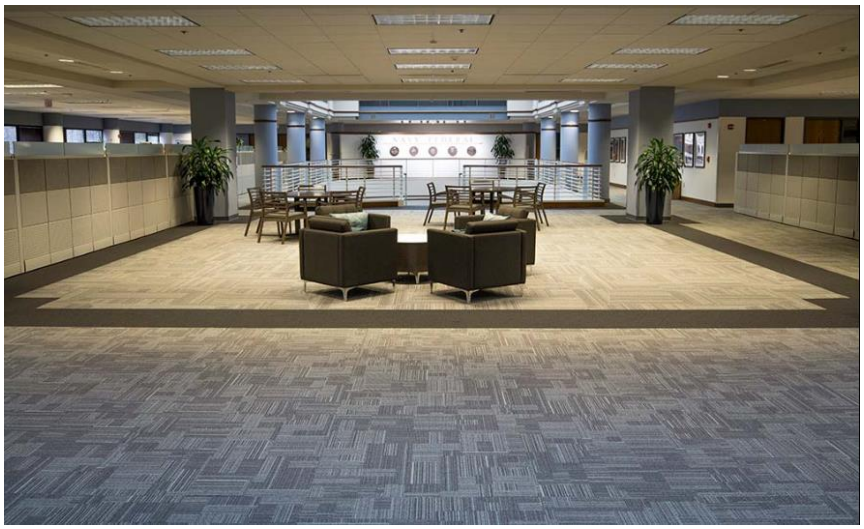
ENVIRONMENTAL PRODUCT DECLARATION

WELLBAC™ COMFORT BACKING

ES/ESP - SOLUTION DYED NYLON 6



WellBAC™ Comfort is Milliken's cushion back modular tile. In addition to providing superior underfoot comfort and significantly improving the carpet's wear performance, WellBAC™ Comfort also offers installation, ergonomic, acoustic, safety and environmental benefits.

Milliken

Designing innovative products and solutions for our customers is the utmost importance. Through meaningful design, deep science and unique insights, we advance product development to the next level while supporting Milliken's efforts to increase sustainable results and minimize environmental impact of all products.

Milliken's holistic approach to innovation encompasses all stages of the life cycle – from material sourcing and manufacturing to end-of-life management. Our commitment to transparency, health, safety, quality and sustainability allows us to put our customers, associates and communities first.

For more information visit

www.millikencarpet.com

UL CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

Milliken

WellBAC™ Comfort Backing
ES/ESP – Solution Dyed – Nylon 6

According to ISO 14025, EN 15804, and ISO21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Environment 333 Pfingsten Road Northbrook, IL 60611 https://www.ul.com/ https://spot.ul.com/
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	General Program Instructions v.2.4 July 2018
MANUFACTURER NAME AND ADDRESS	Milliken, 300 Lukken Industrial Dr., LaGrange GA 30240
DECLARATION NUMBER	4787801051.105.1
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	WellBAC™ Comfort SDN Nylon 6 ES & ESP, (1) m2 of floor covering
REFERENCE PCR AND VERSION NUMBER	Part A: Life Cycle Assessment Calculation Rules and Report Requirements, (UL Environment, V3.2, 2018) and Part B: Flooring EPD Requirements (UL Environment V2.0, 2018)
DESCRIPTION OF PRODUCT APPLICATION/USE	WellBAC™ Comfort Backed, digital dyed injected nylon modular tiles
PRODUCT RSL DESCRIPTION (IF APPL.)	15 Years
MARKETS OF APPLICABILITY	North America
DATE OF ISSUE	January 1, 2019
PERIOD OF VALIDITY	5 Years
EPD TYPE	Product-Specific]
RANGE OF DATASET VARIABILITY	[Industry-average only; mean, median, standard deviation]
EPD SCOPE	Cradle-to-Grave
YEAR(S) OF REPORTED PRIMARY DATA	2017
LCA SOFTWARE & VERSION NUMBER	GaBi v.8.7
LCI DATABASE(S) & VERSION NUMBER	GaBi v.8.7, Sevice Pack 35
LCIA METHODOLOGY & VERSION NUMBER	TRACI 2.1

This PCR Review was conducted by:	UL Environment PCR Review Panel-Chair: Lindita Bushi, PhD epd@ulenvironment.com
This declaration was independently verified in accordance with ISO 14025: 2006. ☐ INTERNAL ☒ EXTERNAL	Grant R. Martin Grant R. Martin, UL Environment
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Thomas P. Gloria Thomas P. Gloria, Industrial Ecology Consultants

LIMITATIONS

Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc.

Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

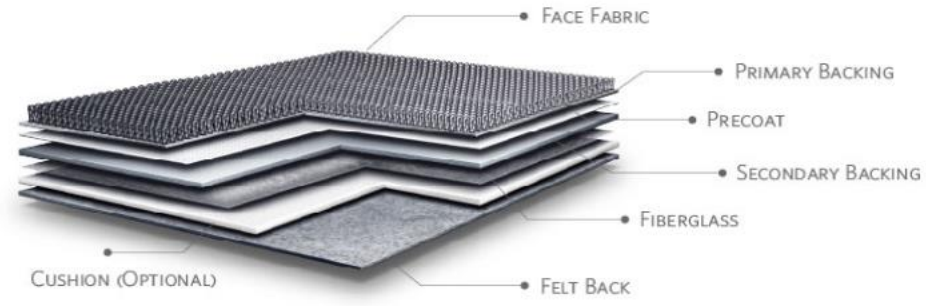
Comparability: EPDs from different programs may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible". Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

1. Product Definition and Information

1.1. Description of Company/Organization

The Milliken Floor Covering division is part of Milliken & Company, an innovation company that has been exploring, discovering and creating ways to enhance people's lives since 1865. The company is a privately held for-profit corporation. The company is headquartered in Spartanburg, South Carolina, and operates design and manufacturing facilities in the United States, United Kingdom, Australia and China. In 2017, Milliken was recognized as one of the world's most ethical companies for the eleventh consecutive year.

1.2. Product Description



Product Identification

This EPD represents Milliken's WellBac™ Comfort Backed Carpet Tile manufactured in the US. The face fiber used in the carpet is solution dyed nylon 6.

A carpet tile's backing is critical to its performance, durability and appearance retention. The right backing will not only ensure the carpet tile remains dimensionally stable and flat on the floor, it can provide acoustic, insulation and sustainability benefits. In addition to providing superior underfoot comfort and significantly improving the carpet's wear performance, WellBAC™ Comfort also offers installation, ergonomic, acoustic, safety and environmental benefits.

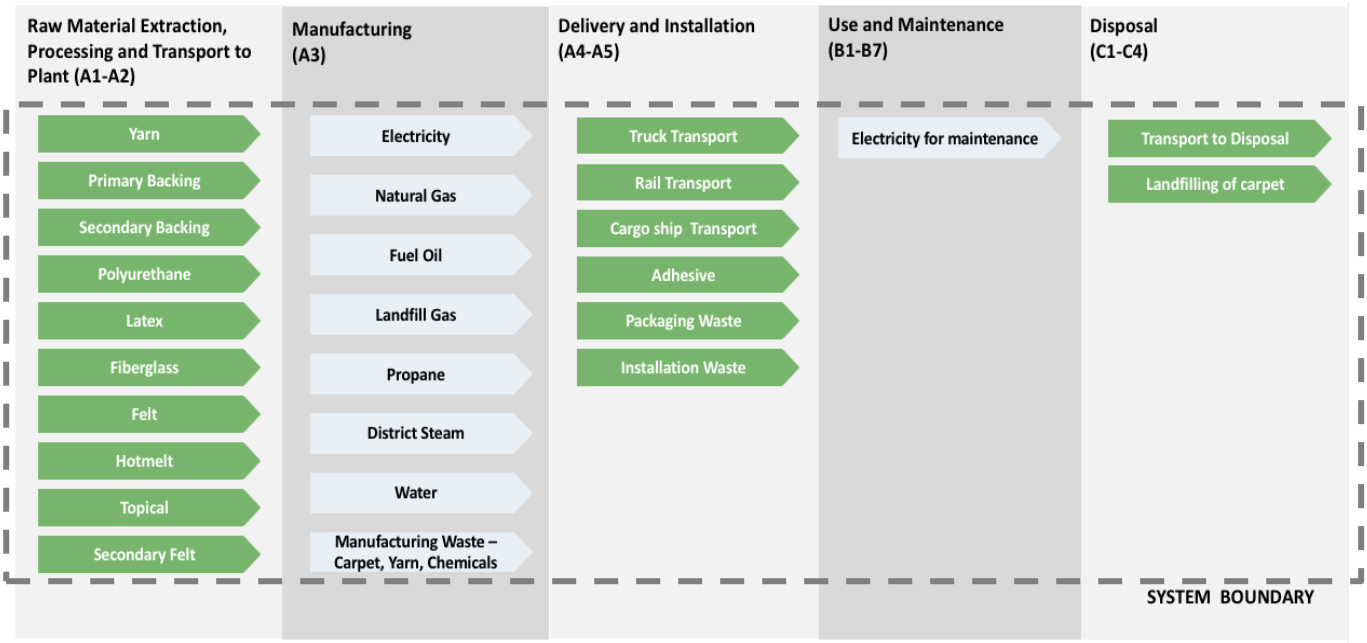
Product Specification

The product is described using the specifications outlined in Table 2. Additionally, the product has performance characteristics outlined in Table 1.

Table 1: Carpet Performance Testing

NAME	VALUE	UNIT
Static Electricity(AATCC 134)	≤ 3.5	kV
Flammability (ASTM E 648)	≥0.45 (Class I)	-
Smoke Density (ASTM E 662)	≤450	-
Methenamine Pill Test (CPSC FF-1-70 or ASTM D 2859)	Self Extinguishing	-

Flow Diagram



Product Average

An average based on product construction was utilized for the life cycle assessment. The average was created by utilizing the standard formulation for the backing and the weighted sales average for the face fiber. This is deemed to be an accurate representation of an average flooring product.

