BORAL

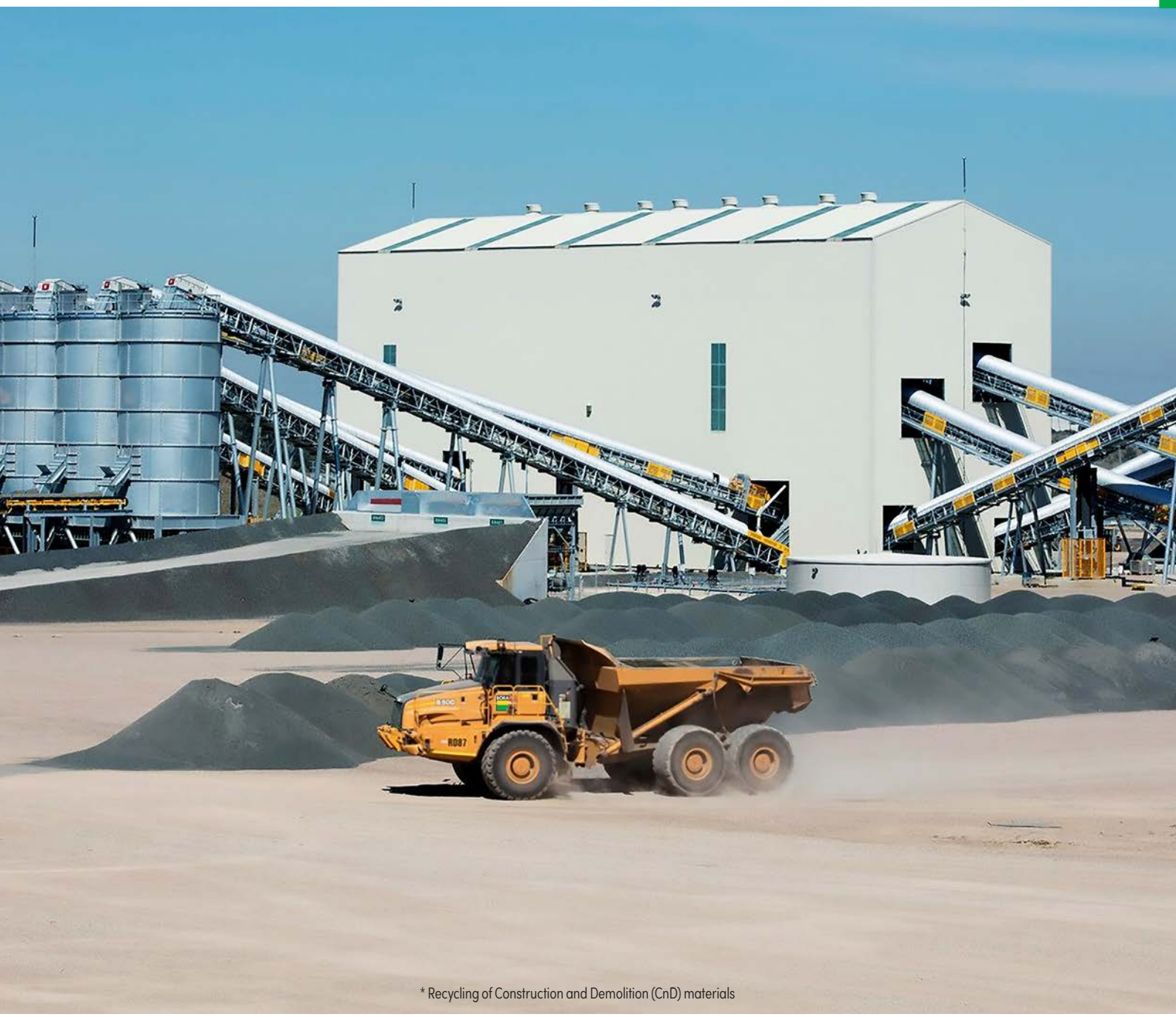
Building something great

Quarry and Recycling Products

(including recycled road base, sand, aggregate and stabilized product)

Environmental Product Declaration

Victoria (VIC) region



* Recycling of Construction and Demolition (CnD) materials

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

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.epd-australasia.com

EPD Registration Number S-P-10222

Publication date: 28 February 2024| **Valid until:** 28 February 2029| **Geographical Scope:** VIC region

Contents

Program information and verification

An Environmental Product Declaration (EPD) is a standardised way of quantifying the potential environmental impacts of a product or system. EPDs are produced according to a consistent set of rules — Product Category Rules (PCR) — that define the requirements within a given product category.

These rules are a key part of ISO 14025, ISO 14040 and ISO 14044 as they enable transparency and comparability between EPDs. This EPD provides environmental indicators for Boral products. This EPD is a "cradle-to-gate" declaration covering production of the quarry products and their supply chain.

This EPD is verified to be compliant with EN 15804+A2. 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. Boral, as the EPD owner, has the sole ownership, liability and responsibility for the EPD.

Declaration owner	BORAL	**Boral**	**Address** Level 3, Triniti 2, 39 Delhi Road, North Ryde NSW 2113 **W** www.boral.com.au **T** +61 2 9220 6300
EPD program operator	AUSTRALASIA EPD® ENVIRONMENTAL PRODUCT DECLARATION	**EPD Australasia Limited**	**Address** 315a Hardy Street, Nelson 7010, New Zealand **W** www.epd-australasia.com **T** +61 2 8005 8206 **E** info@epd-australasia.com
EPD produced by	START2SEE LIFE CYCLE ASSESSMENTS	**Rob Rouwette, start2see**	**Address** 36 Renaissance Boulevard Mernda Vic 3754, Australia **W** www.start2see.com.au **T** +61 403 834 470 **E** Rob.Rouwette@start2see.com.au
Third Party Verifier accredited or approved by EPD Australasia Ltd.	Life Cycle Logic	**Andrew D. Moore, Life Cycle Logic**	**Address** PO Box 571, Fremantle WA 6959, Australia **W** www.lifecyclelogic.com.au **T** +61 4 2432 0057 **E** andrew@lifecyclelogic.com.au

Program information and verification

EPD version:	Type of EPD
Version 1.0	Specific. The results in this EPD cover site-specific average products, which includes both virgin and recycled aggregate products.
Reference year for data:	2021-07-01 / 2022-06-30

CEN standard EN 15804 served as the core PCR	
PCR	PCR 2019:14 Construction Products and Construction Services, Version 1.3.1, 2023-07-08
PCR review was conducted by	The Technical Committee of the International EPD® System. Chair: No Chair appointed. Contact via info@environdec.com
Independent verification of the declaration and data, according to ISO 14025	☐ EPD process certification (Internal) ☒ EPD verification (External)
Procedure for follow-up of data during EPD validity involved third-party verifier	☐ No ☒ Yes

Bacchus Marsh Quarry and Sand, VIC

About Boral

Boral is the largest integrated construction materials company in Australia, with a leading position underpinned by strategically located quarry reserves and an extensive network of operating sites.

Boral has 84 quarry and recycling sites around Australia.

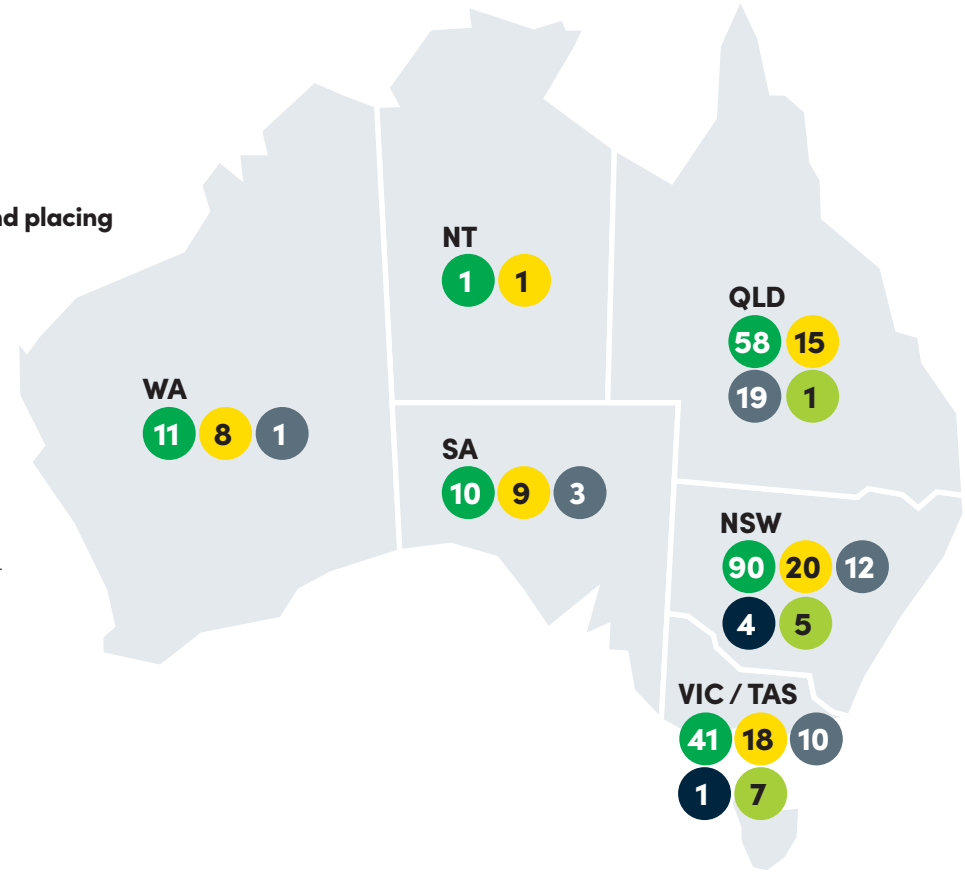
In Victoria we currently have **14 quarries (five hybrid sites with recycling inclusion)** and **two dedicated recycling sites** that supply various products for concrete, asphalt and the broader construction industry. Inclusive in the quarry and recycling sites around the Victoria region is one quarry site, Culcairn, that is located in New South Wales (just across the state border).

Construction materials
Leading integrated network

345
Operating sites*

- 211 **Concrete and placing**
- 71 **Quarries**
- 45 **Asphalt**
- 5 **Cement**
- 13 **Recycling**

* Includes transport, fly ash and research and development sites.



About Boral

ZERO HARM TODAY

How we work

At Boral, we have a culture of 'working together' with a focus on Zero Harm Today.

This ensures all of our employees, contractors, partners and communities in which we operate are free from harm, injury and illnesses.

Boral has a team of full-time Health, Safety , Environment and Quality specialists who operate across our integrated business, offering a single interface for safety communications and innovation across raw materials, logistics, operations and placement.

Innovation and technical capability

The Innovation Factory is Boral's in-house centre of excellence responsible for developing advanced cement and concrete solutions for our customers.

Through consultation with our customers, the Innovation Factory is central to enabling transformation through innovative products at Boral.

Our focus on engagement and action is backed by intensive research and development through our dedicated and talented team who work in collaboration with many sections of the company to create a world of future generations will be proud.

Montrose Quarry and Recycling, VIC

About Boral

Technical services

As one of Australia's largest construction materials companies, Boral is committed to excellence, providing customers with quality products and reliable service.

" **Boral Materials Technical Services** is also the largest facility of its kind in the country. "

Our aim is to provide products backed up by specialised testing as well as extensive quality control testing and technical support.

To ensure we remain at the forefront, we constantly improve, develop and refine our products to maintain the high standards customers have come to expect.

Our production, technical and quality managers are committed to quality excellence in our manufacturing process. We have committed additional resources to research and we strive to develop whole-of-life solutions that offer a sustainable future. Our innovative products are designed in collaboration with our clients.

Not only are we the only Australian construction materials company to maintain a full-service construction materials laboratory in Australia, **Boral Materials Technical Services is also the largest facility of its kind in the country**, providing special and standard testing and product development services to Boral and our customers.

Boral maintains an ISO 9001-certified Quality System to ensure we conduct a regular regime of physical properties testing on all materials to certify they:

- meet Australian Standards in the civil and structural construction industry
- comply with applicable legislation, regulations and industry standards
- meet project specifications
- allow for continuous improvement.

Boral laboratory facilities have a quality management system that meets international standards and they are NATA-accredited for construction materials testing and chemical testing. These customer-focused services have earned Boral the reputation of a market leader in its approach.

About Boral

Sustainability at Boral

We recognise that our commitment and progress in managing sustainability outcomes is vital to our business and meeting the expectations of our customers.

We strive to:

- **Deliver** innovative, superior performing and more sustainable products and solutions that respond to a changing world and better meet our customers' needs
- **Drive** safety performance towards world's best practice and invest in our people to enable them to deliver on our strategy
- **Reduce** our environmental footprint and build our resilience to climate impacts
- **Be** a socially responsible member of the communities in which we operate.

In recent years, we have substantially reshaped our business to respond and adapt to changing commercial, technological, and environmental factors.

We are increasing our investment in innovation to enable us to expand our products and solutions that have a lower carbon footprint and thereby positively contribute to an effective transition to a lower carbon economy.

Our commitment

ZERO HARM TODAY

Our overarching goal is to deliver Zero Harm Today. This means we target zero injuries to our people and seek to eliminate adverse environmental impacts.

Where elimination is not possible, we seek to minimise any harmful effects from our operations. At an absolute minimum, this means complying with environmental legislation, regulations, standards and codes of practice.

- **Reducing greenhouse gas** emissions from our processes, operations and facilities.
- **Reducing waste** in all forms including through the efficient use of energy, conservation of water, minimising and recycling waste materials and energy, prevention of pollution, and effective use of virgin and recovered resources and supplemental materials.
- **Protecting biodiversity** values at and around our facilities.
- **Openly and constructively engaging** with communities surrounding our operations.

Geographical scope

Victoria region

The Quarrying and Recycling operations considered for this Environmental Product Declaration (EPD) comprises of those in the state of Victoria (including one plant, Culcairn, that is located in NSW, just across the state border). **There are 14 quarries included in this EPD, as listed on the map below.** Each site is represented individually in the EPD results.

Declared products

Products considered for the Victoria (VIC) region Quarries and Recycled Products EPD

The aggregate products considered for the EPD fall into four broad categories:

1) Unbound aggregates

1a) Fine aggregate

1b) Coarse aggregate

1c) Road base

2) Stabilised products

A brief description of each category is given on page 9, followed by a full list of the products.

The product codes for aggregates are UN CPC 153 (sands, pebbles, gravel, broken or crushed stone, natural bitumen and asphalt) and ANZSIC 0911 (gravel and sand quarrying) / ANZSIC 0919 (other construction material mining).

Declared products

1) Unbound aggregates

1a) Fine aggregate

Fine aggregate is granular material either natural / processed from deposits of sand, gravel or rock. Recycled fine aggregate material is derived from Construction and Demolition waste (C&D).

Fine aggregate is aggregate less than 4.75 mm nominal size.

