SURFACE TECH™

VERIFIED by SCS Global Services
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

Declaration Owner

Surface Tech LLC
888 Prospect Street, #200
La Jolla, California 92037
Phone: +1 619 880 0265 | https://surface-tech.com/

Product:

AQU™

Declared Unit

The declared unit is one metric ton of AQU™ manufactured in Rockford, Illinois

EPD Number and Period of Validity

SCS-EPD-09449
EPD Valid October 4, 2023 through October 3, 2028

Product Category Rule

ISO 21930:2017. Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services.

Program Operator

SCS Global Services
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SCSglobal SERVICES

Declaration owner:	Surface Tech LLC
Address:	888 Prospect Street, #200, La Jolla, CA 92037
Declaration Number:	SCS-EPD-09449
Declaration Validity Period:	EPD Valid October 4, 2023 through October 3, 2028
Program Operator:	SCS Global Services
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
LCA Practitioner:	Ilan MacAdam-Somer, SCS Global Services
LCA Software and LCI database:	OpenLCA 1.11.0 software and the Ecoinvent v3.9.1 database
Product's Intended Application:	As an aramid polymer fiber pre-treated with a water binder for us as an additive for asphalt
Product RSL:	N/A
Markets of Applicability:	North America, including Mexico
EPD Type:	Product-Specific
EPD Scope:	Cradle-to-Gate
LCIA Method and Version:	TRACI 2.1
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	☒ internal ☐ external
LCA Reviewer:	,Tess Garvey, Ph.D., SCS Global Services
Product Category Rule:	ISO 21930:2017. Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services.
PCR Review conducted by:	ISO Technical Committee
Independent verification of the declaration and data, according to ISO 14025 and the PCR	☐ internal ☒ external
EPD Verifier:	Thomas Gloria, Ph.D., Industrial Ecology Consultants

Declaration Contents:

Disclaimers: *This EPD conforms to ISO 14025, 14040, 14044, and ISO 21930.*

Scope of Results Reported: *The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.*

Accuracy of Results: *Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.*

Comparability: *The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.*

In accordance with ISO 21930:2017, EPDs are comparable only if they comply with the core PCR, use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.

1. Summary of Results

This section contains a summary of the cradle-to-gate LCIA results (**Table 2**) reported for the impact categories required by the PCR [1]—global warming potential (GWP), acidification potential (AP), eutrophication potential (EP), ozone depletion potential (ODP), smog potential (POCP) and fossil fuel depletion (FF) —using the impact method required by the PCR for North America, TRACI 2.1. The LCIA contribution results can be found in **Section 5** and the LCI results can be found in **Section 6.**

Table 1. *The life cycle modules included within the system boundary.*

Product			Construction Process		Use							End-of-life				Benefits and loads beyond the system boundary
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material extraction and processing	Transport to manufacturer	Manufacturing	Transport	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
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

X = Module Included | MND = Module Not Declared

Table 2. *The cradle-to-gate impact of the AQU™ product, reported by life cycle module for all impact categories. Impact is reported for one metric ton of AQU™ product.*

Impact Category (units)	Total (A1-A3)	A1	A2	A3
GWP (kg CO_2 eq)	7,820	6,400	71.9	1,350
AP (kg SO_2 eq)	100%	82%	1%	17%
EP (kg N eq)	15.0	11.5	1.58	1.93
ODP (kg CFC-11 eq)	100%	77%	11%	13%
POCP (kg NMVOC eq)	4.36	2.84	8.44×10^{-2}	1.44
FF (MJ surplus)	100%	65%	2%	33%

2. Declaration Owner and Product Description

2.1 SURFACE TECH LLC

Surface Tech is an innovation-driven company dedicated to providing proven solutions for the construction and building materials industry. By focusing on performance, ease of adoption, sustainability and cost savings, Surface Tech has introduced high-tech products that benefit the asphalt, concrete and specialty products industries.

2.2 PRODUCT DESCRIPTION

AQU™

AQU™ Polymer Fiber is an aramid fiber pre-treated with a water binder. Aramid Reinforced Composite Asphalt (ARCA) solutions reinforce and control the liquid bitumen and aggregates that traditionally comprise asphalt mixes, preventing cracking and rutting while improving fatigue resiliency and toughness. Our patented water binder ensures a 100% delivery of the fibers into the Hot Mix Asphalt / Warm Mix Asphalt, creating a confident dosing solution for all QC-conscious project stakeholders, with no change to the mix design's volumetric properties. AQU™ Polymer Fibers have proven performance across all climates and pavement applications – from airfield runways in northern Canada to Ports of Entry in the desert Southwest and streets, highways, tollways, multi-modal facilities, and commercial centers across the United States.

