

Environmental Product Declaration for aggregates from Kragerø quarry – Valberg



According to EN 15804:2012+A2:2019, ISO 14025, ISO 14040 and ISO 14044

Programme operator: EPD International AB

EPD owner: NCC Industry Nordic AB

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The aggregates declared in the EPD are divided into 6 product groups. See Table 1 for all declared products in this EPD.

EPD INFORMATION

Declared unit: 1000 kg product

PCR: Product Category Rules PCR 2019:14 Construction products, version 1.11 of 2021-02-05.

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

PRODUCT INFORMATION

1. General product information

The products declared are aggregates manufactured by NCC Industry, Division Stone Materials. The declared site is Valberg in Kragerø, a stationary crushing site of NCC Industry in Norway.

The declared products manufactured at Valberg during April 2019- March 2020 (product list in Table 1) are intended to be used as, e.g. asphalt and concrete, filling material in civil engineering and Armour Stone.

Aggregates are produced in various fractions; from blasted rock to finely crushed 0/2 mm material (grains between 0 and 2 mm in diameter). There are 33 types of aggregates declared in this EPD, representing the products manufactured at the declared site, see Table 1. The technical standards which the aggregates are compliant with are also presented. The aggregates consist of hyperit.

Table 1: Products manufactured at the declared site, classified into product groups.

Product group	Product names (English)	Product names (Norwegian)	EN-12620 ¹⁾	EN-13242 ²⁾	EN-13043 ³⁾	EN-13383-1 ⁴⁾
1	All-In Rock unspecified	Knust Fjell Uspesifisert		X		
	All-In Rock 0/300	Knust Fjell 0/300		X		
	All-In Rock 0/16	Knust Fjell 0/16		X		
2	All-In Rock 0/32	Knust Fjell 0/32		X		
	All-In Rock 0/45	Knust Fjell 0/45		X		
	All-In Rock 0/11	Knust Fjell 0/11 Settesand		X	X	
	Coarse Rock 11/32	FK Pukk 11/32		X		
	Coarse Rock 16/32	FK Pukk 16/32		X		
	Coarse Rock 32/250	FK Pukk 32/250		X		
	All-In Rock 0/16	Knust Fjell 0/16 T1		X		
	All-In Rock 0/32 T1	Knust Fjell 0/32 T1		X		
	All-In Rock 0/32 STS	Knust Fjell 0/32 STS		X		
	All-In Rock 0/45 STS	Knust Fjell 0/45 STS		X		
	All-In Rock 0/45	Knust Fjell 0/45 Blandingsmasse		X		
3	Coarse Rock 32/50	FK Pukk 32/50		X		
	Rock Fines 0/5	Steinmel 0/5	X	X	X	
4	Coarse Rock 2/5	FK Pukk 2/5	X		X	
	Coarse Rock 5/8	FK Pukk 5/8	X		X	
	Coarse Rock 8/16	FK Pukk 8/16		X		
	Coarse Rock 8/11	FK Pukk 8/11		X		
	Coarse Rock 11/16	FK Pukk 11/16	X		X	
	Coarse Rock 16/22	FK Pukk 16/22	X			
	Rock Fines 0/2	Steinmel 0/2	X		X	
5	Coarse Rock 80/200	FK Pukk 80/200 for Gabion		X		
	Armour Stone 5/40 kg	Vannbyggingstein 5/40 kg				X
	Armour Stone 10/60 kg	Vannbyggingstein 10/60 kg				X
	Armour Stone 40/200 kg	Vannbyggingstein 40/200 kg				X
	Armour Stone 60/300 kg	Vannbyggingstein 60/300 kg				X
	Armour Stone HMA + HMB 1000/3000 kg	Vannbyggingstein HMA + HMB 1000/3000				X
	Armour Stone HMA + HMB 3000/6000	Vannbyggingstein HMA + HMB 3000/6000				X
	Armour Stone HMA + HMB 6000/10000	Vannbyggingstein HMA + HMB 6000/10000				X
6	Armour Stone 3-9 INCH	3-9 INCH				X
	Machine Sand 0/2	Maskinsand 0/2	X			

1) EN-12620+A1:2008 - Aggregates for Concrete

2) EN-13242+A1:2007 - Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction

3) EN-13043/AC:2006 - Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas

4) EN 13383-1:2002 - Armourstone

drilled, filled with explosives and detonated. The number of holes drilled depends on the amount of rock to extract at each blast. The explosives are normally taken to the site by tanker trucks. The explosive is in most cases a two-component product that is mixed and activated when pumped down into the holes. Hence, no explosives are stored at site. After the blast, the raw material is fed into the production process using a combination of excavators, wheel loaders and/or dumper trucks.

The continued production process is a combination of material feeders, conveyor belts, crushers and screens that transports, breaks and sorts the material into different products. The production process set-up is illustrated in Figure 1.