Fine aggregates may be produced to Australian Standards (AS 2758) or to more specific customer requirements. Specification requirements can include, but are not limited to:

- Grading
- NZ flow cone
- Atterberg limits
- Bulk density, and
- Water absorption.

Fine aggregates can be used in various applications including:

- Concrete
- Drainage
- Asphalt, and
- Bedding.

TABLE 1. FINE AGGREGATE

	Product group			
	Natural sand	Manufactured sand	Crusher dust	Recycled product
Product Name	• Fine sand • Medium sand • Coarse sand • Blended sand • Fill sand • Pipe bedding • Sand – Other	• Manufactured sand	• Dust • Asphalt dust • Drainage filter	• Recycled pipe bedding • Sand • Recycled fines

Declared products

1b) Coarse aggregate

Aggregate is granular material either natural / processed from deposits of sand, gravel or rock. Aggregate recycled material is derived from Construction and Demolition waste (C&D).

Coarse aggregate is aggregate greater than 4.75mm nominal size.

Coarse aggregates may be produced to Australian Standards (AS 2758) or to more specific customer requirements. Specification requirements can include, but are not limited to:

- Grading
- Los Angeles testing
- Shape
- Bulk density
- Wet and dry strength testing, and
- Water absorption.

Coarse aggregates can be used in various applications including:

- Concrete
- Drainage
- Asphalt
- Sealing aggregate, and
- Ballast.

TABLE 2. COARSE AGGREGATE

	Product group		
	Aggregate	Other aggregate	Recycled product
Product Name	• Concrete aggregate – 5mm – 7mm – 10mm – 14mm – 20mm – Other • Asphalt aggregate – 5mm – 7mm – 10mm – 14mm – 20mm – Other • Sealing aggregate – 5mm – 7mm – 10mm – 14mm – Other	• Armour rock • Drainage filter aggregates • Blended aggregates • Shot rock • Size graded rock • Spalls • Drainage blanket • Gabion • Ballast • Aggregate – Other	• Recycled aggregate – 10mm – 20mm – 40mm – Other

Declared products

1c) Road base

Road base is a graded granular material either natural / processed from rock and / or recycled material, which is then engineered to maximise compaction and resist deformation under load.

Specification requirements may include:

- Maximum particle size
- Grading
- Plasticity
- Unsound, and
- Other design criteria.

Uses can include:

- Base materials
- Sub-base materials
- Backfill
- Sub-grade replacement, and
- Hardstands.

TABLE 3. ROAD MATERIALS

	Product group	
	Natural road base	Specified recycled road base
Product Name*	• Road Base – Class 1 • Road Base – Class 2 • Road Base – Class 3 • Road Base – Class 4 • Road Base – Type A Fill • Road Base – Type B Fill • Road Base – Wet mix • Road Base – Other • Road Base – Unspecified • Crusher Run • Nondescript Crushed Rock (NDCR) • Scoria Crusher Run – Unspecified	• Recycled Road Base – Class 2 • Recycled Road Base – Class 3 • Recycled Road Base – Wet Mix • Recycled Road Base – Other • Recycled Road Base – Unspecified • Recycled Fill – Non-Specified

Declared products

2) Stabilised products

Stablised granular is a bound granular material either natural / processed from rock and / or recycled material, which is then engineered to maximise compaction and resist deformation under load.

Specification requirements may include:

- Maximum particle size
- Grading
- Plasticity
- Unsound
- Unconstrained Compressive Strength (UCS), and
- Other design criteria.

Uses can include:

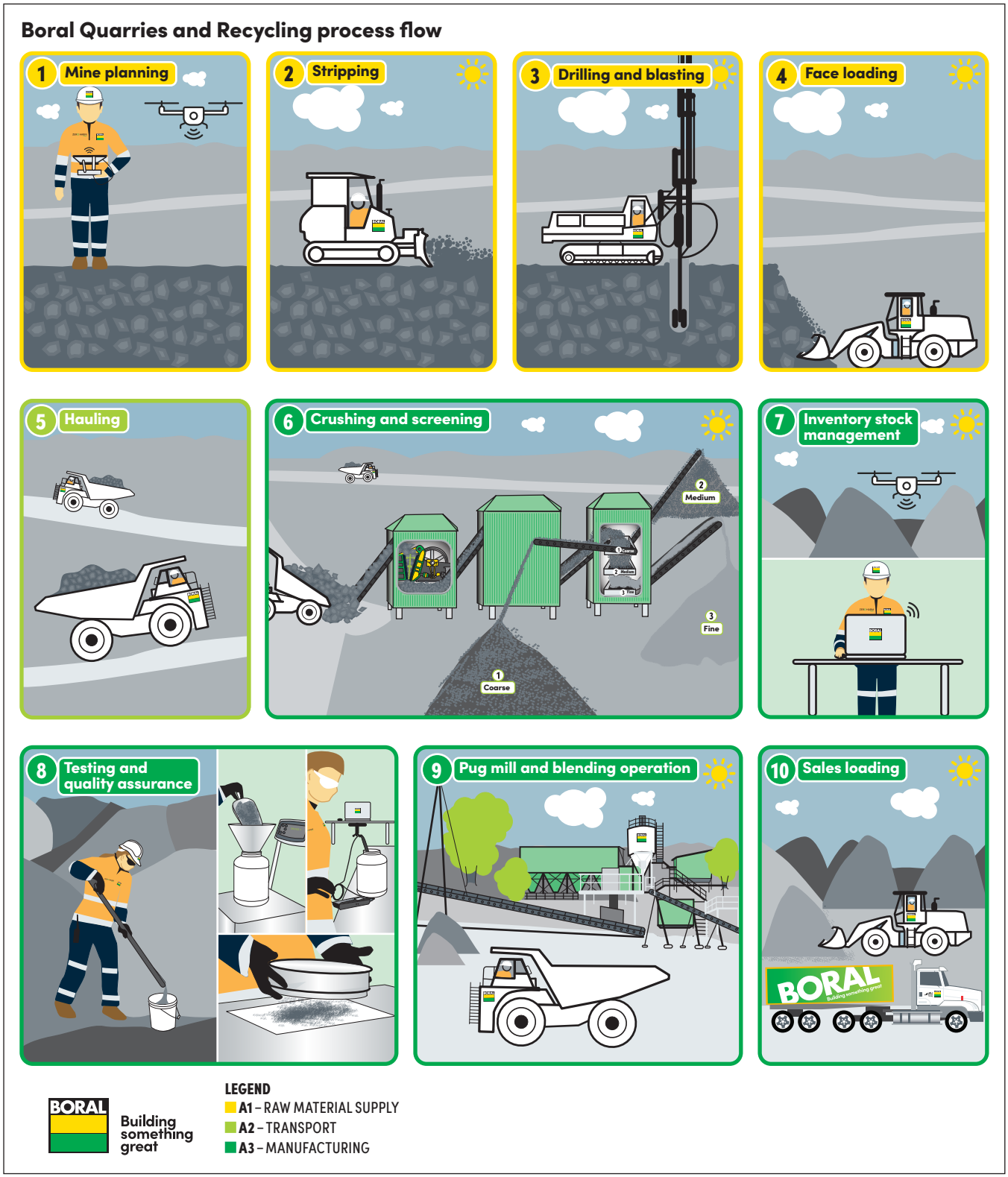
- Base materials
- Sub-base materials
- Backfill
- Sub-grade replacement, and
- Hardstands.

TABLE 4. STABILISED PRODUCTS

Product group
Stablised products
Product Name*
• Cement treated roadbase – 1.0% – 2.0% – 3.0% – 4.0% – 5.0%

Life cycle stages covered by the Life Cycle Assessment (LCA)

FIGURE 1. BORAL QUARRIES AND RECYCLING PROCESS FLOW



Life cycle stages covered by the Life Cycle Assessment (LCA)

Lifecycle Stages A1-A3

The process of manufacturing natural Quarry Products is depicted for simplicity in the process flow diagram on page 13. The process for manufacturing Recycled Products will follow a truncated version of the flow diagram, commencing from five (5).

This EPD covers the cradle-to-gate life cycle stages (A1-A3), as per diagram page 13. Downstream stages have not been included, as these are best modelled at the building or infrastructure project level.

A1 – Raw material supply

Raw material in a quarry is sourced from natural feed that is usually obtained through a drill and blast process, face loaded (by excavator or front-end loader) into mine dump trucks ready for transport and processing. Recycled raw material is typically Construction and Demolition (C&D) waste that is delivered to the facility, where it is dumped in designated stockpiles and managed with a front end loader.

Input flows include explosives, electricity, diesel and water for dust management.

A2 – Transport

Explosives and liquid fuels are transported to our sites by truck. Transport also covers externals of raw feed from pit to plant, as well as final plant to stockpile and stockpile to weighbridge.

A3 – Manufacturing

Manufacturing of both quarried and recycled products most often employs crushers, screening equipment facilitated by conveyor belt transfer. Further product improvement often includes stabilisation with cementitious binders through a pug mill. Most materials are stockpiled by conveyor belt or front end loader with some loaded directly into a delivery truck (eg. Stabilised materials from pug mill). Natural sand quarries do not require explosives. Sand is quarried by removal of the material from an open pit using an excavator. The sand is then screened and washed.

The quarry products meet the relevant conditions for limiting the scope to modules A1-A3, as the material:

- becomes physically integrated with other products (e.g. in concrete and asphalt) so it cannot be physically separated at the end of life
- is no longer identifiable at the end of life as a result of the physical transformation process, and
- does not contain biogenic carbon.

Life cycle stages covered by the Life Cycle Assessment (LCA)

TABLE 5. SCOPE OF EPD

	Product stage			Construction stage		Use stage							End-of-life stage				Benefits beyond system boundary
	RAW MATERIAL SUPPLY	**TRANSPORT**	**MANUFACTURING**	TRANSPORT	CONSTRUCTION-INSTALLATION PROCESS	USE	MAINTENANCE	REPAIR	REPLACEMENT	REFURBISHMENT	OPERATIONAL ENERGY USE	OPERATIONAL WATER USE	DECONSTRUCTION DEMOLITION	TRANSPORT	WASTE PROCESSING	DISPOSAL	REUSE, RECOVERY, RECYCLING POTENTIAL
Modules	**A1**	**A2**	**A3**	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
				Sc enario		**Scenario**							**Scenario**				
Modules declared	✔	✔	✔	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Geography	AU	AU	AU														
Specific data used	>80%																
Variation — Products	0%																
Variation — Sites	0%																

✔ = module is included in this study ND = module is not declared*

* When a module is not accounted for, the stage is marked with "ND" (Not Declared).
ND is used when we cannot define a typical scenario.

Note: When cement is added to our unbound aggregates to form stabilised products, the geography in Module A1 extends to Japan and Indonesia, while the percentage specific data used is between 20-40% for stabilised products.

Life Cycle Assessment (LCA) methodology

Background data

Boral has supplied primary data from key recycling and quarry sites as well as cement production facilities.

All quarry and recycling production sites covered by this EPD provided primary production data. Of the 14 sites, all sites provided production volume data, as well as data on explosives and diesel use.

Ten sites recorded electricity data. Four sites (Culcairn, Dareton, Mt Napier and Waurn Ponds) do not have a separate electricity meter and therefore we were unable to measure electricity use by the quarry. We have used the highest electricity intensity from the other sites to estimate the electricity use at these four sites. We believe this represents a conservative approach.

Boral does not measure water consumption at its quarry sites. Instead, we have taken water use data from the AusLCI shadow database (Sand, at mine / CH U / AusSD U) as proxy figures (1390 L/t).

Background data for the binder in stabilised materials have been sourced from *Boral Cement EPD S-P-05506* (based on FY20 data).

All production data has been collected from **Financial Year 2022**. The vast majority of the environmental profiles of our products are based on life cycle data that are less than five-years-old.

Background data (eg. for explosives) have been sourced from AusLCI and the AusLCI shadow database (v1.42) (AusLCI 2023). Background data used are either less than 10-years-old or have been reviewed within this period.

Methodological choices have been applied in line with EN 15804+A2; deviations have been recorded.

Allocation

The key process that requires allocation is the shared production of aggregates

Quarry and recycling materials are produced through crushing of rock, C&D feeds which is processed into different products. The energy required for the processing does not vary greatly between products. Therefore, impacts are allocated to products (eg. recycled materials, aggregates and manufactured sand) based on the inclusion percentage of constituents into the final products. Hence, all aggregates have the same environmental profile.

Recycling of (concrete, masonry) rubble through crushing requires a definition of the end-of-waste state for the rubble. Only the impacts occurring after the end-of-waste state should be assigned to the recycled aggregates. Any processing occurring before the end-of-waste should be assigned to (module C3 of) the disposing life cycle. Recycled aggregates only reach the end-of-waste state after the crushing and screening process. In effect, the crushing and screening process are entirely assigned to the disposing life cycle. However, for Boral we are deviating from this approach, as Boral currently is not able to measure and report the volumes of recycled materials passing through its quarries. Therefore, we have opted to allocate the total energy consumption across the quarries to all products (both virgin and recycled products). This approach means that the recycled aggregates do pick up environmental impacts from the crushing process.

Life Cycle Assessment (LCA) methodology

Cut-off criteria

Where possible (i.e. for which data are available), all inputs and outputs to a process have been included. The cut-off criteria applied are one per cent of renewable and non-renewable primary energy usage and one per cent of the total mass input of a process.

Ancillary materials used on the sites including, but not limited to, greases, lubricating oils, engine oils, conveyor belts and other minor ancillary materials used during production have been excluded.

The contribution of capital goods (production equipment and infrastructure) and personnel is excluded, as these processes are non-attributable and they contribute less than ten per cent to GWP-GHG.

Key assumptions

Water consumption

Water consumption is not measured consistently across recycling and quarry sites, however, Boral is currently working to improve this. In the meantime, we have used AusLCI water consumption data per tonne of coarse and fine aggregates instead.

Electricity

Electricity has been modelled for core processes using the AusLCI data for the electricity mix used in Victoria (NSW for Culcairn). The GWP-GHG intensity of the electricity is aligned with National Greenhouse Accounts (NGA) 2022 factors, and comes to 0.92 and 0.79 kg CO_2e / kWh respectively.

The grid mixes in AusLCI v1.42 are based on the Australian Energy Statistics, 2021.

