Environmental Product Declaration

Afirma II™ Hardback

SOLUTION DYED – NYLON 6,6 YARN

Carpet tile offered in Solution Dye (Nylon 6,6 Yarn)

BENTLEY®

For more than 40 years, Bentley Mills, Inc. has defined design, color, quality, and customer service in the commercial carpet industry. Our California-based brand manufactures and markets award-winning broadloom, carpet tile, and area rug products for interiors across the globe.

With luxury, timelessness and crafted quality at the forefront of our product design, Bentley is consistently recognized for leadership in design, performance, and customer service to the architecture and interior design community. And as California's only commercial carpet company, we're committed to sustainable commerce and social responsibility. We continue to evolve our product lines to mirror our eco-conscious philosophy and achieve top industry certifications, including Cradle to Cradle and NSF® 140. We proudly operate in a LEED-EBOM® Gold carpet manufacturing facility.

UL CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION
UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

BENTLEY®

AFIRMA II™ Hardback
Solution Dyed - Nylon 6,6 Yarn

According to ISO 14025 and ISO21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Environment www.ul.com 333 Pfingsten Rd, Northbrook, IL 60062 www.spot.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	Program Operator Rules v 2.7 2022
MANUFACTURER NAME AND ADDRESS	Bentley Mills, Inc. 14641 E. Don Julian Rd. City of Industry, CA, 91746
DECLARATION NUMBER	4790678056.107.1
DECLARED PRODUCT & FUNCTIONAL UNIT	AFIRMA II™ Hardback carpet tile with Nylon 6,6 Yarn – Solution Dyed 1 m^2 of installed flooring
REFERENCE PCR AND VERSION NUMBER	UL PCR Part A: Life Cycle Assessment Calculation Rules and Report Requirements v3.2 UL PCR Part B: Product Category Rules for Flooring EPD Requirements 10010–7 v2
DESCRIPTION OF PRODUCT APPLICATION/USE	Commercial flooring
PRODUCT RSL DESCRIPTION (IF APPL.)	15 years
MARKETS OF APPLICABILITY	North America
DATE OF ISSUE	April 1, 2023
PERIOD OF VALIDITY	5 Years
EPD TYPE	Product-specific
EPD SCOPE	Cradle to grave
YEAR(S) OF REPORTED PRIMARY DATA	2021
LCA SOFTWARE & VERSION NUMBER	GaBi 10.6.2.9
LCI DATABASE(S) & VERSION NUMBER	GaBi Database Service Pack 2022.1
LCIA METHODOLOGY & VERSION NUMBER	TRACI 2.1

The PCR review was conducted by:	UL Environment PCR Review Panel epd@ul.com
This declaration was independently verified in accordance with ISO 14025: 2006. ☐ INTERNAL ☒ EXTERNAL	Cooper McCollum, UL Environment
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	WAP Sustainability
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	James Mellentine, Thrive ESG

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.

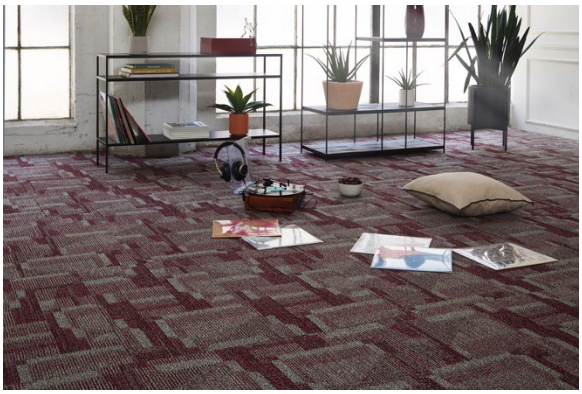
1. Product Definition and Information

1.1. Description of Company/Organization

For more than 40 years, Bentley Mills, Inc. has defined design, color, quality, and customer service in the commercial carpet industry. Our California-based brand manufactures and markets award-winning broadloom, carpet tile, and area rug products for interiors across the globe. With luxury, timelessness and crafted quality at the forefront of our product design, Bentley is consistently recognized for leadership in design, performance, and customer service to the architecture and interior design community. And as California's only commercial carpeting company, we're committed to sustainable commerce and social responsibility. We continue to evolve our product lines to mirror our eco-conscious philosophy and achieve top industry certifications, including Cradle to Cradle and NSF® 140. We proudly operate in a LEED-EBOM® Gold carpet manufacturing facility.

