# Dolcito Limestone Quarry

## Environmental Product Declaration

This Environmental Product Declaration (EPD) is for aggregate products manufactured by

Vulcan Materials Company at Dolcito Quarry


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# General information

## Environmental Product Declaration

This Environmental Product Declaration (EPD) reports the impacts for 1 US ton (dry weight) aggregates, for use in business-to-business (B2B) in accordance with ISO 14025, ISO 21930, and ASTM International's EPD program operator rules.

| Product Name | Construction aggregate |
|---|---|
| Manufacturer Name and Address | Vulcan Materials Company<br>1200 Urban Center Drive<br>Birmingham, AL 35242 |
| Program Operator | ASTM International<br>http://www.astm.org/EPDs.htm |
| General Program instructions and Version Number | ASTM Program Operator for Product Category Rules (PCRs) and Environmental Product Declarations (EPDs), General Program Instructions. Version 8.0, revised April 29, 2020. |
| Declaration Number | EPD 799 |
| Reference PCR and Version Number | ISO 21930:2017 Sustainability in Building Construction – Environmental Declarations of Building Products serves as the core PCR.<br>Product Category Rule for Environmental Product Declarations: Construction Aggregates – NSF/ASTM 1126-23 |
| EPD Type and Scope (facility/product/average) | Type III EPD<br>Cradle-to-gate (modules A1 to A3)<br>Facility average |
| Defined functional or declared unit | 1 US Ton of aggregate |
| Product's intended Application and Use | This EPD is intended for business-to-business (B-to-B) audiences. |
| Product RSL (Reference Service Life) * | Not Applicable (B modules not included in scope) |
| Markets of Applicability | United States and Canada |
| Date of Issue | September 18, 2024 |
| Period of Validity | Five years – September 17, 2029 |
| Year of reported manufacturer primary data | January 1, 2022 to December 31, 2022 |
| LCA Software and Version Number | SimaPro 9.1 |
| LCI Database and Version Number | USLCI, SmartData, Construction Aggregates – NSF/ASTM 1126-23 Annex A V2.0 |
| LCIA Methodology and Version Number | TRACI 2.1 v1.04 |
| Overall Data Quality Assessment Score | 2 |

| | | |
|---|---|---|
| The sub-category PCR review was conducted by: | Industrial Ecology Consultants, Thomas P. Gloria, Ph.D<br>t.gloria@industrial-ecology.com | |
| This declaration was independently verified in accordance with ISO 14025: 2006. ISO 21930:2017 serves as the core PCR. Sub-category PCR: NSF/ASTM 1126: Construction Aggregates Product Category Rule | □ Internal ☑ External | |
| This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by: | Nawal Shoaib<br>nawal@climateearth.com<br>Climate Earth, Inc.<br>137 Park Place, Suite 204, Point Richmond, CA, 94801<br>(415) 391-2725 ▪ http://www.climateearth.com | |
| This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by: | Thomas P. Gloria, PhD<br>t.gloria@industrial-ecology.com<br>Industrial Ecology Consultants<br>35 Bracebridge Rd.<br>Newton, MA 02459-1728<br>(617) 553-4929<br>http://www.industrial-ecology.com | |
| Explanatory material may be obtained from the following: | David S. Crigler, P.E.<br>Director, Technical Services<br>(205) 229-1470<br>criglerd@vmcmail.com | Holly C. Brunson<br>Manager, Environmental Services<br>205-410-6401<br>carmichaelh@vmcmail.com |
| *Only applicable where the LCA/EPD includes Module B. | | |

