Declaration Owner

Wilsonart

2501 Wilsonart Drive P.O. Box 6110, Temple, TX 76503-6110

Smartline@wilsonart.com | 800-433-3222 | www.wilsonart.com

Product

High Pressure Laminate

Declared Unit

One square meter of product

EPD Number and Period of Validity

SCS-EPD-08043

EPD Valid: July 8, 2022 through July 7, 2027

Version: August 14, 2024

Product Category Rule

Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report. Version 2.0, 2021.

Part B: Requirements on the EPD for Laminates. Version 1.1, 2018.

Program Operator

SCS Global Services

2000 Powell Street, Ste. 600, Emeryville, CA 94608

+1.510.452.8000 | www.SCSglobalServices.com

Declaration owner:	Wilsonart
Address:	29 Concord St. North Reading, MA 01864
Declaration Number:	SCS-EPD-08043
Declaration Validity Period:	EPD Valid July 8, 2022 through July 7, 2027
Version:	August 14, 2024
Program Operator:	SCS Global Services
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
LCA Practitioner:	Sid Premchandani
LCA Software and LCI database:	GaBi 2022.1
Product's Intended Application:	Residential and commercial buildings
Markets of Applicability:	North America
EPD Type:	Product-Specific
EPD Scope:	Cradle-to-Gate w/ Options
LCIA Method and Version:	15804
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	☐ internal ☒ external
LCA Reviewer:	U. U. Talaty Urvi Talaty, SCS Global Services
Product Category Rule:	Part A: Life Cycle Assessment Calculation Rules and Report Requirements, Standard 10010, Version 2.0, 2017 Institute Bauen und Umwelt e V. www.bau-umwelt.com, 2017 Part B: Requirements of the EPD for Laminates, 12.2018
PCR Review conducted by:	
Independent verification of the declaration and data, according to ISO 14025 and the PCR	☐ internal ☒ external
EPD Verifier:	U. U. Talaty Urvi Talaty, SCS Global Services
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Disclaimers: *This EPD conforms to ISO 14025, 14040, 14044, and EN 15804+A2.*

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.*

1. About Wilsonart

Wilsonart is a world-leading engineered surfaces company headquartered in Austin, Texas, with operations in the Americas and Europe. We manufacture and distribute High Pressure Laminate (HPL) and Compact High Pressure Laminate (CHPL). Coordinated TFL and Edgebanding, Quartz, Solid Surface, Epoxy, and other decorative engineered surfaces that are used in a variety of applications, including furniture, countertops, worktops, and walls.

We honor the unwavering commitment of our founder, Ralph Wilson, to provide customers with industry-leading products and service. Wilsonart has a rich 65-year history serving customers with high quality products. We continue on our journey of growth with expanding our product and application offering with a keen eye on a sustainable future.

2. Product

2.1 Product Description

Recommended Uses
Wilsonart® Laminate, types 107, 335, and 350, is suitable for use on fine quality residential and commercial furniture, fixtures, and casework, and for architectural application on columns, wainscoting, valances, cornices, interior doors and divider systems.

General Purposes
(HGS) Type 107 is most frequently used for work surfaces on counters, islands, vanities, desks, and tables. Typical vertical uses include surfacing for wall panels, teller cages and the front panels of workstations, such as those in hospitals, airports, and restaurants. Type 107 is produced for both horizontal and vertical interior applications where the surface must be functional, durable, and decorative.

Vertical Surface (VGP) Type 335 is the usual choice to surface cabinet walls, doors, and drawer panels. It often appears on the vertical surfaces of desks, restaurants booths and maître d' stations, and as architectural cladding. Type 335 is intended for vertical applications where a functional, durable, decorative surface must absorb somewhat less impact than a comparable horizontal surface. VGP surfaces may be postformed to achieve radius edges.

Postforming (HGP) Type 350 adds the decorative capability of a soft edge to any typical laminate use. Common applications of postforming laminates are formed edges for counters, desktops, cabinet doors and drawer panels. Type 350 is intended for use on vertical and horizontal interior surfaces where it is necessary or desirable to roll the laminate on a simple radius over the edge of the substrate. This eliminates seams and leaves an attractive surface.

Wilsonart® HD® finishes feature Antimicrobial Protection that helps inhibit the growth of stain and odor causing bacteria, mold, and mildew on your countertop or surface. Wilsonart's Antimicrobial Protection won't wash away or wear off. Premium and Standard finishes are available with Antimicrobial Protection upon request during the ordering process.

Product Composition
Decorative surface papers impregnated with melamine or phenolic resins are pressed over Kraft paper core sheets. These sheets are then bonded at pressures greater than 1000 pounds per square inch at temperatures approaching 300°F (149°C). Finished sheets are trimmed, and the backs are sanded to facilitate bonding.

Basic Limitations
Wilsonart® Laminate is for interior use only and is not recommended for direct application to plaster, concrete walls, or gypsum wallboard. It is not structural material and must be bonded to a suitable substrate.

2.2 Application

This EPD covers all types of HPL products manufactured by Wilsonart at their facilities situated in Temple, TX and Fletcher, NC. The products are intended for use in residential and commercial buildings. This declaration covers the following Wilsonart® products:

- Wilsonart® HD® & Premium HPL

- Traceless™
- SOLICOR™ Laminate
- Markerboard
- High Wear Laminate
- Fired-Rated Laminate
- Chemsurf® Laminate

2.3 Technical Data

Typical Fire Test Data
High-pressure laminates are subject to flame spread and smoke developed standards in structures where codes establish such conditions.

Test data to determine compliance with these codes were obtained by the Steiner Tunnel Test method of the American Society for Testing Materials (ASTM-E-84, Standard Test Method for Surface Burning Characteristics of Building Materials). Tests were conducted in accordance with test method and mounting procedure as described in paragraph X1.7.2 of the test method. This procedure is cataloged by Underwriters Laboratories, Inc. as UL 723. Here is typical data for Wilsonart® Laminates, averaged from two specific tests:

Model Code Designations used to determine flame spread classification

- Flame Spread Classification (max. rating)
- International (IBC) Life Safety
- (NFPA 101): 25 A A, 75 B B ,200 C C

All Model Codes regulate the generation of smoke by interior finish material. In all cases they specify a maximum smoke development rating of 450.

