Environmental Product Declaration for aggregates from Mäntsälä quarry – Ohkola

According to EN 15804:2012+A1:2013, ISO 14025, ISO 14040 and ISO 14044
Program operator: International EPD® System
EPD owner: NCC Industry Nordic AB
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First publication date 2020-10-19 Last revision date: - Valid until 2025-10-18 Version 2020-10-19

Reg. no. S-P-02082 UN CPC 15320

The verifier and the program operator do not make any claim nor have any responsibility of the legality of the product, its production process or its supply chain.

This is a "cradle-to-gate" EPD based on an LCA model described in the background report and in the corresponding annex (see list of references). The products declared are aggregates manufactured by NCC Industry, Division Stone Materials. The declared site is Ohkola in Mäntsälä, a medium-sized mobile crushing plant of NCC Industry in Finland.

The declared products are intended to be used as, e.g., filling material in civil engineering and construction projects, railway macadam and as bulk material in concrete and asphalt.

EPD INFORMATION	
Declared unit:	1000 kg product, at the declared site
RSL:	Not specified
PCR:	Product Category Rules PCR 2012:01. Construction products and construction services. Version 2.3 of 2018-11-15.
Program operator:	The International EPD® System operated by EPD International AB Box 210 60 SE-100 31 Stockholm Sweden info@environdec.com

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 15 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 in the table below. The aggregates consist of granodiorite gneiss.

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

Product group	Product names (English)	Product names (Finnish)	EN-12620 [1)]	EN-13242 [2)]	EN-13043 [3)]
1	Raw Rock	Louhe		X	
2	All-In Rock 0/150	Kalliomurske 0/150		X	
	Coarse rock 100/200	Kalliosepeli 100/200		X	
	All-In Rock 0/11	Kalliomurske 0/11		X	
3	All-In Rock 0/16	Kalliomurske 0/16		X	
	All-In Rock 0/32	Kalliomurske 0/32		X	
	All-In Rock 0/56	Kalliomurske 0/56		X	
	All-In Rock 0/90	Kalliomurske 0/90		X	
	Coarse rock 16/32	Kalliosepeli 16/32		X	
4	Rock Fines 0/3	Kivituhka 0/3		X	
	Rock Fines 0/6	Kivituhka 0/6		X	
	Coarse rock 1/6	Kalliosepeli 1/6		X	
	Coarse rock 3/6	Kalliosepeli 3/6			
	Coarse rock 6/16	Kalliosepeli 6/16		X	
	Coarse rock 6/32	Kalliosepeli 6/32		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

The products are classified into product groups based on the number of crushing steps they pass. Product group 1 has not been crushed, group 2 products pass one crushing step, group 3 pass two crushing steps and group 4 pass three crushing steps.

When extracting virgin rock at the site, the first step is to remove the overburden, like soil, moraine and trees, with an excavator to uncover the hard rock. Consideration is taken to animals inhabiting the site by avoiding felling trees during the breeding season. The overburden is normally stored within the quarry to be used in rehabilitation of the quarry at the end of life. After removal of the overburden, holes are 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.

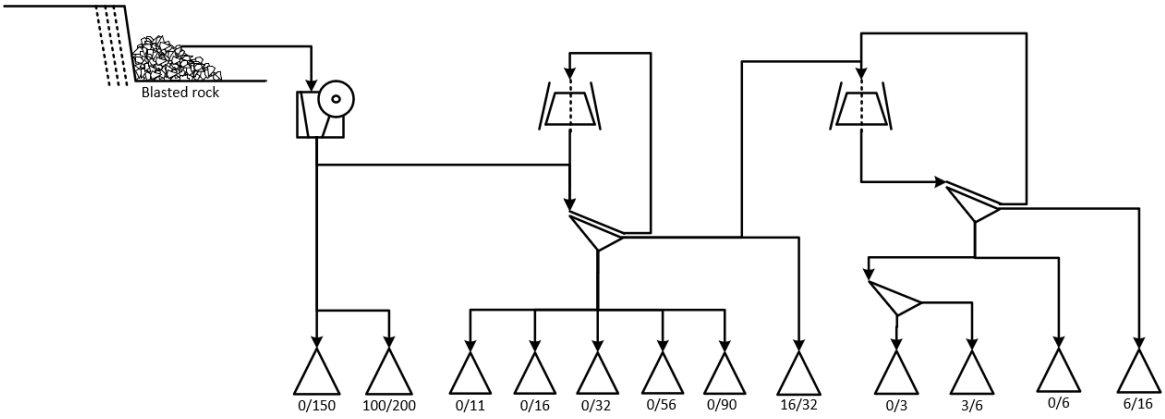

Figure 1: Process set-up for the production of aggregates at the declared site.