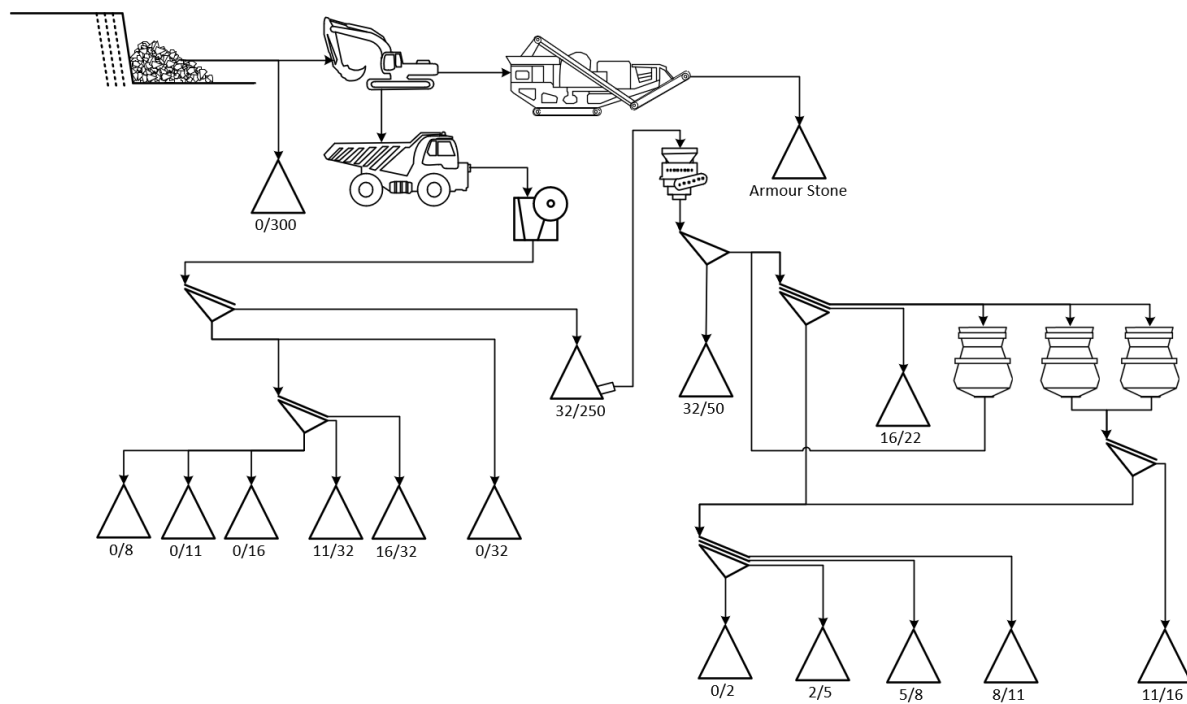


Figure 1: Process set-up for the production of aggregates at the declared site.

The geographical location of the declared site is shown in Figure 2.



Figure 2: Map and picture showing the geographical location of the declared site.

2. Declared unit

The declared unit is 1 tonne (1000 kg) of aggregates.

3. System boundary

The system boundaries cover aspects such as temporal and geographical. The setting of system boundaries follows two principles according to EN 15804: (1) The “modularity principle” and (2) the “polluter pays principle”. The EPD is based on an LCA model described in the background report and in the related annex (see reference list). The declared modules are A1-A3, C and D, see Figure 3. The product system under study is presented in Figure 4.

For aggregates used in asphalt and concrete the declared modules are A1-A3 (i.e. “cradle-to-gate”). Exemptions in EN 15804 (chapter 5.2) are fulfilled permitting not to declare module C and D.

For aggregates used in other applications the declared modules are A1-A3, C and D (i.e. “cradle-to-gate with modules C1–C4, and module D”).

Data that represent the current production process at the site are used. All input data used in the LCA model (e.g. raw materials and production data) that NCC Industry has influence over are site specific data for the production period April 2019 - March 2020. The geographical scope, i.e. location(s) of use and end-of-life performance, is Europe.

The environmental impact from infrastructure, construction, production equipment and tools that are not directly consumed in the production process are not accounted for in the Life Cycle Inventory (LCI). Personnel-related impacts, such as transportation to and from work, are neither accounted for in the LCI.

Declaration of the RSL is only possible if B1-B5 are included, i.e. RSL is not assessed.

	Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundary
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse, recovery, recycling potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	NO	NO	NO	-	-	-	-	-	-	-	-	-	DK/DE	DK/DE	DK/DE	DK/DE	DK/DE
Specific data	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	<10%**			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	Not relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Only declared for products used in other applications than asphalt and concrete.

**Within each product group. The variation between different product groups are bigger, see result tables.

Figure 3: Modules of the life cycle in the EPD, including models declared, geography, share of specific data (in GWP-GHG indicator) and data variation.