General Standards
Wilsonart® Laminates, types 107, 335 and 350, conform to the voluntary standards of the American National Standards Institute, for thickness, performance properties and appearance. Wilsonart® Laminates 107,335 and 350 meet or exceed the International Standards Organization specifications as found in ISO 4586, titled "High-Pressure Decorative Laminate (HPDL) – Sheets Based on Thermosetting Resins – Part I: specifications." Wilsonart follows all applicable environmental laws wherever we do business. Wilsonart manufacturing facilities are certified and follows the ISO 45000 Health and Safety standards and the ISO 14000 Environmental Management standards.

- USGBC – LEED v4 & v4.1
- UL Greenguard Gold
- SCS Indoor Advantage Gold
- SCS Recycled content

Specific Product Standards
U.S. Federal Specification L-P 508H, April 9, 1977, "Plastic Sheets, Laminated, Decorative and Non-decorative." Spells out criteria for decorative laminates for federal installations. Wilsonart 107, 335 and 350 laminates comply.

- NSF International (NSF) #35 "Laminated Plastic for Surfacing for Food Service Equipment." All solid colors and printed patterns in Basic Types 107, 335 and 350, comply.
- U.S. Federal Register, August 9, 1984, Housing and Urban Development Mobile Home Construction and Safety Standard:
- (24CFR) 3280.203. General Purpose Type 107 and Vertical Surface Type 335 comply.

- U.S. Federal Test Method, Federal Aviation Regulation, DOT, Part 25.853, Airworthiness Standards:
- Transport Category Airplane (Interior Finish). Vertical Surface Type 335 and Postforming Type 350 comply with parts A and C.
- U.S. Federal Motor Vehicle Safety Standard (FMVSS) 302, "Flammability of Interior Materials." Basic Types 107, 335 and 350 comply.
- U.S. Military Standard MIL-P-17171E (SHIPS)/Plastic Laminate. General Purpose Type 107 complies.
- Branded Cleaner and Sanitizer Resistance for Wilsonart® Laminate per ISO 4586-2 Method 31 (B):
- Resistance of Furniture to UV Lights for Wilsonart® Laminate per BIFMA HCF 8.1-201X Section 9 (Alternate Method per ASTM G155 using ISO 4586-2.33 conditions).
- Wilsonart® Laminates 107,335,350 and 376 conforms to BIFMA – Healthcare Furniture Design
- Guidelines for Cleanability, Section 9 Resistance to Furniture to UV Lights. Wilsonart® Laminates 107, 335, 350 and 376 meet or exceed the acceptance level for surface evaluation.

Below is the link to the Technical Data sheet for the HPL that supports the above claims.
https://www.wilsonart.com/media/Technical_Resources/en/basiclaminatetechdata.pdf

2.4 Delivery Status

The study considered the environmental impacts of HPL and CHPL products. The declared unit for this analysis is one square meter ($1m^2$) of HPL.

2.5 Base Materials

Table 1 presents the primary materials included in the modeling. As per Section 2.5 of the Addendum for Adapting the IBU PCR Part B for use in North America. the product does not contain any hazardous or toxic materials that are required to be disclosed by OSHA, EPA, RCRA, OEHHA, Stockholm convention, NPRI and SEMARNAT.

As per sections 7.1, 7.2, 7.5, and 7.6 of the Addendum for Adapting the IBU PCR Part B for use in North America, methods used to measure the levels of formaldehyde, phenol, melamine, and formaldehyde emissions need to be indicated. Following are the test methods that were used to determine their levels.

- Formaldehyde: As per the Occupational Safety and Health Administration (OSHA) Method 1007, the levels of formaldehyde were found to be below the TWA limit of 0.75 ppm, and below the STEL limit of 2 ppm.
- Melamine: As per the Occupational Safety and Health Administration (OSHA) Method 32, the levels of formaldehyde were found to be below the permissible levels.
- Phenol: As per the Occupational Safety and Health Administration (OSHA) Method 32, the levels of phenol were found to be below the TWA limit of 5 ppm, and below the STEL limit of 15.6 ppm.
- Formaldehyde Emissions: The laminates analysed in this study have achieved a GREENGUARD Gold certification and have been tested as per the California Department of Public Health (CDPH) Standard Method V1.2-2017. The levels of formaldehyde emissions were found to be below the Maximum Allowable Predicted Concentration of 7.3 ppb.

For any questions related to the above methods and tests, please contact Wilsonart at https://www.wilsonart.com.

Table 1. *Material content for the HPL, per square meter and as a percent of total mass.*

Material	(kg/m^2)	Percent
Total Product	**8.97E+07**	**100%**
Phenolic resin	2.01E+07	22.434%
Kraft paper	4.62E+07	51.531%
Core paper	4.43E+04	0.048%
Deco paper	9.67E+06	10.765%
Melamine resin	1.33E+07	14.780%
Additives	4.00E+05	0.44%
Total Packaging	**6.00E-02**	**100%**
Tape	1.64E-04	0.27%
Lumber	6.04E-03	10.066%
Pallets	4.52E-02	75.320%
Cardboard	3.74E-03	6.231%
Plastic Roll	1.03E-06	0.002%
Corner protectors	1.71E-04	0.285%
Refrigerant	3.13E-07	0.001%
Slip sheet	1.80E-04	0.300%
Plate Protectors	4.46E-03	7.435%

2.6 Manufacture

The manufacturing process involves resin treating and drying, collation and assembly, pressing, sanding (only in HPL), and cutting to size:

Resin Treating and Drying: Two resins are used in the production of the Wilsonart's high pressure laminate: phenol-formaldehyde and melamine-formaldehyde resins for treating of the core papers and for treatment of the overlay and decorative papers. During the treating and drying step, papers are mechanically fed through a resin bath and then heated in an oven to cure the resin.

