

Statement of Verification

BREG EN EPD No.: 000639

Issue 01

This is to verify that the

Environmental Product Declaration

provided by:

Forterra Building Products

is in accordance with the requirements of:

EN 15804:2012+A2:2019

and

BRE Global Scheme Document SD207

This declaration is for:

1 tonne of Kirton brick

**BRE Global
Verified
EPD**

Company Address

Forterra Building Products
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Emma Baker

Signed for BRE Global Ltd

Emma Baker
Operator

22 October 2024
Date of this Issue

22 October 2024
Date of First Issue

21 October 2029
Expiry Date



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Environmental Product Declaration

EPD Number: 000639

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE 2023 Product Category Rules (PN 514 Rev 3.1) for Type III environmental product declaration of construction products to EN 15804:2012+A2:2019
Commissioner of LCA study	LCA consultant/Tool
Forterra Building Products Northampton 5 Grange Park Court, Roman Way Northamptonshire NN4 5EA United Kingdom	LCA Tool: BRE LINA A2 LCA Consultant: Joseph Gosling
Declared/Functional Unit	Applicability/Coverage
1 tonne of Kirton brick	Product specific
EPD Type	Background database
Cradle to Grave	Ecoinvent v3.8
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	
(Where appropriate ^b) Third party verifier: Bala Subramanian	
a: Product category rules b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)	
Comparability	
Environmental product declarations from different programmes may not be comparable if not compliant with EN 15804:2012+A2:2019. Comparability is further dependent on the specific product category rules, system boundaries and allocations, and background data sources. See Clause 5.3 of EN 15804:2012+A2:2019 for further guidance	

Information modules covered

Product			Construction		Use stage								End-of-life				Benefits and loads beyond the system boundary
A1	A2	A3	A4	A5	Related to the building fabric					Related to the building			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 demolition	Transport	Waste processing	Disposal		Reuse, Recovery and/or Recycling potential
☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒

Note: Ticks indicate the Information Modules declared.

Manufacturing site(s)

Forterra
Station Road
Kirton
Newark
NG22 9LG

Construction Product:

Product Description

Bricks have a wide range of applications across the construction industry. Most bricks are used in cavity walls in building projects. Bricks generally form the outside face of the wall. Protected by the outer brick there is an insulation filled cavity (either full-filled or part-filled), an internal skin of thermal blockwork, a timber or steel framed structure, finished with either dry lined or a wet plastered finish which completes a typical wall. Bricks are also used fair faced internally replacing the internal blockwork and plasterwork, and for both free standing walls and civil engineering structures. Kirton Bricks are available in five different types: Kirton A, Kirton B, Kirton C, Kirton D, and Kirton F. In this EPD, the LCA results for each individual product are included, as they have similar mix designs and follow the same manufacturing process

Technical Information Kirton

Property	Kirton A	Kirton B	Kirton C	Kirton D	Kirton F
Tolerance category	T2	T2	T2	T2	T2
Range category	R1	R1	R1	R1	R1
Compressive strength	30 N/mm ²	30 N/mm ²	30 N/mm ²	20 N/mm ²	20N/mm ²
Water absorption	15%	15%	17%	19%	26%
Durability against freeze-thaw	F2	F2	F2	F2	F2
Active soluble salt content	S2	S2	S2	S2	S2
Reaction to Fire	Class A1	Class A1	Class A1	Class A1	Class A1
Bond strength	0.15 N/mm ²	0.15 N/mm ²	0.15 N/mm ²	0.15 N/mm ²	0.15 N/mm ²
Water vapour diffusion coefficient	50/100	50/100	50/100	50/100	50/100



Main Product Contents

Materia Input	%
Clay	98
Colourant	1
Additives	<1
Barium	<1

Material/Chemical Input Kirton B	%
Clay	98
Colourant	1
Additives	<1
Barium	<1

Material/Chemical Input Kirton C	%
Clay	98
Colourant	1
Additives	<1
Barium	<1

Material/Chemical Input Kirton D	%
Clay	98
Colourant	1
Additives	<1
Barium	<1

Material/Chemical Input Kirton F	%
Clay	99
Colourant	1
Additives	<1

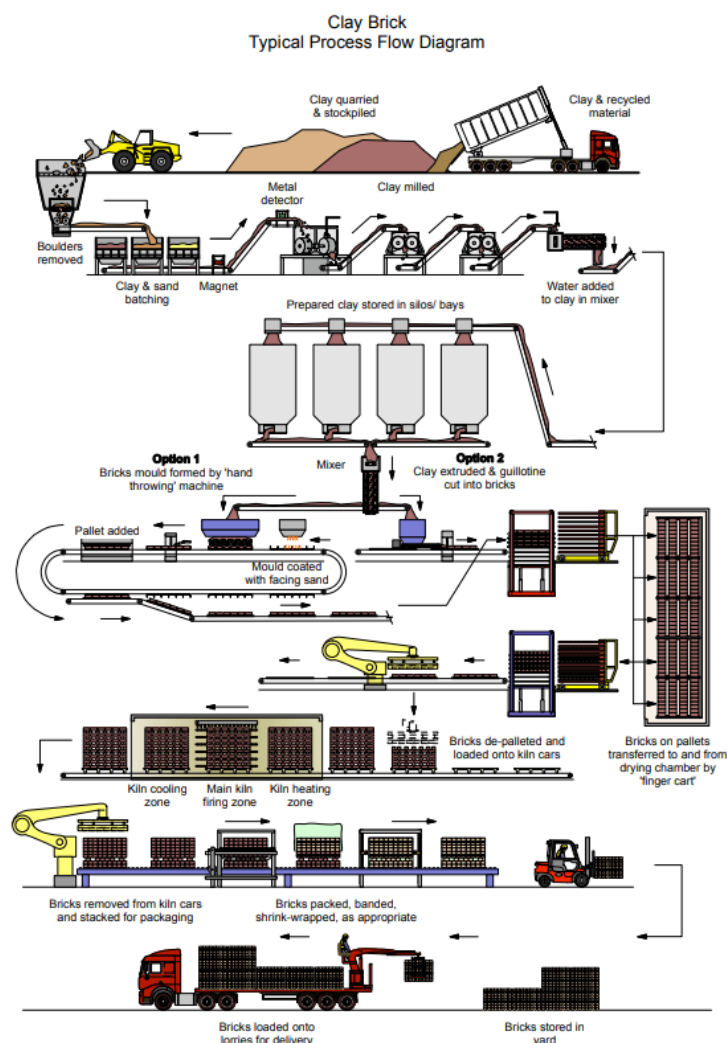
Manufacturing Process

For all brick types, the clay is dug from the ground in the adjacent quarry next to the factory. It is then stockpiled ready to enter to manufacturing process. The clay is transported to the factory where it undergoes a series of milling to reduce the clay particle size. Water is then added where the mixture is then extruded and cut into bricks. These 'green' bricks are then placed onto carts to be dried. Once the bricks have the correct moisture content, they are transferred onto kiln cars and fired through the kiln where they then cool. Bricks are then stacked ready to be packaged and loaded onto lorries for delivery or stored in the yard.

Mass loss explanation

In the manufacturing of bricks, mass loss occurs through two processes. First is the water in the clay which evaporates during firing. Likewise, during firing, at the point of vitrification chemical changes occur in the clay which reduces the mass. Different types of clay behave differently and have varying rates of loss.

Process flow diagram



Construction Installation

Bricks are generally laid by hand, on-site, with a cementitious or lime-based mortar to bond the individual units together.

Use Information

Given the nature of the product and its application in the structure of the building, no impacts are associated with use stage of bricks over the lifetime of the building.

End of Life

Under the BRE PCR the following End of Life scenario is applied:

- 95% is crushed for aggregate scrap recycling.
- 5% is landfilled.

The module D, which presents the results of the environmental benefits or loads beyond the system boundary have been calculated according to the end-of-life scenario.

Life Cycle Assessment Calculation Rules

Declared / Functional unit description

1 tonne of Kirton brick

System boundary

This Cradle to Grave EPD has been assessed in accordance with the modular approach as defined in EN15804:2012+A2:2019 and includes the processes covered in the manufacturing site and product stage A1 to A3, A4, A5, B, C and D. This Life Cycle Assessment has been performed in accordance with BRE PCR Type III EPD of Construction Products to EN 15804+A2 (PN 514 Revision 3.1).

Data sources, quality and allocation

Specific primary data derived from Forterra Building Products' production process in Kirton Works, Station Road, Kirton, NG22 9LG, have been modelled using the LINA LCA A2 software A2 and the ecoinvent 3.8 database. In accordance with the requirements of EN 15804:2012+A2:2019, the most current available data has been used. The manufacturer-specific data from Forterra Building Products covers a period of one year (01/01/2022 – 31/12/2022). Secondary data has been obtained for all other upstream and downstream processes that are beyond the control of the manufacturer (i.e. raw material production) from the ecoinvent 3.8 database. No proxy dataset used in the LCA analysis. All ecoinvent datasets are complete within the context used and conform to the system boundary and the criteria for the exclusion of inputs and outputs, according to the requirements specified in EN 15804:2012+A2:2019.