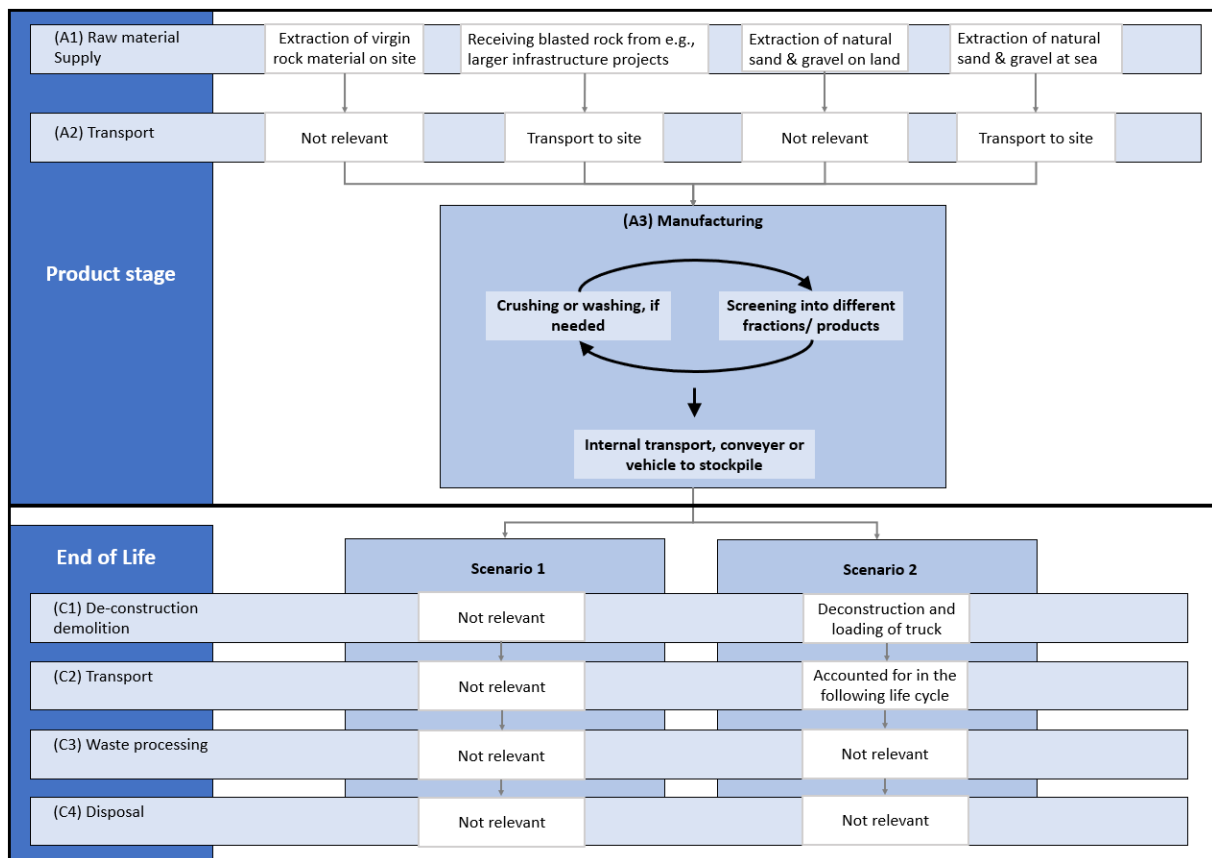


Figure 4: System boundaries for the studied product system

4. Assumptions and approximations

Various oils and lubricants used in the production process, are approximated with a dataset for lubricants since no dataset or EPD were found for hydraulic oil or grease and the impact is judged to be similar.

The amount of worn-off manganese steel and the amount of cables used for detonation of explosives has not been measured. Instead, it has been approximated based on previous knowledge.

Product group 5 consists of a type of product called Armour Stone used for reinforcement of waterfront structures. This means that in most cases, Armour Stone does not reach the end-of-life stage and none of modules, C1-C4, and D, are assumed to not be applicable.

5. Allocation

The production does not deliver any co-products.

The products are divided into different product groups (see Table 1) based on the number of crushing steps they pass through. This affects for instance the amount of electricity, fuels and lubricants used in the production.

The consumption of explosives is allocated equally on all products originating from blasted rock, based on mass.

The electricity consumption is known for the production (crushing) process as a whole. Since the electricity consumption is known for the production process as a whole, allocation of electricity is made based on knowledge about the mass of rock going through each process step.

Fuel used for drilling and blasting, and general activities has been allocated equally to all products. Remaining fuel has been allocated based on knowledge about which process steps each product goes through.

6. Cut-offs

The cut-off criteria are 1% of the renewable and non-renewable primary energy usage and 1% of the total mass input of the manufacture process (according to the EN 15804 standard).

In the assessment, all available data from the production process are considered, i.e. all raw materials used, utilised ancillary materials, and energy consumption using the best available LCI GaBi datasets.

The following cut-offs have been made:

- The amount of oil-contaminated soil due to spillage from machines/vehicles is very difficult to estimate. Based on internal expert knowledge, this amount is deemed negligible and very rarely occurring.
- The packaging for the input materials used in the production process are negligible.

7. Software and database

The LCA software GaBi Professional and its integrated database from Sphera has been used in the LCA modelling. See the list of references.

8. Electricity at manufacturing

If the electricity in module A3 accounts for more than 30% of the total energy in stage A1 to A3, the energy sources behind the electricity grid in module A3 shall be documented, including the LCA data of grams CO₂ eq./kWh. The information is given in Table 2.

Table 2: Electricity in manufacturing (A3)

Energy source	LCA data (g CO ₂ eq./kWh)
Hydropower	14.3

9. Data quality

The primary data collected by the manufacturer are based on the required materials and energy to manufacture the product. The data of the raw materials are collected per declared unit. All necessary life cycle inventories for the basic materials are available in the GaBi database or via EPDs. No generic selected datasets (secondary data) used are older than ten years. No specific data collected is older than five years and represent a period of about one year. The representativeness, completeness, reliability and consistency are judged as good.

10. About NCC

NCC is one of the leading construction and property development companies in the Nordic region, with sales of 53 billion NOK and approximately 14 500 employees in 2020. With the Nordic region as its home market, NCC is active throughout the value chain – developing commercial properties and constructing housing, offices, industrial facilities and public buildings, roads, civil engineering structures and other types of infrastructure. NCC also offers input materials used in construction and accounts for paving and road services.

NCC's vision is to renew our industry and provide superior sustainable solutions. NCC aims to be the leading society builder of sustainable environments and will proactively develop new businesses in line with this.