Resin: The phenolic and melamine resins contain around 60%-64.5% solids that is purchased by Wilsonart and then combined with dyes and additives on-site.

Collation and Assembly: During collation (of the core sheets) and assembly (of the decorative and overlay sheets) sheets of treated and untreated paper are stacked both manually and mechanically. This step is in preparation of the pressing stage.

Pressing: During pressing, the collated core and assembled decorative/overlay sheets are brought together to be pressed into the laminate product using stainless steel plates and high temperature and pressure. The output of the pressing process is the laminate product. Untreated kraft paper is used as a protective layer and a thermal barrier between the textured metal plates and the heated press platens.

Sanding: During the sanding process, sanding belts are used to remove the release resin on the outside face of the laminate. Small quantities of solvents and inks are applied to the laminate product.

Cut-to-size: Some of the countertop products are cut before shipment, but many products are shipped in their standard size to the fabricator.

2.7 Environment and Health during Manufacture

Wilsonart follows ISO standards' specific requirements for environmental, occupational health and safety, and quality management systems. Wilsonart uses these standards to enhance environmental performance, provide safe and healthy workplaces, enhance customer satisfaction and more. Wilsonart has the following:

- ISO 9001 – Quality Management System Certification
- ISO 14001 – Environnemental Management System Certificate
- Iso 45001 – Occupational Health and Safety Management System

2.8 Product Processing/Installation

An average distribution distance of 100 miles is assumed for both HPL and CHPL. However, the impacts associated with installation are considered to be outside of the system boundary of this "cradle-to-gate w/ options" LCA study.

2.9 Packaging

The product is packaged onsite before distribution. Packaging includes protective cardboard, skids, slip sheets, wooden shipping pallets, and plastic film.

2.10 Condition of Use

No special conditions of use are noted.

2.11 Environment and Health during use

No environmental or health impacts are expected due to normal use of the product

2.12 Reference Service Life

The Reference Service Life (RSL) of the wallcovering is 20-50 years, based on the manufacturers' warranty.

2.13 Extraordinary Effects

No environmental or health impacts are expected due to extraordinary effects including fire and/or water damage and product destruction.

2.14 Re-Use Phase

The products are not typically reused or recycled at end-of-life. Energy recovery at end-of-life is possible through waste incineration.

2.15 Disposal

At end-of-life, the product may be disposed of in a landfill or via incineration.

2.16 Further Information

Further information on the product can be found on the manufacturers' website at www.wilsonart.com.

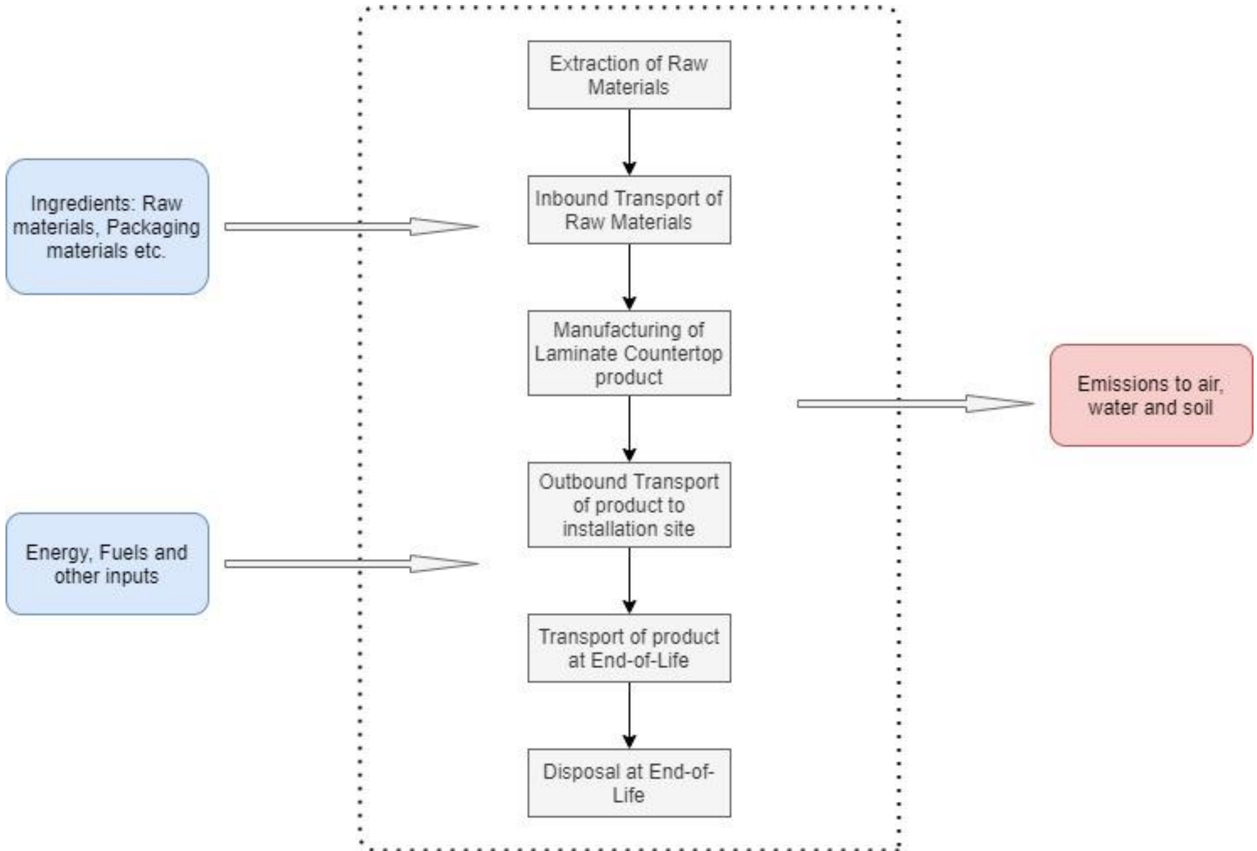
3. LCA: Calculation Rules

3.1 Declared Unit

The declared unit used in the study, as specified in the PCR, is 1 m^2 of laminate product. The reference flow for the product system is 1.07 kg/m^2.

