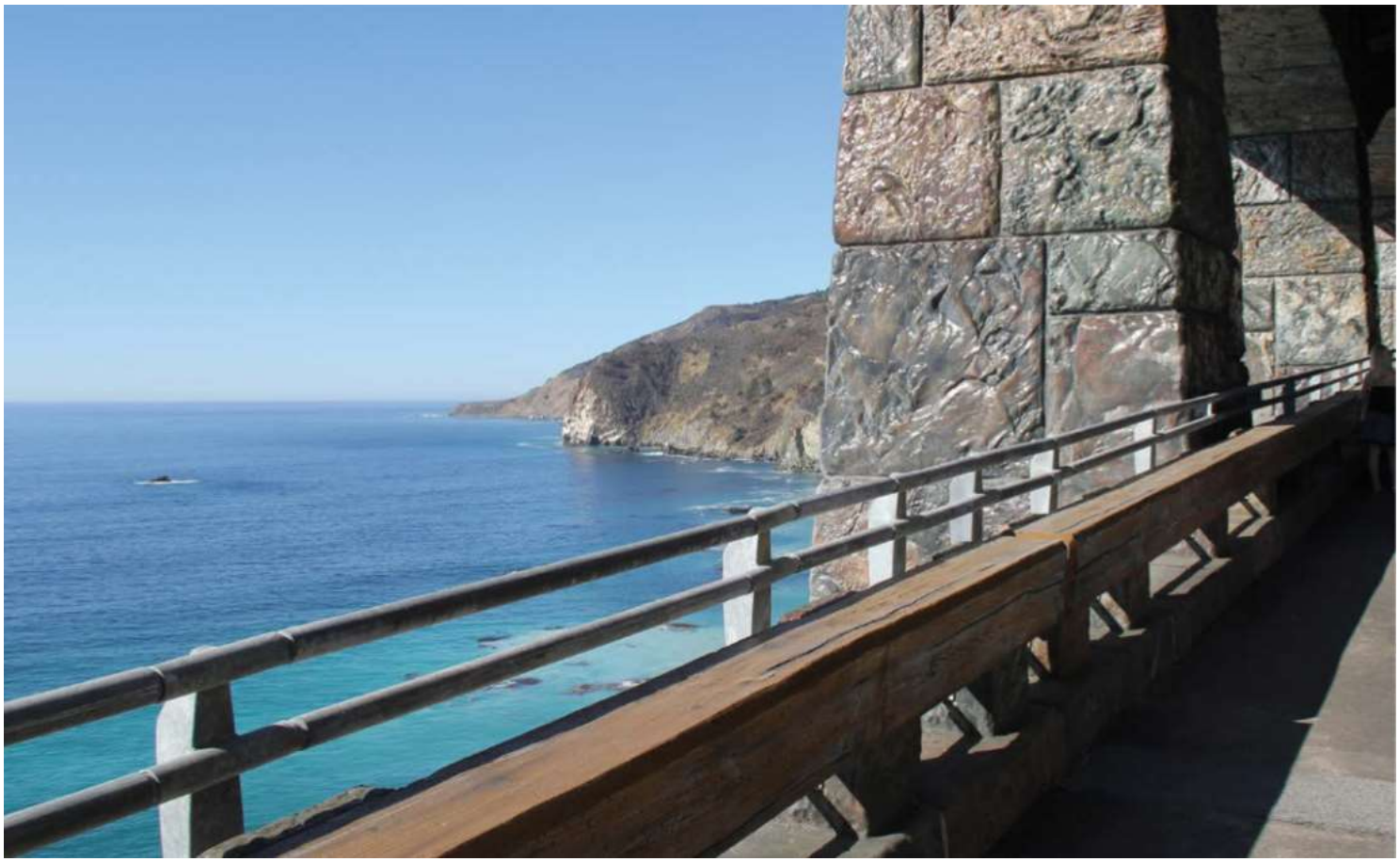
Environmental
Product
Declaration

Graniterock

CONSTRUCTION AGGREGATE

Construction aggregate produced at 2 Graniterock Facilities



Environmental Product Declaration

NRMCA Certified Environmental Product Declaration

This environmental product declaration was conducted in accordance with ISO 14025:2006