The LCA analysis was conducted for each individual product in the Kirton series using their specific production information. The LCA results for each individual product are enclosed in this EPD. Forterra manufactures other products in addition to Kirton series (Forterra Kirton), therefore an allocation of fuel, water, material usage, and waste emissions are required. The allocation has been made based on the total production output of Forterra Kirton factory and weighted accordingly by mass. All the input and output materials such as, transportation, energy, water use and wastes are included according to the provisions of the BRE PCR PN514 and EN 15804:2012+A2:2019. Only exceptions are emissions to water & soil. Water evaporated to air during the drying process is accounted in emission to air section. Site wide values for energy, water and wastewater have been taken from bills. Figures for the raw materials, ancillary materials and packaging were from actual usages.

Quality Level	Geographical representativeness	Technical representativeness	Time representativeness
Very Good	Data from area under study.	Data from processes and products under study. Same state of technology applied as defined in goal and scope (i.e. identical technology).	There is less than 5 years between the ecoinvent LCI reference year, and the time period for which the LCA was undertaken.

Specific UK datasets have been selected from the ecoinvent LCI for this LCA. The quality level of geographical and technical representativeness is therefore very good. The quality level of time representativeness is good as the background LCI datasets are based on ecoinvent v3.8 which was compiled in 2021. Therefore, there is less than 5 years between the ecoinvent LCI reference year and the time period for which the LCA was undertaken.

Across all brick types, the mass loss is over 5%. This is because of two reasons. First is the chemical change at the point of vitrification from the firing process. Second is the moisture loss from the bricks themselves. UK Consumption mix was used for electricity with an emissions factor of 0.239kgCO₂e/kWh for electricity, and a factor of 0.232kgCO₂e/kWh for UK natural gas (at industrial furnace). The Brick Development Association highlight that the process water that enters the manufacturing process leaves as evaporation during the drying and firing processes.

Cut-off criteria

All processes associated with the manufacturing process have been included except pre-processing impacts in Module C3 as the data is not currently available. All inputs or outputs have been included and all raw materials, transport, energy, water use and wastes, are included, except for direct emissions to water and soil, which are not measured. Upstream extraction and/or processing of inputs are included within the use of the background datasets within LINA.

LCA Results Kirton A

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts

			GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater
			kg CO ₂ eq	kg CO ₂ eq	kg CO ₂ eq	kg CO ₂ eq	kg CFC11 eq	mol H ⁺ eq	kg (PO ₄) ³⁻ eq
Product stage	Raw material supply	A1	1.87E+01	1.87E+01	1.83E-03	1.85E-02	9.57E-06	1.88E-01	5.74E-03
	Transport	A2	1.77E+00	1.76E+00	1.61E-03	6.62E-04	4.15E-07	7.26E-03	1.12E-04
	Manufacturing	A3	2.03E+02	2.03E+02	7.43E-02	1.72E-02	1.27E-05	1.32E-01	3.01E-03
	Total	A1-3	2.24E+02	2.23E+02	7.77E-02	3.64E-02	2.27E-05	3.27E-01	8.87E-03
Construction process stage	Transport	A4	9.09E+00	9.07E+00	8.82E-03	3.26E-03	2.17E-06	3.79E-02	5.65E-04
	Construction	A5	1.50E+01	1.50E+01	4.82E-03	2.20E-03	1.37E-06	2.03E-02	5.37E-04
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.36E+00	1.36E+00	1.32E-03	4.89E-04	3.25E-07	5.68E-03	8.48E-05
	Waste processing	C3	3.14E+00	3.14E+00	1.11E-03	3.13E-04	6.70E-07	3.26E-02	9.71E-05
	Disposal	C4	5.31E-01	5.26E-01	4.05E-03	5.33E-04	1.60E-07	4.44E-03	1.53E-04
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-8.00E+00	-7.88E+00	-1.02E-01	-1.11E-02	-6.36E-07	-5.07E-02	-4.29E-03

GWP-total = Global warming potential, total;
 GWP-fossil = Global warming potential, fossil;
 GWP-biogenic = Global warming potential, biogenic;
 GWP-luluc = Global warming potential, land use and land use change;

ODP = Depletion potential of the stratospheric ozone layer;
 AP = Acidification potential, accumulated exceedance; and
 EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

LCA Results (continued) Kirton A

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts			EP-marine	EP-terrestrial	POCP	ADP-mineral & metals	ADP-fossil	WDP	PM
			kg N eq	mol N eq	kg NMVOC eq	kg Sb eq	MJ, net calorific value	m ³ world eq deprived	disease incidence
Product stage	Raw material supply	A1	3.60E-02	4.27E-01	1.30E-01	6.35E-04	6.68E+02	1.11E+01	2.35E-06
	Transport	A2	2.20E-03	2.41E-02	7.57E-03	5.03E-06	2.71E+01	1.27E-01	1.81E-07
	Manufacturing	A3	5.17E-02	5.62E-01	1.57E-01	9.64E-05	2.58E+03	6.67E+00	1.67E-06
	Total (Residual+GO)	A1-3	8.98E-02	1.01E+00	2.95E-01	7.36E-04	3.27E+03	1.79E+01	4.20E-06
Construction process stage	Transport	A4	1.16E-02	1.26E-01	4.06E-02	2.08E-05	1.41E+02	6.83E-01	1.07E-06
	Construction	A5	5.70E-03	6.37E-02	1.85E-02	4.43E-05	1.97E+02	1.17E+00	2.59E-07
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.73E-03	1.89E-02	6.10E-03	3.12E-06	2.12E+01	1.02E-01	1.60E-07
	Waste processing	C3	1.44E-02	1.58E-01	4.35E-02	1.61E-06	4.30E+01	9.94E-02	7.94E-06
	Disposal	C4	1.53E-03	1.67E-02	4.82E-03	1.72E-06	1.24E+01	5.57E-01	8.91E-08
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.17E-02	-1.41E-01	-3.63E-02	-7.45E-05	-1.16E+02	-1.52E+01	-6.41E-07

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
 EP-terrestrial = Eutrophication potential, accumulated exceedance;
 POCP = Formation potential of tropospheric ozone;
 ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;

ADP-fossil = Depletion potential of the stratospheric ozone layer;
 WDP = Water (user) deprivation potential, deprivation-weighted water consumption; and
 PM = Particulate matter.

LCA Results (continued) Kirton A

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U ²³⁵ eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	3.00E+00	6.33E+03	4.97E-08	5.86E-06	1.74E+02
	Transport	A2	1.38E-01	2.11E+01	6.32E-10	2.27E-08	2.52E+01
	Manufacturing	A3	1.40E+01	3.01E+02	1.63E-08	2.09E-07	1.72E+02
	Total	A1-3	1.72E+01	6.65E+03	6.66E-08	6.10E-06	3.72E+02
Construction process stage	Transport	A4	7.16E-01	1.10E+02	3.06E-09	1.21E-07	1.62E+02
	Construction	A5	1.03E+00	4.03E+02	4.14E-09	3.71E-07	2.25E+01
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.07E-01	1.66E+01	4.58E-10	1.81E-08	2.43E+01
	Waste processing	C3	1.94E-01	2.52E+01	9.74E-10	1.83E-08	5.48E+00
	Disposal	C4	5.83E-02	8.81E+00	3.79E-10	5.91E-09	2.96E+01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.80E+00	-1.34E+02	-7.81E-09	-1.41E-07	-1.07E+02

IRP = Potential human exposure efficiency relative to U235;
ETP-fw = Potential comparative toxic unit for ecosystems;
HTP-c = Potential comparative toxic unit for humans;

HTP-nc = Potential comparative toxic unit for humans; and
SQP = Potential soil quality index.