3.2 System Boundary

The scope of the EPD is cradle-to-gate with options, including raw material extraction and processing, transportation, product manufacture, product delivery, installation, and product disposal. The life cycle phases included in the product system boundary are shown below.



3.3 Estimates and Assumptions

Proxy data were used where exact datasets were not found:

Table 2. *Dataset and data provide information*

Location	Dataset	Data Provider	Reference Year	
US	Phenolic resin (45% concentration)	Sphera	2020	Tech
EU-28	Kraft paper (EN15804 A1-A3)	Sphera	2020	Geo
US	Lactic acid (fermentative)	Sphera	2020	Tech
GLO	Thickening agent (polysaccharides derivate)	Sphera	2020	Geo/Tech
EU-28	Corrugated board excl. paper production (2018), open paper input, average composition	Sphera	2020	Geo
EU-28	Kraftliner (2018) - for use in cut-off EoL scenario cases	Sphera	2020	Geo
EU-28	Aluminium oxide mix (alumina, Al2O3)	Sphera	2020	Geo
DE	Melamine Resin (MF)	Sphera	2020	Geo
EU-28	Stainless steel sheet part	Sphera	2020	Geo
EU-28	Tetrafluoroethane (R134a) (estimate)	Sphera	2020	Geo
DE	Defoamer	Sphera	2020	Geo
DE	Precipitated silica (approximation)	Sphera	2020	Geo
US	Ethanol (96%) (hydrogenation with nitric acid)	Sphera	2020	Tech
GLO	Carbon fiber thermoplastic tape PP (oil heated)	Fraunhofer IGCV	2020	Geo

It should also be noted that life cycle impact assessment (LCIA) results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

The PCR allows for the results for several inventory flows related to construction products to be reported as "other parameters". These are aggregated inventory flows, and do not characterize any potential impact; results should be interpreted considering this limitation.

3.4 Cut-off criteria

No cut-off criteria are defined for this study. This is consistent with the PCR which requires processes contributing greater than 1% of the total environmental impact indicator for each impact to be included in the inventory. No data gaps were allowed which were expected to significantly affect the outcome of the indicator results.

3.5 Background Data

Primary data were provided by Willsonart for the Temple, TX and Fletcher, NC. The sources of secondary life cycle inventory (LCI) data are from the version GaBi 2021.2

Table 3. *Data sources for the HPL product system.*

Location	Dataset	Data Provider	Reference Year
PRODUCT			
US	Petroleum coke at refinery	Sphera	2017
US	Naphtha at refinery	Sphera	2017
US	Phenolic resin (45% concentration)	Sphera	2020
EU-28	Kraft paper (EN15804 A1-A3)	Sphera	2020
US	Polyethylene film (PE-LD) (Oxi)	Sphera	2020
US	Glass fibres	Sphera	2020
US	Toluene (from pyrolysis gasoline)	Sphera	2020
US	Lactic acid (fermentative)	Sphera	2020
US	Nylon (PA 6.6) - yarn	Sphera	2020
US	Titanium dioxide pigment (chloride process)	Sphera	2020
GLO	Thickening agent (polysaccharides derivate)	Sphera	2020
US	Acetone (from cumene)	Sphera	2020
EU-28	Corrugated board excl. paper production (2018), open paper input, average composition	Sphera	2020
US	Butane at refinery	Sphera	2017
EU-28	Kraftliner (2018) - for use in cut-off EoL scenario cases	Sphera	2020
EU-28	Aluminium oxide mix (alumina, Al_2O_3)	Sphera	2020
US	Carbon fiber (CF; PAN-based; HT) - 06	Fraunhofer IGCV	2019
DE	Melamine Resin (MF)	Sphera	2020
EU-28	Stainless steel sheet part	Sphera	2020
US	Phenol (from cumene)	Sphera	2020
US	Formaldehyde (HCHO; 100%)	Sphera	2020
US	Polyethylene glycol (PEG)	Sphera	2020
US	Polypropylene Film (PP) without additives	Sphera	2020
EU-28	Tetrafluoroethane (R134a) (estimate)	Sphera	2020
US	Cellulose	Sphera	2020
DE	Defoamer	Sphera	2020
US	Sawmill lumber softwood	Sphera	2020
US	Vat Dye	Sphera	2020
US	Wax / Paraffins at refinery	Sphera	2017

Location	Dataset	Data Provider	Reference Year
DE	Precipitated silica (approximation)	Sphera	2020
US	Ethanol (96%) (hydrogenation with nitric acid)	Sphera	2020
GLO	Carbon fiber thermoplastic tape PP (oil heated)	Fraunhofer IGCV	2020
US	Plastic waste on landfill	Sphera	2020
ENERGY			
US	Electricity grid mix – ERCT (direct)	Sphera	2018
US	Electricity grid mix – SRVC	Sphera	2018
US	Electricity grid mix (eGRID)	Sphera	2018
US	Electricity from solar thermal	Sphera	2017
US	Natural gas mix	Sphera	2017
US	Diesel mix at refinery	Sphera	2017
US	Diesel mix at filling station	Sphera	2017
US	Gasoline (regular) at refinery	Sphera	2017
TRANSPORTATION			
GLO	Bulk commodity carrier, average, ocean going	Sphera	2020
GLO	Rail transport cargo - Diesel, average train, gross tonne weight 1,000t / 726t payload capacity	Sphera	2020
US	Truck - TL/dry van (EPA SmartWay)	Sphera	2020

3.6 Data Quality

The data quality assessment addressed the following parameters: time-related coverage, geographical coverage, technological coverage, precision, completeness, representativeness, consistency, reproducibility, sources of data, and uncertainty.

