Environmental Product Declaration

BREG EN EPD No.: 000105 Issue: 01

This is to certify that this verified Environmental Product Declaration provided by:

Tarmac

Is in accordance with the requirements of:

EN 15804:2012+A1:2013

This declaration is for:

Generic Aggregate

Company Address

T3 Tarmac,
Ground Floor, T3 Trinity Park,
Bickenhill Lane,
Birmingham, B37 7ES

Signed for BRE Global Ltd	Laura Critien Operator	11 March 2016 Date of this Issue
11 March 2016 Date of First Issue		10 March 2021 Expiry Date

BRE Global Ltd., Garston, Watford WD25 9XX.
T: +44 (0)333 32188 11 F: +44 (0)1923 664603 E: Enquiries@breglobal.com

EPD verification and LCA details

Demonstration of Verification
CEN standard EN 15804 serves as the core PCR[a]
Independent verification of the declaration and data according to EN ISO 14025:2010 ☐ Internal ☑ External
Third party verifier[b]: **Kim Allbury**
a: Product category rules b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)

LCA Consultant	Verifier
Alex Hardwick thinkstep Electric Works, Sheffield Digital Campus Sheffield S1 2BJ thinkstep.com	Kim Allbury BRE Global Bucknalls Lane Watford WD25 9XX www.bre.co.uk

Commissioner of LCA study	
Andrew Swain Tarmac Bickenhill Lane Solihull, B37 7ES sustainability@tarmac.com	TARMAC A CRH COMPANY

General Information

Summary

This environmental product declaration is for 1 tonne of Generic Aggregate produced by Tarmac at the following manufacturing facilities:

All 132 UK Tarmac aggregate sites
Head Office: T3 Tarmac, Ground Floor,
T3 Trinity Park, Bickenhill Lane,
Birmingham, B37 7ES
UK

This is a Cradle to gate with options EPD. The life cycle stages included are as shown below (X = included, MND = module not declared):

Product			Construction		Use stage							End-of-life					Benefits and loads beyond the system boundary
					Related to the building fabric					Related to the building							
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4		D
Raw materials supply	Transport	Manufacturing	Transport to site	Construction - Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water use	Deconstruction	Transport	Waste processing	Disposal		Reuse, Recovery and/or Recycling potential
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X

Programme Operator

BRE Global, Watford, Herts, WD25 9XX, United Kingdom.
This declaration is based on the BRE Environmental Profiles 2013 Product Category Rules for Type III environmental product declaration of construction products to EN 15804:2012+A1:2013.

Comparability

Environmental declarations from different programmes may not be comparable if not compliant with EN 15804:2012+A1:2013. Comparability is further dependent on the product category rules used and the source of the data, e.g. the database. See EN 15804:2012+A1:2013 for further guidance.

Construction Product

Product Description

Aggregate is a natural resource extracted from the ground and can be crushed and screened to produce different sized aggregates. Aggregates can be used in readymix concrete, asphalt or as fill material for civil engineering and landscaping applications.

Technical Information

Property	Value	Unit
Aggregate properties vary by material type, grain size and regularity/shape	-	-