TABLE 6. NEW SOUTH WALES (NSW) AND VICTORIA (VIC) ELECTRICITY GRID MIX

Electricity grid mix	NSW	Victoria
Brown coal	–	68.7%
Black coal	76.5%	–
Natural gas	4.1%	6.4%
Oil products	0.5%	0.4%
Wood	1.0%	0.5%
Biogas	0.6%	1.1%
Wind	6.5%	11.4%
Hydro	3.0%	4.7%
Solar	7.9%	6.8%

Product composition

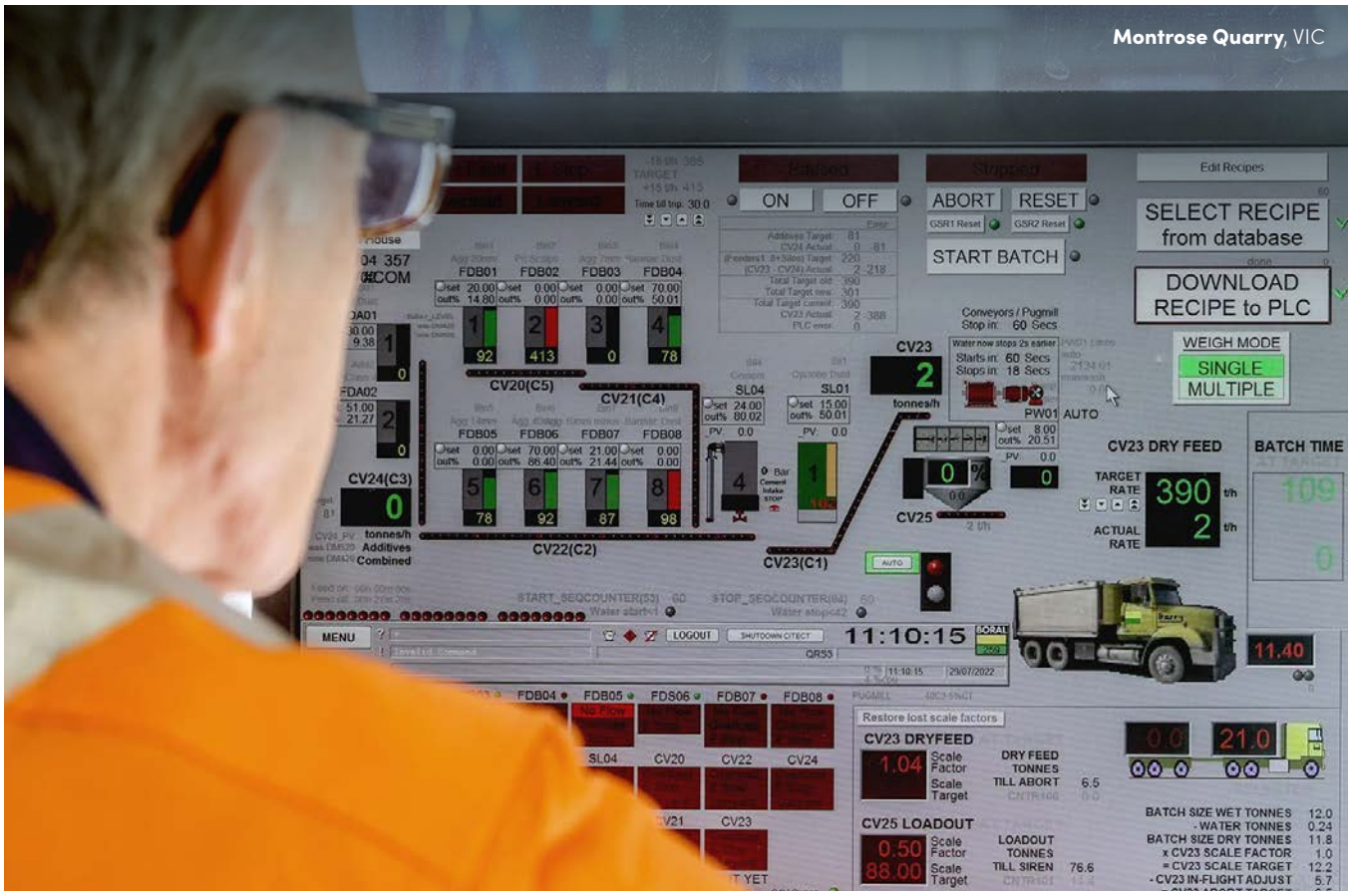
Content declaration (per declared unit)

TABLE 7. QUARRY AND RECYCLING PRODUCT COMPOSITIONS (VICTORIA REGION)

Product	Composition	Mass kg	Post consumer material %	Renewable material mass %
Crushed aggregates (including manufactured sand)	Natural rock.	1,000	0%	0%
Recycled aggregates	Recycled concrete aggregates, brick and masonry.	1,000	0-100%*	0%
Sand	Natural sand.	1,000	0%	0%
Cement treated products	• Aggregates • Cement.	950-990 10-50	0% 0%	0% 0%

*Recycled aggregates are produced from concrete construction and demolition waste, as well as production waste from concrete plants. Boral does not record whether the source material is pre-consumer or post-consumer recycled material.

The products as supplied are non-hazardous. The products included in this EPD do not contain any substances of very high concern as defined by European REACH regulation in concentrations >0.1% (m / m). Boral's unbound aggregate products and stabilised products do not contain biogenic carbon.



Montrose Quarry, VIC

Declared unit

The background LCA serves as the foundation for this EPD. An LCA analyses the environmental processes in the value chain of a product. It provides a comprehensive evaluation of all upstream (and sometimes downstream) material and energy inputs and outputs. The results are provided for a range of environmental impact categories, in line with EN 15804+A2.

The declared unit that covers all of the products is one tonne (1,000 kg) of aggregates.

All results are presented per declared unit and cover the A1-A3 life cycle stages (cradle-to-gate).

Environmental indicators

TABLE 8. EN 15804+A2 CORE IMPACT CATEGORIES INCLUDED IN THIS ASSESSMENT

Impact category	Acronym	Unit
Global warming potential — Total	**GWP-total**	kg CO_2 equivalents
Global warming potential — Fossil	**GWP-fossil**	kg CO_2 equivalents
Global warming potential — Biogenic	**GWP-biogenic**	kg CO_2 equivalents
Global warming potential — Land use and land use change	**GWP-luluc**	kg CO_2 equivalents
Depletion potential of the stratospheric ozone layer	**ODP**	kg CFC-11 equivalents
Acidification potential and accumulated exceedance	**AP**	mol H^+ equivalents
Eutrophication potential and aquatic freshwater	**EP-freshwater**	kg P equivalents
Eutrophication potential and aquatic marine	**EP-marine**	kg N equivalents
Eutrophication potential and terrestrial	**EP-terrestrial**	mol N equivalents
Photochemical ozone formation potential	**POCP**	kg NMVOC equivalents
Abiotic depletion potential for non-fossil resources*	**ADP-minerals and metals**	kg Sb equivalents
Abiotic depletion potential for fossil resources*	**ADP-fossils**	MJ
Water (user) deprivation potential*	**WDP**	m^3 world equivalent deprived

TABLE 9. EN 15804+A2 ADDITIONAL IMPACT CATEGORIES INCLUDED IN THIS ASSESSMENT

Impact category	Acronym	Unit
Global warming potential — climate impact#	**GWP-GHG**	kg CO_2 equivalents
Particulate matter emissions	**PM**	Disease incidence
Ionizing radiation and human health**	**IRP**	kBq U235 equivalents
Eco-toxicity — Freshwater*	**ETP-fw**	CTUe
Human toxicity potential and cancer*	**HTP-c**	CTUh
Human toxicity potential and non-cancer*	**HTP-nc**	CTUh
Land use related impacts / Soil quality*	**SQP**	-

* 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.

** 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 from some construction materials is also not measured by this indicator.

The GWP-GHG indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product as defined by IPCC AR 5 (IPCC 2013). This indicator is determined using the IPCC AR5 Global Warming Potentials (GWP) with a 100-year time horizon, , although in PCR 2019:14 this was changed to include indirect radiative forcing and therefore GWP-GHG is no longer completely aligned with Australian greenhouse gas reporting frameworks (e.g. National Greenhouse and Energy Reporting (NGER) framework). For the products in this EPD the difference in results is minimal.

Environmental indicators

TABLE 10. PARAMETERS DESCRIBING RESOURCE USE, WASTE AND OUTPUT FLOWS

Resource use	Acronym	Unit
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	**PERE**	MJ_{NCV}
Use of renewable primary energy resources used as raw materials	**PERM**	MJ_{NCV}
Total use of renewable primary energy resources	**PERT**	MJ_{NCV}
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	**PENRE**	MJ_{NCV}
Use of non-renewable primary energy resources used as raw materials	**PENRM**	MJ_{NCV}
Total use of non-renewable primary energy resources	**PENRT**	MJ_{NCV}
Use of secondary material	**SM**	kg
Use of renewable secondary fuels	**RSF**	MJ_{NCV}
Use of non-renewable secondary fuels	**NRSF**	MJ_{NCV}
Use of net fresh water	**FW**	m^3
Waste categories		
Hazardous waste disposed	**HWD**	kg
Non-hazardous waste disposed	**NHWD**	kg
Radioactive waste disposed	**RWD**	kg
Output flows		
Components for re-use	**CRU**	kg
Materials for recycling	**MFR**	kg
Materials for energy recovery	**MER**	kg
Exported energy	**EE**	MJ

TABLE 11. EN 15804+A1 IMPACT CATEGORIES INCLUDED IN THIS ASSESSMENT

Impact category	Acronym	Unit
Global Warming Potential	**GWP**	kg CO_2 equivalents
Ozone Depletion Potential	**ODP**	kg CFC-11 equivalents
Acidification Potential of Soil and Water	**AP**	kg SO_2 equivalents
Eutrophication Potential	**EP**	kg PO_4^{3-} equivalents
Photochemical Ozone Creation Potential	**POCP**	kg C_2H_4 equivalents
Abiotic Depletion Potential for Mineral Elements	**ADPE**	kg Sb equivalents
Abiotic Depletion Potential for Fossil Fuels	**ADPF**	MJ

Environmental profiles

The cradle-to-gate (module A1-A3) environmental profiles and environmental parameters of each product group are expressed per tonne.

The environmental impact indicators are determined using the EFv3.0 characterisation factors (JRC 2018). The environmental parameters are based on the life cycle inventory. There can be some ambiguity around their presentation, and this should be considered when comparing EPDs.

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.

Limitations

The results of this study and the EPD are valid for Boral products only. Products from other manufacturers will likely have different impacts due to differences in quarry operations and supply chains. The main limitations of the LCA results are found in the parameter results, which are highly dependent on background data. 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.

This EPD contains three versions of climate change indicators:

1. **Global warming potential — Total (GWP-Total)**
   Aligns with the EN 15804+A2 default method. It is based on a European implementation of Global Warming Potentials, which includes indirect radiative forcing and therefore doesn't fully align with Australian reporting frameworks.

2. **The Carbon footprint (GWP-GHG) indicator**
   Includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is determined using IPCC AR5 Global Warming Potentials (GWP) with a 100-year time horizon, although in PCR 2019:14 this was changed to include indirect radiative forcing and therefore GWP-GHG is no longer completely aligned with Australian greenhouse gas reporting frameworks (e.g. National Greenhouse and Energy Reporting (NGER) framework). For the products in this EPD the difference in results is minimal.

3. **The GWP indicator**
   Aligns with the EN 15804+A1 default method. This indicator is determined using IPCC AR4 Global Warming Potentials (GWP) with a 100-year time horizon. It aligns with some of the tools that are currently used in Australia (e.g. ISC Materials Calculator).


FL2088
CAT
980

Victoria region

Environmental profiles and parameters

Environmental profiles table list

The results are presented per site:

Cradle-to-gate GWP-GHG summary (kg CO_2 eq / tonne)

	UNBOUND AGGREGATES				STABILISED PRODUCTS				
	AGGREGATE AND RECYCLED PRODUCTS	SAND AND RECYCLED PRODUCTS	AGGREGATE PRODUCTS	SAND PRODUCTS	1.0%	2.0%	3.0%	4.0%	5.0%
BACCHUS MARSH		6.5							
CHARLTON			4.9						
COLDSTREAM	5.0								
COSGROVE (SHEPPARTON)			4.8						
CULCAIRN			5.3						
DARETON (IRYMPLE)				2.9					
DEER PARK	4.8				14.6	24.4	34.2	44.0	53.8
DUNNSTOWN			3.4		13.3	23.1	33.0	42.8	52.6
KATUNGA		7.1							
LYSTERFIELD (DANDENONG)	4.7				14.5	24.4	34.2	44.1	53.9
MONTROSE			3.7		13.6	23.4	33.3	43.2	53.1
MT NAPIER (DUNDAS)			8.3						
WAURN PONDS	3.6								
WOLLERT	9.9					29.5	39.3	49.1	58.9

Note: Percentages are % cement content in the stabilised product.

Bacchus Marsh

Victoria region

TABLE 12. EN 15804+A2 IMPACT CATEGORIES (A1–A3) – UNBOUND AGGREGATES – BACCHUS MARSH (VIC), PER TONNE

BACCHUS MARSH		
Indicator	Unit	SAND AND AGGREGATE PRODUCTS
GWP — Total	**kg CO_2 eq.**	**6.56E+00**
GWP — Fossil	kg CO_2 eq.	6.55E+00
GWP — Biogenic	kg CO_2 eq.	9.36E-03
GWP — Luluc	kg CO_2 eq.	2.29E-06
ODP	kg CFC11 eq.	7.16E-07
AP	mol H+ eq.	6.10E-02
EP — Freshwater	kg P eq.	3.11E-06
EP — Marine	kg N eq.	2.23E-02
EP — Terrestrial	mol N eq.	2.46E-01
POCP	kg NMVOC eq.	6.53E-02
ADP — Minerals and Metals*	kg Sb eq.	9.46E-08
ADP — Fossil*	MJ (NCV)	9.45E+01
WDP*	m^3 eq.	1.01E+02

TABLE 13. EN 15804+A2 ADDITIONAL IMPACT CATEGORIES (A1–A3) – UNBOUND AGGREGATES – BACCHUS MARSH (VIC), PER TONNE

BACCHUS MARSH		
Indicator	Unit	SAND AND AGGREGATE PRODUCTS
PM	Disease incidence	1.43E-06
IRP**	kBq U235 eq.	9.86E-05
ETP-fw*	CTUe	1.74E+01
HTP-c*	CTUh	2.05E-10
HTP-nc*	CTUh	1.80E-08
SQP*	-	2.04E+02
Carbon footprint (IPCC AR5, 100yr)		
GWP-GHG#	**kg CO_2 eq.**	**6.5**

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Bacchus Marsh Quarry – Unbound aggregates, VIC

Bacchus Marsh

Victoria region

TABLE 14. ENVIRONMENTAL PARAMETERS (A1-A3) – UNBOUND AGGREGATES – BACCHUS MARSH (VIC), PER TONNE

BACCHUS MARSH		
Indicator	Unit	SAND AND AGGREGATE PRODUCTS
PERE	MJ_{NCV}	1.40E+00
PERM	MJ_{NCV}	0.00E+00
PERT	MJ_{NCV}	1.40E+00
PENRE	MJ_{NCV}	9.45E+01
PENRM	MJ_{NCV}	0.00E+00
PENRT	MJ_{NCV}	9.45E+01
SM	kg	0.00E+00
RSF	MJ_{NCV}	0.00E+00
NRSF	MJ_{NCV}	0.00E+00
FW	m^3	1.40E+00
HWD	kg	0.00E+00
NHWD	kg	3.26E-03
RWD	kg	0.00E+00
CRU	kg	0.00E+00
MFR	kg	0.00E+00
MER	kg	0.00E+00
EE	MJ	0.00E+00