**Table 1: Products manufactured at the Dolcito Quarry**

| Specification | Product Name | Product Description | Images |
|---|---|---|---|
| **ASTM D2940/ ALDOT 801** | 410MOD | Dense graded base. A well-graded material that generally consists of sizes ranging from 1 ½ in. to dust, and is used in building roadways to support traffic and protect underlying soils. |  |
| **ASTM D2940/ ALDOT 825** | ALDOT 825-B | Alabama DOT dense graded base. Base Stone is a well-graded material that generally consists of sizes ranging from 1 ½ in. to dust, and is used in building roadways to support traffic and protect underlying soils. Water is oftentimes added to this product and is mixed in a pugmill. |  |
| **ASTM D2940/ ALDOT 801** | 610 MOD | Dense graded base. A well-graded material that generally consists of sizes ranging from 3/in. to dust, and is used in building roadways to support traffic and protect underlying soils. |  |
| **ASTM C33/ALDOT 801** | DOT 57 | Size ranges from 1 ½ in to 1/4 in, and is a fast-draining material commonly used under slabs, backfill material and bedding stone. Coarser asphalt mixes may contain DOT 57 stone blended with other products for various type asphalt applications. It is often used a concrete coarse aggregate. |  |
| **ASTM C33/ALDOT 801** | DOT 67 | Common concrete stone with sizes ranging generally from 1 in to ¼ in. It is a fast-draining material and is often used under slabs and as backfill. Coarser asphalt mixes of contain DOT 67 blended with other products for various types of hot mix asphalt applications such as binder. |  |
| **ASTM C33/ALDOT 801** | DOT 78 | Commonly used in Asphalt as well as concrete. Sizes ranges from 3/4in to #4. |  |
| **ASTM C33/ALDOT 802** | Manufactured Sand | Washed fine aggregate commonly used in Asphalt and concrete mixes. As the name implies, it is a fine aggregate that has been washed to remove most of the fine dust particles. Manufactured sands have shown to increase concrete strengths and improve other concrete characteristics when compared to natural sand |  |

| | | | |
|---|---|---|---|
| **ASTM C33 & D1073/ALD OT 802** | 8910 MOD | Consist of material ranging from ¼ in down to fine dust. Depending on the dust content, screenings material such as these can be used in asphalt and concrete mixtures. You may also see them used in concrete block, slurry seals, pipe backfill and in livestock area. |  |
| **ASTM D2487/ VMC-AWF** | All Weather Fill | Vulcan's All-Weather Fill (AWF) is a manufactured crushed stone, predominantly within the sand grain-size range. It has been identified as a superior alternative fill material, proven to withstand inclement weather. |  |
| **ASTM D4992/ ALDOT 814** | ALDOT Class 1 Riprap | Size ranges from 10-100 pounds. Commonly used in erosion control applications. Examples: Bank protection, creek lining, outfall, and slope protection. |  |
| **ASTM D4992/ ALDOT 814** | ALDOT Class 2 Riprap | Size ranges from 10-200 pounds. Commonly used in erosion control applications. Examples: Bank protection, creek lining, outfall, and slope protection. |  |
| **ASTM D6711/ VMC** | 3in x 6in Gabion | Size Ranges from 6in to 3in. Designed to be placed in Gabion Baskets and can be used for slope stabilization and erosion control |  |

# LCA Study

## System boundary

This study captures the following mandatory cradle-to-gate (A1-A3) life cycle product stages (as illustrated in Figure 1):

A1 - Extraction and processing of raw materials including fuels used in extraction and transport within the process;

A2 – Specific transportation of raw 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 of the product, including all energy and materials required and all emissions and wastes produced.

| Product Stage | | | Construction Process Stage | | Use Stage | | | | | | | End of Life Stage | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 |
| 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 |
| X | X | X | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND |

**Figure 1. Life-Cycle Stages and Modules (Note: MND = module not declared; x = module included)**

Except as noted above, all other life cycle stages as described in Figure 1 are excluded from the LCA study. The following processes are also excluded from the study:

1. Production, manufacture, and construction of manufacturing capital goods and infrastructure;
2. Production and manufacture of production equipment, delivery vehicles, and laboratory equipment;
3. Personnel-related activities (travel, furniture, office supplies);
4. Fuel used to transport personnel around the mine and sand & gravel facility.
5. Energy and water use related to company management and sales activities.

The main processes included in the system boundary are illustrated in Figure 2.