1.2. Product Description

Bentley's AFIRMA II™ Hardback Tile is a modular hardback tile containing recycled content. These products feature superior Texture Appearance Retention Rating's (TARR), as well as Green Label Plus, NSF® 140, and Cradle to Cradle certifications.This declaration covers carpet tiles with AFIRMA II™ backing and face fiber pile weight at 14 oz/yd^2.



Bentley Mills offers their carpet products in both solution dye and piece dye options to accommodate customer needs, with various face fiber options. In this EPD, the following dye and yarn options are included and results presented separately:

- Solution Dyed – 75% Recycled Nylon 6,6 Yarn

This product falls under CSI division 09 68 00 – Carpeting.

1.3. Application

Bentley Mills' carpet products are used as flooring in commercial settings, among others.

1.4. Declaration of Methodological Framework

This LCA follows an attributional approach. This LCA is cradle-to-grave and covers all life cycle stages, described in Table 9.

The reference service life is outlined in Section 1.13 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.

1.5. Technical Requirements

Technical data that describes the assessed product is presented in Table 1.

Table 1. Technical Data for Solution Dye Carpet

NAME	VALUE	UNIT
Yarn Type	75% Recycled Nylon 6,6 Yarn	
Primary Backing Type	PET	
Secondary Backing Type	PET, Fiberglass	
CRI Rating	2.5-4.0	2.5 Moderate, 3.0 Heavy, 3.5 Severe, 4 Extreme
Total Thickness	5.3	mm
Product Weight	2,739	g/m^2
Surface Pile Thickness	2.3	mm
Surface Pile Weight	474.7	g/m^2

The Bentley Mills products in this EPD also meet the following testing criteria.

Table 2. Additional Technical Data

TEST METHOD	TEST RESULTS
AATCC Test Method 134 Electrostatic Propensity of Carpets	≤ 3.5 kV
AATCC Test Method 16, Option 3 Colorfastness to Light	4 minimum @ 40 AFU's
ASTM E648 Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source	Passes class 1, ≥ 0.45 W/cm^2
ASTM E662 Standard test Method for Specific Optical Density of	≤ 450 dm

Smoke Generated by Solid Materials	corrected
ASTM D5252 Standard Practice for the Operation of the Hexapod Tumble Drum Tester	2.5 moderate - 4.5 Extreme Traffic

1.6. Properties of Declared Product as Delivered

AFIRMA II™ Hardback carpet tile is offered in sizes of 18”x36” (46 cm x 91 cm),), 24” x 24” (61 cm x 61 cm), and 9”x36” (23 cm x 91 cm). The tiles are stacked and packed in cardboard v-boards with sleeves and lids. Plastic wrap is wrapped around the outside of the stacks of tiles. The tiles are shipped on pallets.

1.7. Material Composition

The product composition of the product is presented in Table 3.

Table 3. Material Composition for Solution Dye Carpet

Component	% of Product Mass	Material
Face Fiber	17%	75% Recycled Nylon 6,6
Primary Backing	5%	PET
Secondary Backing	5%	PET
Thermoplastic Coating	35%	Calcium Carbonate
Latex	38%	Ethylene Vinyl Acetate, Calcium Carbonate, Alumina Trihydrate, Ammonium Lauryl Sulfate, Acrylate

1.8. Manufacturing

Bentley Mills carpet products are manufactured at their facility in City of Industry, California.

In the solution dyeing process, yarn is colored by the supplier before it is drawn into fiber by adding pigment to the nylon resin in the extruder. The dyed nylon is then drawn into nylon fiber. Bentley Mills tufts the dyed yarn onto the primary backing, then applies a latex coating. Secondary backing and, if applicable, thermoplastic adhesive coating are added and then carpet is cut to size.

1.9. Packaging

Packaging used in the shipment of the product is described in Table 4.

Table 4. Packaging for Solution Dye Carpet, per m^2

Component	Mass (kg)
Cardboard	6.55E-02
Polyethylene (PE) Film	4.64E-03
Polypropylene (PP) Strap	2.32E-03

Wood Pallet	1.35E-01

1.10. Transportation

The product is delivered from the point of purhcase to the building site via truck over an assumed distance of 800 km based on the PCR Part B.

The transportation distance for all waste flows is assumed to be 161 km, also based on the PCR.