The products declared are classified according to the United Nations Central Product Classification (UN CPC) 15320. All materials are produced according to the Construction Products Regulation (CPR) within the EU regulation 305/2011. The products declared do not contain any substances of very high concern (SVHC) according to REACH.

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

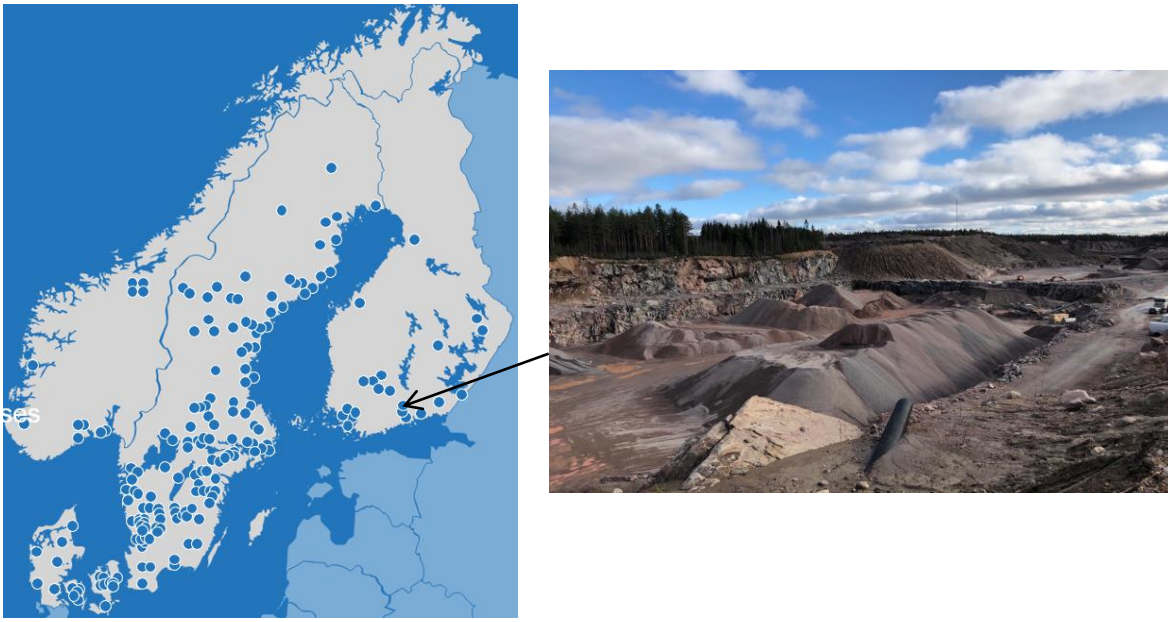

Figure 2: Map and aerial view showing the geographical location of the declared site.

1. Declared unit and reference flow

The declared unit is 1 tonne (1000 kg) of aggregates. The reference flow is calculated at the production gate.

2. System boundary

The system boundaries cover several aspects such as temporal, geographical and which unit processes to include in the system model. The setting of system boundaries follows two principles according to EN 15804: (1) The "modularity principle" entails that the environmental impacts are declared in the life cycle stage where they appear, (2) the "polluter pays principle" means that waste processing shall be assigned to the flow diagram that generates the waste until the end-of-waste state is reached (i.e. until a new user pays for it as a raw material).

The EPD is cradle-to-gate, declaring the modules A1-A3, see Figure 3.

Data that represent the current situation production process at the plant is used. All input data for the core module and for raw materials that NCC Industry has influence over are site specific data for the production year 2019.

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 LCI. Personnel-related impacts, such as transportation to and from work, are neither accounted for in the LCI.

Upstream	Core	Downstream													Other environmental information
Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
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	Future reuse, recycling or energy recovery potentials
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Figure 3: The system boundaries of the LCA. Modules of the production life cycle included in the EPD (X = declared module; MND = module not declared)

3. Assumptions and approximations

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

The amount of worn-off manganese steel that ends up in the products has not been measured. Instead, it has been approximated based on previous knowledge.