Engineered Fibers Technology (EFT) produces Surface Tech's AQU™ product at EFT's facility in Rockford, IL.

2.3 ADDITIONAL ENVIRONMENTAL INFORMATION

No regulated substances or materials of very high concern were identified with the production of AQU™.

2.4 FURTHER INFORMATION

Further information on the product can be found on the manufacturers' website at https://surface-tech.com/.

3. Scope of the Study

3.1 FUNCTIONS OF THE PRODUCT SYSTEM

AQU™ serves the primary function as an aramid polymer fiber additive to asphalt, where it reduces cracking and rutting, extending the road's life expectancy. In accordance with the PCR for cradle-to-gate LCAs, a declared unit of one metric ton of manufactured and packaged product is used. The reference flow for the modeling of this system is 1 metric ton of AQU™ product (**Table 3**).

Table 3. *The declared unit and reference flow used to model the AQU™ product.*

Parameter	Value	Unit
Declared Unit	1	Metric ton
Reference Flow	1	Metric ton

3.2 PRODUCT MATERIAL COMPOSITION

The AQU™ product is made of aramid fiber and water, which make up 75% and 25% of the product, respectively.

3.3 SYSTEM BOUNDARY

The system under study includes the cradle-to-gate life cycle of the AQU™ product, which includes all inputs required and outputs generated from the production life cycle stage.

The production life cycle stage is subdivided into information modules as prescribed by the PCR. Each module is described in **Table 4.** The AQU™ processes incorporated into each life cycle module are described in detail in **Section 4.1**. The major individual unit processes that make up each module of the product stage shown in **Figure 1**.

Table 4. *A description of the life cycle phases included in the AQU™ product system boundary.*

Module	Module Description	Included in System Boundary
A1	Raw Material extraction and upstream production, which includes raw material extraction and processing, as well as processing of secondary material inputs (e.g., recycled or reused materials)	✓
A2	Transport to factory, which covers transport of raw materials and other inputs to the factory and internal transport	✓
A3	Manufacturing, which includes all fuels, electricity, and water used in manufacturing the product; the extraction and upstream production, transport to factory, and manufacturing of product packaging; transport and treatment of all waste generated at the manufacturing facility	✓
A4	Transport to the building site	**MND**
A5	Installation	**MND**
B1	Use stage	**MND**
B2 – B5	Maintenance, repair, replacement, and refurbishment	**MND**
B6 – B7	Operational energy and water use	**MND**
C1	Deconstruction/demolition	**MND**
C2	Transport to waste processing or disposal	**MND**
C3	Waste processing for generation of secondary materials (i.e. recycling)	**MND**
C4	Disposal of waste	**MND**
D	Optional supplementary information about the potential net benefits from reuse, recycling and energy recovery beyond the system boundary of the studied product system	**MND**

