDRR.SN4	PKS ID 1000 5.8m SUPADUCT SN4 DRR Black	50.19
PK10CIVDRR.SN8	DN1000x5.8mxSN8 DRR CIVIL PIPE	58.40
PK1100SUPA.SN4	PKS ID 1100 5.8m SUPADUCT SN4 DRR Black	62.49
PK11CIVDRR.SN16	DN1100x5.8mxSN16 DRR CIVIL PIPE	109.32
PK11CIVDRR.SN8	DN1100x5.8mxSN8 DRR CIVIL PIPE	72.97
PK1200SUPA.SN4	PKS ID 1200 5.8m SUPADUCT SN4 DRR Black	69.46
PK12CIVDRR.SN16	DN1200x5.8mxSN16 DRR CIVIL PIPE	133.03
PK12CIVDRR.SN8	DN1200x5.8mxSN8 DRR CIVIL PIPE	99.90
PK1400SUPA.SN4	PKS ID 1400 5.8m SUPADUCT SN4 DRR Black	91.97
PK14CIVDRR.SN16	DN1400x5.8mxSN16 DRR CIVIL PIPE	147.05
PK14CIVDRR.SN8	DN1400x5.8mxSN8 DRR CIVIL PIPE	136.60
PK1500SUPA.SN4	PKS ID 1500 5.8m SUPADUCT SN4 DRR Black	111.99
PK15CIVDRR.SN16	DN1500x5.8mxSN16 DRR CIVIL PIPE	177.22
PK15CIVDRR.SN8	DN1500x5.8mxSN8 DRR CIVIL PIPE	137.56
PK1660SUPA.SN4	PKS ID 1660 5.8m SUPADUCT SN4 DRR Black	111.40
PK16CIVDRR.SN16	DN1660x5.8mxSN16 DRR CIVIL PIPE	262.71
PK16CIVDRR.SN8	DN1660x5.8mxSN8 DRR CIVIL PIPE	155.22

PK1800SUPA.SN4	PKS ID 1800 5.8m SUPADUCT SN4 DRR Black	163.48
PK18CIVDRR.SN16	DN1800x5.8mxSN16 DRR CIVIL PIPE	302.04
PK18CIVDRR.SN8	DN1800x5.8mxSN8 DRR CIVIL PIPE	210.72
PK2000SUPA.SN4	PKS ID 2000 5.8m SUPADUCT SN4 DRR Black	186.86
PK20CIVDRR.SN16	DN2000x5.8mxSN16 DRR CIVIL PIPE	320.97
PK20CIVDRR.SN8	DN2000x5.8mxSN8 DRR CIVIL PIPE	245.13
PK2500SUPA.SN4	PKS ID 2500 5.8m SUPADUCT SN4 DRR Black	303.54
PK25CIVDRR.SN16	DN2500x3.5mxSN16 DRR CIVIL PIPE	789.97
PK25CIVDRR.SN8	DN2500x5mxSN8 DRR CIVIL PIPE	294.72
PK500CIVDRR.SN8	DN500x5.8mxSN8 DRR CIVIL PIPE	15.95
PK500SUPA.SN4	PKS ID 0500 5.8m SUPADUCT SN4 DRR Black	15.95
PK600SUPA.SN4	PKS ID 0600 5.8m SUPADUCT SN4 DRR Black	18.97
PK700SUPA.SN4	PKS ID 0700 5.8m SUPADUCT SN4 DRR Black	21.93
PK800SUPA.SN4	PKS ID 0800 5.8m SUPADUCT SN4 DRR Black	32.36
PK900SUPA.SN4	PKS ID 0900 5.8m SUPADUCT SN4 DRR Black	36.68

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Programme-Related Information and Verification

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CEN standard EN 15804+A2 served as the core PCR	
PCR:	PCR 2019.14 Construction Products Version 1.3.4 (published on 2024-04-30, valid until 2025-06-20) UN CPC Ver.2, 36230, Tubes, pipes and hoses, and fittings therefore, of plastic ANZSIC 2006, 19120, Rigid and semi-rigid polymer product manufacturing
PCR review was conducted by:	The Technical Committee of the International EPD® System See www.environdec.com for a list of members.
Chair:	The most recent review chair: Claudia Peña, PINDA LCT SpA. The review panel may be contacted via the Secretariat: www.environdec.com/contact
Independent verification of the declaration and data, according to ISO 14025:	❑ EPD process certification (Internal) ☑ EPD verification (External)
EPD verification by individual verifier Third-party verifier: (Approved by: EPD Australasia)	Claudia A. Peña, Director of PINDA LCT SpA pinda.lct@gmail.com
Procedure for follow-up of data during EPD validity involved third-party verifier	❑ Yes ☑ No

An Environmental Product Declaration, or EPD, is a standardised and verified way of quantifying the environmental impacts of a product based on a consistent set of rules known as a PCR (Product Category Rules).

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

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