1.11. Product Installation

Bentley Mills carpet products should be installed accroding to manufacturer instructions, found on Bentley Mills' website.

AFIRMA II™ Hardback is installed using spread adhesive. Healthbond 2399 adhesive is spread at a rate of 12-14 yd^2/gal.

Product installation waste and packaging is disposed of according to regionally representative data in Section 2.8.5 of *Part A: Life Cycle Assessment Calculation Rules and Report Requirements* from UL Environment. Details on disposal pathway by packaging material is presented in Table 5.

Table 5. Disposal Pathways by Packaging Material

COMPONENT	RECYCLING	LANDFILL	INCINERATION
Cardboard	75%	20%	5%
Polyethylene (PE) Film	15%	68%	17%
Polypropylene (PP) Strap	15%	68%	17%
Wood Pallet	75%	20%	5%

1.12. Use

Bentley Mills carpet products should be maintained according to manufacturer instructions. Frequency of cleaning depends on expected foot traffic. In this LCA, it is assumed the carpet is in a high foot traffic area and is vacuumed 5 times per week for 50 weeks each year of the building lifetime.

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 over the full life of the building. The reference service life assumes the product was installed according to the manufacturer's recommendations.

1.14. 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. Per the region- and material-specific data in Part A, product is 100% landfilled at the end of its life.

2. Life Cycle Assessment Background Information

2.1. Functional or Declared Unit

The functional unit of the flooring product is one (1) m^2 of installed floor covering, as indicated in Table 6. This weight includes 1 m^2 of carpet plus installation materials and carpet wasted upon installation.

Table 6: Functional Unit for Solution Dye Carpet

NAME	VALUE	UNIT
Functional Unit	1 m^2	
Mass	3.24E+00	kg

2.2. Functional or Declared Unit

This 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	2021	Raw Material sourcing and processing as defined by secondary data.
A2	Product Stage: Transport	2021	Shipping from supplier to manufacturing site. Fuel use requirements estimated based on product weights and estimated distance.
A3	Product Stage: Manufacturing	2021	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	2021	Shipping from manufacturing site to project site. Fuel use requirements estimated based on product weights and mapped distance.
A5	Construction Process Stage: Installation	2021	Installation adhesives, installation waste and packaging material waste.
B1	Use Stage: Use	2021	Use of the product.
B2	Use Stage: Maintenance	2021	Cleaning energy, water, and materials, including refinishing the product.
B3	Use Stage: Repair	2021	Materials and energy required to repair the product.
B4	Use Stage: Replacement	2021	Total materials and energy required to manufacture a replacement.
B5	Use Stage: Refurbishment	2021	Materials and energy required to refurbish the product.
B6	Operational Energy Use	2021	Operational Energy Use of Building Integrated System During Product Use
B7	Operational Water Use	2021	Operational Water Use of Building Integrated System During Product Use
C1	EOL: Deconstruction	2021	No inputs required for deconstruction.
C2	EOL: Transport	2021	Shipping from project site to landfill. Fuel use requirements estimated based on product weight and mapped distance.
C3	EOL: Waste Processing	2021	Waste processing not required. All waste can be processed as is.
C4	EOL: Disposal	2021	Assumes all products are sent to landfill. Landfill impacts modeled based on secondary data.

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 electricity and water data was collected as annual totals including all utility usage and production information. Natural gas usage was sub-metered. 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:

- Raw materials below 1% by mass of the total product weight were excluded. Each of the excluded raw materials is not listed here due to the proprietary nature of some of the ingredients in the product.
- Additives to latex constituting ≤0.40% of the total material inputs
- Additives to secondary backing constituting ≤0.13% of the total material inputs

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 10.6.2.9, Service Pack 2022.1.

2.6. Data Quality

The geographical scope of the manufacturing portion of the life cycle is City of Industry, California, 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 represents all information for calendar year 2021. 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 Bentley Mills uses in manufacturing their product. It is site-specific and considered of good quality.

It is worth noting that the electricity 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 all suppliers would improve technological coverage.

2.7. Period Under Review

The period under review is calendar year 2021.