NCC works to reduce both our own and our customers' environmental impact and continues to further refine our offerings with additional products and solutions for sustainability. In terms of the environment, this entails that NCC, at every step of the supply chain, is to offer resource and energy-efficient products and solutions to help our customers reduce their environmental impact and to operate more sustainably.

NCC's sustainability work is based on a holistic approach with all three dimensions of sustainability –

social, environmental and economical. In NCC's new sustainability framework, our focus areas with regards to sustainability are defined; Climate and Energy, Materials & Waste, Social Inclusion, Health & Safety, Compliance and Portfolio Performance. Our sustainability strategy includes the aim of being both a leader and a pioneer in these areas.

NCC reports on its sustainability progress each year and the report has been included in NCC's Annual Report since 2010. NCC applies Global Reporting Initiative (GRI) Standards, the voluntary guidelines of the GRI for the reporting of sustainability information. In addition to GRI, NCC also reports the Group's emission of greenhouse gases to the CDP each year. NCC is a member in BSCI (Business Social Compliance Initiative), which is the broadest business-driven

platform for the improvement of social compliance in the global supply chain and has been a member of the UN Global Compact since 2010. The UN Global Compact is a strategic policy initiative for businesses that are committed to aligning their operations and strategies with 10 defined and universally accepted principles in the areas of human rights, labour, environment and anti-corruption.

Also visit: <https://www.ncc.group/sustainability>

11. EPD owner

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CONTENT DECLARATION INCLUDING PACKAGING

The products declared consist of hyperit and do not contain any substances of very high concern (SVHC) according to REACH. Table 3 presents the content declaration for the various product groups. The mass of biogenic carbon in the products is less than 5%. The packaging material is negligible.

Table 3: Content declaration of aggregates declared.

Product group	Product component	Weight, kg	Post-consumer material, weight-%	Renewable material weight-%
1	Hyperit	1000	0	0
2	Hyperit	1000	0	0
3	Hyperit	1000	0	0
4	Hyperit	1000	0	0
5	Hyperit	1000	0	0
6	Hyperit	1000	0	0
Product group	Packaging material	Weight, kg	Weight-% (versus the product)	
1-6	Negligible for all product groups	Negligible	Negligible	

ENVIRONMENTAL PERFORMANCE

The results of the life cycle assessment, based on the declared unit, can be found in Table 4 and 5 (core environmental indicators), Table 6 and 7 (resource use) and Table 8 and 9 (output flows and waste categories). The products are grouped into product groups depending on the process steps they pass through. Products within the same product group carry the same impact. The deviation within each product group is less than 10% for any core environmental indicators, resource use and waste category.

Table 4: Results of the LCA (modules A1-A3) – Core environmental indicators per declared unit of the respective product group.

Core environmental indicators			Product group 1	Product group 2	Product group 3	Product group 4	Product group 5	Product group 6
			All-In Rock unspecified, 0/300	0/16, 0/32, 0/45, 0/11, 11/32, 16/32, 32/250, 0/16, 0/32 T1, 0/32 STS, 0/45 STS, 0/45	32/50, 0/5	2/5, 5/8, 8/16, 8/11, 16/22, 0/2	80/200, 5/40 kg, 10/60 kg, 40/200 kg, 60/300 kg, HMA + HMB 1000/3000 kg, HMA + HMB 3000/6000, HMA + HMB 6000/10000, 3-9 INCH	Machine Sand 0/2
Impact category		Unit	A1-3	A1-3	A1-3	A1-3	A1-3	A1-3
Climate change	Total	kg CO ₂ eq	0.52	2.1	1.9	2.5	3.1	1.9
	Fossil	kg CO ₂ eq	0.52	2.1	1.9	2.5	3.1	1.9
	Biogenic*	kg CO ₂ eq	0	0	0	0	0	0
	Land use and land use change	kg CO ₂ eq	4.8E-04	7.1E-04	6.8E-04	7.7E-04	8.4E-04	6.9E-04
	GWP-GHG**	kg CO ₂ eq	0.52	2.1	1.9	2.5	3.1	1.9
Ozone depletion		kg CFC 11 eq	3.4E-11	3.4E-11	3.4E-11	3.4E-11	3.4E-11	3.4E-11
Acidification		mol H ⁺ eq.	5.3E-03	2.2E-02	1.9E-02	2.6E-02	3.2E-02	2.0E-02
Eutrophication aquatic freshwater		kg PO ₄ ³⁻ eq.***	4.6E-07	9.6E-07	1.0E-06	1.3E-06	1.2E-06	1.1E-06
Eutrophication aquatic freshwater		kg P eq.	4.6E-07	9.6E-07	1.0E-06	1.3E-06	1.2E-06	1.1E-06
Eutrophication aquatic marine		kg N eq.	2.1E-03	1.1E-02	8.9E-03	1.2E-02	1.6E-02	9.3E-03
Eutrophication terrestrial		mol N eq.	2.7E-02	1.2E-01	1.0E-01	1.4E-01	1.8E-01	1.1E-01
Photochemical ozone formation		kg NMVOC eq.	5.2E-03	3.0E-02	2.5E-02	3.5E-02	4.5E-02	2.6E-02
Depletion of abiotic resources - minerals and		kg Sb eq.	1.4E-07	2.2E-07	2.3E-07	2.6E-07	2.4E-07	2.5E-07
Depletion of abiotic resources - fossil fuels		MJ, net calorific value	6.3	28	25	34	41	26
Water use		m ³ world eq. deprived	4.3E-02	5.1E-02	5.6E-02	6.1E-02	5.1E-02	6.2E-02

*This indicator is set to zero, due to inconsistencies in the dataset used delivered by Sphera. Though, net result over the life cycle is zero since carbon uptake and emission is zero during a life-cycle.

