




**BMI**



## EverGuard® Extreme TPO Roofing Membrane

Smooth Back

Environmental Product Declaration

Program Operator	NSF Certification, LLC 789 N. Dixboro Ann Arbor, MI 48105 www.nsf.org		<b>Certified Environmental Product Declaration</b> www.nsf.org
General Program instructions and Version Number	Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report, Institut Bauen und Umwelt e.V., V, 2018		
Manufacturer Name and Address	BMI Group 20 Air Street, London, United Kingdom, W1B 5AN		
Declaration Number	EPD10293		
Declared Product and Functional Unit	EverGuard® Extreme TPO Membrane Smooth 1 m <sup>2</sup> of installed roofing membrane, with a thickness of 1.2 mm, 1.5 mm, 1.8 mm or 2.0 mm for a period of its Reference Service Life.		
Included Products	EverGuard® Extreme TPO Membrane Smooth in 1.2-, 1.5-, 1.8- or 2.0-mm thicknesses and all color options. Product can be manufactured at one of the facilities listed below: Gainesville Facility--1301 Corporate Dr, Gainesville, TX 76240, USA; New Columbia Facility--2093 Old Rte 15, New Columbia, PA 17856, USA		
Reference PCR and Version Number	Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report V1.7, IBU Part B: Requirements on the EPD for Plastic and Elastomer Roofing and Sealing Sheet Systems		
Product's intended Application and Use	Roofing		
Product RSL	25 Years		
Markets of Applicability	Europe		
Date of Issue	December 11 <sup>th</sup> , 2019		
Period of Validity	5 years from date of issue		
EPD Type	Product Specific		
Range of Dataset Variability	N/A		
EPD Scope	Cradle to Grave		
Year of reported manufacturer primary data	2018		
LCA Software and Version Number	GaBi 9.2,0.58		
LCI Database and Version Number	GaBi Database Service Pack 39		
LCIA Methodology and Version Number	CML 2001-Jan 2016		
The sub-category PCR review was conducted by:	IBU - Institut Bauen und Umwelt e.V.		
This declaration was independently verified in accordance with ISO 14025: 2006 and the reference PCR: Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report V1.7, IBU Part B: Requirements on the EPD for Plastic and Elastomer Roofing and Sealing Sheet Systems. <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External	Jenny Oorbeck joorbeck@nsf.org 		
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	WAP Sustainability Consulting, LLC		
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Angela Fisher Aspire Sustainability <a href="mailto:angela@aspireustainability.com">angela@aspireustainability.com</a> 		
<p>Limitations:</p> <p>Environmental declarations from different programs (ISO 14025) may not be comparable.</p> <p>Comparison of the environmental performance of Plastic and Elastomer Roofing and Sealing Sheet Systems using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the building energy use phase as instructed under this PCR.</p> <p>Full conformance with the PCR for Plastic and Elastomer Roofing and Sealing Sheet Systems 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.</p>			



### Company Description

Established in 1852, BMI Group is the largest manufacturer of flat and pitched roofing and waterproofing solutions throughout Europe with a significant presence in parts of Asia and Africa. BMI Group is a Standard Industries company. The company's products include a comprehensive portfolio of roofing and waterproofing solutions for residential and commercial properties as well as for civil engineering applications. For more information about BMI Group, visit <https://www.bmigroup.com>.

### Product Description and Application

EverGuard® Extreme TPO membrane is a single-ply roofing style product and is designed to be used as an outer roof layer, either in new construction or re-covering applications. The membrane can be mechanically fastened to the roof deck. It is made of two layers of thermoplastic polyolefin (TPO) bonded to a layer of polyester scrim in the middle. This configuration meets all the inherent properties and performance which TPO is known for, including excellent seam strength, long-term weathering, natural resistance to fungi, energy savings, and more.



### Technical Data

Table 1: Product Performance Properties

Product	Everguard Extreme TPO Smooth Back Membrane				Unit	Test Method
Product Form	Dual layers of Extreme TPO reinforced with a layer of PET scrim					-
Nominal Thickness	1.2	1.5	1.8	2.0	mm	DIN EN 1849-2
Waterproof	Pass					DIN EN 1928
Tensile Strength	≥1150				N/50 mm	DIN EN 12311-2
Tensile Strain	≥20				%	DIN EN 12311-2
Peel Resistance of the Seam Joint	≥150				N/50 mm	DIN EN 12316-2
Shear Resistance of the Seam Joint	≥800				N/50 mm	DIN EN 12317-2
Tear Propagation Resistance (longitudinal/ Transversal)	≥375/≥475				N	DIN EN 12310-2
UV-stress (>5000 hr)	Pass					
Dimensional Change to Warm Storage (Longitudinal/Transversal)	≤ 0.4 / ≤0.3				%	DIN EN 1107-2
Folding in the Cold	≤ -25				oC	DIN EN 495-5
Bitumen Compatibility	Pass				-	DIN EN 1548
Resistance against Impulsive Load	≥ 400				mm	DIN EN 12691 Method A
	≥ 1150					Method B



### Delivery Status

EverGuard® Extreme TPO membrane is delivered in rolls with a width of 1.52 m and a length of 20 m or 30 m depending on the thickness.