Product Contents

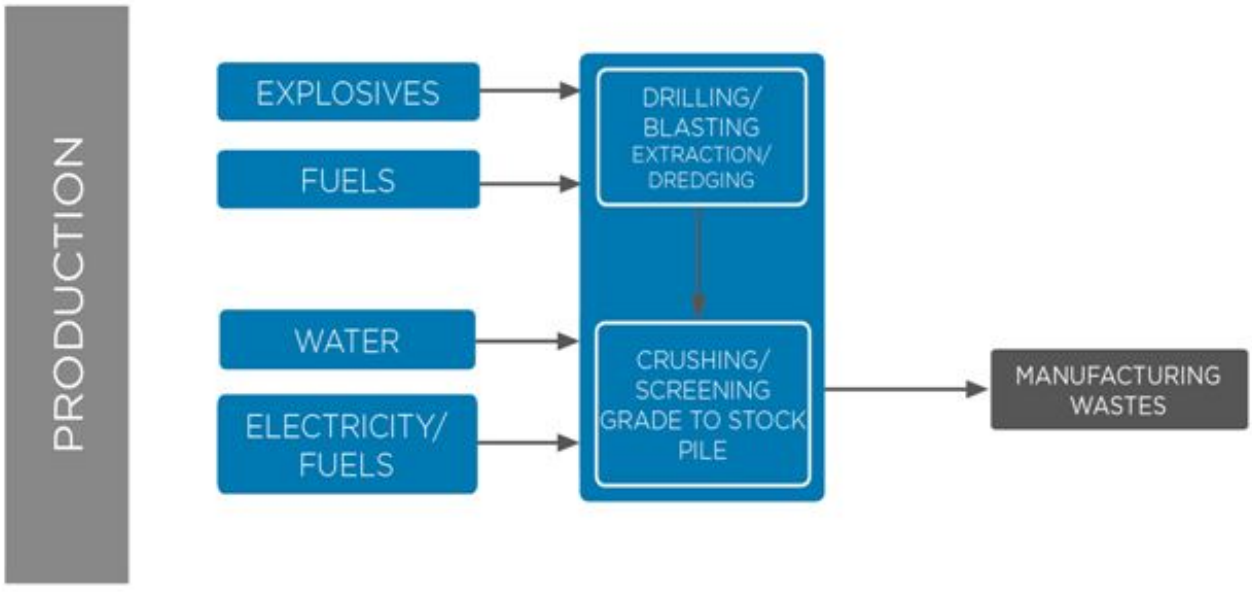
Material/Chemical Input	%
Crushed Rock	58.1%
Sand & Gravel	35.3%
Slag aggregate	6.6%

Manufacturing Process

Aggregates covered in this EPD are produced via three main routes: Aggregates from quarries that are extracted from the ground (with machinery and in some cases explosives), marine aggregates that are dredged from the seabed and recycled or slag aggregates that are produced by crushing slags produced by the steel industry. Electricity, fuels and water are used on site in order to produce aggregates.

Aggregate is transported either directly to the customer or may be transported to a Tarmac operated rail loading depot prior to distribution.

The process flow diagram is shown below:



Construction Installation

Aggregate is assumed to be transported to the customer by lorry. Aggregate is an intermediate product and the use of the aggregate itself is not expected to result in impacts during construction or installation.

Use Information

Given the nature of the product and its application, there are no anticipated impacts associated with the use phase of aggregate.

Reference Service Life

The reference service life will be equal to the lifetime of the individual structure in which the aggregate is used. For the purposes of this study a reference service life for a building of 60 years has been modelled.

End of Life

Demolition of the building containing aggregate has been modelled based on information related to the demolition of office building structural systems. Transport to recycling or landfill and waste processing are also included. Aggregate crushing/processing is based on an average crusher used for processing construction rubble. At end-of-life, 90% of aggregate is assumed to be recycled while the remainder is sent to landfill.

Life Cycle Assessment Calculation Rules

Declared / Functional unit

1 tonne (t) of aggregate.

System boundary

This is a cradle to gate with all options declared EPD covering all modules from A1 to C4 and includes module D. Impacts and aspects related to losses/wastage (i.e. production, transport and waste processing and end-of-life stage of lost waste products and materials) are considered in the modules in which the losses/wastage occur.

Data sources, quality and allocation

Data collected by Tarmac for 132 aggregate production sites for the 2014 calendar year has been used to generate a mass weighted average of aggregate production for this EPD. Data provided covers all aggregate products produced and sold by Tarmac at these sites in 2014. Allocation of materials, energy, water, emissions and waste has been done according to the provisions of the BRE PCR PN514 and EN 15804. All background LCI datasets used in the generation of this EPD are taken from the ecoinvent 3.1 database contained in the GaBi ts software tool.

Cut-off criteria

All raw materials and energy input to the manufacturing process have been included.