TABLE 15. EN 15804+A1 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – BACCHUS MARSH (VIC), PER TONNE

BACCHUS MARSH		
Indicator	Unit	SAND AND AGGREGATE PRODUCTS
GWP	**kg CO_2 eq.**	**6.49E+00**
ODP	kg CFC11 eq.	5.65E-07
AP	kg SO_2 eq.	3.65E-02
EP	kg PO_4^{3-} eq.	7.67E-03
POCP	kg C_2H_4 eq.	3.51E-03
ADPE	kg Sb eq.	9.55E-08
ADPF	MJ_{NCV}	9.45E+01

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Bacchus Marsh Quarry – Unbound aggregates, VIC

Charlton

Victoria region

TABLE 16. EN 15804+A2 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – CHARLTON (VIC), PER TONNE

CHARLTON		
Indicator	Unit	AGGREGATE PRODUCTS
GWP — Total	**kg CO_2 eq.**	**4.97E+00**
GWP — Fossil	kg CO_2 eq.	4.96E+00
GWP — Biogenic	kg CO_2 eq.	1.06E-02
GWP — Luluc	kg CO_2 eq.	1.39E-06
ODP	kg CFC11 eq.	4.08E-07
AP	mol H+ eq.	4.05E-02
EP — Freshwater	kg P eq.	5.04E-06
EP — Marine	kg N eq.	1.28E-02
EP — Terrestrial	mol N eq.	1.46E-01
POCP	kg NMVOC eq.	3.72E-02
ADP — Minerals and Metals*	kg Sb eq.	3.07E-07
ADP — Fossil*	MJ (NCV)	6.87E+01
WDP*	m^3 eq.	1.01E+02

TABLE 17. EN 15804+A2 ADDITIONAL IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – CHARLTON (VIC), PER TONNE

CHARLTON		
Indicator	Unit	AGGREGATE PRODUCTS
PM	Disease incidence	8.47E-07
IRP**	kBq U235 eq.	7.27E-05
ETP-fw*	CTUe	1.13E+01
HTP-c*	CTUh	1.42E-10
HTP-nc*	CTUh	1.02E-08
SQP*	-	3.65E+02
Carbon footprint (IPCC AR5, 100yr)		
GWP-GHG#	**kg CO_2 eq.**	**4.9**

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Boral tipper

Charlton

Victoria region

TABLE 18. ENIVIRONMENTAL PARAMETERS CATEGORIES (A1-A3) – UNBOUND AGGREGATES – CHARLTON (VIC), PER TONNE

CHARLTON		
Indicator	Unit	AGGREGATE PRODUCTS
PERE	MJ_{NCV}	1.40E+00
PERM	MJ_{NCV}	0.00E+00
PERT	MJ_{NCV}	1.40E+00
PENRE	MJ_{NCV}	6.87E+01
PENRM	MJ_{NCV}	0.00E+00
PENRT	MJ_{NCV}	6.87E+01
SM	kg	0.00E+00
RSF	MJ_{NCV}	0.00E+00
NRSF	MJ_{NCV}	0.00E+00
FW	m^3	1.40E+00
HWD	kg	0.00E+00
NHWD	kg	3.32E-03
RWD	kg	0.00E+00
CRU	kg	0.00E+00
MFR	kg	0.00E+00
MER	kg	0.00E+00
EE	MJ	0.00E+00

TABLE 19. EN 15804+A1 ADDITIONAL IMPACT CATEGORIES (A1-A3)– UNBOUND AGGREGATES – CHARLTON (VIC), PER TONNE

CHARLTON		
Indicator	Unit	AGGREGATE PRODUCTS
GWP	**kg CO_2 eq.**	**4.92E+00**
ODP	kg CFC11 eq.	3.22E-07
AP	kg SO_2 eq.	2.21E-02
EP	kg PO_4^{3-} eq.	4.90E-03
POCP	kg C_2H_4 eq.	1.96E-03
ADPE	kg Sb eq.	3.08E-07
ADPF	MJ_{NCV}	6.87E+01

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Charlton Quarry – Unbound aggregates, VIC

Coldstream

Victoria region

TABLE 20. EN 15804+A2 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – COLDSTREAM (VIC), PER TONNE

COLDSTREAM		
Indicator	Unit	AGGREGATE AND RECYCLED PRODUCTS
GWP — Total	**kg CO_2 eq.**	**5.10E+00**
GWP — Fossil	kg CO_2 eq.	5.08E+00
GWP — Biogenic	kg CO_2 eq.	1.10E-02
GWP — Luluc	kg CO_2 eq.	1.41E-06
ODP	kg CFC11 eq.	4.15E-07
AP	mol H+ eq.	4.27E-02
EP — Freshwater	kg P eq.	3.66E-06
EP — Marine	kg N eq.	1.34E-02
EP — Terrestrial	mol N eq.	1.49E-01
POCP	kg NMVOC eq.	3.93E-02
ADP — Minerals and Metals*	kg Sb eq.	1.42E-07
ADP — Fossil*	MJ (NCV)	7.44E+01
WDP*	m^3 eq.	1.01E+02

TABLE 21. EN 15804+A2 ADDITIONAL IMPACT CATEGORIES (A1-A3)– UNBOUND AGGREGATES – COLDSTREAM (VIC), PER TONNE

COLDSTREAM		
Indicator	Unit	AGGREGATE AND RECYCLED PRODUCTS
PM	Disease incidence	9.05E-07
IRP**	kBq U235 eq.	6.35E-05
ETP-fw*	CTUe	1.10E+01
HTP-c*	CTUh	1.40E-10
HTP-nc*	CTUh	1.07E-08
SQP*	-	4.64E+02
Carbon footprint (IPCC AR5, 100yr)		
GWP-GHG#	**kg CO_2 eq.**	**5.0**

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Coldstream Quarry – Aggregate and recycling products, VIC

Coldstream

Victoria region

TABLE 22. ENVIRONMENTAL PARAMETERS (A1-A3) – UNBOUND AGGREGATES – COLDSTREAM (VIC), PER TONNE

COLDSTREAM		
Indicator	Unit	AGGREGATE AND RECYCLED PRODUCTS
PERE	MJ_{NCV}	1.61E+00
PERM	MJ_{NCV}	0.00E+00
PERT	MJ_{NCV}	1.61E+00
PENRE	MJ_{NCV}	7.44E+01
PENRM	MJ_{NCV}	0.00E+00
PENRT	MJ_{NCV}	7.44E+01
SM	kg	0.00E+00
RSF	MJ_{NCV}	0.00E+00
NRSF	MJ_{NCV}	0.00E+00
FW	m^3	1.40E+00
HWD	kg	0.00E+00
NHWD	kg	3.72E-03
RWD	kg	0.00E+00
CRU	kg	0.00E+00
MFR	kg	0.00E+00
MER	kg	0.00E+00
EE	MJ	0.00E+00

TABLE 23. EN 15804+A1 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – COLDSTREAM (VIC), PER TONNE

COLDSTREAM		
Indicator	Unit	AGGREGATE AND RECYCLED PRODUCTS
GWP	**kg CO_2 eq.**	**5.04E+00**
ODP	kg CFC11 eq.	3.28E-07
AP	kg SO_2 eq.	2.22E-02
EP	kg PO_4^{3-} eq.	4.79E-03
POCP	kg C_2H_4 eq.	2.08E-03
ADPE	kg Sb eq.	1.43E-07
ADPF	MJ_{NCV}	7.44E+01

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Coldstream Quarry – Aggregate and recycling products, VIC

Cosgrove (Shepparton)

Victoria region

TABLE 24. EN 15804+A2 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – COSGROVE (SHEPPARTON) (VIC), PER TONNE

COSGROVE (SHEPPARTON)		
Indicator	Unit	AGGREGATE AND RECYCLED PRODUCTS
GWP — Total	**kg CO_2 eq.**	**4.91E+00**
GWP — Fossil	kg CO_2 eq.	4.90E+00
GWP — Biogenic	kg CO_2 eq.	8.07E-03
GWP — Luluc	kg CO_2 eq.	1.64E-06
ODP	kg CFC11 eq.	4.97E-07
AP	mol H+ eq.	4.35E-02
EP — Freshwater	kg P eq.	3.74E-06
EP — Marine	kg N eq.	1.53E-02
EP — Terrestrial	mol N eq.	1.72E-01
POCP	kg NMVOC eq.	4.48E-02
ADP — Minerals and Metals*	kg Sb eq.	2.11E-07
ADP — Fossil*	MJ (NCV)	6.82E+01
WDP*	m^3 eq.	1.01E+02

TABLE 25. EN 15804+A2 ADDITIONAL IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – COSGROVE (SHEPPARTON) (VIC), PER TONNE

COSGROVE (SHEPPARTON)		
Indicator	Unit	AGGREGATE AND RECYCLED PRODUCTS
PM	Disease incidence	9.86E-07
IRP**	kBq U235 eq.	7.79E-05
ETP-fw*	CTUe	1.27E+01
HTP-c*	CTUh	1.52E-10
HTP-nc*	CTUh	1.24E-08
SQP*	-	1.46E+02
Carbon footprint (IPCC AR5, 100yr)		
GWP-GHG#	**kg CO_2 eq.**	**4.8**

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Cosgrove Quarry (Shepparton) – Aggregate and recycling products, VIC

Cosgrove (Shepparton)

Victoria region

TABLE 26. ENVIRONMENTAL PARAMETERS (A1-A3) – UNBOUND AGGREGATES – COSGROVE (SHEPPARTON) (VIC), PER TONNE

COSGROVE (SHEPPARTON)		
Indicator	Unit	AGGREGATE AND RECYCLED PRODUCTS
PERE	MJ_{NCV}	1.08E+00
PERM	MJ_{NCV}	0.00E+00
PERT	MJ_{NCV}	1.08E+00
PENRE	MJ_{NCV}	6.82E+01
PENRM	MJ_{NCV}	0.00E+00
PENRT	MJ_{NCV}	6.82E+01
SM	kg	0.00E+00
RSF	MJ_{NCV}	0.00E+00
NRSF	MJ_{NCV}	0.00E+00
FW	m^3	1.40E+00
HWD	kg	0.00E+00
NHWD	kg	2.56E-03
RWD	kg	0.00E+00
CRU	kg	0.00E+00
MFR	kg	0.00E+00
MER	kg	0.00E+00
EE	MJ	0.00E+00

TABLE 27. EN 15804+A1 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – COSGROVE (SHEPPARTON) (VIC), PER TONNE

COSGROVE (SHEPPARTON)		
Indicator	Unit	AGGREGATE AND RECYCLED PRODUCTS
GWP	**kg CO_2 eq.**	**4.86E+00**
ODP	kg CFC11 eq.	3.92E-07
AP	kg SO_2 eq.	2.58E-02
EP	kg PO_4^{3-} eq.	5.56E-03
POCP	kg C_2H_4 eq.	2.40E-03
ADPE	kg Sb eq.	2.12E-07
ADPF	MJ_{NCV}	6.82E+01

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Cosgrove Quarry (Shepparton) – Aggregate and recycling products, VIC

Culcairn

Victoria region

TABLE 28. EN 15804+A2 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – CULCAIRN (NSW), PER TONNE

CULCAIRN		
Indicator	Unit	AGGREGATE PRODUCTS
GWP — Total	**kg CO_2 eq.**	**5.34E+00**
GWP — Fossil	kg CO_2 eq.	5.33E+00
GWP — Biogenic	kg CO_2 eq.	7.65E-03
GWP — Luluc	kg CO_2 eq.	1.83E-06
ODP	kg CFC11 eq.	5.43E-07
AP	mol H+ eq.	4.98E-02
EP — Freshwater	kg P eq.	3.31E-06
EP — Marine	kg N eq.	1.78E-02
EP — Terrestrial	mol N eq.	1.98E-01
POCP	kg NMVOC eq.	5.19E-02
ADP — Minerals and Metals*	kg Sb eq.	1.31E-07
ADP — Fossil*	MJ (NCV)	6.89E+01
WDP*	m^3 eq.	1.01E+02

TABLE 29. EN 15804+A2 ADDITIONAL IMPACT CATEGORIES (A1-A3)– UNBOUND AGGREGATES – CULCAIRN (NSW), PER TONNE

CULCAIRN		
Indicator	Unit	AGGREGATE PRODUCTS
PM	Disease incidence	1.05E-06
IRP**	kBq U235 eq.	8.00E-05
ETP-fw*	CTUe	1.53E+01
HTP-c*	CTUh	2.24E-10
HTP-nc*	CTUh	1.60E-08
SQP*	-	2.45E+02
Carbon footprint (IPCC AR5, 100yr)		
GWP-GHG#	**kg CO_2 eq.**	**5.3**

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Culcairn Quarry – Unbound aggregates, NSW

Culcairn

Victoria region

TABLE 30. ENVIRONMENTAL PARAMETERS (A1-A3) – UNBOUND AGGREGATES – CULCAIRN (NSW), PER TONNE

CULCAIRN		
Indicator	Unit	AGGREGATE PRODUCTS
PERE	MJ_{NCV}	2.29E+00
PERM	MJ_{NCV}	0.00E+00
PERT	MJ_{NCV}	2.29E+00
PENRE	MJ_{NCV}	6.89E+01
PENRM	MJ_{NCV}	0.00E+00
PENRT	MJ_{NCV}	6.89E+01
SM	kg	0.00E+00
RSF	MJ_{NCV}	0.00E+00
NRSF	MJ_{NCV}	0.00E+00
FW	m^3	1.40E+00
HWD	kg	0.00E+00
NHWD	kg	1.77E-02
RWD	kg	0.00E+00
CRU	kg	0.00E+00
MFR	kg	0.00E+00
MER	kg	0.00E+00
EE	MJ	0.00E+00

TABLE 31. EN 15804+A1 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – CULCAIRN (NSW), PER TONNE

CULCAIRN		
Indicator	Unit	AGGREGATE PRODUCTS
GWP	**kg CO_2 eq.**	**5.25E+00**
ODP	kg CFC11 eq.	4.29E-07
AP	kg SO_2 eq.	2.92E-02
EP	kg PO_4^{3-} eq.	6.25E-03
POCP	kg C_2H_4 eq.	2.62E-03
ADPE	kg Sb eq.	1.34E-07
ADPF	MJ_{NCV}	6.89E+01

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Culcairn Quarry – Unbound aggregates, NSW

Dareton (Irymple)

Victoria region

TABLE 32. EN 15804+A2 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – DARETON (IRYMPLE) (VIC), PER TONNE