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 an area basis. Manufacturing inputs were allocated on a per-area basis based on quantities produced at the facility. 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	
Fuel Economy	42	l/100km
Vehicle type	Heavy duty diesel truck, 53,333 lb payload	
Transport distance	800	km
Capacity utilization (including empty runs, mass based	67	%
Weight of products transported	3.08E+00	kg
Capacity utilization volume factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaging products)	=1	-

Table 9. Installation into the building (A5)

NAME	VALUE	UNIT
Adhesive	3.51E-01	kg
Product loss per functional unit	5	%
Waste materials at the construction site before waste processing, generated by product installation	3.44E-01	kg
Installation waste to landfill	1.47E-01	
Packaging waste to landfill	4.27E-02	kg
Packaging waste to incineration	1.07E-02	kg
Packaging waste to recycling	1.44E-01	kg
Biogenic carbon contained in packaging	2.99E-01	kg CO_2
Direct emissions to ambient air, soil and water	≤0.5	mg/m^3
VOC content	-	µg/m^3

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 (if instructed by the manufacturer), including references to the appropriate practices and application codes)	Installation per recommendation by manufacturer	-
An assumed quality of work, when installed in accordance with the manufacturer's instructions	Accepted industry standard	-
Indoor environment	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	7.92E-01	kWh/m^2/year
Power output of equipment	1.4	kW
Direct emissions to ambient air, soil and water	-	kg
Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants);	3 vacuum 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 (cite source in report)	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 (amount evaporated, amount disposed to sewer)	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 (specify materials)	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 (amount evaporated, amount disposed to sewer)	0	m^3
Installation Materials	1.40E+00	kg

Replacement of carpet	1.30E+01	kg
Direct emissions to ambient air, soil and water	≤0.5	mg/m³

Table 14. Refurbishment (B5)

NAME	VALUE	UNIT
Refurbishment process description (cite source in report)	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 (amount evaporated, amount disposed to sewer)	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. End of life (C1-C4)

NAME		VALUE	UNIT
Assumptions for scenario development (description of deconstruction, collection, recovery, disposal method and transportation)		Product is either disposed of with the underlying floor or manually removed via scraping	
Collection process (specified by type)	Collected separately	0	kg
	Collected with mixed construction waste	3.09E+00	kg
Recovery (specified by type)	Reuse	0	kg
	Recycling	0	kg
	Landfill	3.09E+00	kg
	Incineration	0	kg
	Incineration with energy recovery	0	kg
	Energy conversion efficiency rate	-	-
Disposal (specified by type)	Product or material for final deposition	3.09E+00	kg
Removals of biogenic carbon (excluding packaging)		0	kg CO_2

4. Life Cycle Assessment Results

Table 16. 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	Manufacturing	Transport from gate to site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Building Operational Energy Use During Product Use	Building Operational Water Use During Product Use	Deconstruction	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	X	MND

4.1 Life Cycle Impact Assessment Results – AFIRMA II™ Hardback with Nylon 6,6 Yarn, Solution Dyed

For tables in this section, modules B1, B3, B5, B6, B7, C1, and C3 have been excluded for readability. These modules are included in the system boundary of this LCA but impacts across all categories in these modules are equal to 0.

Table 17. North American Impact Assessment Results

TRACI v2.1	A1-A3	A4	A5	B2	B4	C2	C4
AP [kg SO_2 eq]	1.58E-02	9.16E-04	2.83E-03	3.72E-02	8.07E-02	1.12E-04	5.66E-04
EP [kg N eq]	1.45E-03	8.16E-05	2.58E-04	3.15E-03	1.05E-02	1.18E-05	8.20E-04
GWP [kg CO_2 eq]	5.71E+00	1.97E-01	1.01E+00	2.75E+01	2.84E+01	3.96E-02	1.30E-01
ODP [kg CFC 11 eq]	7.33E-09	3.73E-16	2.48E-14	2.31E-12	2.93E-08	7.52E-17	4.17E-15
Resources [MJ]	1.58E+01	3.68E-01	3.41E+00	2.86E+01	7.94E+01	7.41E-02	2.51E-01
SFP [kg O_3 eq]	2.87E-01	2.12E-02	3.26E-02	5.66E-01	1.41E+00	2.56E-03	9.94E-03

4.2 Life Cycle Inventory Results – AFIRMA II™ Hardback with Nylon 6,6 Yarn, Solution Dyed

For tables in this section, modules B1, B3, B5, B6, B7, C1, and C3 have been excluded for readability. They are included in the system boundary of this LCA but indicators across all categories in these modules are equal to 0.