Internal Verification External Verification X

Declared Product:	This Environmental Product Declaration (EPD) covers construction aggregate produced by Graniterock.	
Declaration Owner:	**Graniterock** 350 Technology Drive; PO Box 50001 Watsonville, CA 95077-5001 http://www.graniterock.com/ 831.768.2000	
Program Operator:	**National Ready Mix Concrete Association** 900 Spring St. Silver Spring, MD 20910 301-587-1400 www.nrmca.org/sustainability Lionel Lemay	NRMCA
LCA and EPD Developer:	**Athena Sustainable Materials Institute** 119 Ross Ave. #100 Ottawa, ON K1Y 0N6 613-729-9996 www.athenasmi.org James Salazar	Athena Sustainable Materials Institute
Product Category Rule:	ASTM Product Category Rules (PCR) for Construction Aggregates: Natural Aggregate, Crushed Concrete, and Iron/Steel Furnace Slag, issued January, 2017.	
	PCR review was conducted by: Jamie Meil ▪ jamie.meil@athenasmi.org The PCR peer review report is available upon request: cert@astm.org	
Independent LCA Reviewer and EPD Verifier:	This EPD was independently verified by NSF International in accordance with ISO 14025 and ISO 21930. The life cycle assessment was independently reviewed in accordance ISO 14044 and the referenced PCR. Independent verification of the declaration, according to ISO 14025: 2006 ☐ Internal ☒ External	
	Third Party Verifier Paula Bernstein, Consultant at Long Trail Sustainability on Behalf of NRMCA	
Date of Issue:	Issued July 3, 2018	
Period of Validity:	5 Years	
EPD Number	NRMCAEPD: 10020	

Description of Company

Graniterock has served the needs of the construction industry since 1900. Graniterock supplies crushed aggregate, sand and gravel, concrete, building materials, natural stone, and asphaltic concrete to any construction job, large or small. The Company's construction division is a significant regional heavy engineering contractor building roadways, airports and private commercial and residential projects. Graniterock was founded on Valentine's Day, February 14, 1900. Graniterock has operations in Watsonville, Santa Cruz, Seaside, Salinas, Hollister, Aromas, Cupertino, Felton, San Jose, Redwood City, Oakland, and South San Francisco.

At Graniterock, we believe that quality products and exemplary service can only be achieved with highly skilled and motivated people who take personal ownership of customer satisfaction. You will notice a difference in Graniterock People. We are proud of our dedication to uncompromising product quality and service.

Graniterock received the 1992 Malcolm Baldrige National Quality Award and the 1994 Governor's Golden State Quality Award. The future of Graniterock will echo the many remarkable achievements of the past. Graniterock has strategic plans to maintain its leadership position in the industry. High-technology solutions are being implemented to enhance the products, service and procedures already in place at the A. R. Wilson Quarry in Aromas.

Community Contribution and Responsibility is one of the corporate objectives at Graniterock. All team members are encouraged "to be exemplary citizens of each of the communities in which we operate by actively participating in achieving community goals. The environment is important to us; our actions shall be consistent with environmental responsibility." Details for Graniterock's environmental responsibility and sustainability report can be found at: http://www.graniterock.com/about_us/environment

Graniterock has led the way through for more than 100 years and will continue to be a community and market leader through employee dedication, technological innovation and commitment to excellence.

Location of Facilities

This EPD is for aggregate produced by Graniterock at the following two facilities:

Graniterock: A.R. Wilson Quarry
1900 Quarry Rd
Aromas, CA 95004

Graniterock: Southside Sand and Gravel
5632 Airline Highway
Hollister, CA 95023-9642

Description of Product

This EPD covers two average aggregate products representing the product range offered by the two participating facilities. The product range for each facility is listed in Table 1. The product composition is 100% construction aggregate, with no packaging or other additional materials added to the shipped products. The products are compliant with ASTM-C33 Standard Specification for Concrete Aggregates and thus fulfills the desired function/performance of a building product.