**"GWP – total" but excluding "biogenic"

***In EN 15804 the unit is PO₄³⁻ eq. This is not correct and shall be P eq.

Table 5: Results of the LCA (modules C and D) – Core environmental indicators per declared unit of the respective product group.

Core environmental indicators			All product groups				Product group 1	Product group 2	Product group 3	Product group 4	Product group 5	Product group 6
Impact category		Unit	C1 (S1/S2)	C2	C3	C4	D (S1/S2)	D (S1/S2)	D (S1/S2)	D (S1/S2)	D (S1/S2)	D (S1/S2)
Climate change	Total	kg CO ₂ eq.	NR/0.90	NR	NR	NR	NR/-0.16	NR/-0.16	NR/-0.16	NR/-0.16	NR/-0.16	NR/-0.16
	Fossil	kg CO ₂ eq.	NR/0.89	NR	NR	NR	NR/-0.16	NR/-0.16	NR/-0.16	NR/-0.16	NR/-0.16	NR/-0.16
	Biogenic	kg CO ₂ eq.	NR/0	NR	NR	NR	NR/0	NR/0	NR/0	NR/0	NR/0	NR/0
	Land use and land use change	kg CO ₂ eq.	NR/7.5E-03	NR	NR	NR	NR/2.5E-03	NR/2.5E-03	NR/2.5E-03	NR/2.5E-03	NR/2.5E-03	NR/2.5E-03
	GWP-GHG	kg CO ₂ eq.	NR/0.90	NR	NR	NR	NR/-0.16	NR/-0.16	NR/-0.16	NR/-0.16	NR/-0.16	NR/-0.16
Ozone depletion		kg CFC 11 eq.	NR/1.2E-16	NR	NR	NR	NR/-3.4E-11	NR/-3.4E-11	NR/-3.4E-11	NR/-3.4E-11	NR/-3.4E-11	NR/-3.4E-11
Acidification		mol H ⁺ eq.	NR/0.01	NR	NR	NR	NR/-4.9E-03	NR/-4.9E-03	NR/-4.9E-03	NR/-4.9E-03	NR/-4.9E-03	NR/-4.9E-03
Eutrophication aquatic freshwater		kg PO ₄ ³⁻ eq.	NR/2.7E-6	NR	NR	NR	NR/6.2E-07	NR/6.2E-07	NR/6.2E-07	NR/6.2E-07	NR/6.2E-07	NR/6.2E-07
Eutrophication aquatic freshwater		kg P eq.	NR/2.7E-6	NR	NR	NR	NR/6.2E-07	NR/6.2E-07	NR/6.2E-07	NR/6.2E-07	NR/6.2E-07	NR/6.2E-07
Eutrophication aquatic marine		kg N eq.	NR/5.1E-6	NR	NR	NR	NR/-2.0E-03	NR/-2.0E-03	NR/-2.0E-03	NR/-2.0E-03	NR/-2.0E-03	NR/-2.0E-03
Eutrophication terrestrial		mol N eq.	NR/5.6E-6	NR	NR	NR	NR/-0.03	NR/-0.03	NR/-0.03	NR/-0.03	NR/-0.03	NR/-0.03
Photochemical ozone formation		kg NMVOC eq.	NR/0.02	NR	NR	NR	NR/-4.9E-03	NR/-4.9E-03	NR/-4.9E-03	NR/-4.9E-03	NR/-4.9E-03	NR/-4.9E-03
Depletion of abiotic resources - minerals and metals		kg Sb eq.	NR/7.0E-8	NR	NR	NR	NR/-1.2E-07	NR/-1.2E-07	NR/-1.2E-07	NR/-1.2E-07	NR/-1.2E-07	NR/-1.2E-07
Depletion of abiotic resources - fossil fuels		MJ, net calorific value	NR/12	NR	NR	NR	NR/-1.5	NR/-1.5	NR/-1.5	NR/-1.5	NR/-1.5	NR/-1.5
Water use		m ³ world eq. deprived	NR/8.0E-03	NR	NR	NR	NR/3.1E-03	NR/3.1E-03	NR/3.1E-03	NR/3.1E-03	NR/3.1E-03	NR/3.1E-03

Table 6: Results of the LCA (modules A1-A3) – Resource use per declared unit of the respective product group.