LCA Results

(INA = Indicator not assessed, AGG = Aggregated, NA = Not Applicable)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3
		Raw Material supply	Transport to factory	Manufacturing	Merged A1/A2/A3	Transport to site	Construction - installation	Use	Maintenance	Repair
Environmental impacts per declared/functional unit										
GWP	kg CO_2 eq.	AGG	AGG	AGG	6.71	3.78	0.00	0.00	0.00	0.00
ODP	kg CFC 11 eq.	AGG	AGG	AGG	8.24E-07	7.48E-07	0.00	0.00	0.00	0.00
AP	kg SO_2 eq.	AGG	AGG	AGG	0.0273	0.0114	0.00	0.00	0.00	0.00
EP	kg $(PO_4)^{3-}$ eq.	AGG	AGG	AGG	0.00813	0.00319	0.00	0.00	0.00	0.00
POCP	kg C_2H_4 eq.	AGG	AGG	AGG	0.00322	0.0024	0.00	0.00	0.00	0.00
ADPE	kg Sb eq.	AGG	AGG	AGG	7.18E-06	9.06E-06	0.00	0.00	0.00	0.00
ADPF	MJ eq.	AGG	AGG	AGG	77.2	61.6	0.00	0.00	0.00	0.00
GWP = Global Warming Potential (Climate Change); ODP = Ozone Depletion Potential; AP = Acidification Potential for Soil and Water; EP = Eutrophication Potential; POCP = Photochemical Ozone Creation; ADPE = Abiotic Depletion Potential – Elements; ADPF = Abiotic Depletion Potential – Fossil Fuels										
Resource use										
PERE	MJ	AGG	AGG	AGG	2.01	1.14	0.00	0.00	0.00	0.00
PERM	MJ	AGG	AGG	AGG	0.00	0.00	0.00	0.00	0.00	0.00
PERT	MJ	AGG	AGG	AGG	2.01	1.14	0.00	0.00	0.00	0.00
PENRE	MJ	AGG	AGG	AGG	83.5	62.8	0.00	0.00	0.00	0.00
PENRM	MJ	AGG	AGG	AGG	0.00	0.00	0.00	0.00	0.00	0.00
PENRT	MJ	AGG	AGG	AGG	83.5	62.8	0.00	0.00	0.00	0.00
SM	kg	AGG	AGG	AGG	0.00	0.00	0.00	0.00	0.00	0.00
RSF	MJ	AGG	AGG	AGG	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	AGG	AGG	AGG	0.00	0.00	0.00	0.00	0.00	0.00
FW	m^3	AGG	AGG	AGG	0.0817	0.0136	0.00	0.00	0.00	0.00
PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water										
Waste to disposal										
HWD	kg	AGG	AGG	AGG	0.000897	0.00	0.00	0.00	0.00	0.00
NHWD	kg	AGG	AGG	AGG	0.393	0.00	0.00	0.00	0.00	0.00
TRWD	kg	AGG	AGG	AGG	1.06E-05	0.000338	0.00	0.00	0.00	0.00
RWDHL	kg	AGG	AGG	AGG	2.03E-07	4.72E-08	0.00	0.00	0.00	0.00
HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; TRWD = Total Radioactive waste disposed; RWDHL = Radioactive waste disposed (high-level nuclear waste)										
Other output flows										
CRU	kg	AGG	AGG	AGG	0.00	0.00	0.00	0.00	0.00	0.00
MFR	kg	AGG	AGG	AGG	0.00	0.00	0.00	0.00	0.00	0.00
MER	kg	AGG	AGG	AGG	0.00	0.00	0.00	0.00	0.00	0.00
EE	MJ	AGG	AGG	AGG	0.00	0.00	0.00	0.00	0.00	0.00
CRU = Components for reuse; MFR = Materials for recycling; MER = Materials for energy recovery; EE = Export energy										

LCA Results (continued)

(INA = Indicator not assessed, AGG = Aggregated, NA = Not Applicable)