DARETON (IRYMPLE)		
Indicator	Unit	SAND PRODUCTS
GWP — Total	**kg CO_2 eq.**	**2.92E+00**
GWP — Fossil	kg CO_2 eq.	2.91E+00
GWP — Biogenic	kg CO_2 eq.	8.27E-03
GWP — Luluc	kg CO_2 eq.	2.13E-06
ODP	kg CFC11 eq.	1.64E-07
AP	mol H+ eq.	2.27E-02
EP — Freshwater	kg P eq.	1.75E-06
EP — Marine	kg N eq.	5.93E-03
EP — Terrestrial	mol N eq.	6.47E-02
POCP	kg NMVOC eq.	1.80E-02
ADP — Minerals and Metals*	kg Sb eq.	4.82E-09
ADP — Fossil*	MJ (NCV)	4.55E+01
WDP*	m^3 eq.	1.00E+02

TABLE 33. EN 15804+A2 ADDITIONAL IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – DARETON (IRYMPLE) (VIC), PER TONNE

DARETON (IRYMPLE)		
Indicator	Unit	SAND PRODUCTS
PM	Disease incidence	4.32E-07
IRP**	kBq U235 eq.	8.62E-05
ETP-fw*	CTUe	4.81E+00
HTP-c*	CTUh	8.47E-11
HTP-nc*	CTUh	1.48E-08
SQP*	-	2.98E+02
Carbon footprint (IPCC AR5, 100yr)		
GWP-GHG#	**kg CO_2 eq.**	**2.9**

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Dareton – Sand, Irymple, VIC

Dareton (Irymple)

Victoria region

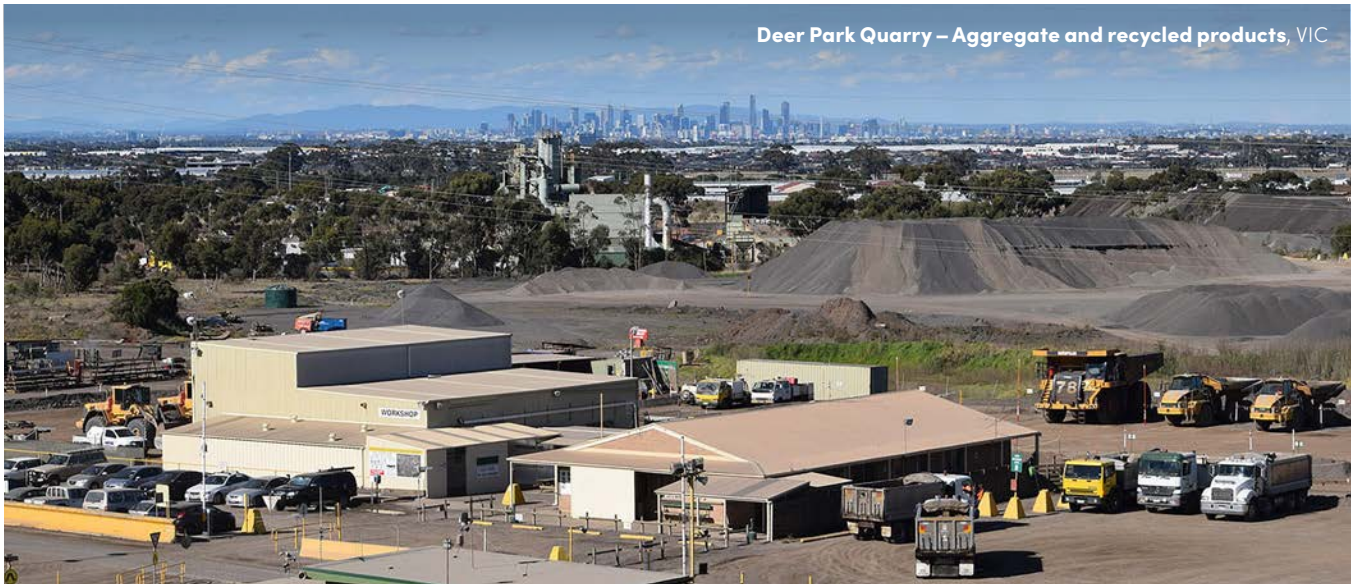
TABLE 34. ENVIRONMENTAL PARAMETERS (A1-A3) – UNBOUND AGGREGATES – DARETON (IRYMPLE) (VIC), PER TONNE

DARETON (IRYMPLE)		
Indicator	Unit	SAND PRODUCTS
PERE	MJ_{NCV}	1.27E+00
PERM	MJ_{NCV}	0.00E+00
PERT	MJ_{NCV}	1.27E+00
PENRE	MJ_{NCV}	4.55E+01
PENRM	MJ_{NCV}	0.00E+00
PENRT	MJ_{NCV}	4.55E+01
SM	kg	0.00E+00
RSF	MJ_{NCV}	0.00E+00
NRSF	MJ_{NCV}	0.00E+00
FW	m^3	1.40E+00
HWD	kg	0.00E+00
NHWD	kg	2.87E-03
RWD	kg	0.00E+00
CRU	kg	0.00E+00
MFR	kg	0.00E+00
MER	kg	0.00E+00
EE	MJ	0.00E+00

TABLE 35. EN 15804+A1 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – DARETON (IRYMPLE) (VIC), PER TONNE

DARETON (IRYMPLE)		
Indicator	Unit	SAND PRODUCTS
GWP	**kg CO_2 eq.**	**2.88E+00**
ODP	kg CFC11 eq.	1.30E-07
AP	kg SO_2 eq.	9.37E-03
EP	kg PO_4^{3-} eq.	2.01E-03
POCP	kg C_2H_4 eq.	1.17E-03
ADPE	kg Sb eq.	5.70E-09
ADPF	MJ_{NCV}	4.55E+01

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.



Deer Park Quarry – Aggregate and recycled products, VIC

Deer Park

Victoria region

TABLE 36. EN 15804+A2 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES AND STABILISED PRODUCTS – DEER PARK (VIC), PER TONNE

DEER PARK							
		CEMENT TREATED AGGREGATES					AGGREGATE AND RECYCLED PRODUCTS
Indicator	Unit	1.0%	2.0%	3.0%	4.0%	5.0%	
GWP — Total	**kg CO_2 eq.**	**1.47E+01**	**2.46E+01**	**3.44E+01**	**4.43E+01**	**5.41E+01**	**4.87E+00**
GWP — Fossil	kg CO_2 eq.	1.47E+01	2.46E+01	3.44E+01	4.43E+01	5.41E+01	4.86E+00
GWP — Biogenic	kg CO_2 eq.	1.34E-02	1.68E-02	2.02E-02	2.36E-02	2.71E-02	9.95E-03
GWP — Luluc	kg CO_2 eq.	4.93E-04	9.86E-04	1.48E-03	1.97E-03	2.46E-03	1.41E-06
ODP	kg CFC11 eq.	5.25E-07	6.31E-07	7.37E-07	8.43E-07	9.49E-07	4.18E-07
AP	mol H+ eq.	8.20E-02	1.23E-01	1.65E-01	2.06E-01	2.48E-01	4.05E-02
EP — Freshwater	kg P eq.	6.51E-05	1.26E-04	1.86E-04	2.47E-04	3.07E-04	4.55E-06
EP — Marine	kg N eq.	2.45E-02	3.59E-02	4.72E-02	5.86E-02	7.00E-02	1.31E-02
EP — Terrestrial	mol N eq.	2.76E-01	4.04E-01	5.32E-01	6.59E-01	7.87E-01	1.48E-01
POCP	kgNMVOCeq.	6.88E-02	9.94E-02	1.30E-01	1.61E-01	1.91E-01	3.82E-02
ADP — Minerals and Metals*	kg Sb eq.	3.02E-07	3.39E-07	3.76E-07	4.13E-07	4.50E-07	2.66E-07
ADP — Fossil*	MJ (NCV)	1.24E+02	1.80E+02	2.36E+02	2.93E+02	3.49E+02	6.78E+01
WDP*	m^3 eq.	1.60E+02	2.20E+02	2.79E+02	3.39E+02	3.98E+02	1.01E+02

* 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.

TABLE 37. EN 15804+A2 ADDITIONAL IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES AND STABILISED PRODUCTS – DEER PARK (VIC), PER TONNE

DEER PARK							
		CEMENT TREATED AGGREGATES					AGGREGATE AND RECYCLED PRODUCTS
Indicator	Unit	1.0%	2.0%	3.0%	4.0%	5.0%	
PM	Disease incidence	1.04E-06	1.21E-06	1.38E-06	1.55E-06	1.72E-06	8.64E-07
IRP**	kBq U235 eq.	5.21E-02	1.04E-01	1.56E-01	2.08E-01	2.60E-01	7.15E-05
ETP-fw*	CTUe	1.14E+01	1.15E+01	1.16E+01	1.17E+01	1.18E+01	1.13E+01
HTP-c*	CTUh	1.68E-10	1.94E-10	2.21E-10	2.48E-10	2.74E-10	1.41E-10
HTP-nc*	CTUh	1.06E-08	1.08E-08	1.09E-08	1.10E-08	1.12E-08	1.05E-08
SQP*	-	2.61E+02	2.60E+02	2.60E+02	2.59E+02	2.58E+02	2.62E+02
Carbon footprint (IPCC AR5, 100yr)							
GWP-GHG	**kg CO_2 eq.**	**14.6**	**24.4**	**34.2**	**44.0**	**53.8**	**4.8**

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Deer Park

Victoria region

TABLE 38. ENVIRONMENTAL PARAMETERS (A1-A3)– UNBOUND AGGREGATES AND STABILISED PRODUCTS – DEER PARK (VIC), PER TONNE

DEER PARK							
		CEMENT TREATED AGGREGATES					AGGREGATE AND RECYCLED PRODUCTS
Indicator	Unit	1.0%	2.0%	3.0%	4.0%	5.0%	
PERE	MJ_{NCV}	1.87E+00	2.42E+00	2.97E+00	3.52E+00	4.07E+00	1.32E+00
PERM	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ_{NCV}	1.87E+00	2.42E+00	2.97E+00	3.52E+00	4.07E+00	1.32E+00
PENRE	MJ_{NCV}	1.24E+02	1.80E+02	2.37E+02	2.93E+02	3.49E+02	6.78E+01
PENRM	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ_{NCV}	1.24E+02	1.80E+02	2.37E+02	2.93E+02	3.49E+02	6.78E+01
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ_{NCV}	5.27E-01	1.05E+00	1.58E+00	2.11E+00	2.63E+00	0.00E+00
NRSF	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	1.43E+00	1.46E+00	1.49E+00	1.52E+00	1.55E+00	1.40E+00
HWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NHWD	kg	4.55E-03	5.97E-03	7.39E-03	8.81E-03	1.02E-02	3.13E-03
RWD	kg	0.00E+00	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
MFR	kg	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
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE 39. EN 15804+A1 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES AND STABILISED PRODUCTS – DEER PARK (VIC), PER TONNE

DEER PAR							
		CEMENT TREATED AGGREGATES					AGGREGATE AND RECYCLED PRODUCTS
Indicator	Unit	1.0%	2.0%	3.0%	4.0%	5.0%	
GWP	**kg CO_2 eq.**	**1.46E+01**	**2.44E+01**	**3.42E+01**	**4.39E+01**	**5.37E+01**	**4.82E+00**
ODP	kg CFC11 eq.	4.17E-07	5.03E-07	5.89E-07	6.75E-07	7.61E-07	3.30E-07
AP	kg SO_2 eq.	5.10E-02	7.96E-02	1.08E-01	1.37E-01	1.65E-01	2.24E-02
EP	kg PO_4^{3-} eq.	9.03E-03	1.31E-02	1.72E-02	2.13E-02	2.54E-02	4.93E-03
POCP	kg C_2H_4 eq.	3.24E-03	4.46E-03	5.68E-03	6.90E-03	8.12E-03	2.02E-03
ADPE	kg Sb eq.	3.07E-07	3.47E-07	3.88E-07	4.28E-07	4.69E-07	2.66E-07
ADPF	MJ_{NCV}	1.24E+02	1.81E+02	2.37E+02	2.93E+02	3.50E+02	6.78E+01

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Dunnstown

Victoria region

TABLE 40. EN 15804+A2 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES AND STABILISED PRODUCTS – DUNNSTOWN (VIC), PER TONNE

DUNNSTOWN							
		CEMENT TREATED AGGREGATES					AGGREGATE PRODUCTS
Indicator	Unit	1.0%	2.0%	3.0%	4.0%	5.0%	
GWP — Total	**kg CO_2 eq.**	**1.34E+01**	**2.33E+01**	**3.32E+01**	**4.31E+01**	**5.30E+01**	**3.49E+00**
GWP — Fossil	kg CO_2 eq.	**1.34E+01**	2.33E+01	3.32E+01	4.31E+01	5.29E+01	3.48E+00
GWP — Biogenic	kg CO_2 eq.	1.18E-02	1.52E-02	1.87E-02	2.21E-02	2.55E-02	8.33E-03
GWP — Luluc	kg CO_2 eq.	4.93E-04	9.85E-04	1.48E-03	1.97E-03	2.46E-03	9.24E-07
ODP	kg CFC11 eq.	3.72E-07	4.85E-07	5.98E-07	7.11E-07	8.24E-07	2.59E-07
AP	mol H+ eq.	6.97E-02	1.11E-01	1.53E-01	1.95E-01	2.37E-01	2.79E-02
EP — Freshwater	kg P eq.	6.39E-05	1.24E-04	1.85E-04	2.46E-04	3.06E-04	3.33E-06
EP — Marine	kg N eq.	1.98E-02	3.14E-02	4.29E-02	5.44E-02	6.59E-02	8.33E-03
EP — Terrestrial	mol N eq.	2.24E-01	3.53E-01	4.82E-01	6.12E-01	7.41E-01	9.43E-02
POCP	kgNMVOCeq.	5.53E-02	8.63E-02	1.17E-01	1.48E-01	1.79E-01	2.43E-02
ADP — Minerals and Metals*	kg Sb eq.	2.15E-07	2.52E-07	2.90E-07	3.28E-07	3.65E-07	1.77E-07
ADP — Fossil*	MJ (NCV)	1.06E+02	1.63E+02	2.20E+02	2.77E+02	3.33E+02	4.96E+01
WDP*	m^3 eq.	1.60E+02	2.20E+02	2.80E+02	3.39E+02	3.99E+02	1.01E+02

* 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.