Table 4. *Data quality assessment for the HPL 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	All primary data used in the model represent an average of the year 2020 operations in order to account for seasonal variations. The representative background data (mainly raw materials, energies, fuels, and construction and ancillary materials) were obtained from the GaBi database and literature, based on data availability. The results of the study are relevant for 2020, the year in which the study is conducted, and are expected to be relevant until such time as there is a significant change in the production mix, energy mix or production technologies required for Wilsonart's HPL manufacturing.
Geographical Coverage: Geographical area from which data for unit processes is collected to satisfy the goal of the study	This LCA study covers the products manufactured and sold by Wilsonart in North America. Data on material inputs, inbound and outbound transport, energy, water, waste etc. were collected from manufacturing facilities located at Temple, TX and Fletcher, NC
Technology Coverage: Specific technology or technology mix	This study assesses the potential environmental impacts of Wilsonart's HPL production from cradle-to-gate with option. Manufacturing data was gathered from two different locations that manufacture the two HPL products being analyzed in this study to ensure that the model is both geographically and technologically representative for each stage of the production process involved. US aggregated datasets of raw materials were used in this study for majority of the materials. In absence of US datasets, EU and DE datasets were used as proxies to fill the data gaps. Ancillary and process material data, such as the production of chemicals, fuels, energy, and power, were adopted as average industry mixes from the GaBi 2021 database release (http://www.gabi-software.com)
Precision:	As the majority of the relevant foreground data are measured data or calculated based on primary information sources of the owner of the technology, precision is considered to be high.

Data Quality Parameter	Data Quality Discussion
Measure of the variability of the data values for each data expressed	Seasonal were balanced out by using weighted averages. All background data are sourced from GaBi databases with the documented precision.
Completeness: Percentage of flow that is measured or estimated	Each foreground process was checked for mass balance and completeness of the emission inventory. No data were knowingly omitted. Completeness of foreground unit process data is considered to be high. All background data are sourced from GaBi databases with the documented completeness.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest	**Temporal:** All primary data were collected for the year 2020. All secondary data come from the GaBi 2020 databases and are representative of the years 2011-2020. As the study intended to compare the product systems for the reference year 2020, temporal representativeness is considered to be high. **Geographical:** All primary and secondary data were collected specific to the countries or regions under study. Where country-specific or region-specific data were unavailable, proxy data were used. Geographical representativeness is considered to be high. **Technological:** All primary and secondary data were modeled to be specific to the technologies or technology mixes under study. Where technology-specific data were unavailable, proxy data were used. Technological representativeness is considered to be high
Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis	To ensure data consistency, all primary data were collected with the same level of detail, while all background data were sourced from the GaBi databases.
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	Reproducibility is supported as much as possible through the disclosure of input-output data, dataset choices, and modeling approaches in this report. Based on this information, any third party should be able to approximate the results of this study using the same data and modeling approaches.
Sources of the Data: Description of all primary and secondary data sources	All primary data were collected using customized data collection templates, which were sent out by email to the respective data providers in the participating companies. Upon receipt, each questionnaire was cross-checked for completeness and plausibility using mass balance, stoichiometry, as well as internal and external benchmarking. If gaps, outliers, or other inconsistencies occurred, Sphera engaged with the data provider to resolve any open issues.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	The use of proxies constitutes to limitations to technological/geographical representativeness. Proxy data were used only for ancillary materials, which contribute minimally to potential environmental impacts. This study is based on a European PCR and may not be fully representative of results based on a North American PCR. The IBU European PCR was chosen because it was more representative of the product under review. The IBU PCR covers laminates while ULE PCR covers all countertops- HPL and CHPL are laminates only and are not considered to be full countertops.

3.7 Period under review

The period of review is calendar year 2020.

3.8 Allocation

Manufacturing resource use was allocated to the products based on mass. Impacts from transportation were allocated based on the mass of material and distance transported.

3.9 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.

4. LCA: Scenarios and additional Technical Information

Delivery and Installation stage (A4 - A5)

Distribution of the product to the point of installation assumed a transport distance of 99.4 miles (160 km) by diesel driven truck. It is assumed that packaging materials are disposed during the installation stage and are transported over a distance of 99.4 miles (160 km) by diesel driven truck. Transportation parameters for modeling are summarized in Table 5.

Table 5. *Transport parameters, per m^2 (A4)*

Parameter	Value	Unit
Transport distance (truck)	99.4	Mile
Transport distance (ship)	N/A	km
Gross mass of products transported	1.07	kg

The parameters associated with installation are shown in Table 6. Disposal rates for packaging are based on the US EPA's Advancing Sustainable Materials Management: 2018 Fact Sheet: Assessing Trends in Materials Generation and Management in the United States (US EPA, 2020) and are listed in the Table 7 below**.**

Table 6. *Parameters for Installation into the building (A5).*

Parameter	Value	Unit
Auxiliary materials	N/A	kg
Water consumption	N/A	kg
Other resources	N/A	m^3
Electricity consumption	N/A	kg
Other energy carriers	N/A	kWh
Material loss	N/A	kg
Output substances following waste treatment on site	N/A	kg
Dust in the air	N/A	kg

Table 7. *Disposal rates for packaging materials (A5)*

Material	Material Category	Recycling (%)	Incineration (%)	Landfilling (%)
Cardboard, corner protectors, plate protectors	Paper/paperboard	80.9%	3.7%	15.4%
Lumber, pallets	Wood	26.9%	14.3%	58.8%
Plastic roll, glass beads, slip sheet	Plastic	13.6%	16.9%	69.5%

Use stage (B1)

The scope of this study is cradle-to-gate with options and hence the impacts associated with use and maintenance are outside of the system boundary and are not included in the scope of this LCA.