The mobile crushers used in Ohkola have also been used on other sites during the data collection period. The emissions originating from transport have been approximated based on knowledge that the crushers and equipment have been moved eight times to Ohkola by trucks (estimated to be of type Truck-trailer, Euro 6, gw 34-40 tonnes) with a total equipment load of 255 tonnes, and an estimated mean distance between sites of 50km.

4. 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 have passed. This affects the amount of fuels used in the production of every product type.

The consumption of explosives is allocated equally on all products originating from blasted rock, based on mass. Explosives are not allocated to products not originating from blasted rock.

Allocation of the fuel consumption is made based on knowledge about which process steps each product passes through. In addition to the specific process steps, fuel consumed in machines used for general activities on the site is allocated on all products produced, based on mass.

The electricity consumed at the site is used for general activities and is allocated on all products produced, based on mass.

5. Release of dangerous substances during the use phase

The products have been tested for radioactivity and the tests show that the activity index is 0,8 which is below the limit of 1,0 for construction materials (STUK-Finnish Radiation and Nuclear Safety Authority). Which means that no usage restriction is applied to the material regarding radio activity (STUK directive ST 12.2 / 17.12.2010).

6. Cut-offs

The cut-off criteria are 1% of the renewable and non-renewable primary energy usage, 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 GaBi LCI datasets. All raw materials and energy used in the aggregate manufacture are included.

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 is 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. Data quality

The primary data collected by the manufacturer are based on the materials and energy required and the waste generated in the manufacture of the product to create a general model. The data 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 and 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.

9. Comparability

EPDs of construction products may not be comparable if they do not comply with EN 15804. Neither may EPD within the same product category from different programs be comparable.

A comparison of EPDs is only possible if all the data sets to be compared are created according to ISO 14025 and EN 15804, and the building context, particularly the product-specific characteristics of performance, is taken into account.

ENVIRONMENTAL PERFORMANCE-RELATED INFORMATION

The results of the life cycle assessment, based on the declared unit, can be found in Table 2 (potential environmental impact), Table 3 (resource use) and Table 4 (output flows and waste categories). The products are grouped into product groups depending on the number of crushing steps they pass through, affecting the environmental impact. Products within the same product group carry the same impact. The deviation within each product group is less than 10% for any potential environmental impact, resource use and waste category.

Table 2: Results of the LCA – Potential environmental impact for 1 tonne (1000 kg) of aggregates.

Potential environmental impact			Product group 1	Product group 2	Product group 3	Product group 4
			Raw rock	All-In Rock 0/150, Macadam 100/200	All-In Rock 0/11, All-In Rock 0/16, All-In Rock 0/32, All-In Rock 0/56, All-In Rock 0/90, Macadam 16/32	Rock Fines 0/3, Rock Fines 0/6, Macadam 1/6, Macadam 3/6, Macadam 6/16, Macadam 6/32
Parameter		Unit	A1-A3	A1-A3	A1-A3	A1-A3
Global warming potential (GWP_{100})	Fossil*	kg CO_2 eq	1.8	2.6	3.5	4.3
	Biogenic**	kg CO_2 eq	0	0	0	0
	Land use / land transformation*	kg CO_2 eq	2.7E-4	3.4E-4	4.6E-4	4.6E-4
	TOTAL	kg CO_2 eq	1.8	2.6	3.5	4.3
Ozone depletion potential (ODP)		kg CFC 11 eq	3.9E-08	3.9E-08	3.9E-08	3.9E-08
Acidification potential of land and water (AP)		kg SO_2 eq	0.012	0.018	0.024	0.031
Eutrophication potential (EP)		kg PO_4^{3-} eq	0.021	0.023	0.024	0.026
Photochemical ozone creation potential (POCP)		kg C_2H_2 eq	1.1E-3	1.8E-3	2.5E-3	3.0E-3
Depletion of abiotic resources (elements) (ADPE)		kg Sb eq	1.5E-06	1.5E-06	1.6E-06	1.6E-06
Depletion of abiotic resources (fossil) (ADPF)		MJ, net calorific value	22	22	34	46

*This is additional information that is not required in the standard. Only the total GWP100 is compulsory to report.

**This indicator is set to zero, due 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.

Table 3: Results of the LCA - Resource use for 1 tonne (1000 kg) of aggregates.