✓ = Module Included | MND = Module Not Declared

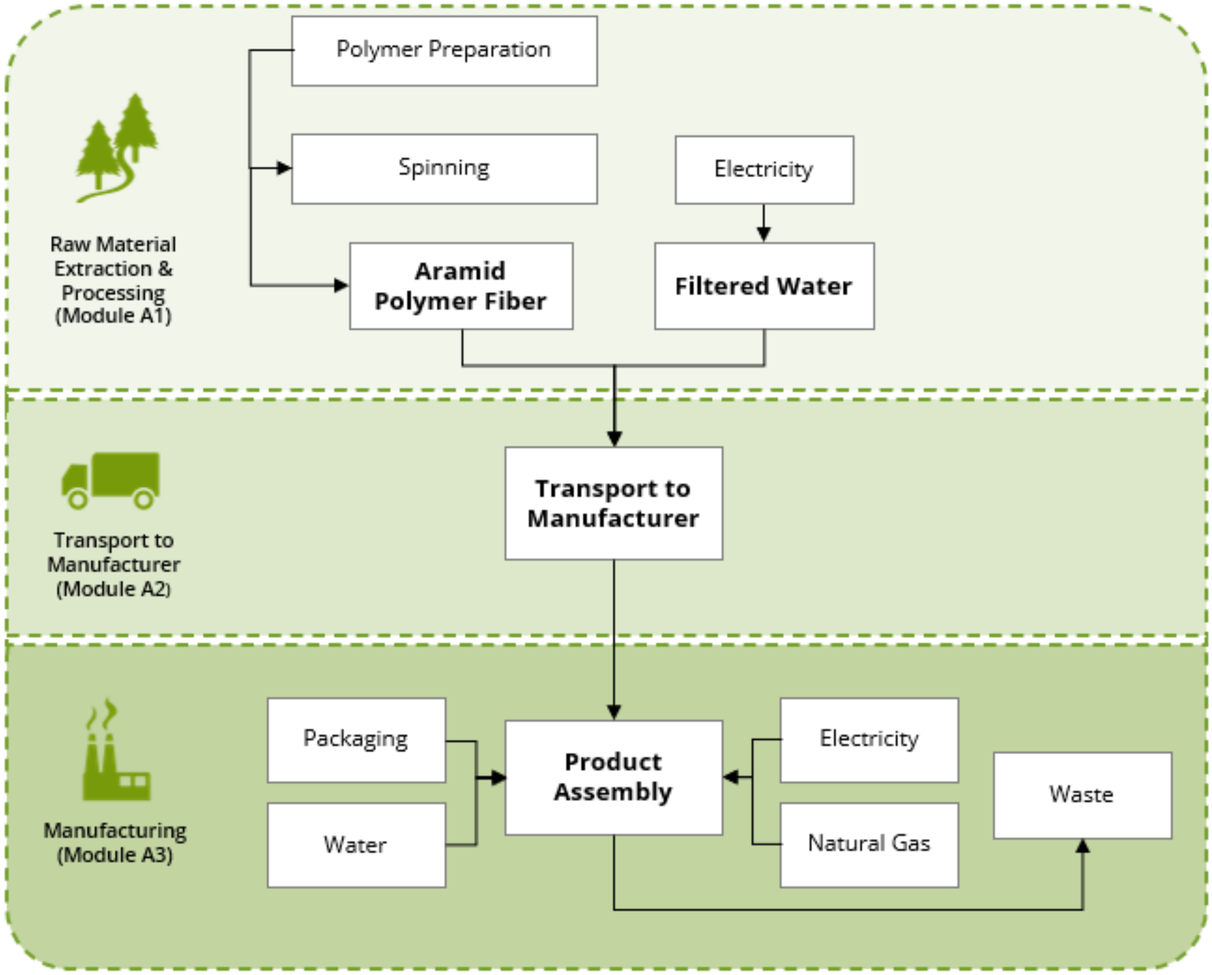

Figure 1. *Flow diagram representing the major processes over the cradle-to-gate life cycle of the AQU™ product.*

4. Technical Information and Scenarios

4.1 LIFE CYCLE MODULES

(A1) Raw Material Extraction

This module includes the inputs and outputs required to extract and produce the raw materials— filtered water and aromatic polyamide (aramid) fibers—that make up 25% and 75% of the AQU™ product, respectively. The production of the filtered water was modeled in openLCA v1.11.0 [2] using secondary data from the Ecoinvent v3.9.1 database [3]. The LCIA values from producing the aramid fiber were provided by the supplier, Teijin.

(A2) Transport to Factory

This module includes the transport of the aramid fibers from The Netherlands to Rockford, IL. Transport distance and mode of transport were provided by Surface Tech's manufacturer of AQU™, EFT. Transport was modeled in openLCA v1.11 using the Ecoinvent v3.9.1 database. The type of transport, type of vehicle, fuel type, and fuel utilization modeled are reported in **Table 5** below.