LCA Results (continued) Kirton A

Parameters describing resource use, primary energy								
			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	1.22E+01	0.00E+00	1.22E+01	1.84E+02	4.73E+02	6.57E+02
	Transport	A2	3.62E-01	0.00E+00	3.62E-01	2.66E+01	0.00E+00	2.66E+01
	Manufacturing	A3	6.57E+01	1.72E+01	8.29E+01	2.80E+03	2.62E+01	2.82E+03
	Total	A1-3	7.83E+01	1.72E+01	9.54E+01	3.01E+03	4.99E+02	3.51E+03
Construction process stage	Transport	A4	1.80E+00	0.00E+00	1.80E+00	1.39E+02	0.00E+00	1.39E+02
	Construction	A5	-1.19E+01	1.76E+01	5.76E+00	1.61E+02	5.04E+01	2.12E+02
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.70E-01	0.00E+00	2.70E-01	2.08E+01	0.00E+00	2.08E+01
	Waste processing	C3	2.41E-01	0.00E+00	2.41E-01	4.22E+01	0.00E+00	4.22E+01
	Disposal	C4	2.11E-01	0.00E+00	2.11E-01	1.22E+01	0.00E+00	1.22E+01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.18E+01	0.00E+00	-2.18E+01	-2.33E+02	0.00E+00	-2.33E+02

PERE = Use of renewable primary energy excluding renewable primary energy 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 resource

LCA Results (continued) Kirton A

Parameters describing resource use, secondary materials and fuels, use of water						
			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m ³
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	2.63E-01
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	3.13E-03
	Manufacturing	A3	1.34E-01	3.25E-04	0.00E+00	2.16E-01
	Total	A1-3	1.34E-01	3.25E-04	0.00E+00	4.82E-01
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	1.68E-02
	Construction	A5	8.32E-03	1.95E-05	0.00E+00	3.13E-02
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	2.45E-03
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	1.31E-02
	Disposal	C4	-2.49E-01	0.00E+00	0.00E+00	-3.58E-01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.49E-01	0.00E+00	0.00E+00	-3.58E-01

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;

NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

LCA Results (continued) Kirton A

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	1.94E+00	2.39E+01	4.06E-03
	Transport	A2	2.92E-02	5.12E-01	9.68E+01
	Manufacturing	A3	8.61E-01	1.33E+01	9.29E-03
	Total	A1-3	2.83E+00	3.77E+01	9.68E+01
Construction process stage	Transport	A4	1.49E-01	2.59E+00	9.48E+02
	Construction	A5	1.97E-01	3.03E+00	5.81E+00
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.24E-02	3.89E-01	1.42E+02
	Waste processing	C3	5.64E-02	3.97E-01	2.97E-04
	Disposal	C4	2.40E-02	5.05E+01	7.40E-05
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.34E+00	-4.07E+01	-1.19E-03

HWD = Hazardous waste disposed;
 NHWD = Non-hazardous waste disposed;
 RWD = Radioactive waste disposed

LCA Results (continued) Kirton A

Other environmental information describing output flows – at end of life								
			CRU	MFR	MER	EE	Biogenic carbon (product)	Biogenic carbon (packaging)
			kg	kg	kg	MJ per energy carrier	kg C	kg C
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	3.06E-02	7.48E-06	7.03E-02	2.29E-02	5.08E-01
	Total	A1-3	0.00E+00	3.06E-02	7.48E-06	7.03E-02	2.29E-02	5.08E-01
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Construction	A5	0.00E+00	2.30E+00	6.64E-01	4.22E-03	5.29E-01	3.05E-02
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	9.50+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

LCA Results Kirton B

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts			GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater
			kg CO ₂ eq	kg CO ₂ eq	kg CO ₂ eq	kg CO ₂ eq	kg CFC11 eq	mol H ⁺ eq	kg (PO ₄) ³⁻ eq
Product stage	Raw material supply	A1	1.86E+01	1.86E+01	1.82E-03	1.84E-02	9.51E-06	1.87E-01	5.70E-03
	Transport	A2	1.75E+00	1.75E+00	1.60E-03	6.57E-04	4.12E-07	7.21E-03	1.11E-04
	Manufacturing	A3	2.00E+02	2.00E+02	7.31E-02	1.69E-02	1.25E-05	1.30E-01	2.97E-03
	Total (Residual+GO)	A1-3	2.20E+02	2.20E+02	7.65E-02	3.60E-02	2.24E-05	3.24E-01	8.78E-03
Construction process stage	Transport	A4	9.09E+00	9.07E+00	8.82E-03	3.26E-03	2.17E-06	3.79E-02	5.65E-04
	Construction	A5	1.48E+01	1.48E+01	4.75E-03	2.18E-03	1.36E-06	2.01E-02	5.32E-04
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.36E+00	1.36E+00	1.32E-03	4.89E-04	3.25E-07	5.68E-03	8.48E-05
	Waste processing	C3	3.14E+00	3.14E+00	1.11E-03	3.13E-04	6.70E-07	3.26E-02	9.71E-05
	Disposal	C4	5.31E-01	5.26E-01	4.05E-03	5.33E-04	1.60E-07	4.44E-03	1.53E-04
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-8.00E+00	-7.88E+00	-1.02E-01	-1.11E-02	-6.36E-07	-5.07E-02	-4.29E-03

GWP-total = Global warming potential, total;
 GWP-fossil = Global warming potential, fossil;
 GWP-biogenic = Global warming potential, biogenic;
 GWP-luluc = Global warming potential, land use and land use change;

ODP = Depletion potential of the stratospheric ozone layer;
 AP = Acidification potential, accumulated exceedance; and
 EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

LCA Results (continued) Kirton B

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts			EP-marine	EP-terrestrial	POCP	ADP-mineral & metals	ADP-fossil	WDP	PM
			kg N eq	mol N eq	kg NMVOC eq	kg Sb eq	MJ, net calorific value	m ³ world eq deprived	disease incidence
Product stage	Raw material supply	A1	3.57E-02	4.24E-01	1.30E-01	6.31E-04	6.64E+02	1.10E+01	2.33E-06
	Transport	A2	2.19E-03	2.39E-02	7.52E-03	5.00E-06	2.69E+01	1.26E-01	1.80E-07
	Manufacturing	A3	5.09E-02	5.53E-01	1.55E-01	9.49E-05	2.54E+03	6.57E+00	1.64E-06
	Total	A1-3	8.88E-02	1.00E+00	2.92E-01	7.30E-04	3.23E+03	1.77E+01	4.15E-06
Construction process stage	Transport	A4	1.16E-02	1.26E-01	4.06E-02	2.08E-05	1.41E+02	6.83E-01	1.07E-06
	Construction	A5	5.63E-03	6.30E-02	1.83E-02	4.40E-05	1.95E+02	1.16E+00	2.57E-07
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.73E-03	1.89E-02	6.10E-03	3.12E-06	2.12E+01	1.02E-01	1.60E-07
	Waste processing	C3	1.44E-02	1.58E-01	4.35E-02	1.61E-06	4.30E+01	9.94E-02	7.94E-06
	Disposal	C4	1.53E-03	1.67E-02	4.82E-03	1.72E-06	1.24E+01	5.57E-01	8.91E-08
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.17E-02	-1.41E-01	-3.63E-02	-7.45E-05	-1.16E+02	-1.52E+01	-6.41E-07

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
 EP-terrestrial = Eutrophication potential, accumulated exceedance;
 POCP = Formation potential of tropospheric ozone;
 ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;

ADP-fossil = Depletion potential of the stratospheric ozone layer;
 WDP = Water (user) deprivation potential, deprivation-weighted water consumption; and
 PM = Particulate matter.

LCA Results (continued) Kirton B

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U ²³⁵ eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	2.98E+00	6.29E+03	4.94E-08	5.82E-06	1.73E+02
	Transport	A2	1.37E-01	2.10E+01	6.27E-10	2.25E-08	2.50E+01
	Manufacturing	A3	1.38E+01	2.65E+02	1.58E-08	1.99E-07	1.70E+02
	Total	A1-3	1.69E+01	6.57E+03	6.58E-08	6.05E-06	3.68E+02
Construction process stage	Transport	A4	7.16E-01	1.10E+02	3.06E-09	1.21E-07	1.62E+02
	Construction	A5	1.02E+00	3.98E+02	4.10E-09	3.68E-07	2.23E+01
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.07E-01	1.66E+01	4.58E-10	1.81E-08	2.43E+01
	Waste processing	C3	1.94E-01	2.52E+01	9.74E-10	1.83E-08	5.48E+00
	Disposal	C4	5.83E-02	8.81E+00	3.79E-10	5.91E-09	2.96E+01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.80E+00	-1.34E+02	-7.81E-09	-1.41E-07	-1.07E+02

IRP = Potential human exposure efficiency relative to U235;
ETP-fw = Potential comparative toxic unit for ecosystems;
HTP-c = Potential comparative toxic unit for humans;

HTP-nc = Potential comparative toxic unit for humans; and
SQP = Potential soil quality index.