Use of resources		Product group 1	Product group 2	Product group 3	Product group 4	Product group 5	Product group 6
		All-In Rock unspecified, 0/300	0/16, 0/32, 0/45, 0/11, 11/32, 16/32, 32/250, 0/16, 0/32 T1, 0/32 STS, 0/45 STS, 0/45	32/50, 0/5	2/5, 5/8, 8/16, 8/11, 16/22, 0/2	80/200, 5/40 kg, 10/60 kg, 40/200 kg, 60/300 kg, HMA + HMB 1000/3000 kg, HMA + HMB 3000/6000, HMA + HMB 6000/10000, 3-9 INCH	Machine Sand 0/2
Parameter	Unit	A1-3	A1-3	A1-3	A1-3	A1-3	A1-3
Use of renewable primary energy excl. renewable primary energy resources used as raw materials	MJ, net calorific value	2.9	5.6	11	13	3.1	16
Use of renewable primary energy as raw materials	MJ, net calorific value	0	0	0	0	0	0
Total use of renewable primary energy	MJ, net calorific value	2.9	5.6	11	13	3.1	16
Use of non-renewable primary energy excl. non-renewable primary energy resources used as raw materials	MJ, net calorific value	6.3	28	25	34	41	26
Use of non-renewable primary energy as raw materials	MJ, net calorific value	0	0	0	0	0	0
Total use of non-renewable primary energy	MJ, net calorific value	6.3	28	25	34	41	26
Use of secondary material	kg	0	0	0	0	0	0
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0
Use of non-renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0
Use of net fresh water	m ³	5.4E-03	9.7E-03	0.02	0.02	5.7E-03	0.03

Table 7: Results of the LCA (modules C and D) – Resource use per declared unit of the respective product group.

Use of resources		All product groups				Product group 1	Product group 2	Product group 3	Product group 4	Product group 5	Product group 6
Parameter	Unit	C1 (\$1/\$2)	C2	C3	C4	D (\$1/\$2)	D (\$1/\$2)	D (\$1/\$2)	D (\$1/\$2)	D (\$1/\$2)	D (\$1/\$2)
Use of renewable primary energy excl. renewable primary energy resources used as raw materials	MJ, net calorific value	NR/0.70	NR	NR	NR	NR/-2.6	NR/-2.6	NR/-2.6	NR/-2.6	NR/-2.6	NR/-2.6
Use of renewable primary energy as raw materials	MJ, net calorific value	NR/0	NR	NR	NR	NR/0	NR/0	NR/0	NR/0	NR/0	NR/0
Total use of renewable primary energy	MJ, net calorific value	NR/0.70	NR	NR	NR	NR/-2.6	NR/-2.6	NR/-2.6	NR/-2.6	NR/-2.6	NR/-2.6
Use of non-renewable primary energy excl. non-renewable primary energy resources used as raw materials	MJ, net calorific value	NR/12	NR	NR	NR	NR/-1.5	NR/-1.5	NR/-1.5	NR/-1.5	NR/-1.5	NR/-1.5
Use of non-renewable primary energy as raw materials	MJ, net calorific value	NR/0	NR	NR	NR	NR/0	NR/0	NR/0	NR/0	NR/0	NR/0
Total use of non-renewable primary energy	MJ, net calorific value	NR/12	NR	NR	NR	NR/-1.5	NR/-1.5	NR/-1.5	NR/-1.5	NR/-1.5	NR/-1.5
Use of secondary material	kg	NR/0	NR	NR	NR	NR/0	NR/0	NR/0	NR/0	NR/0	NR/0
Use of renewable secondary fuels	MJ, net calorific value	NR/0	NR	NR	NR	NR/0	NR/0	NR/0	NR/0	NR/0	NR/0
Use of non-renewable secondary fuels	MJ, net calorific value	NR/0	NR	NR	NR	NR/0	NR/0	NR/0	NR/0	NR/0	NR/0
Use of net fresh water	m ³	NR/7.8E-04	NR	NR	NR	NR/-5.1E-03	NR/-5.1E-03	NR/-5.1E-03	NR/-5.1E-03	NR/-5.1E-03	NR/-5.1E-03

Table 8: Results of the LCA (modules A1-A3) – Waste categories and output flows per declared unit of the respective product group.

Waste categories & output flows		Product group 1	Product group 2	Product group 3	Product group 4	Product group 5	Product group 6
		All-In Rock unspecified, 0/300	0/16, 0/32, 0/45, 0/11, 11/32, 16/32, 32/250, 0/16, 0/32 T1, 0/32 STS, 0/45 STS, 0/45	32/50, 0/5	2/5, 5/8, 8/16, 8/11, 16/22, 0/2	80/200, 5/40 kg, 10/60 kg, 40/200 kg, 60/300 kg, HMA + HMB 1000/3000 kg, HMA + HMB 3000/6000, HMA + HMB 6000/10000, 3-9 INCH	Machine Sand 0/2
Parameter/Indicator	Unit	A1-3	A1-3	A1-3	A1-3	A1-3	A1-3
Hazardous waste disposed	kg	1.8E-03	2.7E-03	4.5E-03	5.4E-03	1.8E-03	5.4E-03
Non-hazardous waste disposed	kg	2.0E-02	4.0E-02	5.4E-02	6.3E-02	3.4E-02	6.2E-02
Radioactive waste disposed	kg	8.2E-05	1.2E-04	1.2E-04	1.4E-04	1.4E-04	1.2E-04
Components for re-use*	kg	0	0	0	0	0	0
Materials for recycling*	kg	0	0	0	0	0	0
Materials for energy recovery*	kg	1.0E-02	1.4E-02	1.4E-02	1.4E-02	1.4E-02	1.4E-02
Exported energy*	MJ per energy carrier	0	0	0	0	0	0

* Due to lack of data, only A3 is declared.

Table 9: Results of the LCA (modules C and D) – Waste categories and output flows per declared unit of the respective product group.