Table 18. Resource Use

PARAMETER	A1-A3	A4	A5	B2	B4	C2	C4
RPR_E [MJ, LHV]	1.91E+01	1.08E-01	7.91E-01	1.06E+02	8.07E+01	2.18E-02	1.86E-01
RPR_M [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RPR_T [MJ, LHV]	1.91E+01	1.08E-01	7.91E-01	1.06E+02	8.07E+01	2.18E-02	1.86E-01
$NRPR_E$ [MJ, LHV]	1.23E+02	2.78E+00	2.49E+01	4.60E+02	6.13E+02	5.60E-01	1.98E+00

$NRPR_M$ [MJ, LHV]	3.15E+00	0.00E+00	0.00E+00	0.00E+00	1.26E+01	0.00E+00	0.00E+00
$NRPR_T$ [MJ, LHV]	1.26E+02	2.78E+00	2.49E+01	4.60E+02	6.23E+02	5.60E-01	1.98E+00
SM [kg]	1.07E+00	0.00E+00	0.00E+00	0.00E+00	4.29E+00	0.00E+00	0.00E+00
RSF [MJ, LHV]	1.04E-21	0.00E+00	0.00E+00	0.00E+00	4.17E-21	0.00E+00	0.00E+00
NRSF [MJ, LHV]	1.23E-20	0.00E+00	0.00E+00	0.00E+00	4.90E-20	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
FW [m^3]	3.28E-02	3.88E-04	3.77E-03	1.90E-01	1.49E-01	7.83E-05	2.84E-04

Table 19. Output Flows and Waste Categories

PARAMETER	A1-A3	A4	A5	B2	B4	C2	C4
HWD [kg]	8.61E-06	1.15E-11	1.53E-09	1.82E-08	3.44E-05	2.33E-12	7.42E-11
NHWD [kg]	5.34E-01	2.39E-04	1.84E-01	1.45E-01	1.52E+01	4.81E-05	3.08E+00
HLRW [kg] or [m^3]	2.86E-06	9.13E-09	2.27E-07	5.74E-05	1.25E-05	1.84E-09	1.98E-08
ILLRW [kg] or [m^3]	2.46E-03	7.69E-06	1.94E-04	4.80E-02	1.07E-02	1.55E-06	1.74E-05
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR [kg]	1.43E-01	0.00E+00	1.44E-01	0.00E+00	1.15E+00	0.00E+00	0.00E+00
MER [kg]	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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 20. Carbon Emissions and Uptake

PARAMETER	A1-A3	A4	A5	B2	B4	C2	C4
BCRP [kg CO2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEP [kg CO2]	1.12E-01	0.00E+00	0.00E+00	0.00E+00	4.50E-01	0.00E+00	0.00E+00
BCRK [kg CO2]	4.64E-01	0.00E+00	0.00E+00	0.00E+00	1.86E+00	0.00E+00	0.00E+00
BCEK [kg CO2]	1.07E-01	0.00E+00	2.99E-01	0.00E+00	1.62E+00	0.00E+00	0.00E+00
BCEW [kg CO2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCE [kg CO2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCR [kg CO2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CWNR [kg CO2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

4.5 Life Cycle Assessment Results – AFIRMA II™ Hardback A1-A3 Global Warming Potential for Additional Product Yarn Pile Weights

Global Warming Potential (GWP) results for the flooring products from cradle-to-gate (A1-A3) are presented for the product at additional yarn pile weights (oz/yd^2)in Table 21. Results are presented in kg CO2e/m^2 of carpet using the

TRACI characterization methodology.

Table 21. TRACI A1-A3 Global Warming Potential for the carpet product at additional yarn pile weights – Solution Dye

YARN PILE WEIGHT (OZ/YD^2)	YARN PILE WEIGHT (G/M^2)	A1-A3 (KG CO2E/M2)
10 oz	339 g	5.26E+00
14 oz	475 g	5.71E+00
18 oz	610 g	6.15E+00
22 oz	746 g	6.60E+00
26 oz	881 g	7.04E+00

5. LCA Interpretation

A dominance analysis was performed for to show which of the life cycle modules contributes to the majority of the impacts. Due to the relevance of this impact category to the product type and the manufacturer's interests, this dominance analysis will be provided for TRACI Global Warming Potential (GWP) and Acidification Potential (AP) results.