1.3. Application

Milliken & Company's floor coverings beautify offices, hotels, airports, homes, and commercial environments around the world.

1.4. Declaration of Methodological Framework

This LCA is a cradle-to-grave study. A summary of the life cycle stages can be found in Table 18.

The reference service life is outlined in **Error! Reference source not found.** and is only applicable if all manufacturing guidelines are followed regarding site-selection and installation, found online.

The cut-off criteria are described in Section 2.4 and allocation procedures are described in Section 2.8. No known flows are deliberately excluded from this EPD.

1.5. Technical Requirements

The following technical data describe the product undergoing the life cycle assessment.

Table 2: Carpet Technical Data

NAME	VALUE	UNIT
Product Form	Carpet tile	-
Type of Manufacturing	Solution Dyed, Tufted Nylon 6 on coated backing	-
Yarn Type	Nylon 6	-
Primary Backing Type	Polyester, Nylon 6	-
Cushion Backing	Open Cell Polyurethane	-
Product Weight	3.126 – 3.541	kg/m^2
Surface Pile Thickness	3.05-3.81	mm
Surface Pile Weight	0.578 – 0.580	kg/m^2

1.6. Properties of Declared Product as Delivered

WellBAC™ Comfort backed modular carpet tiles come in sizes of 1mx1m, 50cmx50cm, and 25cmx1m. The tiles are stacked and a cardboard wrapping is placed around the stack to protect the product. These are then stacked on pallets for shipment.

The products declared in this document complies with the following codes or regulations:

- ASTM E 648-17 Radiant Panel
- ASTM E 662-17a Smoke Density
- ASTM D2859 Pill Test
- AATCC 134-2011 GSA Static
- ASTM D5848 Pile weight
- ASTM D5848 Pile Density
- ASTM D6859 Pile Thickness
- ASTM D5793 Stitches
- ASTM D5793 Gauge
- ASTM D7570 AACHEN/ISO 2551 Aachen
- ASTM D1335 Tuft Bind
- AATCC 16.3 Lightfastness

1.7. Material Composition

The materials that make up the flooring product are indicated in Table 3.

Table 3: Material Composition

COMPONENT	MATERIAL	MASS %
Face fiber	Nylon 6 / Nylon 6,6	14-22%
Primary backing	Polyester, Nylon 6	3-4%
Latex	SBR, Limestone	13-14%
Hotmelt	Fly ash, Asphalt	35-46%

COMPONENT	MATERIAL	MASS %
Cushion	Limestone, Polyol	15-20%
Fiberglass	E-glass	1-2%
Felt	Polypropylene, Polyethylene terephthalate	3-4%
Topical	Water, Proprietary materials	3-5%

The product does not contain hazardous substances per the applicable regional-specific legislation, as indicated in Section 2.8.6 of *Part A: Life Cycle Assessment Calculation Rules and Report Requirements* from UL Environment.

1.8. Manufacturing

WellBAC™ Comfort Backed, solution dyed nylon modular tiles are manufactured at Duncan Stewart, Alma and Live Oak facilities in the US. The solution dyed nylon 6 fiber is pre-dyed fibers. The method of adding design for aesthetic appeal is to create designs using the pre-dyed nylon 6 in the tufting process. Tufting is the process of affixing face fiber to a primary backing system. Application of latex backing, hotmelt, polyurethane backing, glass fiber scrim and a felt to the tufted primary backing is called coating. The hotmelt layer is primarily composed of bitumen, limestone, coal fly ash. The polyurethane backing is a cushion backing that is primarily composed of calcium carbonate and polyols. The mixing of these layers occurs in batch containers and is then applied to the primary backing.

Finally the carpet is cut and packaged for shipping.