Table 5. *The one-way distance, fuel utilization, and capacity utilization (percentage of vehicle's freight capacity occupied on the roundtrip) for transport within the A1 and A2 module.*

Transport Specifications	Value	Unit
EURO 4, 16-32 MT Freight Lorry		
Diesel Fuel Utilization	1.92×10^{-2}	kg/tkm
Capacity Utilization	37	%
Aramid Fiber Transport Distance	84	km
43,000 Ton, Sea Container Ship		
Heavy Fuel Oil Utilization	2.52×10^{-3}	kg/tkm
Capacity Utilization	70	%
Aramid Fiber Transport Distance	7,897	km

(A3) Manufacturing

This module includes the steps required to assemble and process the AQU™ product at the EFT manufacturing facility and includes any waste generated from these processes, transport of waste, and all inputs and outputs required to produce the AQU™ product packaging (polyethylene bags and wrap, polyester strapping, and corrugated boxes); tertiary packaging (an HDPE pallet) was excluded as this type of packaging is frequently reused multiple times, makings its influence on the overall results negligible. The material mass of the product packaging is listed in **Table 6** below.

The processing steps are described below:

1. Receiving of aramid fiber on spools;
2. Loading of spools onto creels;
3. Bundled fibers are fed through a water bath until a moisture level of 25% is reached;
4. Cutting fiber to specified length; and
5. Packing of product into plastic bags and corrugated boxes, which are wrapped and strapped down onto plastic pallets for transport to customers or a holding facility.

These five steps require electricity, freshwater, and natural gas and generate corrugated box waste, which is transported to a recycling facility; note that recycling is not included within the scope of this assessment [1]. The electricity used at the Rockford, Illinois based manufacturing facility is modeled in openLCA using data from the US EPA eGRID database for the US RFC region 2022 grid mix [4].

Transport for recycling of manufacturing waste is based on the EPA WARM model [5], which assumes a distance of 20 miles (~32km) from point of generation of waste to a disposal facility (e.g., landfill, recycling or incineration). Waste is assumed to be transported by the same type of truck used in module A2 (**Table 5**).

Table 6. *The mass of the product packaging per declared unit.*

Product Packaging	Mass (kg)
Polyethylene bags	6.05
Polyethylene wrap	6.05
Polyester strapping	6.05
Corrugated boxes	60.6

4.2 DATA SOURCES

Table 7. *The LCI datasets from the Ecoinvent v3.9.1 (2022) database used to model the product system for the AQU™ product.*

Flow	Dataset
A1. Raw Materials	
Filtered Water	market for water, deionised | water, deionised | Cutoff, U - Europe without Switzerland
A2. Transport	
Truck Transport	market for transport, freight, lorry 16-32 metric ton, EURO5 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, U - RER
Ship Transport	transport, freight, sea, container ship | transport, freight, sea, container ship | Cutoff, U - GLO
A3. Manufacturing	
Electricity	market for electricity, medium voltage | electricity, medium voltage | Cutoff, U - US-RFC
Natural Gas	heat production, natural gas, at boiler modulating >100kW | heat, district or industrial, natural gas | Cutoff, U - Europe without Switzerland
Waste Transport	market for transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, U - RER
A3. Product Packaging	
Polyethylene Bags & Wrap	market for packaging film, low density polyethylene | packaging film, low density polyethylene | Cutoff, U - GLO
Polyester Strapping	market for fibre, polyester | fibre, polyester | Cutoff, U - GLO
Corrugated Boxes	corrugated board box production | corrugated board box | Cutoff, U - RoW
A3. Waste Treatment	
Hazardous Waste	treatment of hazardous waste, hazardous waste incineration | hazardous waste, for incineration | Cutoff, U - Europe without Switzerland

*Note that the production of the aramid fiber used as a raw material was not modeled. Instead, the impact results from the production of the aramid fiber were provided by Teijin, whom calculated these results using the impact methods required by the PCR.

4.3 DATA QUALITY

The data quality assessment is discussed in **Table 8** below for each of the data quality parameters. No data gaps were allowed which were expected to significantly affect the outcome of the impact indicator or LCI resource results.