Waste categories & output flows		All product groups				Product group 1	Product group 2	Product group 3	Product group 4	Product group 5	Product group 6
Parameter/Indicator	Unit	C1 (S1/S2)	C2	C3	C4	D (S1/S2)	D (S1/S2)	D (S1/S2)	D (S1/S2)	D (S1/S2)	D (S1/S2)
Hazardous waste disposed	kg	NR/6.2E-10	NR	NR	NR	NR/1.8E-03	NR/1.8E-03	NR/1.8E-03	NR/1.8E-03	NR/1.8E-03	NR/1.8E-03
Non-hazardous waste disposed	kg	NR/1.8E-03	NR	NR	NR	NR/2.0E-02	NR/2.0E-02	NR/2.0E-02	NR/2.0E-02	NR/2.0E-02	NR/2.0E-02
Radioactive waste disposed	kg	NR/1,5E-05	NR	NR	NR	NR/8.2E-05	NR/8.2E-05	NR/8.2E-05	NR/8.2E-05	NR/8.2E-05	NR/8.2E-05
Components for re-use	kg	NR/1000	NR	NR	NR	NR/0	NR/0	NR/0	NR/0	NR/0	NR/0
Materials for recycling	kg	NR/NR	NR	NR	NR	NR/0	NR/0	NR/0	NR/0	NR/0	NR/0
Materials for energy recovery kg	kg	NR/NR	NR	NR	NR	NR/0.01	NR/0.01	NR/0.01	NR/0.01	NR/0.01	NR/0.01
Exported energy	MJ per energy carrier	NR/NR	NR	NR	NR	NR/0	NR/0	NR/0	NR/0	NR/0	NR/0

Table 10: Additional environmental impact indicators are only declared in the Annex to General background report.

Additional environmental impact indicators		
Impact category	Unit	Module A1-D
Particulate Matter emissions	Disease incidence	ND in EPD, see Annex
Ionizing radiation, human health	kBq U235 eq.	ND in EPD, see Annex
Eco-toxicity (freshwater)	CTUe	ND in EPD, see Annex
Human toxicity, cancer effects	CTUh	ND in EPD, see Annex
Human toxicity, non-cancer effects	CTUh	ND in EPD, see Annex
Land use related impacts/Soil quality	dimensionless	ND in EPD, see Annex

Table 11: Classification of disclaimers to the declaration of core and additional environmental impact indicators

ILCD classification	Indicator	Disclaimer
ILCD Type 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
ILCD Type 2	Acidification potential, Accumulated Exceedance (AP)	None
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD Type 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2
Disclaimer 1 – 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.		
Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.		

1. General information

Virgin aggregates, especially glaciofluvial sand and gravel, is a finite resource. To extract rock from bedrock or sand and gravel from natural deposits will affect the environment through use of land which means changed conditions in existing habitats.

The extraction may have a negative impact on surrounding freshwaters and underlying groundwaters and the operations require equipment and vehicles running on fossil and renewable energy. The operations, including transports, cause emissions to air, water and soil and disturbances such as noise, vibrations and dust.

Therefore, quarries, gravel pits and terminals need to be environmentally assessed in accordance with current legislation. During the application procedure consultations are held with interested parties. Decisions and permits can be appealed.

All sites in NCC Industry, Division Stone Materials, are operated according to a given permit/decision from actual authority which include different conditions. Those conditions might regulate e.g. distance to groundwater level, noise, vibrations, dust, emissions to water and air, and rehabilitation of the finalized operation area.

The sites in Denmark, Finland and Sweden are certified according to ISO 14001. The Business Management System in NCC Industry, including Norway, contains routines corresponding to this standard.

However, aggregates are important when building the future society since aggregates is a core building material in residential buildings, offices, public buildings and infrastructure. Building a normal sized single-family house requires about 100 tons of aggregates (SGU, 2018).

The average yearly European demand of aggregates is about 5 tons per capita (UEPG, 2018). In the Nordic countries the demand is higher; 8-13 tons per capita and year, mainly due to a lower population density.

If aggregates are not contaminated, they may be reused many times through recycling which is key in resource efficiency. At many of our sites NCC recycle smaller amounts of aggregates, concrete, asphalt, bricks and different soils. Recycled materials can then be used again. In the end of life, aggregates are usually reused as filling material in construction projects.

When a quarry/gravel pit is opened the existing habitats changes and the area looks sterile. The soil is normally poor in nutrients and different parts of the area are often exceptionally sunlit or shady, conditions that are appreciated by many species. Within a relatively small operational area that is disrupted continuously, like the quarry/gravel pit, the natural environments are often more varied than in the

pristine neighboring area. This makes many of our sites unique and creates opportunities to benefit biodiversity both during operation and when rehabilitating.

Explanatory material is given in the background report to this EPD.

To read more about NCCs general sustainability work, please refer to our webpage:

<https://www.ncc.group/sustainability>

2. Release of dangerous substances to indoor air, soil and water during use stage

According to EN 15804, the EPD does not need to give this information if the horizontal standards on measurement of release of regulated dangerous substances from construction products using harmonized test methods according to the provisions of the respective technical committees for European product standards are not available. This criterion is fulfilled for aggregates.

3. Scenario information

For modules other than A1-A3, scenario-based information shall be declared for the products, see Table 12.

Module C (not for aggregates used in asphalt or concrete)

Scenario 1:

The majority of the aggregates (excluding the asphalt and concrete applications) stay in the construction for a long time period (more than 100 years). Thus, it is assumed that the aggregates do not reach the end-of-life stage.

Scenario 2:

A minor part of the aggregates is relocated, for example at the road where it is located. The material could for instance be used to fill an embankment in the proximity. This is expected to occur within a 100-year time horizon.