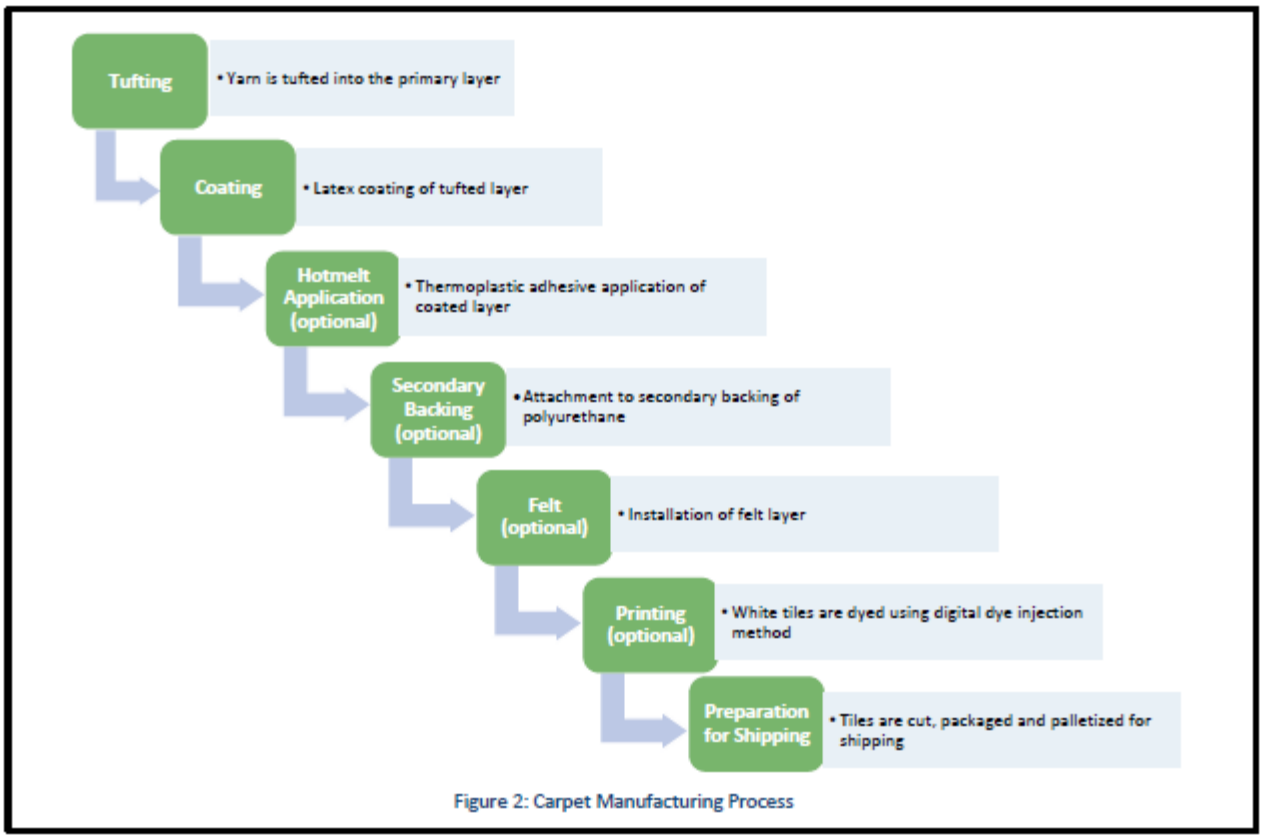


Figure 2: Carpet Manufacturing Process

1.9. Packaging

Packaging utilized in the shipment of the product is described in

Table 4.

Table 4: Packaging

PACKAGING TYPE	MATERIAL	AMOUNT (KG)	DISPOSAL PATHWAY
Box	Corrugated Cardboard	0.066	Landfill, incineration, recycle
Pallet	Wood	0.161	Landfill

1.10. Transportation

It is assumed that all raw materials are distributed by truck, ship and rail, based on global region. An average distance using this information was calculated and used in the model. Transport of raw material from supplier to the manufacturing facility was calculated for each raw material but only an average has been listed here due to simplicity.

An average shipping distance from the manufacturing location to the customer was utilized and was calculated from sales records. The transportation distance for all waste flows is assumed to be 161 km based on best available data.

1.11. Product Installation

While installation equipment is required to install the flooring product, it is not included in the study as these are multi-use tools and the impacts per declared unit is considered negligible. All waste generated during installation, including packaging waste, is disposed of according to the tables found in Section 2.8.5 of *Part A: Life Cycle Assessment Calculation Rules and Report Requirements* from UL Environment.

Except where exceeded or modified by Milliken Carpet Installation Instructions, Milliken recognizes the CRI Carpet Installation Standard 2011 as the minimum acceptable standard for the installation of its carpet products, for more information, visit our website, www.millikencarpet.com.

Sub floor moisture: Milliken warrants that our modular carpet will withstand vapor emission from the slab for the lifetime of the original carpet installation. Technically speaking, we guarantee our carpet tile and adhesive will form a bond that provides tack and resistance to lateral movement while the pressure sensitive adhesive will allow for the removal of the modular carpet allowing for maintenance of the space throughout the life of the carpet.

Adhesive: Milliken modular carpet is designed for installation without permanent adhesives. This allows easy removal and reinstallation. Milliken recommends TractionBack® for all carpet tiles adhesive. If TractionBack® is not available; Milliken recommends Milliken Non-Reactive Standard Adhesive or Milliken Moisture Extreme Spray Adhesive.

1.12. Use

The method of maintenance is using a vacuum cleaner to remove dust and debris from carpet. To calculate the use phase energy, three different types of traffic on carpet were modeled, high, medium and low. High traffic areas are vacuumed every work day. Medium traffic areas are vacuumed on alternative work days while low traffic areas are vacuumed once a week.

Table 5: Use Phase Assumptions

TYPE	VALUE	UNIT
Cleaning per Week	5	#
Weeks per Year Where Cleaning Occurred	50	#

Carpet products are traditionally not repaired or refurbished. If a single carpet tile gets stained or damaged, it can be removed and replaced with a new tile assuming the correct installation method was used per the manufacturer's instructions. Detailed maintenance instructions are provided online at Milliken Flooring Covering's technical documentation webpage.

1.13. Reference Service Life and Estimated Building Service Life

The reference service life of the product is 15 years. For a building's estimated service life of 75 years, this means the carpet will be replaced 4 times, meaning 5 m^2 of tile is needed over the full life of the building. The reference service life assumes the product was installed according to the manufacturer's recommendations.