# System Boundary

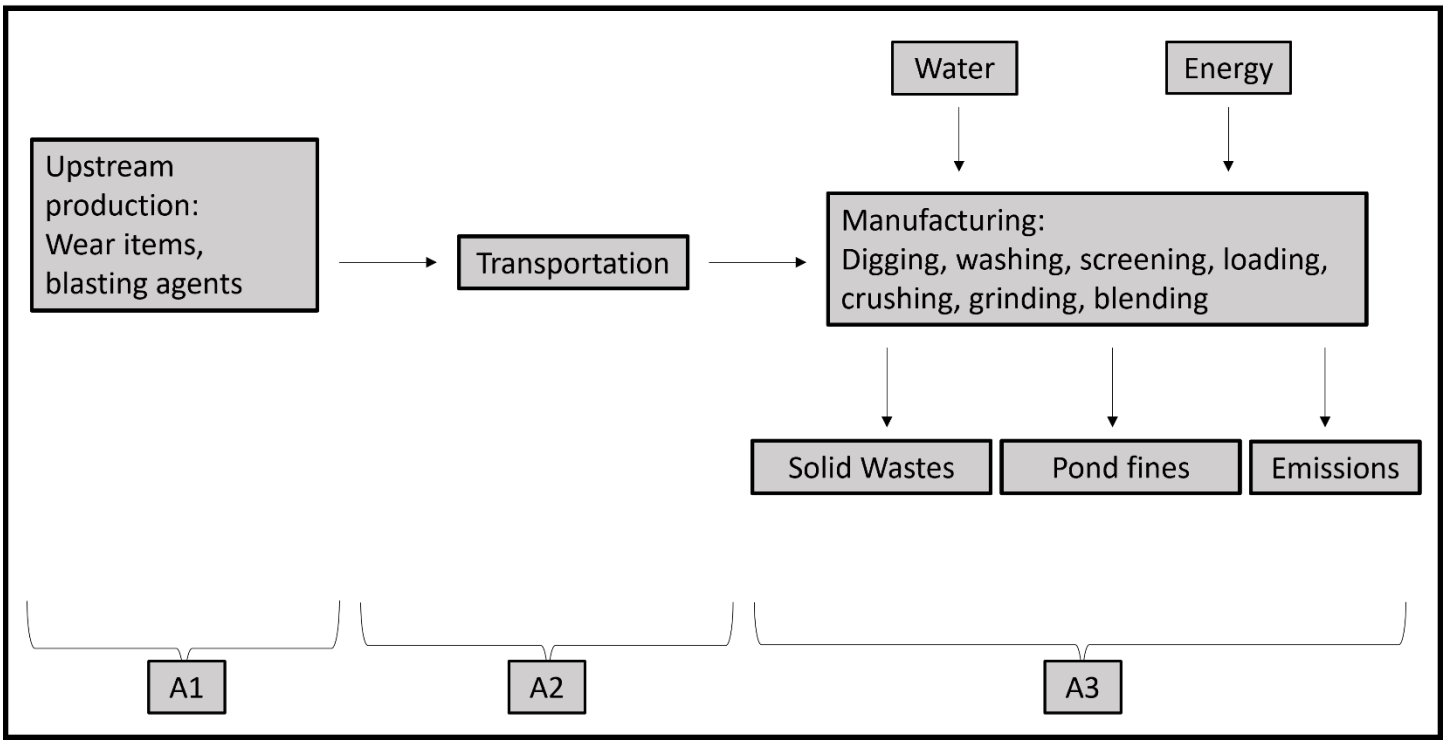


**Figure 2. Main Processes Included in System Boundary**

Explanatory materials may be requested by contacting:

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**Director, Technical Services**
**(205) 229-1470**
**criglerd@vmcmail.com**

**Holly C. Brunson**
**Manager, Environmental Services**
**205-410-6401**
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## Secondary data sources

A list of each secondary with its LCI data sources is provided below.

Diesel: USLCI process (2020): “Diesel, combusted in industrial equipment - Northern America”
Dust Foam Chemical: Ecoinvent 3.8 (2021): “Calcium chloride {GLO}| market for | APOS, U”
Electricity: U.S. DOE NETL (2020) U.S. electricity baseline
Explosives: NSF PCR for Construction Aggregates (2022) “Explosive”
Gasoline: USLCI process (2020): USLCI process (2020): “Gasoline, combusted in equipment - Northern America”
Lubricating oil: US-EI process (2021): “Lubricating oil, at plant/US”
Manganese: NSF PCR for Construction Aggregates (2022): “Manganese”
Rubber belts: Ecoinvent 3.8 (2021): Synthetic rubber, at plant/US- US-EI U
Tires: Ecoinvent 3.8 (2021): Synthetic rubber, at plant/US- US-EI U
Truck Transport: USLCI process (2020): “Transport, combination truck, short-haul, diesel powered, Southeast/tkm/RNA”
Waste: Ecoinvent 3.8 (2021): “Municipal solid waste {RoW}| treatment of, sanitary landfill | APOS, U”
Wear Plates: Ecoinvent 3.8 (2021): Steel, low-alloyed, at plant/US- US-EI U

## Data gaps, assumptions, and limitations

Energy data collected for this plant included the entire plant. Some of the energy, both chemical and electrical, reported may not be used directly in the production of the above mentioned products.

Dust foam chemical, calcium chloride, is a potential data gap as the NSF PCR does not state an agreed upon process to be used. Hence the readily available EcoInvent 3.8 (2021) process was used.