Table 1: Products Represented in this EPD

Product	A.R. Wilson Quarry	Southside Sand and Gravel
1/2 x 1/4 Drain Rock	•	•
1/4 #10 Drain Rock	•	
1/4 Premium	•	
1-1/2 Class 2AB	•	
1-1/2 Class 4AB	•	
1-1/2 x 3/4" Drain Rock	•	•
3/4 Class 2 AB	•	•
3/4 Class 4 AB	•	
3/4 Concrete Mix	•	•
3/4 x 1/2" Drain Rock	•	•
3/8 " Pea Gravel		•
3/8 x # 6 Drain Rock	•	•
AREMA #4 Ballast 1-1/2	•	
Arena Footing		•
Caltrans 1 x #4	•	•
Clay	•	
Concrete Sand	•	•
Gabio 3 x 8"	•	
Granite Rock Fines	•	•
Granite Sand	•	•
Permiable	•	•
Ranchers Baserock		•
Screened Cobbles		•
Rip Rap (all sizes up to 15 ton)	•	
Type 1, 2, 3 Slurry Seal Agg.	•	
Utility Sand	•	•
Washed Sand	•	•

Examples of product offerings

Methodology of Underlying LCA

LCA Project Report

Details of the methodology of the underlying LCA can be found in the LCA Project Report: Athena Sustainable Materials Institute: A Cradle-to-Gate Life Cycle Assessment of Aggregate Products Manufactured by Graniterock; Version 1.0. Prepared by the Athena Sustainable Materials Institute: June 2018.

Declared Unit

The declared unit is 1 metric ton (dry weight basis) of construction aggregate. The declared unit is an average product covering the entire product ranges offered by the two Graniterock facilities.

Scope of LCA

A summary of life cycle stages included in the EPD is as follows:

- A1- Raw material supply: Extraction and processing of raw materials, including fuels used in extraction and transport within the process.
- A2- Transportation: Average or specific transportation of raw materials (including recycled materials) from extraction site or source to manufacturing site (including any recovered materials from source to be recycled in the process) and including empty backhauls and transportation to interim distribution centers or terminals.
- A3- Manufacturing: Manufacturing of the product, including all energy and materials required and all emissions and wastes produced.

A summary of life cycle stages excluded from the EPD is as follows:

- Production, manufacture and construction of buildings capital goods and infrastructure
- Personnel---related activities (travel, furniture, office supplies).
- Energy use related to company management and sales activities.

Building Life Cycle Information Modules															
Product stage			Construction Process stage		Use stage							End-of-life 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
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4

Figure 1. Life cycle stage schematic – alpha-numeric designations as per ASTM PCR 2017 (adapted from CEN 15978:2011)

Cut-off Rules

The cut-off criteria for all activity stage flows considered within the system boundary conform with ISO14044:2006 and section 3.3 of the governing PCR. Specifically, the cut-off criteria were applied as follows:

- All inputs and outputs for which data are available are included in the calculated effects and no collected core process data are excluded.
- A one percent cut-off is considered for renewable and non-renewable primary energy consumption and the total mass of inputs within a unit process. The sum of the total negleted flows does not exceed 5% of all energy consumption and mass of inputs.
- All flows known to contribute a significant impact or to uncertainty are included;
- The cut-off rules are not applied to hazardous and toxic material flows – all of which are included in the life cycle flow inventory.

Allocation

The production processes modeled in this LCA each only produced a single primary product, and no coproducts, and thus no allocation was necessary.

Limitations

The limitations of this EPD include:

- This EPD does not report all of the environmental impacts due to manufacturing of the product, but rather reports the environmental impacts for those categories with established LCA-based methods to track and report. Unreported environmental impacts include (but are not limited to) factors attributable to human health, land use change, and habitat destruction.
- EPDs from different programs (using different PCR) may not be comparable;
- This EPD represents an average performance as the EPD declares a single result for a number of products. The consumption of resources, energy use, and emissions are similar for the different products and thus minimal deviation of impacts between the products could be expected if separate analyses were conducted on each product;
- This EPD reports the results of an LCA or the 'cradle-to-gate' analysis. Thus, declarations themselves are not comparative assertions, defined as an environmental claim regarding the superiority or equivalence of one product versus a competing product that performs the same function. An EPD does not make any statements that the product covered by the EPD is better or worse than any other product.
- Life cycle impact assessment (LCIA) results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.
- This EPD was created using industry average data for upstream materials. Variation can result from differences in supplier locations, manufacturing processes, manufacturing efficiency and fuel type used.

Data Sources and Data Quality Assessment

This EPD is based on foreground LCI data collected from the participating company's production facilities for the calendar year 2016. All upstream material, resource and energy carrier inputs have been sourced from industry-average datasets and literature. Table 2 describes each LCI data source and the data quality for each data source.