Over the 75-year life of a building, the greatest contributors to GWP for all Bentley Mills carpet products is maintenance (B2) and replacements (B4). Maintenance phase accounts for 44% of full life cycle GWP, while the replacement phase accounts for 45% of full life cycle GWP.

From cradle to factory gate, the greatest contributor for all carpet products is the raw materials stage (A1). Raw materials contribute to 75% of cradle-to-gate impacts, while A2 and A3 contribute about 12% each.

Within raw materials, yarn is a major contributor. Yarn contributes 25% of cradle-to-gate GWP, followed by thermoplastic coating contributing 20%.

Over the 75-year life of a building, the greatest contributors to AP for all Bentley Mills carpet products is replacements (B4). The replacement phase is 58% of life cycle AP.

As with GWP, yarn is a major contributor to raw materials AP. For the solution dyed carpet and piece dyed carpet, yarn contributes 25% of cradle-to-gate AP.

6. Additional Environmental Information

6.1 Environment and Health During Manufacturing

Information on Bentley Mills' sustainability programs, sustainability resources, and sustainability certifications can be

found at Bentley Mills' 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.

All of Bentley products are certified to meet the requirements of the Carpet and Rug Institute's (CRI) Green Label Plus test protocol. This independent testing program measures total volatile organic compounds (VOC) emissions as well as individual chemical concentrations. CRI's Green Label Plus test criteria help customers identify low emitting products. These certifications and more information can be found at Bentley Mills' website.

There are no adverse environment or health impacts during installation of this product.

6.3 Extraordinary Effects

Fire

Critical Radiant Flux, $\geq$ 0.45 W/cm^2, Class I (ASTM E648)

Smoke Density, $\leq$ 450 dmc (ASTM E662)

Passes Methenamine Pill Test (CPSC-FF1-70)

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.

6.5 Environmental Activities and Certifications

AFIRMA II™ Hardback carpet tile has the following environmental certifications. These certifications can be accessed from Bentley Mills' website for Transparency & Product Certifications.

- Declare Label
- Health Product Declaration (HPD)
- CRI Green Label Plus
- NSF/ANSI 140
- Cradle-to-Cradle v3.1 Silver

7. Supporting Documentation

The full text of the acronyms found in Section 4 are found in Table 22.

Table 22. Acronym Key

ACRONYM	TEXT	ACRONYM	TEXT
LCA Indicators			
AP	Acidification potential of soil and water	ODP	Depletion of stratospheric ozone layer
EP	Eutrophication potential	SFP	Smog Formation Potential
GWP	Global warming potential	Resources	Depletion of non-renewable fossil fuels
Resource Use Parameters			
RPR_E	Use of renewable primary energy excluding renewable primary energy resources used as raw materials	SM	Use of secondary materials
RPR_M	Use of renewable primary energy resources used as raw materials	RSF	Use of renewable secondary fuels
RPR_T	Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	NRSF	Use of non-renewable secondary fuels
$NRPR_E$	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	RE	Recovered energy
$NRPR_M$	Use of non-renewable primary energy resources used as raw materials	FW	Net use of fresh water
$NRPR_T$	Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)		
Waste Parameters and Output Flows			
HWD	Disposed-of-hazardous waste	CRU	Components for reuse
NHWD	Disposed-of non-hazardous waste	MR	Materials for recycling
HLRW	High-level radioactive waste, conditioned, to final repository	MER	Materials for energy recovery
ILLRW	Intermediate- and low-level radioactive waste, conditioned, to final repository	EE	Recovered energy exported from the product system
Carbon Emissions and Uptake			
BCRP	Biogenic carbon removal from product	BCEW	Biogenic carbon emission from combustion of waste from renewable sources used in production processes
BCEP	Biogenic carbon emission from product	CCE	Calcination carbon emissions
BCRK	Biogenic carbon removal from packaging	CCR	Carbonation carbon emissions
BCEK	Biogenic carbon emission from packaging	CWNR	Biogenic carbon emission from combustion of waste from non-renewable sources used in production processes

8. References

1. Life Cycle Assessment, LCA Report for Bentley Mills. WAP Sustainability Consulting. September 2022.
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 14040: 2006 Environmental Management – Life cycle assessment – Principles and Framework.
5. ISO 14044: 2006 Environmental Management – Life cycle assessment – Requirements and Guidelines.
6. ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
7. ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services.