LCA Results (continued) Kirton B

Parameters describing resource use, primary energy								
			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	1.21E+01	0.00E+00	1.21E+01	1.82E+02	4.70E+02	6.52E+02
	Transport	A2	3.59E-01	0.00E+00	3.59E-01	2.64E+01	0.00E+00	2.64E+01
	Manufacturing	A3	6.47E+01	1.69E+01	8.16E+01	2.76E+03	2.58E+01	2.78E+03
	Total	A1-3	7.72E+01	1.69E+01	9.41E+01	2.96E+03	4.95E+02	3.46E+03
Construction process stage	Transport	A4	1.80E+00	0.00E+00	1.80E+00	1.39E+02	0.00E+00	1.39E+02
	Construction	A5	-1.19E+01	1.76E+01	5.68E+00	1.58E+02	5.02E+01	2.09E+02
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.70E-01	0.00E+00	2.70E-01	2.08E+01	0.00E+00	2.08E+01
	Waste processing	C3	2.41E-01	0.00E+00	2.41E-01	4.22E+01	0.00E+00	4.22E+01
	Disposal	C4	2.11E-01	0.00E+00	2.11E-01	1.22E+01	0.00E+00	1.22E+01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.18E+01	0.00E+00	-2.18E+01	-2.33E+02	0.00E+00	-2.33E+02

PERE = Use of renewable primary energy excluding renewable primary energy 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 resource

LCA Results (continued) Kirton B

Parameters describing resource use, secondary materials and fuels, use of water						
			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m ³
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	2.61E-01
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	3.11E-03
	Manufacturing	A3	1.32E-01	3.20E-04	0.00E+00	2.13E-01
	Total	A1-3	1.32E-01	3.20E-04	0.00E+00	4.77E-01
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	1.68E-02
	Construction	A5	8.19E-03	1.92E-05	0.00E+00	3.10E-02
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	2.52E-03
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	2.45E-03
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	1.31E-02
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.49E-01	0.00E+00	0.00E+00	-3.58E-01

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;

NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

LCA Results (continued) Kirton B

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	1.93E+00	2.38E+01	4.03E-03
	Transport	A2	2.90E-02	5.09E-01	9.61E+01
	Manufacturing	A3	8.47E-01	1.31E+01	9.15E-03
	Total	A1-3	2.80E+00	3.73E+01	9.61E+01
Construction process stage	Transport	A4	1.49E-01	2.59E+00	9.48E+02
	Construction	A5	1.96E-01	3.00E+00	5.77E+00
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.24E-02	3.89E-01	1.42E+02
	Waste processing	C3	5.64E-02	3.97E-01	2.97E-04
	Disposal	C4	2.40E-02	5.05E+01	7.40E-05
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.34E+00	-4.07E+01	-1.19E-03

HWD = Hazardous waste disposed;
 NHWD = Non-hazardous waste disposed;
 RWD = Radioactive waste disposed

LCA Results (continued) Kirton B

Other environmental information describing output flows – at end of life								
			CRU	MFR	MER	EE	Biogenic carbon (product)	Biogenic carbon (packaging)
			kg	kg	kg	MJ per energy carrier	kg C	kg C
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	3.64E-02	7.37E-06	6.92E-02	2.25E-02	5.00E-01
	Total	A1-3	0.00E+00	3.64E-02	7.37E-06	6.92E-02	2.25E-02	5.00E-01
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Construction	A5	0.00E+00	2.30E+00	6.64E-01	4.15E-03	5.29E-01	3.00E-02
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	9.50+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

LCA Results Kirton C

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts

			GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater
			kg CO ₂ eq	kg CO ₂ eq	kg CO ₂ eq	kg CO ₂ eq	kg CFC11 eq	mol H ⁺ eq	kg (PO ₄) ³⁻ eq
Product stage	Raw material supply	A1	1.40E+01	1.40E+01	-7.55E-03	1.74E-02	1.49E-06	1.30E-01	5.48E-03
	Transport	A2	1.05E+00	1.05E+00	1.00E-03	3.81E-04	2.49E-07	4.35E-03	6.55E-05
	Manufacturing	A3	1.91E+02	1.91E+02	7.40E-02	1.71E-02	1.26E-05	1.31E-01	3.00E-03
	Total	A1-3	2.06E+02	2.06E+02	6.74E-02	3.49E-02	1.44E-05	2.66E-01	8.55E-03
Construction process stage	Transport	A4	9.09E+00	9.07E+00	8.82E-03	3.26E-03	2.17E-06	3.79E-02	5.65E-04
	Construction	A5	1.40E+01	1.40E+01	4.21E-03	2.11E-03	8.74E-07	1.65E-02	5.19E-04
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.36E+00	1.36E+00	1.32E-03	4.89E-04	3.25E-07	5.68E-03	8.48E-05
	Waste processing	C3	3.14E+00	3.14E+00	1.11E-03	3.13E-04	6.70E-07	3.26E-02	9.71E-05
	Disposal	C4	5.31E-01	5.26E-01	4.05E-03	5.33E-04	1.60E-07	4.44E-03	1.53E-04
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	8.00E+00	7.88E+00	-1.02E-01	-1.11E-02	-6.36E-07	-5.07E-02	-4.29E-03

GWP-total = Global warming potential, total;
 GWP-fossil = Global warming potential, fossil;
 GWP-biogenic = Global warming potential, biogenic;
 GWP-luluc = Global warming potential, land use and land use change;

ODP = Depletion potential of the stratospheric ozone layer;
 AP = Acidification potential, accumulated exceedance; and
 EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

LCA Results (continued) Kirton C

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts			EP-marine	EP-terrestrial	POCP	ADP-mineral & metals	ADP-fossil	WDP	PM
			kg N eq	mol N eq	kg NMVOC eq	kg Sb eq	MJ, net calorific value	m ³ world eq deprived	disease incidence
Product stage	Raw material supply	A1	2.93E-02	3.55E-01	9.98E-02	6.32E-04	1.83E+02	1.09E+01	1.96E-06
	Transport	A2	1.33E-03	1.45E-02	4.64E-03	2.56E-06	1.63E+01	7.78E-02	1.19E-07
	Manufacturing	A3	5.15E-02	5.60E-01	1.56E-01	9.60E-05	2.57E+03	6.65E+00	1.66E-06
	Total	A1-3	8.21E-02	9.29E-01	2.61E-01	7.30E-04	2.77E+03	1.77E+01	3.74E-06
Construction process stage	Transport	A4	1.16E-02	1.26E-01	4.06E-02	2.08E-05	1.41E+02	6.83E-01	1.07E-06
	Construction	A5	5.23E-03	5.86E-02	1.65E-02	4.40E-05	1.67E+02	1.16E+00	2.32E-07
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.73E-03	1.89E-02	6.10E-03	3.12E-06	2.12E+01	1.02E-01	1.60E-07
	Waste processing	C3	1.44E-02	1.58E-01	4.35E-02	1.61E-06	4.30E+01	9.94E-02	7.94E-06
	Disposal	C4	1.53E-03	1.67E-02	4.82E-03	1.72E-06	1.24E+01	5.57E-01	8.91E-08
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.17E-02	-1.41E-01	-3.63E-02	-7.45E-05	-1.16E+02	-1.52E+01	-6.41E-07

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
 EP-terrestrial = Eutrophication potential, accumulated exceedance;
 POCP = Formation potential of tropospheric ozone;
 ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;

ADP-fossil = Depletion potential of the stratospheric ozone layer;
 WDP = Water (user) deprivation potential, deprivation-weighted water consumption; and
 PM = Particulate matter.

LCA Results (continued) Kirton C

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U ²³⁵ eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	8.59E-01	6.11E+03	4.81E-08	5.83E-06	1.17E+02
	Transport	A2	8.24E-02	1.27E+01	3.59E-10	1.38E-08	1.76E+01
	Manufacturing	A3	1.40E+01	2.68E+02	1.60E-08	2.02E-07	1.72E+02
	Total	A1-3	1.49E+01	6.39E+03	6.45E-08	6.05E-06	3.07E+02
Construction process stage	Transport	A4	7.16E-01	1.10E+02	3.06E-09	1.21E-07	1.62E+02
	Construction	A5	8.98E-01	3.87E+02	4.02E-09	3.68E-07	1.86E+01
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.07E-01	1.66E+01	4.58E-10	1.81E-08	2.43E+01
	Waste processing	C3	1.94E-01	2.52E+01	9.74E-10	1.83E-08	5.48E+00
	Disposal	C4	5.83E-02	8.81E+00	3.79E-10	5.91E-09	2.96E+01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.80E+00	-1.34E+02	-7.81E-09	-1.41E-07	-1.07E+02

IRP = Potential human exposure efficiency relative to U235;
ETP-fw = Potential comparative toxic unit for ecosystems;
HTP-c = Potential comparative toxic unit for humans;

HTP-nc = Potential comparative toxic unit for humans; and
SQP = Potential soil quality index.