Table 2. Secondary Data Sources				
Materials	**LCI Data Source**	**Geography**	**Year**	**Data Quality Assessment**
Lubricants and Greases	USLCI Database: Diesel, at refinery/l/US	North America	2008	**Technology**: very good Process models average North American technology **Time**: good Data is less than 10 years old **Geography**: very good Data is representative of North American lubricants.
Trucking	USLCI Database: Transport, combination truck, diesel powered NREL /US	North America	2008	**Technology**: very good Process models average North American technology **Time**: good Data is less than 10 years old **Geography**: very good Data is representative of North American trucking.
Electricity	ecoinvent 3.3 Database: Electricity, low voltage {WECC}| market for | Alloc Def, U	California	2014	**Technology**: very good Process models average California technology **Time**: very good Data is less than 5 years old **Geography**: very good Data is representative of California electricity.
Gasoline	USLCI 2014 Database: Gasoline, combusted in equipment/US	North America	2014	**Technology**: very good Process models average North American technology **Time**: very good Data is less than 5 years old **Geography**: very good Data is representative of North American gasoline.
Diesel	USLCI 2014 Database: Diesel, combusted in industrial equipment/US	North America	2014	**Technology**: very good Process models average North American technology **Time**: very good Data is less than 5 years old **Geography**: very good Data is representative of North American diesel.
Propane	USLCI 2014 Database: Liquefied petroleum gas, combusted in industrial boiler/US/l/RNA	North America	2014	**Technology**: very good Process models average North American technology **Time**: very good Data is less than 5 years old **Geography**: very good Data is representative of North American propane.
Blasting Materials	Ecoinvent 3.3 Database: Explosive, tovex {GLO}| market for | Alloc Def, U	Global	2014	**Technology**: very good Process models average Global technology **Time**: very good Data is less than 5 years old **Geography**: good Data is representative of explosives purchased.
Waste Treatment	Ecoinvent 3.3 Database: Process specific burdens, inert material landfill | Alloc Def, U	Global	2014	**Technology**: very good Process models average Global technology **Time**: very good Data is less than 5 years old **Geography**: good Data is representative of Global landfilling.

Data Quality Assessment

Data quality requirements, as specified in the ASTM PCR, section 7.1, are applied and reported in Table 2. This section also describes the achieved data quality relative to the ISO 14044:2006 requirements. This LCA and resulting EPD was created using industry average data for upstream materials. Data variation can result from differences in supplier locations, manufacturing processes, manufacturing efficiency and fuel types used. Data quality is judged based on its representativeness (technological, temporal, and geographical).

All LCI data (Table 2) are assessed on the basis of the data quality indicators listed below. Each indicator is interpreted with respect to its context and key determining data parameters are discussed to provide clarity as to how the overall quality of each indicator is assessed and stated.

Technical representativeness: *The degree to which the data reflects the actual technology(ies) used.* Core manufacturing process technology is derived from very recent annual data covering the specific plants at which the products are manufactured. Background data are deemed to be reflective of typical or average technologies used. Some background material and process data are Global but deemed to be similar to technologies used in the US and Canada.

Overall quality - Very good

Temporal representativeness: *The degree to which the data reflects the actual time (e.g. year) or age of the activity.* Core manufacturing process data is very recent (2015). All significant LCI data sources, those that exercise a large influence over the calculated results, are generally less than 10 years old.

Overall quality – Good to Very good

Geographical representativeness: *The degree to which the data reflects the actual geographic location of the activity (e.g. country or site).* Geographical coverage of core manufacturing processes is specific to the Graniterock facilities in California. All energy profiles reflect California-specific conditions for foreground processes, and North American averages for other inputs. Some material and process data are based on Global sources.

Overall quality - Good to very good

Life Cycle Assessment Results

Environmental Indicators and Inventory Metrics

This EPD supports 15 life cycle impact assessment indicators and inventory metrics as listed in Table 3. As specified in the ASTM PCR 2017, the US EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI), version 2.1, 2012 impact categories were used to calculate mandatory category indicators.

Table 4 shows the LCA results for the aggregate produced at the A.R. Wilson Quarry. Table 5 shows the LCA results for the aggregate produced at Southside Sand and Gravel.