# Environmental Impacts

Cradle to Gate (A1-A3) impact results per 1 US ton (short ton TN.SH) of the plant studied here are outlined in Table 2.

**Table 2: Cradle-to-Gate Impact Results for Dolcito Quarry Covered in Study[1]**

| Impact category | Unit | A1 | A2 | A3 | A1 to A3 |
|---|---|---|---|---|---|
| Global warming potential (GWP) | kg $CO_2$ eq | 0.35 | 5.87E-04 | 6.10 | 6.46 |
| Depletion potential of the stratospheric ozone layer (ODP) | kg CFC-11 eq | 8.84E-08 | 2.46E-14 | 2.15E-08 | 1.10E-07 |
| Eutrophication potential (EP) | kg N eq | 3.28E-03 | 3.90E-07 | 2.91E-03 | 6.19E-03 |
| Acidification potential of soil and water sources (AP) | kg $SO_2$ eq | 0.01 | 6.54E-06 | 0.05 | 0.06 |
| Formation potential of tropospheric ozone (POCP) | kg $O_3$ eq | 0.01 | 1.65E-04 | 1.54 | 1.55 |
| Abiotic depletion potential for non-fossil mineral resources (ADPelements)* | kg Sb eq | 3.28E-06 | 0 | 1.69E-11 | 3.28E-06 |
| Abiotic depletion potential for fossil resources (ADPfossil) | MJ | 8.04 | 0.01 | 65.5 | 73.6 |
| Renewable primary energy resources as energy (fuel), (RPRE[2]) * | MJ | 0.16 | 0 | 3.76E-03 | 0.16 |
| Renewable primary resources as material, (RPRM[3]) * | MJ | 0 | 0 | 0 | 0 |
| Non-renewable primary resources as energy (fuel), (NRPRE[3]) * | MJ | 8.38 | 0.01 | 87.0 | 95.4 |
| Non-renewable primary resources as material, (NRPRM[3]) * | MJ | 0 | 0 | 0 | 0 |
| Consumption of fresh water, (FW[3]) | $m^3$ | 5.75E-03 | 0 | 0.41 | 0.42 |
| Secondary Materials, (SM[3]) * | Kg | 0 | 0 | 0 | 0 |
| Renewable secondary fuels, (RSF[3]) * | MJ | 0 | 0 | 0 | 0 |
| Non-renewable secondary fuels (NRSF[3]) * | MJ | 0 | 0 | 0 | 0 |
| Recovered energy, (RE[3]) * | MJ | 0 | 0 | 0 | 0 |
| Hazardous waste disposed, (HW[3])* | Kg | 0 | 0 | 0 | 0 |
| Non-hazardous waste disposed, (NHWD[3])* | Kg | 0 | 0 | 8.57E-03 | 8.57E-03 |
| High-level radioactive waste, (HLRW[3])* | $m^3$ | 1.47E-10 | 0 | 1.11E-13 | 1.47E-10 |
| Intermediate and low-level radioactive waste, (ILLRW[3])* | $m^3$ | 8.22E-10 | 0 | 2.17E-12 | 8.24E-10 |
| Components for reuse, (CRU[3])* | kg | 0 | 0 | 0 | 0 |
| Materials for recycling, (MR[3])* | kg | 0 | 0 | 0.03 | 0.03 |
| Materials for energy recovery, (MER[3])* | kg | 0 | 0 | 9.71E-04 | 9.71E-04 |
| Recovered energy exported from the product system, (EE[3])* | MJ | 0 | 0 | 0 | 0 |
| Calcination | kg $CO_2$ eq | 0 | 0 | 0 | 0 |
| Biogenic CO2 emissions | kg $CO_2$ eq | 0 | 0 | 0 | 0 |

*Emerging LCA impact categories and inventory items are still under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting data in these categories. The following optional indicators are not reported and also have high levels of uncertainty: Land use related impacts, toxicological aspects, and emissions from land use change **Only EPDs prepared from cradle-to-grave life-cycle results and based on the same function, quantified by the same functional unit, and taking account of replacement based on the product reference service life (RSL) relative to an assumed building service life, can be used to assist purchasers and users in making informed comparisons between products.

[1]These products contain no materials that are considered hazardous as defined by the PCR

[2]Calculated per ACLCA ISO 21930 Guidance.

[3]GWP 100; 100-year time horizon GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5). CO2 from biogenic secondary fuels used in kiln are climate-neutral (CO2 sink = CO2 emissions), ISO 21930, 7.2.7.