1.14. Reuse, Recycling, and Energy Recovery

Milliken's modular carpet tiles are 100% recyclable. Keeping unnecessary waste out of landfill is a key part of Milliken's environmental commitment. The Milliken Carpet Take Back program provides a non-landfill disposal solution and

ensures that used carpet is recovered and managed in the most environmentally, socially and financially responsible way. In other cases, carpet is downcycled into construction products and plastic composites. Another option, to further reduce global fossil fuel consumption, is to convert the carpet into a fuel source for use in other industries.

1.15. Disposal

Disposal pathways in the EPD are modeled in accordance with disposal routes and waste classification referenced in Sections 2.8.5 and 2.8.6 of *Part A: Life Cycle Assessment Calculation Rules and Report Requirements* from UL Environment. This indicates an end-of-life split amongst landfill, recycling, and incineration pathways.

2. Life Cycle Assessment Background Information

2.1. Functional Unit

The functional unit of the flooring product is one (1) m^2 of floor covering, as indicated in Table 6.

Table 6: Functional Unit

NAME	VALUE	UNIT
Functional Unit	1 m^2	
Mass	2.744	kg

2.2. System Boundary

The type of EPD is cradle-to-grave. All LCA modules are included and are summarized in Table 7

Table 7: System Boundary

MODULE NAME	DESCRIPTION	ANALYSIS PERIOD	SUMMARY OF INCLUDED ELEMENTS
A1	Product Stage: Raw Material Supply	2017	Raw Material sourcing and processing as defined by secondary data.
A2	Product Stage: Transport	2017	Shipping from supplier to manufacturing site. Fuel use requirements estimated based on product weights and estimated distance.
A3	Product Stage: Manufacturing	2017	Energy, water and material inputs required for manufacturing products from raw materials. Packaging materials and manufacturing waste are included as well.
A4	Construction Process Stage: Transport	2017	Shipping from manufacturing site to project site. Fuel use requirements estimated based on product weights and mapped distance.
A5	Construction Process Stage: Installation	2017	Installation adhesives, installation waste and packaging material waste.
B1	Use Stage: Use	2017	Use of the product.
B2	Use Stage: Maintenance	2017	Cleaning energy, water, and materials, including refinishing the product.
B3	Use Stage: Repair	2017	Materials and energy required to repair the product.

Module Name	Description	Analysis Period	Summary of Included Elements
B4	Use Stage: Replacement	2017	Total materials and energy required to manufacture a replacement.
B5	Use Stage: Refurbishment	2017	Materials and energy required to refurbish the product.
B6	Operational Energy Use	2017	Operational Energy Use of Building Integrated System During Product Use
B7	Operational Water Use	2017	Operational Water Use of Building Integrated System During Product Use
C1	EOL: Deconstruction	2017	No inputs required for deconstruction.
C2	EOL: Transport	2017	Shipping from project site to landfill. Fuel use requirements estimated based on product weight and mapped distance.
C3	EOL: Waste Processing	2017	Waste processing not required. All waste can be processed as is.
C4	EOL: Disposal	2017	Assumes all products are sent to landfill. Landfill impacts modeled based on secondary data.
D	Benefits beyond system	2017	Credits from energy or material capture.

2.3. Estimates and Assumptions

All estimates and assumptions are within the requirements of ISO 14040/44. The majority of the estimations are within the primary data. The primary data was collected as annual totals including all utility usage and production information. For the LCA, the usage information was divided by the production to create an energy and water use per square meter. Another assumption is that the installation tools are used enough times that the per square meter impacts are negligible.

2.4. Cut-off Criteria

All inputs in which data was available were included. Material inputs greater than 1% (based on total mass of the final product) were included within the scope of analysis. Material inputs less than 1% were included if sufficient data was available to warrant inclusion and/or the material input was thought to have significant environmental impact. Cumulative excluded material inputs and environmental impacts are less than 5% based on total weight of the functional unit. The excluded materials include:

- Spot cleaning chemicals are not included due to the infrequency of the activity during use phase
- Raw materials below 5% by mass of the total product weight was excluded. Each of the excluded raw materials is not listed here due to the proprietary nature of some of the ingredients in the product.

2.5. Data Sources

Primary data were collected by facility personnel and from utility bills and was used for all manufacturing processes. Whenever available, supplier data was used for raw materials used in the production process. When primary data did not exist, secondary data for raw material production was utilized from GaBi Database Version 8.7, Service Pack 35.

2.6. Data Quality

The geographical scope of the manufacturing portion of the life cycle is Duncan Stewart, Alma and Live Oak facilities in the US. All primary data were collected from the manufacturer. The geographic coverage of primary data is considered excellent. The primary data provided by the manufacturer represent all information for calendar year 2017. Using this data meets the PCR requirements. Time coverage of this data is considered very good. Primary data provided by the manufacturer is specific to the technology that Milliken uses in manufacturing their product. It is site-specific and considered of good quality. It is worth noting that the energy and water used in manufacturing the product

includes overhead energy such as lighting, heating and sanitary use of water. Sub-metering would improve the technological coverage of data quality. Data necessary to model cradle-to-gate unit processes was sourced from GaBi LCI datasets. Improved life cycle data from suppliers would improve technological coverage.