Table 8. *Data quality assessment of the AQU™ product system.*

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data is collected	The most recent available data are used, based on other considerations such as data quality and similarity to the actual operations. Typically, these data are less than 10 years old (typically 2015 or more recent). All of the data used represented an average of at least one year's worth of data collection. Manufacturer-supplied data (primary data) are based on annual production for 2022.
Geographical Coverage: Geographical area from which data for unit processes is collected to satisfy the goal of the study	The data used in the analysis provide the best possible representation available with current data. Actual processes for upstream operations are primarily US and global. Surrogate data used in the assessment are representative of a mixture of US and global production, when available, and European production when more representative regional data is not available.
Technology Coverage: Specific technology or technology mix	For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations.
Precision: Measure of the variability of the data values for each data expressed	Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one or more years and over multiple operations, which is expected to reduce the variability of results.
Completeness: Percentage of flow that is measured or estimated	The LCA model included all known mass and energy flows for production of the AQU™ product, except for the production of tertiary product packaging (an HDPE pallet) which is justified based on the cut-off criteria (Section 3.5). In some instances, surrogate data used to represent upstream and downstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest	Data used in the assessment represent typical or average processes as currently reported from multiple data sources and are therefore generally representative of the range of actual processes and technologies for production of these materials. Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction.
Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis	The consistency of the assessment is considered to be high. The LCIA values from the aramid fiber (which comprise 75% by mass of the AQU™ product) were provided directly by the supplier. However, these supplier provided results are based on a critically reviewed LCA and are thought to be of high quality. All secondary inventory data are from the Ecoinvent v3.9.1 database and are of similar quality and age.
Reproducibility: Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study	Because proprietary data provided by EFT and Teijin was not included in this LCA, this assessment would not be reproducible by other practitioners. Where NDA requirements do not prohibit it, all assumptions, models, and data sources are documented.
Sources of the Data: Description of all primary and secondary data sources	Data on the material composition, transport, energy, water, and packaging use, as well as waste generate at EFT's manufacturing facility represent an annual average and are considered of high quality due to the length of time over which these data are collected (one year), as compared to a snapshot that may not accurately reflect fluctuations in production. This data was provided by EFT. Teijin, the producer and supplier of the aramid fiber, provided the LCIA results for the production of this fiber. The Ecoinvent v3.9.1 database is used for secondary LCI datasets.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the AQU™ product is low. Primary data for the production of the aramid fiber was provided by the supplier (Teijin). Other upstream operations were modeled using background data and the study relied upon the use of existing representative datasets. These datasets contained relatively recent data (<10 years) and were generally geographically representative. Uncertainty related to the impact assessment methods used in the study are high. The impact assessment method required by the PCR includes impact potentials, which lack characterization of providing and receiving environments or tipping points.

4.4 ALLOCATION

This study follows the allocation guidelines of ISO 14044 and allocation rules specified in the PCR and minimized the use of allocation wherever possible.

The transportation from primary producer of material components (e.g., the raw materials required for manufacturing) to the manufacturing facility is based on primary data provided by EFT, including the mode, location, and amount of material transported from each supplier. Transportation was allocated based on the mass and distance the material was transported.

4.5 CUT-OFF RULES

The cut-off criteria for including or excluding materials, energy, and emissions data from the study are in accordance with the PCR and are listed below.

- All inputs and outputs to a unit process are included in the LCA calculation for which data are available. Any data gaps are filled with representative data. Assumptions used for filling data gaps are documented in the LCA report.
- Where there is a data gap or insufficient data, criteria for exclusion of inputs and outputs is 1% of primary energy usage (renewable and non-renewable energy) and 1% on a mass basis for the specific unit process. The maximum criteria for exclusion of inputs and outputs is 5% of primary energy usage and mass across all modules included in the LCA.
- If a flow meets the above criteria for exclusion but is considered to have a significant potential environmental impact, it is included.
- Excluded processes include: the production of the HDPE pallet used as tertiary packaging for the AQU™ product and processing of waste relegated to recycling or recovery; note that recycling and recovery of all waste is outside of the system boundary. [1].

4.6 SUMMARY OF ASSUMPTIONS

The assessment relied on several assumptions, described below.

- LCIA results provided by Teijin for the production of their aramid fiber in 2021 was assumed to be representative of 2022 aramid fiber production;
- Hazardous waste generated by EFT's Rockford facility was assumed to be incinerated; and
- The transport distance of all waste from the point of generation to a treatment facility is based on the EPA WARM model assumption of 20 miles (~32 km).

4.7 PERIOD UNDER REVIEW

The period of review was 12 months from May 1st, 2022 – April 30th, 2023.

4.8 COMPARABILITY

The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.

5. LCA Results

In accordance with the PCR, the required impact categories—global warming potential (GWP), acidification potential (AP), eutrophication potential (EP), ozone depletion potential (ODP), and smog potential (POCP)—are reported. One additional impact category, fossil fuel depletion (FF), is also reported. As required by the PCR [1], the impact methods for North America, TRACI 2.1, are used.