Indicator	Unit	B4	B5	B6	B7	C1	C2	C3	C4	D
		Replacement	Refurbishment	Operational energy use	Operational water use	Demolition	Transport	Waste Processing	Disposal	Reuse/ Recovery/ Recycling Potential
Environmental impacts per declared/functional unit										
GWP	kg CO_2 eq.	0.00	0.00	0.00	0.00	6.39	4.35	3.70	0.538	-3.99
ODP	kg CFC 11 eq.	0.00	0.00	0.00	0.00	1.15E-06	7.73E-07	6.67E-07	1.80E-07	-5.71E-07
AP	kg SO_2 eq.	0.00	0.00	0.00	0.00	0.0481	0.0114	0.028	0.00417	-0.0126
EP	kg $(PO_4)^{3-}$ eq.	0.00	0.00	0.00	0.00	0.0125	0.00333	0.00721	0.00109	-0.00282
POCP	kg C_2H_4 eq.	0.00	0.00	0.00	0.00	0.00732	0.002	0.00424	0.000638	-0.00109
ADPE	kg Sb eq.	0.00	0.00	0.00	0.00	2.34E-06	1.89E-05	1.35E-06	7.21E-07	-1.62E-06
ADPF	MJ eq.	0.00	0.00	0.00	0.00	91.8	64.1	53.2	15.2	-54.2
GWP = Global Warming Potential (Climate Change); ODP = Ozone Depletion Potential; AP = Acidification Potential for Soil and Water; EP = Eutrophication Potential; POCP = Photochemical Ozone Creation; ADPE = Abiotic Depletion Potential – Elements; ADPF = Abiotic Depletion Potential – Fossil Fuels										
Resource use										
PERE	MJ	0.00	0.00	0.00	0.00	0.565	1.05	0.327	0.491	-0.795
PERM	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERT	MJ	0.00	0.00	0.00	0.00	0.565	1.05	0.327	0.491	-0.795
PENRE	MJ	0.00	0.00	0.00	0.00	92.8	65.3	53.7	15.5	-58.4
PENRM	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PENRT	MJ	0.00	0.00	0.00	0.00	92.8	65.3	53.7	15.5	-58.4
SM	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	m^3	0.00	0.00	0.00	0.00	0.0139	0.0129	0.0081	0.017	-0.0237
PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water										
Waste to disposal										
HWD	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.08E-04
NHWD	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100	-0.015
TRWD	kg	0.00	0.00	0.00	0.00	0.000519	0.000348	0.0003	8.13E-05	-3.11E-04
RWDHL	kg	0.00	0.00	0.00	0.00	3.65E-08	4.39E-08	1.95E-08	8.30E-09	-1.34E-07
HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; TRWD = Total Radioactive waste disposed; RWDHL = Radioactive waste disposed (high-level nuclear waste)										
Other output flows										
CRU	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	kg	0.00	0.00	0.00	0.00	0.00	0.00	873	0.00	0.00
MER	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EE	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRU = Components for reuse; MFR = Materials for recycling; MER = Materials for energy recovery; EE = Export energy										

Scenarios and Additional Technical Information

Module A4 – Transport to the building site				
Vehicle Type	**Fuel Consumption (L/km)**	**Distance (km)**	**Capacity Utilisation (%)**	**Density Of Product (kg/m³)**
Lorry	0.462	47.0	100	1600

End-of-life modules – C1, C3, and C4			
Parameter	**Description**	**Unit**	**Value**
Waste for recycling		%	90
Waste for final disposal		%	10
Other assumptions for scenario development, e.g, transportation	Demolition energy	MJ/kg	0.068

Module C2 – Transport to waste processing				
Vehicle Type	**Fuel Consumption (L/km)**	**Distance (km)**	**Capacity Utilisation (%)**	**Density Of Product (kg/m³)**
Lorry	0.471	20	100	1600

Module D – Reuse/Recovery/Recycling Potential
Aggregate recovered through recycling can be used as secondary aggregate or fill material for a number of construction applications including road building or landscaping. It is assumed that secondary replaces virgin crushed rock aggregate.

Interpretation

The lifecycle of aggregate is not strongly dominated by any particular phase with production (A1-A3), distribution (A4), demolition (C1) and waste processing for recycled material (C3) all contributing at least 10% to GWP, ODP, POCP, ADP of fossil resources and primary energy demand (both non-renewable and renewable). The production of aggregate does not require large amounts of material inputs so the major source of impacts is the fuel and electricity used in the extraction, processing, distribution and end-of-life of the aggregate material. In A4, C1 and C2 these impacts come from the combustion of diesel fuel in vehicles and machinery. The largest sources of impacts from production (A1-A3) for categories that are sensitive to airborne emissions (GWP, ODP, AP, EP, POCP) are electricity production and gas oil production and combustion. The largest contribution to freshwater consumption comes from water used on site.