TABLE 41. EN 15804+A2 ADDITIONAL IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES AND STABILISED PRODUCTS – DUNNSTOWN (VIC), PER TONNE

DUNNSTOWN							
		CEMENT TREATED AGGREGATES					AGGREGATE PRODUCTS
Indicator	Unit	1.0%	2.0%	3.0%	4.0%	5.0%	
PM	Disease incidence	7.44E-07	9.21E-07	1.10E-06	1.27E-06	1.45E-06	5.67E-07
IRP**	kBq U235 eq.	5.22E-02	1.04E-01	1.57E-01	2.09E-01	2.61E-01	4.56E-05
ETP-fw*	CTUe	7.49E+00	7.72E+00	7.95E+00	8.18E+00	8.41E+00	7.26E+00
HTP-c*	CTUh	1.34E-10	1.74E-10	2.14E-10	2.54E-10	2.93E-10	9.44E-11
HTP-nc*	CTUh	6.90E-09	7.17E-09	7.45E-09	7.72E-09	8.00E-09	6.62E-09
SQP*	-	1.08E+02	1.09E+02	1.10E+02	1.10E+02	1.11E+02	1.07E+02
Carbon footprint (IPCC AR5, 100yr)							
GWP-GHG	**kg CO_2 eq.**	**13.3**	**23.1**	**33.0**	**42.8**	**52.6**	**3.4**

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Dunnstown

Victoria region

TABLE 42. ENVIRONMENTAL PARAMETERS (A1-A3) – UNBOUND AGGREGATES AND STABILISED PRODUCTS – DUNNSTOWN (VIC), PER TONNE

DUNNSTOWN							
		CEMENT TREATED AGGREGATES					AGGREGATE PRODUCTS
Indicator	Unit	1.0%	2.0%	3.0%	4.0%	5.0%	
PERE	MJ_{NCV}	1.68E+00	2.23E+00	2.79E+00	3.34E+00	3.89E+00	1.13E+00
PERM	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ_{NCV}	1.68E+00	2.23E+00	2.79E+00	3.34E+00	3.89E+00	1.13E+00
PENRE	MJ_{NCV}	1.06E+02	1.63E+02	2.20E+02	2.77E+02	3.34E+02	4.96E+01
PENRM	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ_{NCV}	1.06E+02	1.63E+02	2.20E+02	2.77E+02	3.34E+02	4.96E+01
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ_{NCV}	5.27E-01	1.05E+00	1.58E+00	2.11E+00	2.63E+00	0.00E+00
NRSF	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	1.43E+00	1.46E+00	1.49E+00	1.52E+00	1.55E+00	1.40E+00
HWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NHWD	kg	4.07E-03	5.49E-03	6.92E-03	8.34E-03	9.77E-03	2.65E-03
RWD	kg	0.00E+00	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
MFR	kg	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
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE 43. EN 15804+A1 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES AND STABILISED PRODUCTS – DUNNSTOWN (VIC), PER TONNE

DUNNSTOWN							
		CEMENT TREATED AGGREGATES					AGGREGATE PRODUCTS
Indicator	Unit	1.0%	2.0%	3.0%	4.0%	5.0%	
GWP	**kg CO_2 eq.**	**1.33E+01**	**2.31E+01**	**3.29E+01**	**4.27E+01**	**5.26E+01**	**3.46E+00**
ODP	kg CFC11 eq.	2.96E-07	3.87E-07	4.79E-07	5.70E-07	6.61E-07	2.04E-07
AP	kg SO_2 eq.	4.30E-02	7.19E-02	1.01E-01	1.29E-01	1.58E-01	1.42E-02
EP	kg PO_4^{3-} eq.	7.30E-03	1.15E-02	1.56E-02	1.98E-02	2.39E-02	3.15E-03
POCP	kg C_2H_4 eq.	2.52E-03	3.76E-03	5.00E-03	6.24E-03	7.48E-03	1.28E-03
ADPE	kg Sb eq.	2.19E-07	2.60E-07	3.02E-07	3.43E-07	3.84E-07	1.78E-07
ADPF	MJ_{NCV}	1.07E+02	1.64E+02	2.20E+02	2.77E+02	3.34E+02	4.96E+01

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Katunga

Victoria region

TABLE 44. EN 15804+A2 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – KATUNGA (VIC), PER TONNE

KATUNGA		
Indicator	Unit	SAND PRODUCTS
GWP — Total	**kg CO_2 eq.**	**7.18E+00**
GWP — Fossil	kg CO_2 eq.	7.18E+00
GWP — Biogenic	kg CO_2 eq.	6.02E-03
GWP — Luluc	kg CO_2 eq.	2.96E-06
ODP	kg CFC11 eq.	9.45E-07
AP	mol H+ eq.	7.24E-02
EP — Freshwater	kg P eq.	1.82E-06
EP — Marine	kg N eq.	2.89E-02
EP — Terrestrial	mol N eq.	3.17E-01
POCP	kg NMVOC eq.	8.48E-02
ADP — Minerals and Metals*	kg Sb eq.	7.06E-09
ADP — Fossil*	MJ (NCV)	1.03E+02
WDP*	m^3 eq.	1.01E+02

TABLE 45. EN 15804+A2 ADDITIONAL IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – KATUNGA (VIC), PER TONNE

KATUNGA		
Indicator	Unit	SAND PRODUCTS
PM	Disease incidence	1.81E-06
IRP**	kBq U235 eq.	1.22E-04
ETP-fw*	CTUe	2.19E+01
HTP-c*	CTUh	2.46E-10
HTP-nc*	CTUh	2.36E-08
SQP*	-	1.54E+03
Carbon footprint (IPCC AR5, 100yr)		
GWP-GHG#	**kg CO_2 eq.**	**7.1**

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Katunga Quarry – Unbound aggregates – *1,000 Tree Planting Project*, VIC

Katunga

Victoria region

TABLE 46. ENVIRONMENTAL PARAMETERS (A1-A3) – UNBOUND AGGREGATES – KATUNGA (VIC), PER TONNE

KATUNGA		
Indicator	Unit	SAND PRODUCTS
PERE	MJ_{NCV}	9.56E-01
PERM	MJ_{NCV}	0.00E+00
PERT	MJ_{NCV}	9.56E-01
PENRE	MJ_{NCV}	1.03E+02
PENRM	MJ_{NCV}	0.00E+00
PENRT	MJ_{NCV}	1.03E+02
SM	kg	0.00E+00
RSF	MJ_{NCV}	0.00E+00
NRSF	MJ_{NCV}	0.00E+00
FW	m^3	1.40E+00
HWD	kg	0.00E+00
NHWD	kg	2.24E-03
RWD	kg	0.00E+00
CRU	kg	0.00E+00
MFR	kg	0.00E+00
MER	kg	0.00E+00
EE	MJ	0.00E+00

TABLE 47. EN 15804+A1 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – KATUNGA (VIC), PER TONNE

KATUNGA		
Indicator	Unit	SAND PRODUCTS
GWP	**kg CO_2 eq.**	**7.10E+00**
ODP	kg CFC11 eq.	7.46E-07
AP	kg SO_2 eq.	4.70E-02
EP	kg PO_4^{3-} eq.	9.71E-03
POCP	kg C_2H_4 eq.	4.60E-03
ADPE	kg Sb eq.	7.73E-09
ADPF	MJ_{NCV}	1.03E+02

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Lysterfield (Dandenong) Quarry – Aggregate and recycled products, VIC

Lysterfield (Dandenong)

Victoria region

TABLE 48. EN 15804+A2 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES AND STABILISED PRODUCTS – LYSTERFIELD (DANDENONG) (VIC), PER TONNE

LYSTERFIELD (DANDENONG)							
		CEMENT TREATED AGGREGATES					AGGREGATE AND RECYCLED PRODUCTS
Indicator	Unit	1.0%	2.0%	3.0%	4.0%	5.0%	
GWP — Total	**kg CO_2 eq.**	**1.46E+01**	**2.45E+01**	**3.44E+01**	**4.44E+01**	**5.43E+01**	**4.75E+00**
GWP — Fossil	kg CO_2 eq.	1.46E+01	2.45E+01	3.44E+01	4.43E+01	5.42E+01	4.74E+00
GWP — Biogenic	kg CO_2 eq.	1.26E-02	1.60E-02	1.95E-02	2.29E-02	2.63E-02	9.18E-03
GWP — Luluc	kg CO_2 eq.	4.94E-04	9.86E-04	1.48E-03	1.97E-03	2.46E-03	1.44E-06
ODP	kg CFC11 eq.	5.44E-07	6.59E-07	7.74E-07	8.90E-07	1.01E-06	4.28E-07
AP	mol H+ eq.	8.24E-02	1.24E-01	1.66E-01	2.08E-01	2.50E-01	4.06E-02
EP — Freshwater	kg P eq.	6.43E-05	1.25E-04	1.86E-04	2.46E-04	3.07E-04	3.74E-06
EP — Marine	kg N eq.	2.50E-02	3.65E-02	4.81E-02	5.96E-02	7.12E-02	1.35E-02
EP — Terrestrial	mol N eq.	2.80E-01	4.10E-01	5.40E-01	6.69E-01	7.99E-01	1.51E-01
POCP	kgNMVOCeq.	7.04E-02	1.02E-01	1.33E-01	1.64E-01	1.95E-01	3.94E-02
ADP — Minerals and Metals*	kg Sb eq.	2.29E-07	2.66E-07	3.04E-07	3.41E-07	3.79E-07	1.91E-07
ADP — Fossil*	MJ (NCV)	1.24E+02	1.81E+02	2.38E+02	2.95E+02	3.52E+02	6.72E+01
WDP*	m^3 eq.	1.61E+02	2.20E+02	2.80E+02	3.40E+02	3.99E+02	1.01E+02

* 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.

TABLE 49. EN 15804+A2 ADDITIONAL IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES AND STABILISED PRODUCTS – LYSTERFIELD (DANDENONG) (VIC), PER TONNE

LYSTERFIELD (DANDENONG)							
		CEMENT TREATED AGGREGATES					AGGREGATE AND RECYCLED PRODUCTS
Indicator	Unit	1.0%	2.0%	3.0%	4.0%	5.0%	
PM	Disease incidence	1.06E-06	1.24E-06	1.41E-06	1.59E-06	1.76E-06	8.86E-07
IRP**	kBq U235 eq.	5.23E-02	1.05E-01	1.57E-01	2.09E-01	2.61E-01	6.81E-05
ETP-fw*	CTUe	1.15E+01	1.18E+01	1.20E+01	1.23E+01	1.25E+01	1.12E+01
HTP-c*	CTUh	1.88E-10	2.38E-10	2.87E-10	3.37E-10	3.86E-10	1.38E-10
HTP-nc*	CTUh	1.11E-08	1.15E-08	1.18E-08	1.21E-08	1.24E-08	1.08E-08
SQP*	-	1.77E+02	1.77E+02	1.77E+02	1.77E+02	1.78E+02	1.77E+02
Carbon footprint (IPCC R5, 100yr)							
GWP-GHG	**kg CO_2 eq.**	**14.5**	**24.4**	**34.2**	**44.1**	**53.9**	**4.7**

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Lysterfield (Dandenong)

Victoria region

TABLE 50. ENVIRONMENTAL PARAMETERS (A1-A3) – UNBOUND AGGREGATES AND STABILISED PRODUCTS – LYSTERFIELD (DANDENONG) (VIC), PER TONNE

LYSTERFIELD (DANDENONG)							
		CEMENT TREATED AGGREGATES					AGGREGATE AND RECYCLED PRODUCTS
Indicator	Unit	1.0%	2.0%	3.0%	4.0%	5.0%	
PERE	MJ_{NCV}	1.82E+00	2.37E+00	2.92E+00	3.47E+00	4.02E+00	1.27E+00
PERM	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ_{NCV}	1.82E+00	2.37E+00	2.92E+00	3.47E+00	4.02E+00	1.27E+00
PENRE	MJ_{NCV}	1.24E+02	1.81E+02	2.38E+02	2.95E+02	3.52E+02	6.72E+01
PENRM	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ_{NCV}	1.24E+02	1.81E+02	2.38E+02	2.95E+02	3.52E+02	6.72E+01
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ_{NCV}	5.27E-01	1.05E+00	1.58E+00	2.11E+00	2.63E+00	0.00E+00
NRSF	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	1.43E+00	1.46E+00	1.49E+00	1.52E+00	1.55E+00	1.40E+00
HWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NHWD	kg	4.40E-03	5.82E-03	7.24E-03	8.66E-03	1.01E-02	2.98E-03
RWD	kg	0.00E+00	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
MFR	kg	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
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE 51. EN 15804+A1 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES AND STABILISED PRODUCTS – LYSTERFIELD (DANDENONG) (VIC), PER TONNE

LYSTERFIELD (DANDENONG)							
		CEMENT TREATED AGGREGATES					AGGREGATE AND RECYCLED PRODUCTS
Indicator	Unit	1.0%	2.0%	3.0%	4.0%	5.0%	
GWP	**kg CO_2 eq.**	**1.45E+01**	**2.44E+01**	**3.42E+01**	**4.40E+01**	**5.38E+01**	**4.70E+00**
ODP	kg CFC11 eq.	4.32E-07	5.25E-07	6.18E-07	7.11E-07	8.05E-07	3.38E-07
AP	kg SO_2 eq.	5.15E-02	8.03E-02	1.09E-01	1.38E-01	1.67E-01	2.26E-02
EP	kg PO_4^{3-} eq.	9.06E-03	1.32E-02	1.74E-02	2.16E-02	2.57E-02	4.90E-03
POCP	kg C_2H_4 eq.	3.34E-03	4.58E-03	5.82E-03	7.06E-03	8.31E-03	2.09E-03
ADPE	kg Sb eq.	2.33E-07	2.74E-07	3.16E-07	3.57E-07	3.98E-07	1.92E-07
ADPF	MJ_{NCV}	1.24E+02	1.81E+02	2.38E+02	2.95E+02	3.53E+02	6.72E+01

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Montrose

Victoria region

TABLE 52. EN 15804+A2 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES AND STABILISED PRODUCTS – MONTROSE (VIC), PER TONNE

MONTROSE							
		CEMENT TREATED AGGREGATES					AGGREGATE PRODUCTS
Indicator	Unit	1.0%	2.0%	3.0%	4.0%	5.0%	
GWP — Total	**kg CO_2 eq.**	**1.37E+01**	**2.36E+01**	**3.35E+01**	**4.34E+01**	**5.34E+01**	**3.73E+00**
GWP — Fossil	kg CO_2 eq.	1.37E+01	2.36E+01	3.35E+01	4.34E+01	5.34E+01	3.72E+00
GWP — Biogenic	kg CO_2 eq.	1.28E-02	1.63E-02	1.97E-02	2.31E-02	2.66E-02	9.40E-03
GWP — Luluc	kg CO_2 eq.	4.93E-04	9.85E-04	1.48E-03	1.97E-03	2.46E-03	9.23E-07
ODP	kg CFC11 eq.	3.77E-07	4.97E-07	6.18E-07	7.38E-07	8.58E-07	2.57E-07
AP	mol H+ eq.	7.14E-02	1.13E-01	1.56E-01	1.98E-01	2.40E-01	2.94E-02
EP — Freshwater	kg P eq.	6.41E-05	1.25E-04	1.85E-04	2.46E-04	3.07E-04	3.44E-06
EP — Marine	kg N eq.	2.01E-02	3.17E-02	4.34E-02	5.50E-02	6.66E-02	8.42E-03
EP — Terrestrial	mol N eq.	2.26E-01	3.57E-01	4.87E-01	6.18E-01	7.49E-01	9.50E-02
POCP	kgNMVOCeq.	5.60E-02	8.74E-02	1.19E-01	1.50E-01	1.82E-01	2.46E-02
ADP — Minerals and Metals*	kg Sb eq.	2.03E-07	2.41E-07	2.79E-07	3.17E-07	3.55E-07	1.65E-07
ADP — Fossil*	MJ (NCV)	1.11E+02	1.68E+02	2.26E+02	2.83E+02	3.40E+02	5.39E+01
WDP*	m^3 eq.	1.60E+02	2.20E+02	2.80E+02	3.40E+02	4.00E+02	1.01E+02

* 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.