Maintenance stage (B2)

The scope of this study is cradle-to-gate with options and hence the impacts associated with use and maintenance are outside of the system boundary and are not included in the scope of this LCA. The product is assumed to have a 10-year lifetime. Though it was speculated that the quantity of materials required for maintenance (predominantly water and piece of reusable dry-cloth) on a need-to-do basis were very minimal, these amounts could not be quantified into numbers, and hence the impacts of maintenance phase were excluded from this cradle-to-gate w/ options EPD.

Table 8. *Maintenance parameters (B2)*

Parameter	Value	Unit
Information on maintenance	N/A	-
Maintenance cycle	N/A	-
Water consumption	N/A	m^3
Auxiliary (mild detergent)	N/A	kg
Other resources	N/A	kg
Electricity consumption	N/A	kWh
Other energy carriers	N/A	MJ
Material Loss	N/A	kg

The declared values in module B2 can be multiplied with the RSL (in years) of the product considered.

Repair/Replacement/Refurbishment stage (B3 - B5)

Repair of the product requires only hand tools and causes no emissions or additional impacts. Product replacement and refurbishment are not relevant during the lifetime of the product.

Building operation stage (B6 – B7)

There is no operational energy or water use associated with the use of the product and the results for these stages are zero.

Disposal stage (C1 - C4)

The disposal stage includes demolition of the products (*C1*); transport of the wallcovering products to waste treatment facilities (*C2*); waste processing (*C3*); and associated emissions as the product degrades in a landfill or is burned in an incinerator (*C4*).

For the HPL product, no emissions are generated during demolition (*C1*) while no waste processing (*C3*) is required for landfill disposal. Transportation of waste materials at end-of-life (C2) is more conservative than the 20 miles assumed by the US EPA WARM model. The relevant recycling rates used for the product and product packaging are based on raw data provided by the client. For the materials not recycled, 100% go to landfill, based on calculations from data provided by client (C4).

5. LCA: Results

Impact category indicators are calculated using the EN15804+A2 characterization methods, including acidification potential, eutrophication potential, global warming potential, ozone depletion potential, and smog potential in accordance with the PCR. Biogenic carbon uptake and biomass CO_2 emissions are also included as per EN15804 requirements. Impacts reported in the tables below have been calculated as weighted averages of impacts associated with the product manufactured at Temple, TX and Fletcher, NC facilities with the production volume as the basis for averaging.

Table 9. *Life cycle phases included in the product system boundary.*

Product			Construction Process		Use							End-of-life				Benefits and loads beyond the system boundary
A1	A2	A3	A4	A5	B1	B1	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	x	x	MND	MND	MND	MND	MND	MND	MND	x	x	x	x	x

X = include in scope | MND = Module not declared

Table 10. *Environmental Impact results according to EN 15804+A2 for the HPL product. All values are rounded to two significant digits. Results are reported per the declared unit of 1 m².*
MND = Module not declared

Environmental Impact Category	Unit	Product Stage (A1-A3)	Transport to the building site (A4)	Construc-tion and Installatio n (A5)	Decon-struction (C1)	Transport to waste process-ing (C2)	Waste Process-ing (C3)	Disposal (C4)	Reuse, Recovery, Recycling Potential (D)
Global warming potential (GWP)	[kg CO2 eq.]	1.83E+00	1.23E-02	6.71E-02	0.00E+00	1.23E-02	0.00E+00	1.10E+00	2.74E-01
		93%	1%	3%	-	1%	-	36%	14%
GWP - total	[kg CO2 eq.]	1.99E+00	1.25E-02	8.26E-02	0.00E+00	1.25E-02	0.00E+00	1.11E+00	2.74E-01
		93%	1%	4%	-	1%	-	35%	13%
GWP - fossil	[kg CO2 eq.]	3.77E+00	1.25E-02	5.25E-03	0.00E+00	1.25E-02	0.00E+00	4.60E-02	0.00E+00
		98%	0%	0%	-	0%	-	1%	0%
GWP - biogenic	[kg CO2 eq.]	-1.78E+00	6.19E-07	7.74E-02	0.00E+00	6.19E-07	0.00E+00	1.06E+00	2.74E-01
		105%	0%	-5%	-	0%	-	-166%	-16%
GWP – land use and land use change	[kg CO2 eq.]	1.55E-03	9.13E-06	1.39E-06	0.00E+00	9.13E-06	0.00E+00	1.64E-05	0.00E+00
		98%	1%	0%	-	1%	-	1%	0%
Depletion potential of the stratospheric ozone layer	[kg CFC-11 eq.]	8.93E-10	1.18E-15	-1.97E-14	0.00E+00	1.18E-15	0.00E+00	7.15E-14	0.00E+00
		100%	0%	0%	-	0%	-	0%	0%
Acidification potential (AP) of land and water	[kg SO2 eq.]	7.89E-03	2.83E-05	1.15E-05	0.00E+00	2.83E-05	0.00E+00	1.80E-04	0.00E+00
		97%	0%	0%	-	0%	-	2%	0%
AP, accumulated exceedance	[Mole of H+ eq.]	1.03E-02	4.16E-05	1.60E-05	0.00E+00	4.16E-05	0.00E+00	2.28E-04	0.00E+00
		97%	0%	0%	-	0%	-	2%	0%