2.7. Period under Review

The period under review is calendar year 2017.

2.8. Allocation

General principles of allocation were based on ISO 14040/44. Where possible, allocation was avoided. When allocation was necessary it was done on a physical mass basis. Allocation was most prevalent in the secondary GaBi datasets used to represent upstream processes. As a default, GaBi datasets use a physical mass basis for allocation.

3. Life Cycle Assessment Scenarios

Table 8. Transport to the building site (A4)

NAME	VALUE	UNIT
Fuel type	Diesel	-
Liters of fuel	39.0625	l/100km
Vehicle type	Truck – Trailer, basic enclosed/ 45,000 lb payload	-
Transport distance	1,405.87	km
Capacity utilization	0.78	%
Gross density of products transported	175.75	kg/m^3
Capacity utilization volume factor	0.85	-

Table 9. Installation into the building (A5)

NAME	VALUE	UNIT
Adhesive	0.097	kg
Product loss per functional unit	0.1559	kg
Waste materials at the construction site before waste processing, generated by product installation	0.4139	kg
Output materials resulting from on-site waste processing	0	kg
Biogenic carbon contained in cardboard packaging	0.237	kg CO2
Biogenic carbon contained in wooden pallet	0.289	kg CO2
Direct emissions to ambient air, soil and water	-	kg
VOC content of flooring	<0.5	µg/m3

Table 10. Reference Service Life

NAME	VALUE	UNIT
RSL	15	years
Declared product properties (at the gate) and finishes, etc.	See Table 1	-
Design application parameters	Installation per recommendation by manufacturer	-
An assumed quality of work, when installed in accordance with the manufacturer's instructions	Accepted industry standard	-
Indoor environment (if relevant for indoor applications)	Normal building operating conditions	-
Use conditions, e.g. frequency of use, mechanical exposure	Normal building operating conditions	-

Table 11. Maintenance (B2)

NAME	VALUE	UNIT
Maintenance process information	Manufacturer recommended	-
Maintenance cycle	3,750	Number/ RSL
Maintenance cycle	18,750	Number/ ESL
Electricity for vacuuming	0.975	kWh/m^2 floor/yr
Power output of equipment	1.4	kW
Direct emissions to ambient air, soil and water	-	kg
Further assumptions for scenario development	3 passes per tile, 50 work weeks in a year considered with 5 working days each	

Table 12. Repair (B3)

NAME	VALUE	UNIT
Repair process information	Product typically not repaired during use	
Repair cycle	0	Number/ RSL
Repair cycle	0	Number/ ESL
Net freshwater consumption specified by water source and fate	0	m^3
Ancillary materials specified by type (e.g. cleaning agent)	0	kg
Energy input, specified by activity, type and amount	0	kWh
Waste materials from repair	0	kg
Direct emissions to ambient air, soil and water	0	kg

Table 13. Replacement (B4)

NAME	VALUE	UNIT
Replacement cycle	0	Number/ RSL
Replacement cycle	4	Number/ ESL
Energy input, specified by activity, type and amount	0	kWh
Net freshwater consumption specified by water source and fate	0	m^3
Adhesive	0.115	kg/ replacement
Direct emissions to ambient air, soil and water	-	kg
Further assumptions for scenario development, e.g. frequency and time period of use		As appropriate

Table 14. Refurbishment (B5)

NAME	VALUE	UNIT
Refurbishment process description	Product typically not refurbished during use	
Replacement cycle	0	Number/ RSL
Replacement cycle	0	Number/ ESL
Energy input, specified by activity, type and amount	0	kWh
Net freshwater consumption specified by water source and fate	0	m^3
Material input for refurbishment, including ancillary materials specified by type (e.g. cleaning agent)	0	kg
Waste material(s), specified by material	0	kg
Direct emissions to ambient air, soil and water	0	kg

Table 15: Operational Energy Use (B6) and Operational Water Use (B7)

NAME	VALUE	UNIT
Net freshwater consumption specified by water source and fate (amount evaporated, amount disposed to sewer)	0	m^3
Ancillary materials	0	kg
Energy input, specified by activity, type and amount	0	kWh
Equipment power output	0	kW
Characteristic performance (e.g. energy efficiency, variation of performance with capacity utilization)	0	Units as appropriate
Direct emissions to ambient air, soil and water	0	kg
Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants)	0	As appropriate

Table 16: End of life (C1-C4)

NAME		VALUE	UNIT
Assumptions for scenario development		Product is either disposed of with the underlying floor or manually removed via scraping	
Collection process	Collected separately	0	kg
	Collected with mixed construction waste	3.231	kg
Recovery	Reuse	0	kg
	Recycling	0	kg
	Landfill	3.231	kg
	Incineration	0	kg
	Incineration with energy recovery	0	kg
	Energy conversion efficiency rate	84-94	%
Disposal	Product or material for final deposition	3.231	kg
Removals of biogenic carbon (excluding packaging)		0.137	kg CO_2