Table 3. Life Cycle Category Indicators and Inventory Metrics		
Impact Category	**Abbreviations**	**Units**
Global Warming Potential (climate change)	**GWP**	kg CO2 eq
Acidification Potential	**ODP**	kg SO2 eq
Eutrophication Potential	**AP**	kg N eq
Photochemical Ozone Creation/Smog Potential	**EP**	kg O3 eq
Ozone Depletion Potential	**POCP**	kg CFC-11 eq
Inventory Metrics - Total Primary Energy Consumption		
Nonrenewable Fossil	**NREF**	MJ (HHV)
Nonrenewable Nuclear	**NREN**	MJ (HHV)
Renewable (Solar, Wind, Hydro, and Geothermal)	**RESWHG**	MJ (HHV)
Renewable (Biomass)	**REB**	MJ (HHV)
Inventory Metrics - Material Resources Consumption		
Nonrenewable Material Resources	**NRM**	kg
Renewable Material Resources	**RM**	kg
Net Freshwater	**NF**	l
Inventory Metrics – Waste and Outputs		
Non-hazardous Waste Generated	**NHW**	kg
Hazardous Waste Generated	**HW**	kg

Table 4. Life Cycle Impact Assessment: 1 ton Aggregate produced at Graniterock: A.R. Wilson Quarry		
Impact Category	**Units**	**Total**
Global Warming Potential (climate change)	kg CO2 eq	9.1472
Acidification Potential	kg SO2 eq	0.0793
Eutrophication Potential	kg N eq	0.0059
Photochemical Ozone Creation/Smog Potential	kg O3 eq	1.8427
Ozone Depletion Potential	kg CFC-11 eq	2.52E-07
Inventory Metrics - Total Primary Energy Consumption		
Nonrenewable Fossil	MJ (HHV)	123.7032
Nonrenewable Nuclear	MJ (HHV)	10.6720
Renewable (Solar, Wind, Hydro, and Geothermal)	MJ (HHV)	0.9249
Renewable (Biomass)	MJ (HHV)	0.5224
Inventory Metrics - Material Resources Consumption		
Nonrenewable Material Resources	kg	1000.5524
Renewable Material Resources	kg	0.0375
Net Freshwater	l	448.6916
Inventory Metrics – Waste and Outputs		
Non-hazardous Waste Generated	kg	0.0000
Hazardous Waste Generated	kg	0.0000

Table 5. Life Cycle Impact Assessment: 1 ton Aggregate produced at Graniterock: Southside Sand and Gravel		
Impact Category	**Units**	**Total**
Global Warming Potential (climate change)	kg CO2 eq	9.8876
Acidification Potential	kg SO2 eq	0.1005
Eutrophication Potential	kg N eq	0.0068
Photochemical Ozone Creation/Smog Potential	kg O3 eq	2.6313
Ozone Depletion Potential	kg CFC-11 eq	1.46E-07
Inventory Metrics - Total Primary Energy Consumption		
Nonrenewable Fossil	MJ (HHV)	141.8359
Nonrenewable Nuclear	MJ (HHV)	9.2757
Renewable (Solar, Wind, Hydro, and Geothermal)	MJ (HHV)	0.0000
Renewable (Biomass)	MJ (HHV)	0.0000
Inventory Metrics - Material Resources Consumption		
Nonrenewable Material Resources	kg	1000.2664
Renewable Material Resources	kg	0.0157
Net Freshwater	l	1968.9325
Inventory Metrics – Waste and Outputs		
Non-hazardous Waste Generated	kg	0.0242
Hazardous Waste Generated	kg	0.0000

References

ASTM International: Product Category Rule (PCR) for Construction Aggregates:
Natural Aggregate, Crushed Concrete, and Iron/Steel Furnace Slag UNCPC 1532 ; Version 1 January 2017.

Athena Sustainable Materials Institute: A Cradle-to-Gate Life Cycle Assessment of Aggregate Products Manufactured by Graniterock; Version 1.0. Prepared by the Athena Sustainable Materials Institute: June 2018.

ISO 21930: 2017 Building construction – Sustainability in building construction – Environmental declaration of building products.

ISO 14025: 2006 Environmental labeling and declarations - Type III environmental declarations - Principles and procedures.

ISO 14044: 2006 Environmental management - Life cycle assessment - Requirements and guidelines.

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

National Renewable Energy Laboratory 2014. U.S. Life Cycle Inventory Database.
https://www.lcacommons.gov/nrel/search.

Wernet, G., Bauer, C., Steubing, B., Reinhard, J., Moreno-Ruiz, E., and Weidema, B., 2016. The ecoinvent database version 3 (part I): overview and methodology. The International Journal of Life Cycle Assessment, [online] 21(9), pp.1218–1230. Available at: <http://link.springer.com/10.1007/s11367-016-1087-8> [Accessed 06 26 2018].