It should be noted that LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. In addition, comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project, before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted.

It should also be noted that Teijin purchases renewable energy certificates (RECs) for its facility, which were included by the Teijin LCA practitioner in the aramid model to reduce the impact from their use of electricity in the production process. This model was used to produce the LCIA results provided to SCS.

Any comparison of EPDs shall be subject to the requirements of ISO 21930:2017 [1]. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparison can be inaccurate and could lead to erroneous selection of materials or products which are higher impact, at least in some impact categories.

The PCR requires the calculation of biogenic carbon emissions and removals. While the product packaging includes a small mass of corrugated boxes which contain biogenic carbon the disposal and treatment of this packaging is not considered within this cradle-to-gate LCA, and since the forest which supplied the wood has not been verified to be sustainably managed, the biogenic carbon content of the packaging is not assessed within this LCA.

5.1 CRADLE-TO-GATE IMPACT

The cradle-to-gate impact for each LCIA category is reported in **Table 9** below. **Figure 2** shows the percent contribution of each life cycle module to the total cradle-to-gate impact.

Table 9. *The cradle-to-gate impact of the AQU™ product, reported by life cycle module for all impact categories. The second row of each impact category shows the percent contribution of each life cycle module to the total cradle-to-gate impact. Impact is reported for one metric ton of AQU™ product.*

Impact Category (units)	Total (A1-A3)	A1	A2	A3
GWP (kg CO_2 eq)	7,820	6,400	71.9	1,350
	100%	82%	1%	17%
AP (kg SO_2 eq)	15.0	11.5	1.58	1.93
	100%	77%	11%	13%
EP (kg N eq)	4.36	2.84	8.44×10^{-2}	1.44
	100%	65%	2%	33%
ODP (kg CFC-11 eq)	4.67×10^{-3}	4.52×10^{-3}	1.27×10^{-6}	1.43×10^{-4}
	100%	97%	0%	3%
POCP (kg O_3 eq)	285	224	29.8	31.4
	100%	79%	10%	11%
FF (MJ surplus)	19,300	16,300	134	2,870
	100%	84%	1%	15%

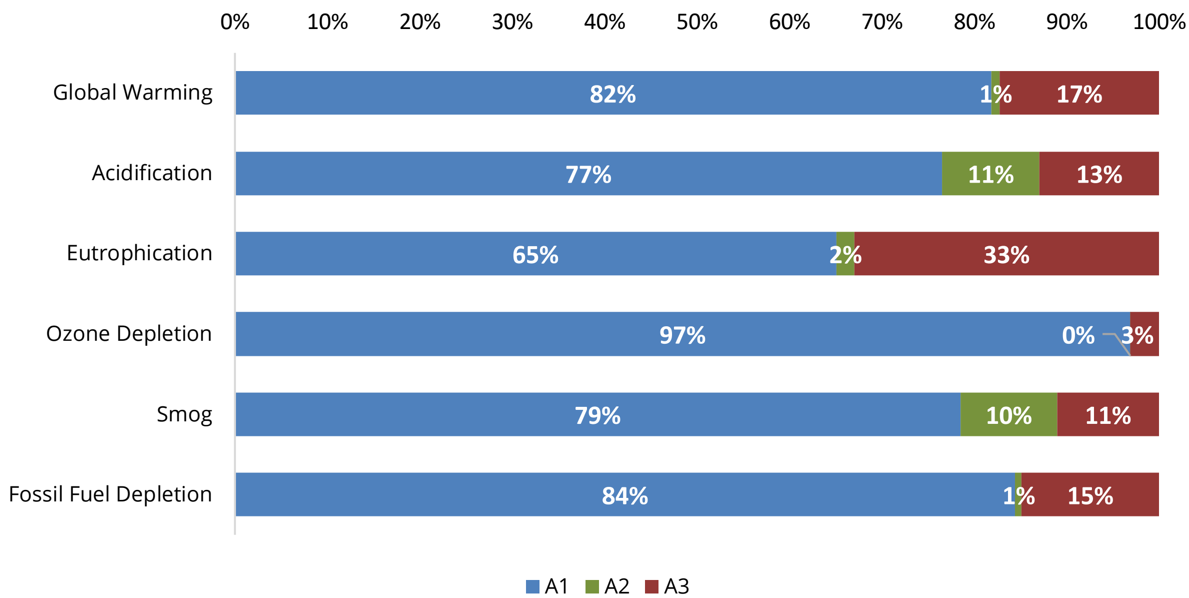

Figure 2. *The contribution of each life cycle module to the total cradle to gate impact for each impact category.*

6. LCI Results

The following life cycle inventory (LCI) parameters specified by the PCR, shown in **Table 10**, are reported in **Table 11,** below.