Environmental Impact Category	Unit	Product Stage (A1-A3)	Transport to the building site (A4)	Construc-tion and Installation (A5)	Decon-struction (C1)	Transport to waste process-ing (C2)	Waste Process-ing (C3)	Disposal (C4)	Reuse, Recovery, Recycling Potential (D)
Eutrophication Potential (EP)	[kg Phosphate eq.]	1.66E-03	7.58E-06	4.56E-05	0.00E+00	7.58E-06	0.00E+00	2.88E-04	0.00E+00
		83%	0%	2%	-	0%	-	14%	0%
EP - fraction of nutrients reaching freshwater end compartment	[kg P eq.]	4.50E-05	6.61E-08	1.17E-06	0.00E+00	6.61E-08	0.00E+00	4.01E-05	0.00E+00
		52%	0%	1%	-	0%	-	46%	0%
EP - fraction of nutrients reaching marine end compartment	[kg N eq.]	3.62E-03	2.04E-05	1.36E-05	0.00E+00	2.04E-05	0.00E+00	6.15E-05	0.00E+00
		97%	1%	0%	-	1%	-	2%	0%
EP - accumulated exceedance	[Mole of N eq.]	3.53E-02	2.26E-04	6.69E-05	0.00E+00	2.26E-04	0.00E+00	6.76E-04	0.00E+00
		97%	1%	0%	-	1%	-	2%	0%
Formation potential of tropospheric ozone photochemical oxidants (POCP)	[kg Ethene eq.]	1.20E-03	-4.59E-06	1.10E-05	0.00E+00	-4.59E-06	0.00E+00	1.66E-06	0.00E+00
		100%	0%	1%	-	0%	-	0%	0%
POCP	[kg NMVOC eq.]	1.14E-02	4.59E-05	3.23E-05	0.00E+00	4.59E-05	0.00E+00	1.69E-04	0.00E+00
		98%	0%	0%	-	0%	-	1%	0%
Abiotic depletion potential for non-fossil resources	[kg Sb eq.]	1.82E-06	4.18E-09	-1.37E-10	0.00E+00	4.18E-09	0.00E+00	1.22E-08	0.00E+00
		99%	0%	0%	-	0%	-	1%	0%
Abiotic depletion potential for fossil resources	[MJ]	7.89E+01	1.71E-01	1.77E-02	0.00E+00	1.71E-01	0.00E+00	6.67E-01	0.00E+00
		99%	0%	0%	-	0%	-	1%	0%
Water (user) deprivation potential, deprivation weighted water consumption	[m³ world equiv.]	4.19E-01	7.75E-04	1.76E-03	0.00E+00	7.75E-04	0.00E+00	2.78E-03	0.00E+00
		99%	0%	0%	-	0%	-	1%	0%

Table 11. *Environmental Impact results according to TRACI 2.1 and IPCC AR5 (Excluding biogenic carbon) for the HPL product. All values are rounded to two significant digits. Results are reported per the declared unit of 1 m^2.*

MND = Module not declared

Environmental Impact Category	Unit	Product Stage (A1-A3)	Transport to the building site (A4)	Construc-tion and Installation (A5)	Decon-struction (C1)	Transport to waste process-ing (C2)	Waste Process-ing (C3)	Disposal (C4)	Reuse, Recovery, Recycling Potential (D)
Global warming potential (IPCC 2013 AR5, GWP 100 years) (Fossil)	kg CO2 equiv.	3.81E+00	1.25E-02	4.92E-02	0.00E+00	1.25E-02	0.00E+00	4.58E-02	0.00E+00
		97%	0%	1%	-	0%	-	1%	-
Ozone Depletion Potential (stratospheric)	kg CFC 11 equiv.	1.18E-09	2.46E-17	-3.99E-16	0.00E+00	2.46E-17	0.00E+00	1.45E-15	0.00E+00
		100%	0%	0%	-	0%	-	0%	-
Acidification Potential (land and water)	kg SO2 equiv.	1.00E-02	3.86E-05	3.33E-05	0.00E+00	3.86E-05	0.00E+00	1.96E-04	0.00E+00
		97%	0%	0%	-	0%	-	2%	-
Eutrophication Potential (land and water)	kg N equiv.	1.54E-03	3.98E-06	1.54E-05	0.00E+00	3.98E-06	0.00E+00	2.85E-04	0.00E+00
		83%	0%	1%	-	0%	-	15%	-
Smog Formation Potential	kg O3 equiv.	2.07E-01	8.91E-04	3.73E-04	0.00E+00	8.91E-04	0.00E+00	3.45E-03	0.00E+00
		97%	0%	0%	-	0%	-	2%	-
Fossil Fuel Depletion	MJ surplus	1.00E+01	2.43E-02	4.67E-03	0.00E+00	2.43E-02	0.00E+00	8.70E-02	0.00E+00
		99%	0%	0%	-	0%	-	1%	-

Table 12. *Resource use results according to EN 15804+A2 for HPL product. All values are rounded to two significant digits. Results reported in MJ per the declared unit of 1 m² are calculated using higher heating values.*

Environmental Impact Category	Unit	Product Stage (A1-A3)	Transport to the building site (A4)	Construction and Installation (A5)	Deconstruction (C1)	Transport to waste processing (C2)	Waste Processing (C3)	Disposal (C4)	Reuse, Recovery, Recycling Potential (D)
Renewable primary energy as energy carrier	[MJ]	1.67E+01	7.13E-03	-1.27E-02	0.00E+00	7.13E-03	0.00E+00	6.45E-02	0.00E+00
		100%	0%	0%	-	0%	-	0%	0%
Renewable primary energy resources as material utilization	[MJ]	2.57E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		100%	-	-	-	-	-	-	-
Total use of renewable primary energy resources	[MJ]	4.24E+01	7.13E-03	-1.27E-02	0.00E+00	7.13E-03	0.00E+00	6.45E-02	0.00E+00
		100%	0%	0%	-	0%	-	0%	0%
Non-renewable primary energy as energy carrier	[MJ]	7.76E+01	1.83E-01	1.77E-02	0.00E+00	1.83E-01	0.00E+00	6.88E-01	0.00E+00
		99%	0%	0%	-	0%	-	1%	0%
Non-renewable primary energy resources as material utilization	[MJ]	2.28E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		100%	-	-	-	-	-	-	-
Total use of non-renewable primary energy resources	[MJ]	7.97E+01	1.83E-01	1.77E-02	0.00E+00	1.83E-01	0.00E+00	6.88E-01	0.00E+00
		99%	0%	0%	-	0%	-	1%	-
Use of Secondary Material	[kg]	3.71E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		100%	-	-	-	-	-	-	-
Use of renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		-	-	-	-	-	-	-	-
Use of non-renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		-	-	-	-	-	-	-	-
Use of net fresh water	[m3]	1.69E-02	2.56E-05	3.54E-05	0.00E+00	2.56E-05	0.00E+00	9.87E-05	0.00E+00
		99%	0%	0%	-	0%	-	1%	-