Table 17. Reuse, recovery and/or recycling potentials (D), relevant scenario information

NAME	VALUE	UNIT
Net energy benefit from energy recovery from waste treatment declared as exported energy in C3 (R>0.6)	0	MJ
Process and conversion efficiencies	84-94	%

4. Life Cycle Assessment Results

Table 18. Description of the system boundary modules

	PRODUCT STAGE			CONSTRUCT-ION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				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 supply	Transport	Manufactu ring	Transport from gate to	Assembly/I nstall	Use	Maintenan ce	Repair	Replaceme nt	Refurbishm ent	Building Operational Energy Use	Building Operational Water Use	Deconstructi on	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential
EPD Type	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X

4.1. Life Cycle Impact Assessment Results

Table 19. North American Impact Assessment Results

TRACI v2.1	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
AP [kg SO_2 eq]	1.82E-02	1.52E-03	1.46E-03	0.00E+00	8.78E-02	0.00E+00	8.73E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.30E-05	0.00E+00	5.78E-04	0.00E+00
EP [kg N eq]	1.07E-03	1.24E-04	3.17E-04	0.00E+00	5.96E-03	0.00E+00	6.18E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.86E-06	0.00E+00	2.93E-05	0.00E+00
GWP 100 [kg CO_2 eq]	8.12E+00	3.28E-01	3.32E-01	0.00E+00	4.19E+01	0.00E+00	3.57E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E-02	0.00E+00	1.25E-01	0.00E+00
ODP [kg CFC-11 eq]	7.22E-09	1.13E-14	5.43E-13	0.00E+00	6.89E-11	0.00E+00	2.89E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.84E-16	0.00E+00	2.30E-14	0.00E+00
Resources [MJ, LHV]	1.88E+01	6.21E-01	5.02E-01	0.00E+00	4.27E+01	0.00E+00	8.08E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.67E-02	0.00E+00	2.51E-01	0.00E+00
POCP [kg O_3 eq]	2.57E-01	5.02E-02	8.63E-03	0.00E+00	9.83E-01	0.00E+00	1.32E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.65E-03	0.00E+00	1.15E-02	0.00E+00

Table 20. EU Impact Assessment Results

CML v4.2	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
ADPelement [kg Sb-eq]	7.51E-06	5.99E-08	9.85E-08	0.00E+00	9.53E-06	0.00E+00	3.09E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E-09	0.00E+00	5.42E-08	0.00E+00
ADPfossil [MJ, LHV]	1.48E+02	4.63E+00	3.65E+00	0.00E+00	5.45E+02	0.00E+00	6.34E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.99E-01	0.00E+00	1.95E+00	0.00E+00
AP [kg SO2 eq]	1.79E-02	1.13E-03	7.15E-04	0.00E+00	9.08E-02	0.00E+00	8.13E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.38E-05	0.00E+00	5.33E-04	0.00E+00
EP [kg PO4-3 eq]	1.91E-03	3.04E-04	4.01E-04	0.00E+00	7.28E-03	0.00E+00	1.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E-05	0.00E+00	6.89E-05	0.00E+00
GWP 100 [kg CO2 eq]	8.17E+00	3.29E-01	3.50E-01	0.00E+00	4.22E+01	0.00E+00	3.60E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E-02	0.00E+00	1.263E-01	0.00E+00
ODP [kg CFC-11 eq]	5.43E-09	1.13E-14	5.13E-13	0.00E+00	6.89E-11	0.00E+00	2.17E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.84E-16	0.00E+00	2.30E-14	0.00E+00
POCP [kg ethene eq]	1.86E-03	1.14E-04	1.52E-04	0.00E+00	6.00E-03	0.00E+00	8.59E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.22E-05	0.00E+00	4.49E-05	0.00E+00

4.2. Life Cycle Inventory Results

Table21. Resource Use

PARAMETER	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
RPRE [MJ, LHV]	9.30E+00	1.15E-01	7.16E-02	0.00E+00	4.78E+01	0.00E+00	3.85E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.94E-03	0.00E+00	1.41E-01	0.00E+00
RPRM [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRPRE [MJ, LHV]	1.60E+02	4.65E+00	3.75E+00	0.00E+00	7.09E+02	0.00E+00	6.82E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-01	0.00E+00	2.00E+00	0.00E+00
NRPRM [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SM [kg]	1.55E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.20E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ, LHV]	2.27E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.08E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW [m3]	8.17E-02	5.60E-04	7.16E-04	0.00E+00	1.71E-01	0.00E+00	3.33E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.41E-05	0.00E+00	2.42E-04	0.00E+00