LCA Results (continued) Kirton C

Parameters describing resource use, primary energy			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	1.12E+01	0.00E+00	1.12E+01	1.76E+02	5.28E+00	1.81E+02
	Transport	A2	2.10E-01	0.00E+00	2.10E-01	1.60E+01	0.00E+00	1.60E+01
	Manufacturing	A3	6.54E+01	1.71E+01	8.25E+01	2.79E+03	2.61E+01	2.81E+03
	Total	A1-3	7.69E+01	1.71E+01	9.40E+01	2.98E+03	3.14E+01	3.01E+03
Construction process stage	Transport	A4	1.80E+00	0.00E+00	1.80E+00	1.39E+02	0.00E+00	1.39E+02
	Construction	A5	-1.19E+01	1.76E+01	5.68E+00	1.59E+02	2.23E+01	1.82E+02
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.70E-01	0.00E+00	2.70E-01	2.08E+01	0.00E+00	2.08E+01
	Waste processing	C3	2.41E-01	0.00E+00	2.41E-01	4.22E+01	0.00E+00	4.22E+01
	Disposal	C4	2.11E-01	0.00E+00	2.11E-01	1.22E+01	0.00E+00	1.22E+01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.18E+01	0.00E+00	-2.18E+01	-2.33E+02	0.00E+00	-2.33E+02

PERE = Use of renewable primary energy excluding renewable primary energy 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 resource

LCA Results (continued) Kirton C

Parameters describing resource use, secondary materials and fuels, use of water						
			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m ³
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	2.60E-01
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	1.92E-03
	Manufacturing	A3	1.34E-01	3.24E-04	0.00E+00	2.15E-01
	Total	A1-3	1.34E-01	3.24E-04	0.00E+00	4.77E-01
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	1.68E-02
	Construction	A5	8.29E-03	1.94E-05	0.00E+00	3.10E-02
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	2.52E-03
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	2.45E-03
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	1.31E-02
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.49E-01	0.00E+00	0.00E+00	-3.58E-01

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;

NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

LCA Results (continued) Kirton C

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	1.84E+00	2.28E+01	6.14E-04
	Transport	A2	1.72E-02	3.00E-01	9.50E+01
	Manufacturing	A3	8.57E-01	1.32E+01	9.26E-03
	Total	A1-3	2.72E+00	3.63E+01	9.50E+01
Construction process stage	Transport	A4	1.49E-01	2.59E+00	9.48E+02
	Construction	A5	1.90E-01	2.94E+00	5.70E+00
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.24E-02	3.89E-01	1.42E+02
	Waste processing	C3	5.64E-02	3.97E-01	2.97E-04
	Disposal	C4	2.40E-02	5.05E+01	7.40E-05
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.34E+00	-4.07E+01	-1.19E-03

HWD = Hazardous waste disposed;
 NHWD = Non-hazardous waste disposed;
 RWD = Radioactive waste disposed

LCA Results (continued) Kirton C

Other environmental information describing output flows – at end of life								
			CRU	MFR	MER	EE	Biogenic carbon (product)	Biogenic carbon (packaging)
			kg	kg	kg	MJ per energy carrier	kg C	kg C
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	3.05E-02	7.46E-06	7.00E-02	2.28E-02	5.06E-01
	Total	A1-3	0.00E+00	3.05E-02	7.46E-06	7.00E-02	2.28E-02	5.06E-01
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Construction	A5	0.00E+00	2.30E+00	6.64E-01	4.20E-03	5.29E-01	3.03E-02
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	9.50+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

LCA Results Kirton D

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts			GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater
			kg CO ₂ eq	kg CO ₂ eq	kg CO ₂ eq	kg CO ₂ eq	kg CFC11 eq	mol H ⁺ eq	kg (PO ₄) ³⁻ eq
Product stage	Raw material supply	A1	1.85E+01	1.84E+01	1.81E-03	1.83E-02	9.43E-06	1.85E-01	5.66E-03
	Transport	A2	1.43E+00	1.42E+00	1.37E-03	5.17E-04	3.39E-07	5.93E-03	8.90E-05
	Manufacturing	A3	2.04E+02	2.03E+02	7.40E-02	1.71E-02	1.26E-05	1.32E-01	3.01E-03
	Total	A1-3	2.23E+02	2.23E+02	7.72E-02	3.59E-02	2.24E-05	3.23E-01	8.75E-03
Construction process stage	Transport	A4	9.09E+00	9.07E+00	8.82E-03	3.26E-03	2.17E-06	3.79E-02	5.65E-04
	Construction	A5	1.50E+01	1.50E+01	4.79E-03	2.17E-03	1.36E-06	2.00E-02	5.31E-04
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.36E+00	1.36E+00	1.32E-03	4.89E-04	3.25E-07	5.68E-03	8.48E-05
	Waste processing	C3	3.14E+00	3.14E+00	1.11E-03	3.13E-04	6.70E-07	3.26E-02	9.71E-05
	Disposal	C4	5.31E-01	5.26E-01	4.05E-03	5.33E-04	1.60E-07	4.44E-03	1.53E-04
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	8.00E+00	7.88E+00	-1.02E-01	-1.11E-02	-6.36E-07	-5.07E-02	-4.29E-03

GWP-total = Global warming potential, total;
 GWP-fossil = Global warming potential, fossil;
 GWP-biogenic = Global warming potential, biogenic;
 GWP-luluc = Global warming potential, land use and land use change;

ODP = Depletion potential of the stratospheric ozone layer;
 AP = Acidification potential, accumulated exceedance; and
 EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

LCA Results (continued) Kirton D

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts			EP-marine	EP-terrestrial	POCP	ADP-mineral & metals	ADP-fossil	WDP	PM
			kg N eq	mol N eq	kg NMVOC eq	kg Sb eq	MJ, net calorific value	m ³ world eq deprived	disease incidence
Product stage	Raw material supply	A1	3.54E-02	4.21E-01	1.29E-01	6.26E-04	6.58E+02	1.09E+01	2.31E-06
	Transport	A2	1.81E-03	1.98E-02	6.33E-03	3.43E-06	2.21E+01	1.06E-01	1.63E-07
	Manufacturing	A3	5.15E-02	5.61E-01	1.57E-01	9.61E-05	2.57E+03	6.67E+00	1.66E-06
	Total	A1-3	8.88E-02	1.00E+00	2.91E-01	7.25E-04	3.25E+03	1.77E+01	4.14E-06
Construction process stage	Transport	A4	1.16E-02	1.26E-01	4.06E-02	2.08E-05	1.41E+02	6.83E-01	1.07E-06
	Construction	A5	5.63E-03	6.29E-02	1.83E-02	4.37E-05	1.96E+02	1.16E+00	2.56E-07
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.73E-03	1.89E-02	6.10E-03	3.12E-06	2.12E+01	1.02E-01	1.60E-07
	Waste processing	C3	1.44E-02	1.58E-01	4.35E-02	1.61E-06	4.30E+01	9.94E-02	7.94E-06
	Disposal	C4	1.53E-03	1.67E-02	4.82E-03	1.72E-06	1.24E+01	5.57E-01	8.91E-08
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.17E-02	-1.41E-01	-3.63E-02	-7.45E-05	-1.16E+02	-1.52E+01	-6.41E-07

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
 EP-terrestrial = Eutrophication potential, accumulated exceedance;
 POCP = Formation potential of tropospheric ozone;
 ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;

ADP-fossil = Depletion potential of the stratospheric ozone layer;
 WDP = Water (user) deprivation potential, deprivation-weighted water consumption; and
 PM = Particulate matter.

LCA Results (continued) Kirton D

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U ²³⁵ eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	2.95E+00	6.24E+03	4.90E-08	5.78E-06	1.72E+02
	Transport	A2	1.12E-01	1.73E+01	4.86E-10	1.89E-08	2.44E+01
	Manufacturing	A3	1.40E+01	2.68E+02	1.60E-08	2.02E-07	1.72E+02
	Total	A1-3	1.71E+01	6.52E+03	6.55E-08	6.00E-06	3.68E+02
Construction process stage	Transport	A4	7.16E-01	1.10E+02	3.06E-09	1.21E-07	1.62E+02
	Construction	A5	1.03E+00	3.95E+02	4.08E-09	3.66E-07	2.23E+01
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.07E-01	1.66E+01	4.58E-10	1.81E-08	2.43E+01
	Waste processing	C3	1.94E-01	2.52E+01	9.74E-10	1.83E-08	5.48E+00
	Disposal	C4	5.83E-02	8.81E+00	3.79E-10	5.91E-09	2.96E+01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.80E+00	-1.34E+02	-7.81E-09	-1.41E-07	-1.07E+02

IRP = Potential human exposure efficiency relative to U235;
ETP-fw = Potential comparative toxic unit for ecosystems;
HTP-c = Potential comparative toxic unit for humans;

HTP-nc = Potential comparative toxic unit for humans; and
SQP = Potential soil quality index.