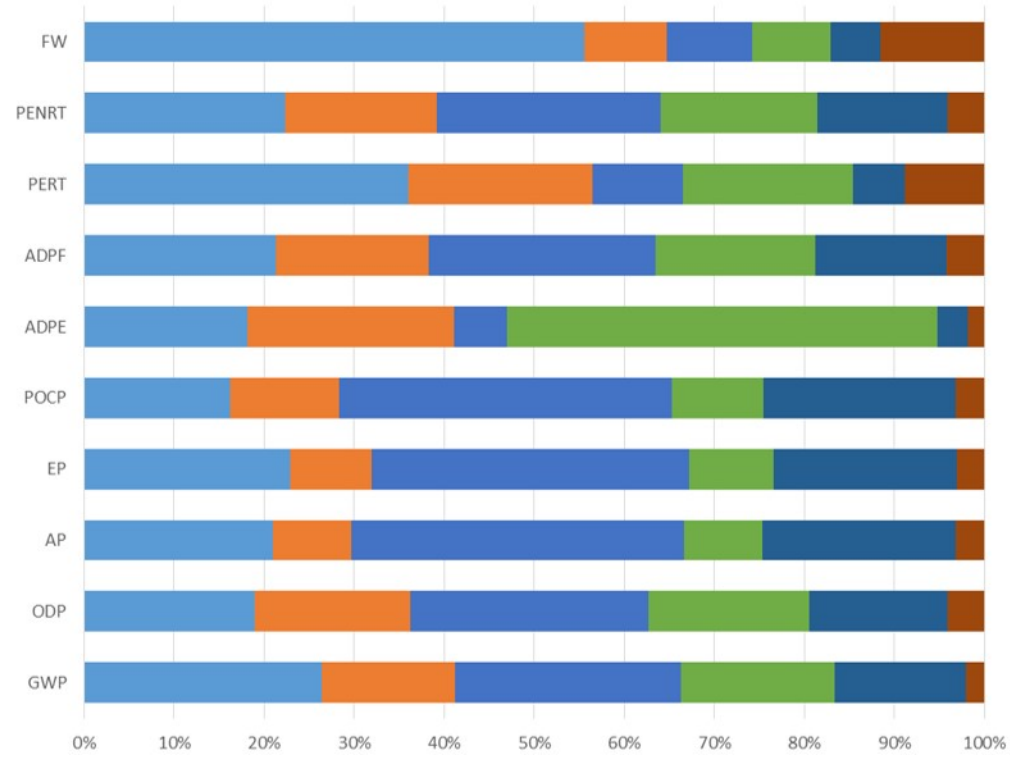


Figure 1

	GWP	ODP	AP	EP	POCP	ADPE	ADPF	PERT	PENRT	FW
A1-A3	26%	19%	21%	23%	16%	18%	21%	36%	22%	56%
A4	15%	17%	9%	9%	12%	23%	17%	20%	17%	9%
A5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
B1-B7	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
C1	25%	26%	37%	35%	37%	6%	25%	10%	25%	9%
C2	17%	18%	9%	9%	10%	48%	18%	19%	17%	9%
C3	15%	15%	21%	20%	21%	3%	15%	6%	14%	6%
C4	2%	4%	3%	3%	3%	2%	4%	9%	4%	12%

A1-A3 A4 A5 B1-B7 C1 C2 C3 C4

Figure 2

Sources of additional information

BRE Global. BRE Environmental Profiles 2013: Product Category Rules for Type III environmental product declaration of construction products to EN 15804:2012+A1:2013. PN 514. Watford, BRE, 2014.

BSI. Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products. BS EN 15804:2012+A1:2013. London, BSI, 2013.

BSI. Environmental labels and declarations – Type III Environmental declarations – Principles and procedures. BS EN ISO 14025:2010 (exactly identical to ISO 14025:2006). London, BSI, 2010.

BSI. Environmental management – Life cycle assessment – Principles and framework. BS EN ISO 14040:2006. London, BSI, 2006.

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ecoinvent (2013) Weidema, B.P.; Bauer, Ch.; Hischier, R.; Mutel, Ch.; Nemecek, T.; Reinhard, J.; Vadenbo, C.O.; Wernet, G, 2013, The ecoinvent database: Overview and methodology, Data quality guideline for the ecoinvent database version 3. www.ecoinvent.org. Zurich: Ecoinvent

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