Table 22. Output Flows and Waste Categories

PARAMETER	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD [kg]	9.84E-08	3.62E-08	2.59E-09	0.00E+00	3.49E-07	0.00E+00	5.83E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-09	0.00E+00	6.90E-09	0.00E+00
NHWD [kg]	1.29E-01	1.75E-04	2.60E-01	0.00E+00	1.96E-01	0.00E+00	1.30E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.51E-06	0.00E+00	2.85E+00	0.00E+00
HLRW [kg] or [m3]	5.86E-06	1.23E-08	4.43E-08	0.00E+00	7.73E-05	0.00E+00	2.38E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.30E-10	0.00E+00	2.60E-08	0.00E+00
ILLRW [kg] or [m3]	4.64E-03	1.02E-05	3.68E-05	0.00E+00	6.44E-02	0.00E+00	1.88E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.39E-07	0.00E+00	2.05E-05	0.00E+00
CRU [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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR [kg]	0.00E+00	0.00E+00	5.01E-02	0.00E+00	0.00E+00	0.00E+00	2.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER [kg]	0.00E+00	0.00E+00	3.34E-03	0.00E+00	0.00E+00	0.00E+00	1.34E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE [MJ, LHV]	0.00E+00	0.00E+00	9.92E-03	0.00E+00	0.00E+00	0.00E+00	3.97E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 23. Carbon Emissions and Removals

PARAMETER	PARAMETER	WELLBAC COMFORT SDN, N6	UNIT
BCRP	Biogenic Carbon Removal from Product	0.112	kg CO_2
BCEP	Biogenic Carbon Emission from Product	0.123	kg CO_2
BCRK	Biogenic Carbon Removal from Packaging	0.526	kg CO_2
BCEK	Biogenic Carbon Emission from Packaging	0.111	kg CO_2

5. LCA Interpretation

Overall for Milliken's carpet product, both broadloom and carpet tile, Global Warming and Abiotic Depletion of fossil fuels are seen to be the largest impact categories. Within the impact categories, the vast majority of impacts are aggregated in the A1-A3 phase of the life cycle of the product. A1-A3 includes raw material sourcing, transportation and manufacturing. The second largest life cycle stage is B2 which is the maintenance of the product over a year.

In the sourcing, extraction and manufacturing stage, yarn contributes to around 54.4% of the overall GWP impacts. The second highest contributor is manufacturing electricity (8.9%) and thermal energy (10.4%) of impacts. Apart from yarn, polyurethane (7.2%) and primary backing (4.6%) have highest impacts. Besides manufacturing inputs, manufacturing waste at the US manufacturing locations contribute 0.7% of total impacts. Finally, use phase contributes 2.9% of life cycle impacts.

6. Additional Environmental Information

6.1. Environment and Health During Manufacturing

Information on Milliken's sustainability programs, "No Carpet to Landfill" pledge and other sustainability resources can be found Milliken Floor Covering's sustainability website.

6.2. Environment and Health During Installation

All recommended personal protective equipment (PPE) should be utilized during installation, as indicated on the SDS and installation guidelines, found online.

6.3. Extraordinary Effects

Fire

The product's fire performance can be found in the technical specifications found in Table 1.

Water

Should the product become flooded, the water should be removed through means of extraction and drying and the product should behave as originally intended. There are no environmental impacts associated with the product being flooded.

Mechanical Destruction

If the product is mechanically destroyed, it should be disposed of using standard procedures and replaced in a timely manner.

6.4. Environmental Activities and Certifications

All Enviornental certifications can be found on Milliken Floor Covering's sustainability website. Select certifications are also presented on mindful Materials.

7. Supporting Documentation

The full text of the acronyms found in Section 0 are found in Table 24

Table 24. Acronym Key

Acronym	Text	Acronym	Text
LCA Indicators			
ADP-elements	Abiotic depletion potential for non-fossil resources	GWP	Global warming potential
ADP-fossil	Abiotic depletion potential for fossil resources	OPD	Depletion of stratospheric ozone layer
AP	Acidification potential of soil and water	POCP	Photochemical ozone creation potential
EP	Eutrophication potential	Resources	Depletion of non-renewable fossil fuels
LCI Indicators			
PERE	Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PENRT	Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)
PERM	Use of renewable primary energy resources used as raw materials	SM	Use of secondary materials
PERT	Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	RSF	Use of renewable secondary fuels
PENRE	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	NRSF	Use of non-renewable secondary fuels
PENRM	Use of non-renewable primary energy resources used as raw materials	FW	Net use of fresh water
HWD	Disposed-of-hazardous waste	MFR	Materials for recycling
NHWD	Disposed-of non-hazardous waste	MET	Materials for energy recovery
RWD	Disposed-of Radioactive waste	EEE	Exported electrical energy
CRU	Components for reuse	EET	Exported thermal energy

8. References

1. Life Cycle Assessment, LCA Report for Milliken & Company. WAP Sustainability Consulting. November 2018.
2. Product Category Rule (PCR) for Building-Related Products and Services, Part A: Life Cycle Assessment Calculation Rules and Report Requirements UL 10010. Version 3.2, September 18th, 2018.
3. Part B: Flooring EPD Requirements. UL Environment V2.0, 2018.
4. ISO 14044: 2006 Environmental Management – Life cycle assessment – Requirements and Guidelines.
5. ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
6. ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services.
7. European Standard DIN EN 15804: 2012.04+A1 2013. Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products (includes Amendment A1:2013)