Table 13. *Waste Categories and Output Flows according to EN 15804+A2 for the HPL product. All values are rounded to two significant digits.*
MND = Module not declared
INA = Indicator not assessed
Neg. = Negligible

Environmental Impact Category	Unit	Product Stage (A1-A3)	Transport to the building site (A4)	Construction and Installation (A5)	Decon-structio n (C1)	Transport to waste processing (C2)	Waste Processing (C3)	Disposal (C4)	Reuse, Recovery, Recycling Potential (D)
Hazardous waste disposed	[kg]	2.44E-06	7.62E-13	4.02E-12	0.00E+00	7.62E-13	0.00E+00	2.58E-11	0.00E+00
		100%	0%	0%	-	-	-	0%	-
Non-hazardous waste disposed	[kg]	1.14E-01	1.58E-05	4.55E-02	0.00E+00	1.58E-05	0.00E+00	1.07E+00	0.00E+00
		9%	0%	4%	-	-	-	87%	-
Radioactive waste disposed	[kg]	2.00E-03	5.08E-07	-4.09E-06	0.00E+00	5.08E-07	0.00E+00	6.04E-06	0.00E+00
		100%	0%	0%	-	-	-	0%	-
Components for re-use	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		-	-	-	-	-	-	-	-
Materials for recycling	[kg]	1.33E-01	0.00E+00	3.79E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		78%	-	22%	-	-	-	-	-
Materials for energy recovery	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		-	-	-	-	-	-	-	-
Exported electrical energy	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		-	-	-	-	-	-	-	-
Exported thermal energy	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

6. LCA: Interpretation

As seen in Table 10, A1- A3 (product stage) is the primary contributor across all the environmental impact categories. Material inputs (Stage A1) is dominant in all categories, except for GWP, EP-freshwater, and POCP. Stage A3 (manufacturing, particularly electricity consumption and disposal of manufacturing waste) is the primary contributor to the overall GWP impacts, and has a significant contribution across GWP – fossil, AP, EP, EP – marine, EP – terrestrial, and POCP impact categories.
Since the disposal of product has been modeled as disposal of plastic in landfill, it is assumed that the product behaves like a plastic polymer matrix at the end of its life and the biogenic carbon stored in the paper (used as raw material) does not get released into the atmosphere within a 100-year time frame. However, it should be noted that this biogenic carbon does get released back into the atmosphere slowly and steadily and therefore a biogenic carbon content of 7.28E-01 kg C per m2 of product holds a potential of releasing 2.67E+00 kg CO2 eq back into the atmosphere, which can be expressed as a negative value of GWP – biogenic in stage C4. Stage C4 (disposal at EoL) is the primary contributor to the EP-freshwater impact category due to generation of landfill leachate.

As per EN15804, module D includes any benefits from materials leaving the product system. This also includes the potential benefits of material and energy recovery from the disposal of packaging waste. However, since the packaging material used and disposed per functional unit and therefore its subsequent benefits are relatively insignificant as compared to the overall impacts of the product, the benefits from disposal of packaging have not been included in module D and have been modeled as going to a dummy sink under the cut-off approach at end of life.

As seen in table 12, Stage A1- A3 (product stage) is the primary contributor across all the resource use indicators. The use of materials (A1) has significant contribution in all indicators, except for the use of non-renewable secondary fuels, which is solely driven by the use of methanol, formaldehyde, and phenol as secondary fuels in boilers during manufacturing (A3).

7. Additional Environmental Information

Table 14. *Additional environmental metrics*

Environ-mental Impact Category	Unit	Product Stage (A1-A3)	Transport to the building site (A4)	Construction and Installation (A5)	Deconstruction (C1)	Transport to waste processing (C2)	Waste Processing (C3)	Disposal (C4)	Reuse, Recovery, Recycling Potential (D)
Particulate Matter	[Disease Incidence]	4.20E-07	2.19E-10	1.48E-10	0.00E+00	0.00E+00	0.00E+00	2.19E-10	0.00E+00
Ionizing Radiation[a]	[kBq U235-Eq.]	1.62E-01	4.29E-05	-7.25E-04	0.00E+00	0.00E+00	0.00E+00	4.29E-05	0.00E+00
Ecotoxicity Potential - Freshwater[b]	[CTUe]	2.82E+01	1.38E-01	5.33E-02	0.00E+00	0.00E+00	0.00E+00	1.38E-01	0.00E+00
Human Toxicity Potential - Cancer[b]	[CTUh]	2.73E-09	2.21E-12	2.05E-12	0.00E+00	0.00E+00	0.00E+00	2.21E-12	0.00E+00
Human Toxicity Potential – Non-Cancer[b]	[CTUh]	4.48E-08	8.45E-11	2.14E-10	0.00E+00	0.00E+00	0.00E+00	8.45E-11	0.00E+00
Soil Quality Potential[b]	[-]	4.17E+02	3.35E-02	-6.60E-03	0.00E+00	0.00E+00	0.00E+00	3.35E-02	0.00E+00

a. This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

b. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

Table 15. *Information describing the biogenic carbon content at the factory gate*

Biogenic carbon content	kg C per declared unit
Biogenic carbon content in product	2.89E-01
Biogenic carbon content in accompanying packaging	4.86E-02

8. References

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For more information contact:

Wilsonart
2501 Wilsonart Drive P.O. Box 6110, Temple, TX 76503-6110
Smartline@wilsonart.com | 800-433-3222 | www.wilsonart.com

SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA
Main +1.510.452.8000 | fax +1.510.452.8001