TABLE 53. EN 15804+A2 ADDITIONAL IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES AND STABILISED PRODUCTS – MONTROSE (VIC), PER TONNE

MONTROSE							
		CEMENT TREATED AGGREGATES					AGGREGATE PRODUCTS
Indicator	Unit	1.0%	2.0%	3.0%	4.0%	5.0%	
PM	Disease incidence	7.64E-07	9.43E-07	1.12E-06	1.30E-06	1.48E-06	5.84E-07
IRP**	kBq U235 eq.	5.24E-02	1.05E-01	1.57E-01	2.09E-01	2.62E-01	4.46E-05
ETP-fw*	CTUe	7.65E+00	8.02E+00	8.38E+00	8.75E+00	9.11E+00	7.29E+00
HTP-c*	CTUh	1.55E-10	2.13E-10	2.71E-10	3.29E-10	3.88E-10	9.70E-11
HTP-nc*	CTUh	7.09E-09	7.52E-09	7.95E-09	8.38E-09	8.81E-09	6.67E-09
SQP*	-	7.95E+01	8.05E+01	8.16E+01	8.26E+01	8.37E+01	7.84E+01
Carbon footprint (IPCC AR5, 100yr)							
GWP-GHG	**kg CO_2 eq.**	**13.6**	**23.4**	**33.3**	**43.2**	**53.1**	**3.7**

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Montrose

Victoria region

TABLE 54. ENVIRONMENTAL PARAMETERS (A1-A3) – UNBOUND AGGREGATES AND STABILISED PRODUCTS – MONTROSE (VIC), PER TONNE

MONTROSE							
		CEMENT TREATED AGGREGATES					AGGREGATE PRODUCTS
Indicator	Unit	1.0%	2.0%	3.0%	4.0%	5.0%	
PERE	MJ_{NCV}	1.87E+00	2.42E+00	2.97E+00	3.52E+00	4.07E+00	1.31E+00
PERM	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ_{NCV}	1.87E+00	2.42E+00	2.97E+00	3.52E+00	4.07E+00	1.31E+00
PENRE	MJ_{NCV}	1.11E+02	1.69E+02	2.26E+02	2.83E+02	3.41E+02	5.39E+01
PENRM	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ_{NCV}	1.11E+02	1.69E+02	2.26E+02	2.83E+02	3.41E+02	5.39E+01
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ_{NCV}	5.27E-01	1.05E+00	1.58E+00	2.11E+00	2.63E+00	0.00E+00
NRSF	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	1.43E+00	1.46E+00	1.49E+00	1.52E+00	1.55E+00	1.40E+00
HWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NHWD	kg	4.47E-03	5.89E-03	7.31E-03	8.73E-03	1.02E-02	3.05E-03
RWD	kg	0.00E+00	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
MFR	kg	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
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE 55. EN 15804+A1 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES AND STABILISED PRODUCTS – MONTROSE (VIC), PER TONNE

MONTROSE							
		CEMENT TREATED AGGREGATES					AGGREGATE PRODUCTS
Indicator	Unit	1.0%	2.0%	3.0%	4.0%	5.0%	
GWP	**kg CO_2 eq.**	**1.35E+01**	**2.34E+01**	**3.33E+01**	**4.31E+01**	**5.30E+01**	**3.69E+00**
ODP	kg CFC11 eq.	3.00E-07	3.97E-07	4.94E-07	5.92E-07	6.89E-07	2.03E-07
AP	kg SO_2 eq.	4.33E-02	7.23E-02	1.01E-01	1.30E-01	1.59E-01	1.42E-02
EP	kg PO_4^{3-} eq.	7.36E-03	1.16E-02	1.58E-02	2.00E-02	2.42E-02	3.16E-03
POCP	kg C_2H_4 eq.	2.54E-03	3.80E-03	5.06E-03	6.32E-03	7.58E-03	1.28E-03
ADPE	kg Sb eq.	2.08E-07	2.49E-07	2.91E-07	3.32E-07	3.74E-07	1.66E-07
ADPF	MJ_{NCV}	1.11E+02	1.69E+02	2.26E+02	2.84E+02	3.41E+02	5.39E+01

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Mount Napier (Dundas)

Victoria region

TABLE 56. EN 15804+A2 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – MOUNT NAPIER (DUNDAS) (VIC), PER TONNE

MOUNT NAPIER (DUNDAS)		
Indicator	Unit	AGGREGATE PRODUCTS
GWP — Total	**kg CO_2 eq.**	**8.38E+00**
GWP — Fossil	kg CO_2 eq.	8.37E+00
GWP — Biogenic	kg CO_2 eq.	1.17E-02
GWP — Luluc	kg CO_2 eq.	2.91E-06
ODP	kg CFC11 eq.	9.15E-07
AP	mol H+ eq.	7.64E-02
EP — Freshwater	kg P eq.	5.89E-06
EP — Marine	kg N eq.	2.80E-02
EP — Terrestrial	mol N eq.	3.13E-01
POCP	kg NMVOC eq.	8.18E-02
ADP — Minerals and Metals*	kg Sb eq.	3.39E-07
ADP — Fossil*	MJ (NCV)	1.16E+02
WDP*	m^3 eq.	1.01E+02

TABLE 57. EN 15804+A2 ADDITIONAL IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – MOUNT NAPIER (DUNDAS) (VIC), PER TONNE

MOUNT NAPIER (DUNDAS)		
Indicator	Unit	AGGREGATE PRODUCTS
PM	Disease incidence	1.78E-06
IRP**	kBq U235 eq.	1.39E-04
ETP-fw*	CTUe	2.29E+01
HTP-c*	CTUh	2.69E-10
HTP-nc*	CTUh	2.27E-08
SQP*	-	7.37E+02
Carbon footprint (IPCC AR5, 100yr)		
GWP-GHG#	**kg CO_2 eq.**	**8.3**

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Mount Napier Quarry (Dundas) – Unbound aggregates, VIC

Mount Napier (Dundas)

Victoria region

TABLE 58. ENVIRONMENTAL PARAMETERS (A1-A3) – UNBOUND AGGREGATES – MOUNT NAPIER (DUNDAS) (VIC), PER TONNE

MOUNT NAPIER (DUNDAS)		
Indicator	Unit	AGGREGATE PRODUCTS
PERE	MJ_{NCV}	1.58E+00
PERM	MJ_{NCV}	0.00E+00
PERT	MJ_{NCV}	1.58E+00
PENRE	MJ_{NCV}	1.16E+02
PENRM	MJ_{NCV}	0.00E+00
PENRT	MJ_{NCV}	1.16E+02
SM	kg	0.00E+00
RSF	MJ_{NCV}	0.00E+00
NRSF	MJ_{NCV}	0.00E+00
FW	m^3	1.41E+00
HWD	kg	0.00E+00
NHWD	kg	3.78E-03
RWD	kg	0.00E+00
CRU	kg	0.00E+00
MFR	kg	0.00E+00
MER	kg	0.00E+00
EE	MJ	0.00E+00

TABLE 59. EN 15804+A1 IMPACT CATEGORIES (A1-A3) UNBOUND AGGREGATES – MOUNT NAPIER (DUNDAS) (VIC), PER TONNE

MOUNT NAPIER (DUNDAS)		
Indicator	Unit	AGGREGATE PRODUCTS
GWP	**kg CO_2 eq.**	**8.29E+00**
ODP	kg CFC11 eq.	7.22E-07
AP	kg SO_2 eq.	4.70E-02
EP	kg PO_4^{3-} eq.	1.01E-02
POCP	kg C_2H_4 eq.	4.39E-03
ADPE	kg Sb eq.	3.40E-07
ADPF	MJ_{NCV}	1.16E+02

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Waurn Ponds

Victoria region

TABLE 60. EN 15804+A2 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – WAURN PONDS (VIC), PER TONNE

WAURN PONDS		
Indicator	Unit	RECYCLED PRODUCTS
GWP — Total	**kg CO_2 eq.**	**3.70E+00**
GWP — Fossil	kg CO_2 eq.	3.69E+00
GWP — Biogenic	kg CO_2 eq.	9.98E-03
GWP — Luluc	kg CO_2 eq.	8.47E-07
ODP	kg CFC11 eq.	2.30E-07
AP	mol H+ eq.	2.83E-02
EP — Freshwater	kg P eq.	3.68E-06
EP — Marine	kg N eq.	7.66E-03
EP — Terrestrial	mol N eq.	8.70E-02
POCP	kg NMVOC eq.	2.24E-02
ADP — Minerals and Metals*	kg Sb eq.	1.81E-07
ADP — Fossil*	MJ (NCV)	5.36E+01
WDP*	m^3 eq.	1.01E+02

TABLE 61. EN 15804+A2 ADDITIONAL IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – WAURN PONDS (VIC), PER TONNE

WAURN PONDS		
Indicator	Unit	RECYCLED PRODUCTS
PM	Disease incidence	5.42E-07
IRP**	kBq U235 eq.	4.23E-05
ETP-fw*	CTUe	6.81E+00
HTP-c*	CTUh	9.30E-11
HTP-nc*	CTUh	6.03E-09
SQP*	-	3.09E+03
Carbon footprint (IPCC AR5, 100yr)		
GWP-GHG#	**kg CO_2 eq.**	**3.7**

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Waurn Ponds Quarry – Aggregate and recycled products, VIC

Waurn Ponds

Victoria region

TABLE 62. ENVIRONMENTAL PARAMETERS (A1-A3) – UNBOUND AGGREGATES – WAURN PONDS (VIC), PER TONNE

WAURN PONDS		
Indicator	Unit	RECYCLED PRODUCTS
PERE	MJ_{NCV}	1.39E+00
PERM	MJ_{NCV}	0.00E+00
PERT	MJ_{NCV}	1.39E+00
PENRE	MJ_{NCV}	5.36E+01
PENRM	MJ_{NCV}	0.00E+00
PENRT	MJ_{NCV}	5.36E+01
SM	kg	0.00E+00
RSF	MJ_{NCV}	0.00E+00
NRSF	MJ_{NCV}	0.00E+00
FW	m^3	1.40E+00
HWD	kg	0.00E+00
NHWD	kg	3.23E-03
RWD	kg	0.00E+00
CRU	kg	0.00E+00
MFR	kg	0.00E+00
MER	kg	0.00E+00
EE	MJ	0.00E+00

TABLE 63. EN 15804+A1 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES – WAURN PONDS (VIC), PER TONNE

WAURN PONDS		
Indicator	Unit	RECYCLED PRODUCTS
GWP	**kg CO_2 eq.**	**3.67E+00**
ODP	kg CFC11 eq.	1.82E-07
AP	kg SO_2 eq.	1.31E-02
EP	kg PO_4^{3-} eq.	2.94E-03
POCP	kg C_2H_4 eq.	1.16E-03
ADPE	kg Sb eq.	1.82E-07
ADPF	MJ_{NCV}	5.36E+01

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Waurn Ponds Quarry – Aggregate and recycled products, VIC

Wollert

Victoria region

TABLE 64. EN 15804+A2 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES AND STABILISED PRODUCTS – WOLLERT (VIC), PER TONNE

WOLLERT						
		CEMENT TREATED AGGREGATES				AGGREGATE AND RECYCLED PRODUCTS
Indicator	Unit	2.0%	3.0%	4.0%	5.0%	
GWP — Total	**kg CO_2 eq.**	**2.97E+01**	**3.96E+01**	**4.94E+01**	**5.93E+01**	**1.01E+01**
GWP — Fossil	kg CO_2 eq.	2.97E+01	3.96E+01	4.94E+01	5.93E+01	1.01E+01
GWP — Biogenic	kg CO_2 eq.	1.57E-02	1.91E-02	2.25E-02	2.60E-02	8.79E-03
GWP — Luluc	kg CO_2 eq.	9.88E-04	1.48E-03	1.97E-03	2.46E-03	4.04E-06
ODP	kg CFC11 eq.	1.51E-06	1.62E-06	1.72E-06	1.83E-06	1.30E-06
AP	mol H+ eq.	1.81E-01	2.23E-01	2.64E-01	3.05E-01	9.90E-02
EP — Freshwater	kg P eq.	1.26E-04	1.86E-04	2.47E-04	3.08E-04	4.67E-06
EP — Marine	kg N eq.	6.19E-02	7.31E-02	8.44E-02	9.56E-02	3.94E-02
EP — Terrestrial	mol N eq.	6.89E-01	8.15E-01	9.41E-01	1.07E+00	4.36E-01
POCP	kgNMVOCeq.	1.76E-01	2.06E-01	2.36E-01	2.66E-01	1.15E-01
ADP — Minerals and Metals*	kg Sb eq.	3.13E-07	3.50E-07	3.87E-07	4.24E-07	2.38E-07
ADP — Fossil*	MJ (NCV)	2.51E+02	3.07E+02	3.63E+02	4.20E+02	1.39E+02
WDP*	m^3 eq.	2.21E+02	2.80E+02	3.40E+02	4.00E+02	1.01E+02

* 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.