Table 10. *The full name, abbreviation, and unit of additional LCI indicators required by the PCR.*

Resources	Unit	Waste and Outflows	Unit
RPR_E: Renewable primary resources used as energy carrier (fuel)	MJ, LHV	**HWD:** Hazardous waste disposed	kg
RPR_M: Renewable primary resources with energy content used as material	MJ, LHV	**NHWD:** Non-hazardous waste disposed	kg
$NRPR_E$: Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	**HLRW:** High-level radioactive waste, conditioned, to final repository	kg
$NRPR_M$: Non-renewable primary resources with energy content used as material	MJ, LHV	**ILLRW:** Intermediate- and low-level radioactive waste, conditioned, to final repository	kg
SM: Secondary materials	MJ, LHV	**CRU:** Components for re-use	kg
RSF: Renewable secondary fuels	MJ, LHV	**MR:** Materials for recycling	kg
NRSF: Non-renewable secondary fuels	MJ, LHV	**MER:** Materials for energy recovery	kg
RE: Recovered energy	MJ, LHV	**RE:** Recovered energy exported from the product system	MJ, LHV
FW: Use of net freshwater resources	m^3	-	-

Table 11. *The cradle-to-gate inventory values of each inventory indicator category reported for one metric ton of AQU™ product. The second row of each inventory category shows the percent contribution of each life cycle module to the total cradle-to-gate result.*

Impact Category (units)	Total (A1-A3)	A1	A2	A3
RPRe (MJ, LHV)	44,800	44,600	7.91	1,230
	100%	99.7%	0.0%	0.3%
RPRm (MJ, LHV)	1,360	0.00	0.00	1,360
	100%	0.0%	0.0%	100.0%
NRPRe (MJ, LHV)	140,000	118,000	914	21,100
	100%	84%	1%	15%
NRPRm (MJ, LHV)	1,200	759	0.00	440
	100%	63.3%	0.0%	36.7%
SM (kg)	0.00	0.00	0.00	0.00
	-	-	-	-
RSF (MJ, LHV)	0.00	0.00	0.00	0.00
	-	-	-	-
NRSF (MJ, LHV)	0.00	0.00	0.00	0.00
	-	-	-	-
RE (MJ, LHV)	0.00	0.00	0.00	0.00
	-	-	-	-
FW (m^3)	535	102	0.273	433
	100%	19.1%	0.1%	80.9%
HWD (kg)	3.53	0.00	0.00	3.53
	100%	0.0%	0.0%	100.0%
NWHD (kg)	85.8	85.8	0.00	0.00
	100%	100.0%	0.0%	0.0%
HLRW (kg)	6.92×10^{-3}	7.47×10^{-7}	3.74×10^{-5}	6.88×10^{-3}
	100%	0.0%	0.5%	99.4%
ILLRW (kg)	2.75×10^{-2}	2.25×10^{-6}	9.94×10^{-5}	2.74×10^{-2}
	100%	0.0%	0.4%	99.6%
CRU (kg)	0.00	0.00	0.00	0.00
	-	-	-	-
MFR (kg)	11.8	0.00	0.00	11.8
	100%	0.0%	0.0%	100.0%
MER (MJ, LHV)	0.00	0.00	0.00	0.00
	-	-	-	-

7. References

1. ISO 21930: 2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services.

2. openLCA 1.11. GreenDelta, 2021. https://www.openlca.org/openlca/

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

4. US EPA, 2023. Emissions & Generation Resource Integrated Database (eGRID). https://www.epa.gov/egrid

5. US EPA, 2004. "WARM Model Transportation Research - Draft." Memorandum from ICF Consulting to United States Environmental Protection Agency.http://epa.gov/epawaste/conserve/tools/warm/SWMGHGreport.html#background

6. ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.

7. ISO 14040: 2006/Amd 1:2020 Environmental Management – Life cycle assessment – Principles and Framework

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