Cradle to Gate (A1-A3) impact results per 1 tonne (metric ton, mtn) of the plant studied here are outlined in Table 2.

**Table 3: Cradle-to-Gate Impact Results for Dolcito Quarry Covered in Study**

| Impact category | Unit | A1 | A2 | A3 | A1 to A3 |
|---|---|---|---|---|---|
| Global warming potential (GWP) | kg $CO_2$ eq | 0.39 | 6.47E-04 | 6.73 | 7.12 |
| Depletion potential of the stratospheric ozone layer (ODP) | kg CFC-11 eq | 9.74E-08 | 2.71E-14 | 2.37E-08 | 1.21E-07 |
| Eutrophication potential (EP) | kg N eq | 3.61E-03 | 4.30E-07 | 3.21E-03 | 6.82E-03 |
| Acidification potential of soil and water sources (AP) | kg $SO_2$ eq | 0.01 | 7.21E-06 | 0.05 | 0.07 |
| Formation potential of tropospheric ozone (POCP) | kg $O_3$ eq | 0.01 | 1.82E-04 | 1.70 | 1.71 |
| Abiotic depletion potential for non-fossil mineral resources (ADPelements)* | kg Sb eq | 3.61E-06 | 0 | 1.86E-11 | 3.61E-06 |
| Abiotic depletion potential for fossil resources (ADPfossil) | MJ | 8.86 | 0.01 | 72.2 | 81.1 |
| Renewable primary energy resources as energy (fuel), (RPRE[4]) * | MJ | 0.17 | 0 | 4.15E-03 | 0.18 |
| Renewable primary resources as material, (RPRM[5]) * | MJ | 0 | 0 | 0 | 0 |
| Non-renewable primary resources as energy (fuel), (NRPRE[5]) * | MJ | 9.24 | 0.01 | 95.9 | 105.1 |
| Non-renewable primary resources as material, (NRPRM[5]) * | MJ | 0 | 0 | 0 | 0 |
| Consumption of fresh water, (FW[5]) | $m^3$ | 6.33E-03 | 0 | 0.46 | 0.46 |
| Secondary Materials, (SM[5]) * | Kg | 0 | 0 | 0 | 0 |
| Renewable secondary fuels, (RSF[5]) * | MJ | 0 | 0 | 0 | 0 |
| Non-renewable secondary fuels (NRSF[5]) * | MJ | 0 | 0 | 0 | 0 |
| Recovered energy, (RE[5]) * | MJ | 0 | 0 | 0 | 0 |
| Hazardous waste disposed, (HW[5])* | Kg | 0 | 0 | 0 | 0 |
| Non-hazardous waste disposed, (NHWD[35])* | Kg | 0 | 0 | 9.44E-03 | 9.44E-03 |
| High-level radioactive waste, (HLRW[5])* | $m^3$ | 1.62E-10 | 0 | 1.22E-13 | 1.62E-10 |
| Intermediate and low-level radioactive waste, (ILLRW[5]) * | $m^3$ | 9.06E-10 | 0 | 2.39E-12 | 9.08E-10 |
| Components for reuse, (CRU[5])* | kg | 0 | 0 | 0 | 0 |
| Materials for recycling, (MR[5])* | kg | 0 | 0 | 0.03 | 0.03 |
| Materials for energy recovery, (MER[5])* | kg | 0 | 0 | 1.07E-03 | 1.07E-03 |
| Recovered energy exported from the product system, (EE[5])* | MJ | 0 | 0 | 0 | 0 |
| Calcination | kg $CO_2$ eq | 0 | 0 | 0 | 0 |
| Biogenic CO2 emissions | kg $CO_2$ eq | 0 | 0 | 0 | 0 |

This EPD meets all comparability requirements stated in ISO 14025:2006. However, differences in certain assumptions, data quality, and variability between LCA data sets may still exist. As such, caution should be exercised when evaluating EPDs from different manufacturers or programs, as the EPD results may not be entirely comparable. Any EPD comparison must be carried out at the construction works level per ISO 21930:2017 guidelines. The results of this EPD reflect an average performance by the product and its actual impacts may vary on a case-to-case basis.

[4]Calculated per ACLCA ISO 21930 Guidance.

[5]GWP 100; 100-year time horizon GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5). CO2 from biogenic secondary fuels used in kiln are climate-neutral (CO2 sink = CO2 emissions), ISO 21930, 7.2.7.

# References

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