TABLE 65. EN 15804+A2 ADDITIONAL IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES AND STABILISED PRODUCTS – WOLLERT (VIC), PER TONNE

WOLLERT						
		CEMENT TREATED AGGREGATES				AGGREGATE AND RECYCLED PRODUCTS
Indicator	Unit	2.0%	3.0%	4.0%	5.0%	
PM	Disease incidence	2.77E-06	2.93E-06	3.09E-06	3.25E-06	2.45E-06
IRP**	kBq U235 eq.	1.05E-01	1.57E-01	2.09E-01	2.61E-01	1.82E-04
ETP-fw*	CTUe	3.10E+01	3.11E+01	3.11E+01	3.12E+01	3.10E+01
HTP-c*	CTUh	4.36E-10	4.80E-10	5.24E-10	5.68E-10	3.48E-10
HTP-nc*	CTUh	3.22E-08	3.23E-08	3.24E-08	3.25E-08	3.21E-08
SQP*	-	2.22E+02	2.21E+02	2.21E+02	2.20E+02	2.22E+02
Carbon footprint (IPCC AR5, 100yr)						
GWP-GHG	**kg CO_2 eq.**	**29.5**	**39.3**	**49.1**	**58.9**	**9.9**

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Wollert

Victoria region

TABLE 66. ENVIRONMENTAL PARAMETERS (A1-A3) – UNBOUND AGGREGATES AND STABILISED PRODUCTS – WOLLERT (VIC), PER TONNE

WOLLERT						
		CEMENT TREATED AGGREGATES				AGGREGATE AND RECYCLED PRODUCTS
Indicator	Unit	2.0%	3.0%	4.0%	5.0%	
PERE	MJ_{NCV}	2.32E+00	2.87E+00	3.42E+00	3.97E+00	1.22E+00
PERM	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ_{NCV}	2.32E+00	2.87E+00	3.42E+00	3.97E+00	1.22E+00
PENRE	MJ_{NCV}	2.52E+02	3.08E+02	3.64E+02	4.20E+02	1.39E+02
PENRM	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ_{NCV}	2.52E+02	3.08E+02	3.64E+02	4.20E+02	1.39E+02
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ_{NCV}	1.05E+00	1.58E+00	2.11E+00	2.63E+00	0.00E+00
NRSF	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	1.47E+00	1.50E+00	1.53E+00	1.56E+00	1.41E+00
HWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NHWD	kg	5.81E-03	7.23E-03	8.65E-03	1.01E-02	2.97E-03
RWD	kg	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
MFR	kg	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
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE 67. EN 15804+A1 IMPACT CATEGORIES (A1-A3) – UNBOUND AGGREGATES AND STABILISED PRODUCTS – WOLLERT (VIC), PER TONNE

WOLLERT						
		CEMENT TREATED AGGREGATES				AGGREGATE AND RECYCLED PRODUCTS
Indicator	Unit	2.0%	3.0%	4.0%	5.0%	
GWP	**kg CO_2 eq.**	**2.95E+01**	**3.93E+01**	**4.90E+01**	**5.88E+01**	**9.95E+00**
ODP	kg CFC11 eq.	1.20E-06	1.28E-06	1.37E-06	1.45E-06	1.03E-06
AP	kg SO_2 eq.	1.22E-01	1.50E-01	1.79E-01	2.07E-01	6.52E-02
EP	kg PO_4^{3-} eq.	2.18E-02	2.59E-02	2.99E-02	3.40E-02	1.37E-02
POCP	kg C_2H_4 eq.	8.63E-03	9.83E-03	1.10E-02	1.22E-02	6.24E-03
ADPE	kg Sb eq.	3.21E-07	3.61E-07	4.02E-07	4.43E-07	2.39E-07
ADPF	MJ_{NCV}	2.52E+02	3.08E+02	3.64E+02	4.20E+02	1.39E+02

Refer to 'Environmental Indicators' p.20-21 for full description of indicators, units, abbreviations and disclaimers.

Other environmental information

Sustainability Strategy

At Boral, we strive to create products that are as sustainable as possible across all our product streams, without any compromise to the technical integrity, quality and consistency, of the end product. This needs to be done with a long-term lens, ensuring that all constituents included in mix designs (whether concrete, asphalt, quarried or recycled) are able to be recycled for continual re-use.

In the Recycling Division, we have developed an internal inspection and receival procedure for Construction and Demolition (C&D) waste to reduce the risk of contamination entering our sites. These typically exceed the EPA minimum standards applied in each state.

This overall process fulfills our intention of a cradle-to-cradle lifecycle rather than a cradle-to-grave lifecycle, and ultimately plays an effective role in the construction material industry's drive towards a low carbon footprint.

Water management

Water is a valuable resource and good quality fresh water is essential to our concrete, construction material operations. We use water in manufacturing, and for dust suppression, cleaning and sanitation. Our quarry and asphalt operations are able to use recycled, brackish and / or process water.

At our larger sites, including quarries, we also capture rainfall or stream flow that is largely used for dust control purposes. We are developing systems that will enable us to collect data on captured rainfall and are developing plans that will underpin an overall improvement in water efficiency.

When developing or purchasing new facilities, our due diligence assessment includes scenario analysis of the quantity and quality of water, assessment of the risks of potential water discharges, and, where relevant, river catchment assessments to ensure sufficient water availability and supply.

Waste and recycling

Throughout Boral's operations, some materials are commonly re-used back into our production processes. Returned concrete is used to make concrete blocks at some plants. This beneficially uses materials that would otherwise require disposal. A large proportion of Boral's recycled and lower carbon products revenue, totalling nine per cent of Boral Limited revenue, is derived from external waste products.

This includes our fly ash and recycling businesses. Opportunities for the re-use of production by-products or waste material continues to grow and are actively being pursued.

Other environmental information

Biodiversity management

Protecting the diversity of plant and animal species at and around our operational sites is a core component of our land management efforts. Some examples of the many initiatives to protect biodiversity at our own sites include:

- Conservation work to provide habitat for the threatened **Legless Lizard** and **Spiny Rice-flower** at Deer Park Quarry in Victoria.
- Working with the local Wildlife Group the implementation of a waterhole and a purpose-built fence to keep the **Eastern Grey kangaroo** hydrated and safe at Wollert Quarry in Victoria.
- Planting 1,000 new trees that provides screen along local roads at Katunga Sand Quarry in Victoria.
- Maintaining **koala fodder plantations** at Narangba and Petrie quarries in Queensland.
- Collaborating with the Royal Botanic Garden Sydney NSW in research on the endangered **Illawarra Socketwood** population at our Dunmore Quarry in New South Wales.
- Partnering with **Sleepy Burrows Wombat Sanctuary** to capture and relocate wombats found at our Peppertree Quarry in New South Wales.
- Boral in WA has completed a number of community projects at Orange Grove Primary School including a **Heritage Garden** space, installation of garden pathways and **cockatoo nesting** boxes.
- Construction of a **bird island habitat** as part of our rehabilitation of wetlands at our Dunmore Quarry in New South Wales.
- Boral has been highly commended by Cement Concrete & Aggregates Australia (CCAA) for their innovative efforts in preserving the rare and ancient **Ormeau Bottle Tree** at their Ormeau Quarry in Queensland.
- Through our community partnership with Conservation Volunteers Australia, we support **conservation and education initiatives in our local communities**, including native vegetation initiatives in local reserves and schools.

Deer Park Quarry – Cement treated and aggregate products – Aggregate and recycled products – Protecting wildlife, VIC

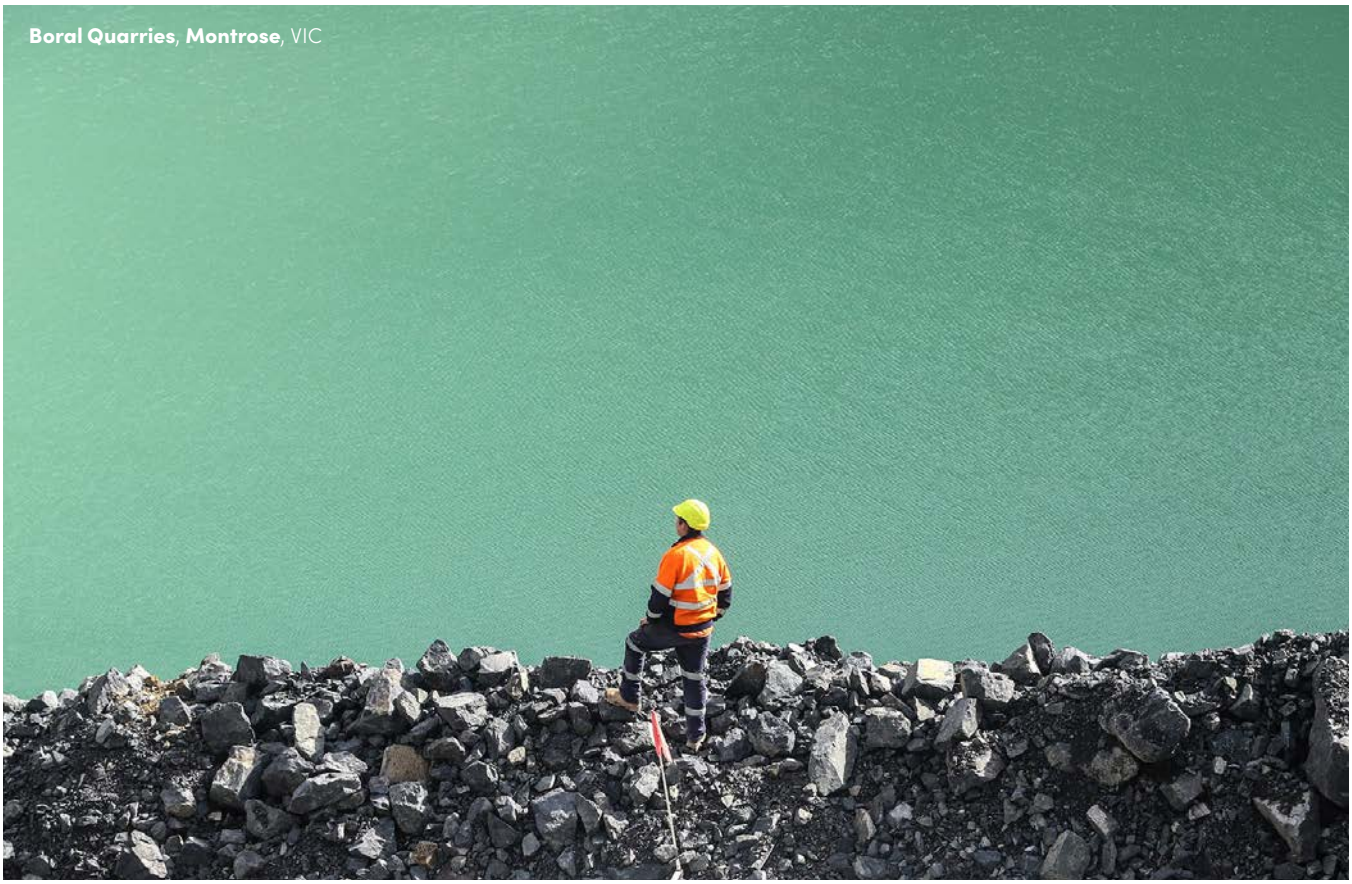
Our approach to climate related risks

Our approach

Boral recognises that climate related physical risks and a global transition to a lower-carbon future are expected to impact our operations, customers and suppliers. We support the Paris Agreement and mechanisms to achieve its objective of limiting future average global temperature rises to well below 2°C, as well as Australia's 2030 target of a 26–28% reduction in carbon emissions below 2005 levels.

Looking at how Boral's carbon emissions are tracking relative to 2005 levels, in Australia we have reduced emissions by around 40% since FY2005. We achieved about half of this decrease largely by realigning our portfolio away from emissions-intensive businesses. The remainder of the decrease is due to reducing clinker manufacturing in Australia in favour of importing it from more efficient and larger scale operations in Asia. We continue to progressively adopt the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). In FY2019, we enhanced our climate-related governance and risk management, completed scenario analysis of Boral Cement's business and continued to strengthen our resilience to a 2°C scenario. We also broadened our reporting of physical climate-related risks and Scope 3 emissions.

We completed a Group-wide review of our climate-related risks and opportunities using the TCFD framework. This review informed a two-year roadmap to undertake further scenario analysis of key climate related business risks. We transparently and constructively engaged with Climate Action 100+ investor representatives and other stakeholders during the year, sharing our progress in aligning our efforts with the TCFD recommendations and building greater resilience to climate-related impacts.



Boral Quarries, **Montrose**, VIC

Our approach to climate related risks

Energy and climate policy

Boral has not identified any major positions on energy and climate policy held by our industry associations that are materially inconsistent with Boral's position.

We support:

- **A national approach to climate and energy policy** to ensure that least-cost carbon emissions abatement is targeted while ensuring reliable and competitive energy can be delivered.
- **Climate and energy policies** that do not unduly erode the competitiveness of domestic based businesses.

Through our community partnership with Conservation Volunteers Australia, we support conservation and education initiatives in our local communities, including native vegetation initiatives in local reserves and schools.

In Australia, we are a member of the Cement Industry Federation (CIF). The CIF policy is to support the Federal Government's national target to reduce emissions by 26–28 per cent by 2030, and the CIF has been working with the World Business Council for Sustainable Development and its current roadmap to reduce emissions.

Boral acknowledges the Paris Agreement and supports mechanisms to achieve its objectives, including a national approach to climate and energy policy. The Industry Associations supporting the Construction Materials Industry are:

- Cement, Concrete and Aggregates Australia (CCAA)
- Green Building Council of Australia (GBCA)
- Infrastructure Sustainability Council (ISC)
- Concrete Institute of Australia (CIA)
- Australian Pozzolan Association (APozA)
- Cement Industry Federation (CIF)
- Institute of Quarrying Australia (IQA)
- Ash Development Association Australia (ADAA)

References

AUSLCI 2023

Australian Life Cycle Inventory Database v1.42, published by the Australian Life Cycle Assessment Society, 2023.

AS 2758

Aggregates and rock for engineering purposes Part 1: Concrete Aggregates, Part 2: Sealing Aggregates, Part 4: Gabion baskets / Wire mattresses, Part 5: Asphalt aggregates, Part 6: Armourstone, and Part 7: Railway Ballast.

Boral Cement EPD S-P-05506

Boral Cement, Bulk Cement and Cementitious Products EPD, S-P-05506, version 1.0, published 20 May 2023.

EN 15804:2012+A1:2013

Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products, European Committee for Standardization (CEN), Brussels, November 2013.

EN 15804:2012+A2:2019

Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products, European Committee for Standardization (CEN), Brussels, October 2019.

ENVIRONDEC 2023

PCR 2019:14 (version 1.3.1), *Product category rules for Construction products* (EN 15804:A2), registration number 2019:14, published on 8 July 2023.

JRC 2018

European Commission, Joint Research Centre, 2018, *Supporting Information to the Characterisation Factors of Recommended EF Life Cycle Impact Assessment Methods: Version 2*, from ILCD to EF 3.0. LU: Publications Office, https://data.europa.eu/doi/10.2760/002447.

ISO 14040

ISO 14040:2006 *Environmental management – Life cycle assessment – Principles and framework.* International Organization for Standardization, Geneva, Switzerland, 2006.

ISO 14044

ISO14044:2006, Environmental management – *Life cycle assessment – Requirements and guidelines*, International Organization for Standardization, Geneva, Switzerland, 2006.

ISO 14025

ISO14025:2006, *Environmental labels and declarations – Type III environmental declarations – Principles and procedures.* International Organization for Standardization, Geneva, Switzerland, 2006.

Scan QR Code

To find out more visit

T 13 26 75
www.boral.com.au

A Safety Data Sheet is available on the Boral website or by contacting Boral customer service. Images in this brochure are only representative of Boral products and the appearance and effect that may be achieved by their use. Particular projects may require the use of specific construction techniques or products. Boral recommends obtaining technical advice prior to construction.
 18026 02/24

BORAL

Building something great