LCA Results (continued) Kirton D

Parameters describing resource use, primary energy								
			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	1.20E+01	0.00E+00	1.20E+01	1.81E+02	4.66E+02	6.47E+02
	Transport	A2	2.84E-01	0.00E+00	2.84E-01	2.17E+01	0.00E+00	2.17E+01
	Manufacturing	A3	6.55E+01	1.71E+01	8.27E+01	2.79E+03	2.61E+01	2.82E+03
	Total	A1-3	7.78E+01	1.71E+01	9.50E+01	2.99E+03	4.92E+02	3.49E+03
Construction process stage	Transport	A4	1.80E+00	0.00E+00	1.80E+00	1.39E+02	0.00E+00	1.39E+02
	Construction	A5	-1.19E+01	1.76E+01	5.74E+00	1.60E+02	5.00E+01	2.10E+02
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.70E-01	0.00E+00	2.70E-01	2.08E+01	0.00E+00	2.08E+01
	Waste processing	C3	2.41E-01	0.00E+00	2.41E-01	4.22E+01	0.00E+00	4.22E+01
	Disposal	C4	2.11E-01	0.00E+00	2.11E-01	1.22E+01	0.00E+00	1.22E+01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.18E+01	0.00E+00	-2.18E+01	-2.33E+02	0.00E+00	-2.33E+02

PERE = Use of renewable primary energy excluding renewable primary energy 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 resource

LCA Results (continued) Kirton D

Parameters describing resource use, secondary materials and fuels, use of water						
			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m ³
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	2.59E-01
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	2.62E-03
	Manufacturing	A3	1.34E-01	3.24E-04	0.00E+00	2.16E-01
	Total (Consumption grid)	A1-3	1.34E-01	3.24E-04	0.00E+00	4.78E-01
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	1.68E-02
	Construction	A5	8.30E-03	1.95E-05	0.00E+00	3.10E-02
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	2.52E-03
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	2.45E-03
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	1.31E-02
	Disposal	C4	-2.49E-01	0.00E+00	0.00E+00	-3.58E-01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.49E-01	0.00E+00	0.00E+00	-3.58E-01

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;

NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

LCA Results (continued) Kirton D

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	1.91E+00	2.36E+01	4.00E-03
	Transport	A2	2.34E-02	4.08E-01	1.35E+02
	Manufacturing	A3	8.59E-01	1.33E+01	9.27E-03
	Total	A1-3	2.79E+00	3.72E+01	1.35E+02
Construction process stage	Transport	A4	1.49E-01	2.59E+00	9.48E+02
	Construction	A5	1.95E-01	3.00E+00	8.08E+00
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.23E-02	3.88E-01	1.42E+02
	Waste processing	C3	5.64E-02	3.97E-01	2.97E-04
	Disposal	C4	2.40E-02	5.05E+01	7.40E-05
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.34E+00	-4.07E+01	-1.19E-03

HWD = Hazardous waste disposed;
 NHWD = Non-hazardous waste disposed;
 RWD = Radioactive waste disposed

LCA Results (continued) Kirton D

Other environmental information describing output flows – at end of life								
			CRU	MFR	MER	EE	Biogenic carbon (product)	Biogenic carbon (packaging)
			kg	kg	kg	MJ per energy carrier	kg C	kg C
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	3.04E-02	7.47E-06	7.01E-02	2.28E-02	5.07E-01
	Total	A1-3	0.00E+00	3.04E-02	7.47E-06	7.01E-02	2.28E-02	5.07E-01
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Construction	A5	0.00E+00	2.30E+00	6.64E-01	4.21E-03	5.29E-01	3.04E-02
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	9.50+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

LCA Results Kirton F

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts

			GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater
			kg CO ₂ eq	kg CO ₂ eq	kg CO ₂ eq	kg CO ₂ eq	kg CFC11 eq	mol H ⁺ eq	kg (PO ₄) ³⁻ eq
Product stage	Raw material supply	A1	1.55E+01	1.55E+01	1.02E-02	1.41E-02	9.96E-06	1.61E-01	4.13E-03
	Transport	A2	4.56E-01	4.55E-01	4.39E-04	1.65E-04	1.08E-07	1.90E-03	2.84E-05
	Manufacturing	A3	2.72E+02	2.72E+02	7.94E-02	1.84E-02	1.36E-05	1.41E-01	3.23E-03
	Total	A1-3	2.88E+02	2.88E+02	9.00E-02	3.26E-02	2.36E-05	3.04E-01	7.38E-03
Construction process stage	Transport	A4	9.09E+00	9.07E+00	8.82E-03	3.26E-03	2.17E-06	3.79E-02	5.65E-04
	Construction	A5	1.89E+01	1.89E+01	5.56E-03	1.97E-03	1.43E-06	1.89E-02	4.48E-04
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.36E+00	1.36E+00	1.32E-03	4.89E-04	3.25E-07	5.68E-03	8.48E-05
	Waste processing	C3	3.14E+00	3.14E+00	1.11E-03	3.13E-04	6.70E-07	3.26E-02	9.71E-05
	Disposal	C4	5.31E-01	5.26E-01	4.05E-03	5.33E-04	1.60E-07	4.44E-03	1.53E-04
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	8.00E+00	7.88E+00	-1.02E-01	-1.11E-02	-6.36E-07	-5.07E-02	-4.29E-03

GWP-total = Global warming potential, total;
 GWP-fossil = Global warming potential, fossil;
 GWP-biogenic = Global warming potential, biogenic;
 GWP-luluc = Global warming potential, land use and land use change;

ODP = Depletion potential of the stratospheric ozone layer;
 AP = Acidification potential, accumulated exceedance; and
 EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

LCA Results (continued) Kirton F

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts			EP-marine	EP-terrestrial	POCP	ADP-mineral & metals	ADP-fossil	WDP	PM
			kg N eq	mol N eq	kg NMVOC eq	kg Sb eq	MJ, net calorific value	m ³ world eq deprived	disease incidence
Product stage	Raw material supply	A1	3.17E-02	3.86E-01	1.13E-01	5.69E-04	6.56E+02	3.79E+00	2.06E-06
	Transport	A2	5.78E-04	6.32E-03	2.03E-03	1.08E-06	7.08E+00	3.41E-02	5.26E-08
	Manufacturing	A3	5.53E-02	6.01E-01	1.68E-01	1.03E-04	2.76E+03	7.15E+00	1.78E-06
	Total	A1-3	8.76E-02	9.94E-01	2.83E-01	6.73E-04	3.42E+03	1.10E+01	3.89E-06
Construction process stage	Transport	A4	1.16E-02	1.26E-01	4.06E-02	2.08E-05	1.41E+02	6.83E-01	1.07E-06
	Construction	A5	5.56E-03	6.25E-02	1.78E-02	4.05E-05	2.06E+02	7.59E-01	2.41E-07
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.73E-03	1.89E-02	6.10E-03	3.12E-06	2.12E+01	1.02E-01	1.60E-07
	Waste processing	C3	1.44E-02	1.58E-01	4.35E-02	1.61E-06	4.30E+01	9.94E-02	7.94E-06
	Disposal	C4	1.53E-03	1.67E-02	4.82E-03	1.72E-06	1.24E+01	5.57E-01	8.91E-08
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.17E-02	-1.41E-01	-3.63E-02	-7.45E-05	-1.16E+02	-1.52E+01	-6.41E-07

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
 EP-terrestrial = Eutrophication potential, accumulated exceedance;
 POCP = Formation potential of tropospheric ozone;
 ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;

ADP-fossil = Depletion potential of the stratospheric ozone layer;
 WDP = Water (user) deprivation potential, deprivation-weighted water consumption; and
 PM = Particulate matter.

LCA Results (continued) Kirton F

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U ²³⁵ eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	2.88E+00	6.06E+02	3.37E-08	5.01E-07	1.70E+02
	Transport	A2	3.59E-02	5.53E+00	1.55E-10	6.04E-09	7.89E+00
	Manufacturing	A3	1.50E+01	2.88E+02	1.72E-08	2.17E-07	1.85E+02
	Total	A1-3	1.79E+01	8.99E+02	5.10E-08	7.24E-07	3.63E+02
Construction process stage	Transport	A4	7.16E-01	1.10E+02	3.06E-09	1.21E-07	1.62E+02
	Construction	A5	1.08E+00	5.75E+01	3.21E-09	4.90E-08	2.19E+01
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.07E-01	1.66E+01	4.58E-10	1.81E-08	2.43E+01
	Waste processing	C3	1.94E-01	2.52E+01	9.74E-10	1.83E-08	5.48E+00
	Disposal	C4	5.83E-02	8.81E+00	3.79E-10	5.91E-09	2.96E+01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.80E+00	-1.34E+02	-7.81E-09	-1.41E-07	-1.07E+02

IRP = Potential human exposure efficiency relative to U235;
ETP-fw = Potential comparative toxic unit for ecosystems;
HTP-c = Potential comparative toxic unit for humans;

HTP-nc = Potential comparative toxic unit for humans; and
SQP = Potential soil quality index.