Use of resources		Product group 1	Product group 2	Product group 3	Product group 4
		Raw rock	All-In Rock 0/150, Macadam 100/200	All-In Rock 0/11, All-In Rock 0/16, All-In Rock 0/32, All-In Rock 0/56, All-In Rock 0/90, Macadam 16/32	Rock Fines 0/3, Rock Fines 0/6, Macadam 1/6, Macadam 3/6, Macadam 6/16, Macadam 6/32
Parameter	Unit	A1-A3	A1-A3	A1-A3	A1-A3
Use of renewable primary energy (PERE)	MJ, net calorific value	0.23	0.32	0.38	0.44
Use of renewable primary energy resources used as raw materials (PERM)	MJ, net calorific value	0	0	0	0
Total use of renewable primary energy resources (PERT)	MJ, net calorific value	0.23	0.32	0.38	0.44
Use of non-renewable primary energy (PENRE)	MJ, net calorific value	22	34	46	58
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ, net calorific value	0	0	0	0
Total use of non-renewable primary energy resources (PENRT)	MJ, net calorific value	22	34	46	58
Use of secondary material (SM)	kg	1.3E-3	1.3E-3	4.6	1.3E-3
Use of renewable secondary fuels (RSF)	MJ, net calorific value	0	0	0	0
Use of non-renewable secondary fuels (NRSF)	MJ, net calorific value	0	0	0	0
Use of net fresh water (FW)	m^3	9.9E-4	1.1E-3	1.2E-3	1.3E-3

Table 4: Results of the LCA - Waste categories for 1 tonne (1000 kg) of aggregates.

Waste		Product group 1	Product group 2	Product group 3	Product group 4
		Raw rock	All-In Rock 0/150, Macadam 100/200	All-In Rock 0/11, All-In Rock 0/16, All-In Rock 0/32, All-In Rock 0/56, All-In Rock 0/90, Macadam 16/32	Rock Fines 0/3, Rock Fines 0/6, Macadam 1/6, Macadam 3/6, Macadam 6/16, Macadam 6/32
Parameter	Unit	A1-A3	A1-A3	A1-A3	A1-A3
Hazardous waste disposed (HWD)	kg	6.0E-3	6.0E-3	6.0E-3	6.0E-3
Non-hazardous waste disposed (NHWD)	kg	0.053	0.054	0.056	0.057
Radioactive waste disposed (RWD)	kg	5.1E-05	7.7E-05	9.7E-05	1.2E-04

ADDITIONAL ENVIRONMENTAL 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 themselves requires 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 tonnes of aggregates (SGU, 2018).

The average yearly European demand of aggregates is about 5 tonnes per capita (UEPG, 2018). In the Nordic countries the demand is higher; 8-13 tonnes 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/

VERIFICATION DETAILS

Table 5: Verification details.

CEN standard EN 15804 served as the core PCR	
PCR:	Product Category Rules PCR 2012:01. Construction products and construction services. Version 2.3 of 2018-11-15
PCR review was conducted by:	The Technical Committee of the International EPD® System. Chair: Massimo Marino Contact via info@environdec.com.
Independent verification of the declaration and data, according to ISO 14025:	☒ EPD process certification (Internal) □ EPD verification (External)
Third party verifier:	Bureau Veritas
Accredited or approved by:	SWEDAC
Procedure for follow-up of data during EPD validity involves third party verifier:	☒ Yes □ No

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EN ISO 14025:2010 Environmental labels and declarations - Type III environmental declarations - Principles and procedures

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

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ABOUT THE EPD

This environmental product declaration (EPD) describes, from a lifecycle perspective, the environmental impact of aggregates from Mäntsälä quarry – Ohkola produced by NCC Industry AB.

The EPD is drawn up in accordance with Product Category Rules (PCR) PCR 2012:01. Construction products and construction services. Version 2.3 of 2018-11-15. The program operator is the International EPD® System (see www.environdec.com for more information).

The aim of this EPD is that it should provide objective and reliable information on the environmental impact of the production of the declared product. Produced by NCC Industry AB, division Stone Materials.

This EPD is developed by NCC. 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 AB is the declaration owner.

ABOUT NCC

NCC is one of the leading construction and property development companies in the Nordic region, with sales of 5,5 billion Euro and approximately 15 300 employees in 2019. 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 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.

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