Table 12: Scenario-based information for end of life.

Scenario information	Unit (per declared unit)	Scenario 1	Scenario 2
Collection process specified by type	kg collected separately	NA	1000
	kg collected with mixed construction waste	NA	0
Recovery system specified by type	kg for re-use	NA	1000
	kg for recycling	NA	0
	kg for energy recovery	NA	0
Disposal specified by type	kg product or material for final disposal	NA	0
Assumptions for scenario development, e.g. transportation	Units as appropriate	Further scenario-based information is presented in the Annex of the Background Report	

Module D

Information in module D aims at transparency of the environmental benefits or loads resulting from reusable products, recyclable materials and/or useful energy carriers leaving a product system e.g. as secondary materials or fuels.

Loads are assigned to module D for materials and fuels where further processing occur after the end-of-waste state is reached. This, in order to replace primary material or fuel input in another product system.

Benefits are assigned to module D for materials and fuels (that have left the system in any of the modules A4-C4) that can substitute primary material of fuels that do not need to be produced. A functional equivalence must be reached.

The substitution effect is only calculating the resulting net output flow. The net output flow for the aggregates declared are shown in Table 13.

Table 13: Net output flow for module D per declared unit.

Product groups	Mass (kg)
1	1000
2	1000
3	1000
4	1000
5	1000
6	1000

Scenario 1 (Net loads and net benefits):

Not relevant.

Scenario 2 (Net loads and net benefits):

The net load relates to the transport of the excavated material. This is assumed to be 3 km transported by a small truck (approximately 9 tons payload capacity).

The benefit gained is equal to the virgin aggregates that are substituted. This is assumed to replace the product group with the lowest environmental impact declared in the EPD (module A1-A3) (conservative assumption).

PROGRAMME INFORMATION

This EPD is developed by NCC Industry Nordic AB. It is a result from an EPD certification process verified by Bureau Veritas. The EPD is valid for five years (after which it can be revised and reissued). NCC Industry Nordic AB is the declaration owner and has the liability and responsibility for the EPD.

EPDs of construction products may not be comparable if they do not comply with EN 15804. EPDs within the same product category but from different programmes may not be comparable.

The aim of this EPD is that it shall provide objective and reliable information on the environmental impact of the production of the declared product.

Table 14: Verification details.

CEN standard EN 15804 served as the core Product Category Rules (PCR)	
Product Category Rules (PCR):	PCR 2019:14 Construction products, version 1.11
PCR review was conducted by:	The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact .
Independent third-party verification of the declaration and data, according to ISO 14025:2006:	<input checked="" type="checkbox"/> EPD process certification (Internal) <input type="checkbox"/> EPD verification (External)
Certification body:	Bureau Veritas
Accredited:	SWEDAC
Procedure for follow-up of data during EPD validity involves third party verifier:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Address of programme operator: EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden, E-mail: info@environdec.com

REFERENCES

Annex to General Background Report, Aggregates, Site specific information for aggregates from the site Kragerø quarry – Valberg 2019 April-2020 March. Version 2021-05-26

EN 15804:2012+A2:2019: Sustainability of construction works - Environmental Product Declarations - Core rules for the product category of construction products.

EPD International (2019) General Programme Instructions for the International EPD® System, version 3.01, dated 2019-09-18. www.environdec.com

EPD process – general description (2020) NCC Industry, Division Stone Materials

GaBi Professional: Documentation of GaBi: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, Leinfelden-Echterdingen, 1992-2021.

General background report, Environmental Product Declarations for Aggregates. Version 2021-03-01.

Geological Survey of Sweden (2017) Grus, sand och krossberg. 2018:2.

MinBaS II (2011). Undersökning av eventuella effekter på vegetation av damning från täktverksamhet – Slutrapport. MinBaS II område nr 3, Delområde nr 3.1a, Delprojekt nr 3.1a-4. Rapport nr 3.1a-4.

Product Category Rules PCR 2019:14 Construction products, version 1.11 of 2021-02-05

Regulation (EU) no. 305/2011 – Construction Products Regulation (CPR), <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:088:0005:0043:EN:PDF>

SS-EN 12620+A1:2008 - Aggregates for Concrete

SS-EN 13043/AC:2006 - Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas

SS-EN 13242+A1:2007 - Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction

SS-EN 13383-1:2002 - Armourstone

SS-EN ISO 14025:2010 Environmental labels and declarations - Type III environmental declarations - Principles and procedures (ISO 14025:2006)

SS-EN ISO 14040:2006 Environmental management - Life cycle assessment - Principles and framework (ISO 14040:2006)

SS-EN ISO 14044:2006/A1:2018 Environmental management - Life cycle assessment - Requirements and guidelines – Amendment 1 (ISO 14044:2006 / Amd 1:2018)

The International EPD® System, EPD International AB, Stockholm, Sweden, <http://www.environdec.com/>

United Nations Statistics Division (2015). Central Product Classification, version 2.1. <https://unstats.un.org/unsd/classifications/unsdclassifications/cpcv21.pdf>.

UEPG (European Aggregates Association) (2018). Annual Review 2017-2018, A Sustainable Industry for a Sustainable Europe. <http://www.uepg.eu/uploads/Modules/Publications/uepg-annual-review-2017-2018.pdf>

DIFFERENCES VERSUS PREVIOUS VERSIONS

Table 15: Versions of this EPD

Date of revision	Description of difference versus previous versions
2021-05-26	Original version
2022-03-08	Editorial changes