LCA Results (continued) Kirton F

Parameters describing resource use, primary energy								
			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	9.21E+00	0.00E+00	9.21E+00	1.37E+02	5.07E+02	6.44E+02
	Transport	A2	9.07E-02	0.00E+00	9.07E-02	6.95E+00	0.00E+00	6.95E+00
	Manufacturing	A3	7.03E+01	1.84E+01	8.87E+01	3.00E+03	2.80E+01	3.02E+03
	Total	A1-3	7.96E+01	1.84E+01	9.80E+01	3.14E+03	5.35E+02	3.67E+03
Construction process stage	Transport	A4	1.80E+00	0.00E+00	1.80E+00	1.39E+02	0.00E+00	1.39E+02
	Construction	A5	-1.18E+01	1.77E+01	5.92E+00	1.69E+02	5.26E+01	2.22E+02
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.70E-01	0.00E+00	2.70E-01	2.08E+01	0.00E+00	2.08E+01
	Waste processing	C3	2.41E-01	0.00E+00	2.41E-01	4.22E+01	0.00E+00	4.22E+01
	Disposal	C4	2.11E-01	0.00E+00	2.11E-01	1.22E+01	0.00E+00	1.22E+01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.18E+01	0.00E+00	-2.18E+01	-2.33E+02	0.00E+00	-2.33E+02

PERE = Use of renewable primary energy excluding renewable primary energy 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 resource

LCA Results (continued) Kirton F

Parameters describing resource use, secondary materials and fuels, use of water						
			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m ³
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	9.24E-02
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	8.39E-04
	Manufacturing	A3	1.44E-01	3.48E-04	0.00E+00	2.31E-01
	Total	A1-3	1.44E-01	3.48E-04	0.00E+00	3.25E-01
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	1.68E-02
	Construction	A5	8.89E-03	2.09E-05	0.00E+00	2.18E-02
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	2.52E-03
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	2.45E-03
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	1.31E-02
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.49E-01	0.00E+00	0.00E+00	-3.58E-01

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;

NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

LCA Results (continued) Kirton F

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	1.62E+00	1.63E+01	4.22E-03
	Transport	A2	7.48E-03	1.30E-01	4.43E+01
	Manufacturing	A3	9.21E-01	1.42E+01	9.94E-03
	Total	A1-3	2.54E+00	3.06E+01	4.43E+01
Construction process stage	Transport	A4	1.49E-01	2.59E+00	9.48E+02
	Construction	A5	1.80E-01	2.60E+00	2.66E+00
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.24E-02	3.89E-01	1.42E+02
	Waste processing	C3	5.64E-02	3.97E-01	2.97E-04
	Disposal	C4	2.40E-02	5.05E+01	7.40E-05
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.34E+00	-4.07E+01	-1.19E-03

HWD = Hazardous waste disposed;
 NHWD = Non-hazardous waste disposed;
 RWD = Radioactive waste disposed

LCA Results (continued) Kirton F

Other environmental information describing output flows – at end of life								
			CRU	MFR	MER	EE	Biogenic carbon (product)	Biogenic carbon (packaging)
			kg	kg	kg	MJ per energy carrier	kg C	kg C
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	3.28E-02	8.01E-06	7.52E-02	2.45E-02	5.43E-01
	Total	A1-3	0.00E+00	3.28E-02	8.01E-06	7.52E-02	2.45E-02	5.43E-01
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Construction	A5	0.00E+00	2.30E+00	6.64E-01	4.51E-03	5.29E-01	3.26E-02
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	9.50+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

Scenarios and additional information for Kirton A, B, C, D and F

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
A4 – Transport to the building site	Typical transportation distance of 100 km has been modelled, and the end-users of the EPD can use this information to calculate the impacts of a bespoke transport distance for module A4 if required.		
	The bulk density of this product is 1420kg/m ³ and can be found in the Declaration of Performance		
	Fuel type / Vehicle type	Litre of fuel type per distance or vehicle type	Lorry, >32t
	Distance:	km	100
	Capacity utilisation (incl. empty returns)	%	50
	Bulk density of transported products	kg/m ³	1420
A5 – Installation in the building	Wastage percentages are derived from BRE Global Product Category Rules (PCR) For Type III EPD of Construction Products to EN 15804+A2 PN 514 Rev 3.1		
	For packaging waste on site, the scenario given is that 1 pack of bricks is ≈ 1 tonne (declared unit). Therefore, packaging volume for one pack will be waste in this module. Packaging volumes per pack can be found on the data collection sheet uploaded in LINA.		
	Installation wastage	%	6
B2 – Maintenance	Bricks once installed require no maintenance themselves, therefore the impacts are zero.		
B3 – Repair	It is assumed that the brick should not need any repair during its service life or the study period, therefore the impacts are zero.		
B4 – Replacement	The service life of the brick is at least as long as the 60-year study period and likely life of the building so no replacements are expected. Therefore, the impacts are zero.		
B5 – Refurbishment	It has been assumed that no refurbishment action that relates to the brick will be required during the 60-year study period, therefore the impacts are zero.		
Reference service life	The PCR gives a service life of 60 years for brick		
B6 – Use of energy	No energy is required for the brick to 'operate' during its use. Therefore, the impacts are zero.		
B7 – Use of water	No water is required for the brick to 'operate' during its use. Therefore, the impacts are zero.		
C1 to C4	At the end of life. The bricks are deconstructed using heavy machinery, placed onto trucks, and transported to the relevant waste processing sites. At the site the waste undergoes crushing to prepare it for disposal. Under the latest PCR, 95% of the brick waste will be recycled and 5% will be landfilled.		
C1 – End-of-life deconstruction	It is assumed that when the brick is removed from its structure, this is part of demolition of the whole structure. Therefore, impacts must be allocated to the whole structure, and it is assumed that those allocated to the brick alone are negligible and can be assumed to be zero.		
C2 – End-of-life transport	It is assumed that the waste facility is local and 15 km away from the construction site.	Fuel consumption (g/tkm)	2.5

Scenarios and additional technical information

Scenario	Parameter	Units	Results
C3 – End-of-life processing	Pre-processing data related to the treatment and handling of waste brick is currently unavailable. As a result, this data cannot be incorporated into the analysis.		
	Under the latest BRE PCR PN514, 95% of the brick will be recycled at the end-of-life and 5% will be landfilled, expressed in Module C4.		
	Benefits of recycling brick are accounted for in Module D where 95% of the declared unit is recycled.		
	Brick waste to recycling	kg	950
C4 – End-of-life disposal	Under BRE PCR PN514, 5% will be sent to landfill.		
	For Module D, the benefits of recycling brick will replace the need for clay.		
	Brick waste to landfill	kg	50
Module D	As mentioned, it is assumed that 95% of the brick waste will be recycled		
	Brick waste to recycling	Kg	950

Interpretation

Kirton A, B and D have the same composition and proportions. Out of the total mass of input materials, clay makes up 98.37%, followed by petroleum coke of 1.2%, barium carbonate and plasticiser make up the remaining of 0.43%. As a result, clay ranks first in terms of overall environmental impacts and is responsible for the greatest impact on GWP, AP, EP, POCP, ADPE, PM, HTP-c, SQP, PERE, PERT, PENRE, HWD and NHWD. Barium carbonate contributes the most to WDP, ETP-fw, HTP-nc and FW. Petroleum coke contributes the most to ODP, ADPF, IR, PENRM, PENRT and RWD.

For Kirton C, clay makes up 99.57%, barium carbonate and plasticiser make up the remaining of 0.43%. Clay ranks first in terms of overall environmental impacts and is responsible for the greatest impact on nearly all indicators except WDP, ETP-fw, HTP-nc, PENRM and FW. Barium carbonate ranks second in terms of overall environmental impacts and contributes the most to WDP, ETP-fw, HTP-nc and FW. Plasticiser contributes 100% to PENRM.

For Kirton F, clay makes up 98.72%, petroleum coke and plasticiser make up the remaining of 1.28%. Clay ranks first in terms of overall environmental impacts and is responsible for the greatest impact on nearly all indicators except ODP, ADPF, IR, PENRM, PENRT and RWD. Petroleum coke ranks second in terms of overall environmental impacts.

The bulk of the environmental impacts and primary energy demand are attributed to the manufacturing phase, covered by information modules A1-A3 of EN15804:2012+A2:2019.

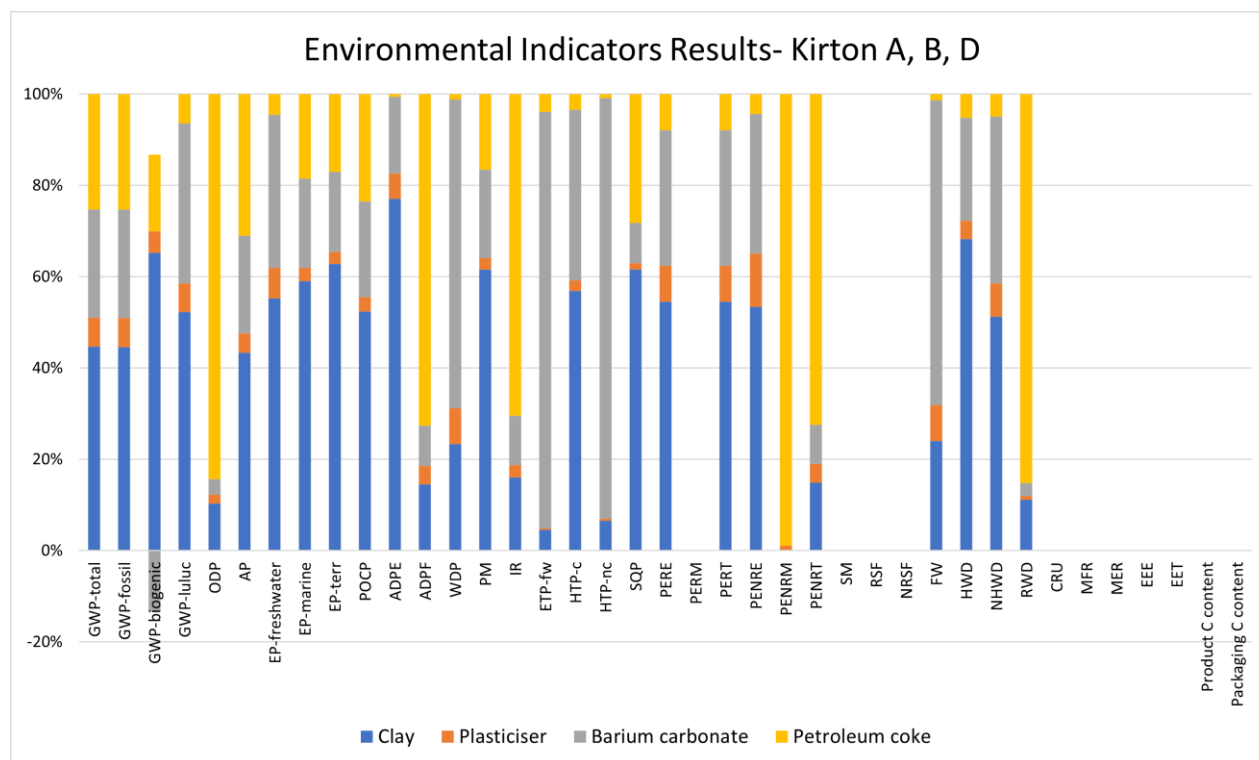


Figure 1

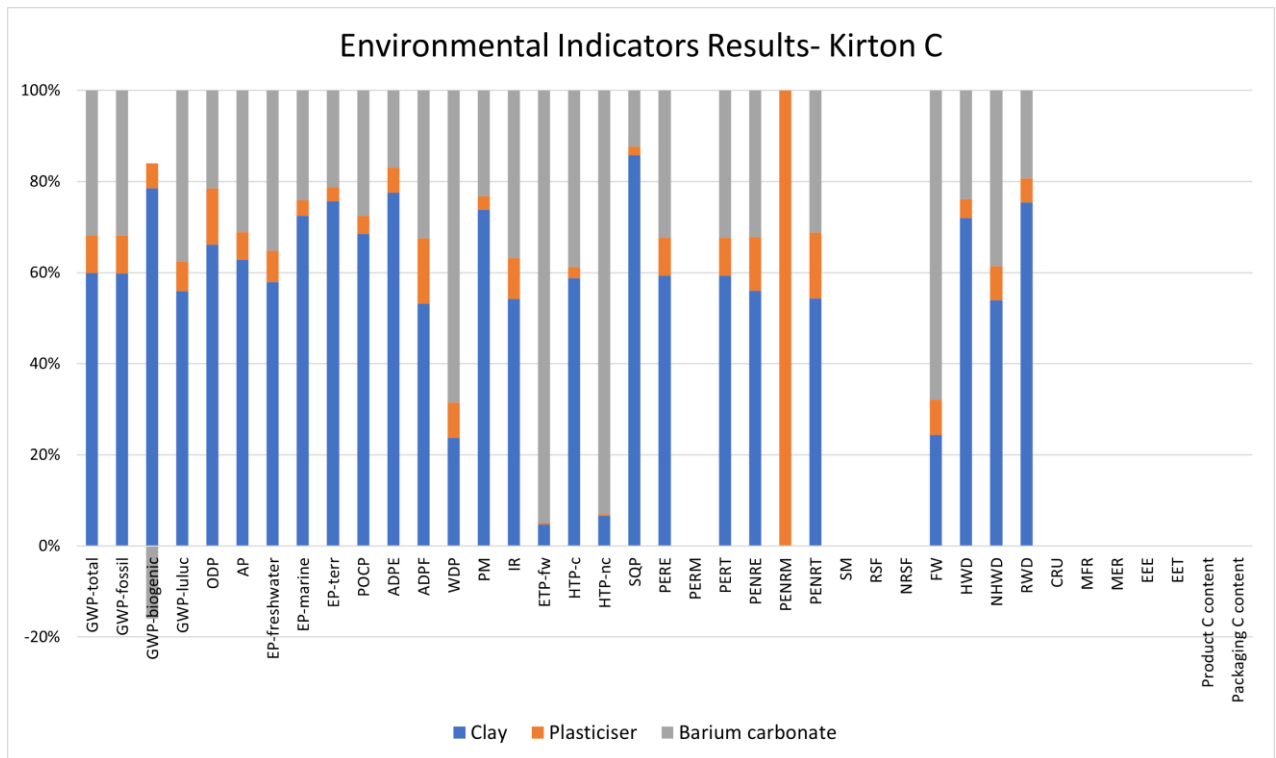


Figure 2

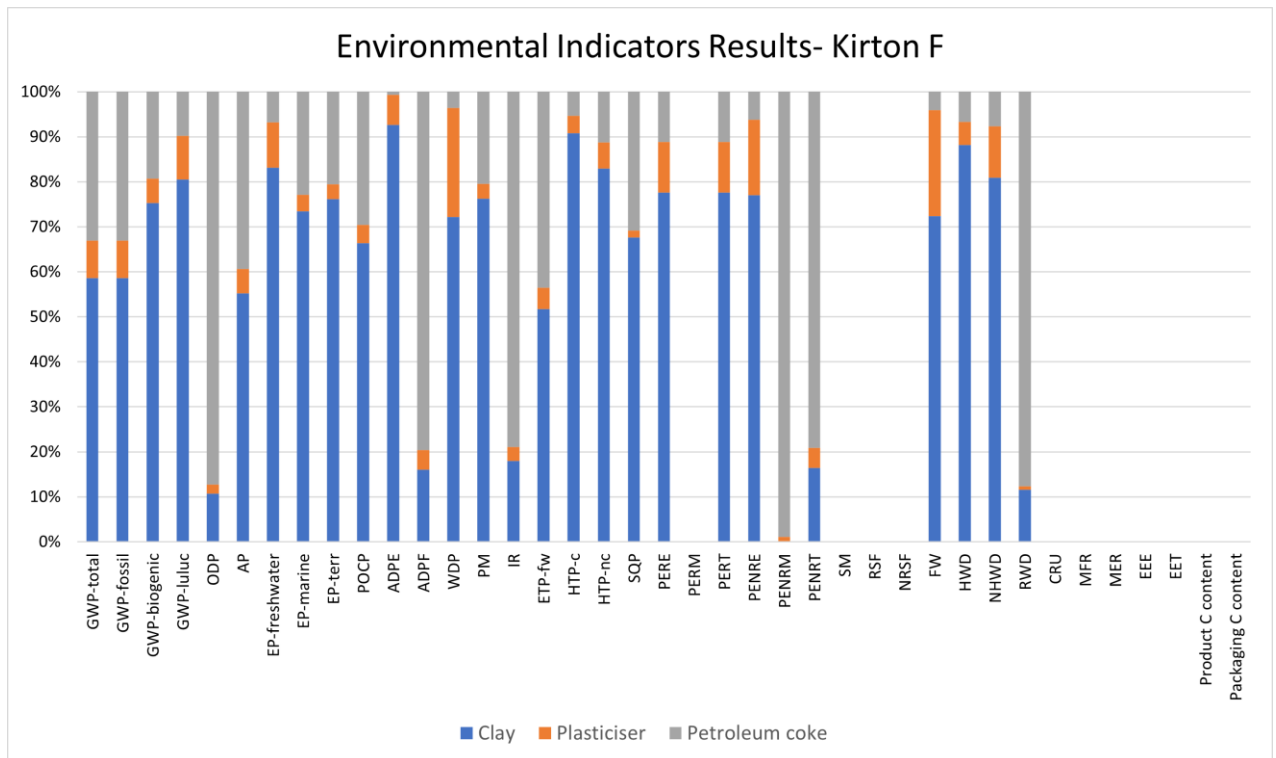


Figure 3

References

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