### Material Composition

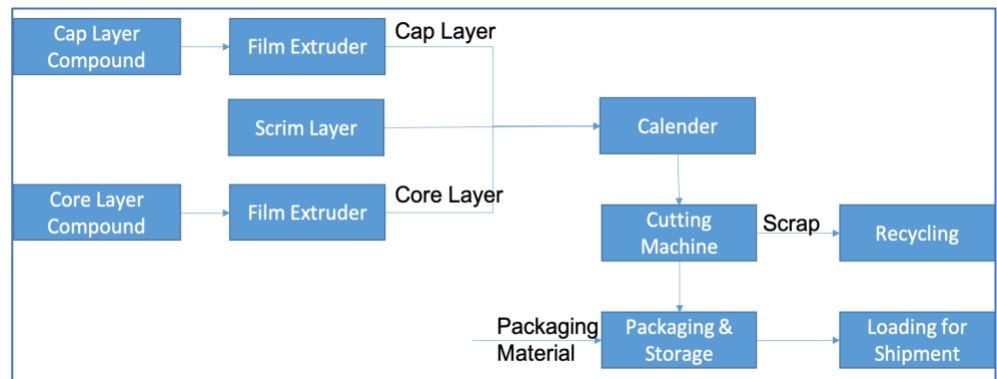
Table 2: Composition

Material	Mass %
Thermoplastic Olefin	90-96
Proprietary additives	
Polyester	4-8
Internal Recycled Content	0-2

### Manufacturing

This stage includes an aggregation of raw material extraction, supplier processing, delivery, manufacturing and packaging by the manufacturing facilities.

EverGuard® Extreme TPO membrane is constructed of three layers, as shown in the table above. The cap and core layers are made of TPO-based compounds and are processed on site. The scrim is



purchased in its ready-to-use form from an off-site supplier. To produce the cap and core layers, pre-mixed compounds are fed into extruders, heated and pressurized and then extruded through a die to form films of a required thickness. The cap layer and core layer will join the scrim layer between a series of heated rollers. In this manner, the layers are bound together to form the final membrane. Once bound, the membrane will go through the cutter where it will be cut into specified dimensions. The finished membrane is reeled to a roll, packaged, labelled and moved into storage until it shipped to a job site for customer use.

### Environment and Health During Manufacturing

During the manufacturing of EverGuard® Extreme TPO membrane, all legal regulations regarding emissions to air, wastewater discharge, solid waste disposal and noise emissions are followed.

### Packaging

After manufacturing, the product is prepared for shipment to the customer. The membrane is reeled on a cardboard core and wrapped in plastic film. Additional packaging materials include product labels, a cardboard protective sheet and steel strap. The product is then shipped on wooden pallets to the customer.



### **Product Installation**

EverGuard® Extreme TPO membrane can be installed with mechanical fasteners. For additional environmental information regarding the specific installation options for your project, please contact BMI Group.

Some equipment may be necessary during the installation phase. This includes weld seaming adjacent membranes using a hot-air welder. Such installation equipment is required though not included in the study as these are multi-use tools and the impacts per declared unit are assumed to be negligible. However, electricity used to power this equipment during the installation process was evaluated.

### **Condition of Use**

With professional installation and proper use, the condition and material content of EverGuard® Extreme TPO membrane remains unchanged throughout the service life.

### **Environment and Health During Use**

No impacts to the environment or the health of the users during the use phase is expected.

### **Reference Service Life (RSL)**

The reference life of each product in the EPD is assumed to be 25 years, based on the preliminary technical test results and the manufacturer's internal technical review. Note that this service life may be adjusted in future iterations of this report as more real-world data become available.

### **Extraordinary Effects Fire**

EverGuard® Extreme TPO membrane is classified in Construction Material Class E, as defined by EN 13501-1.

### **Extraordinary Effects Water**

No environmental impacts are expected due to water exposure of properly installed EverGuard® Extreme TPO membrane.

### **Extraordinary Effects Mechanical Destruction**

EverGuard® Extreme TPO membrane has excellent mechanical strength. No environmental impact is known to result from unexpected mechanical damage.

### **Re-Use Phase**

In general, EverGuard® Extreme TPO membrane can be recycled if local recycling facilities are available. Re-use after service is not recommended.

### **Disposal**

EverGuard® Extreme TPO membrane can be recycled, landfilled or incinerated at the end of the use stage. As prescribed by the PCR Part A, the impact results of all the three scenarios are declared separately. BMI EverGuard® TPO membrane can be classified under Waste Code 17 09 04 according to the European Waste Catalogue.



**Further information**

More information about BMI and its products can be found at [www.bmigroup.com](http://www.bmigroup.com).

**Functional Unit**

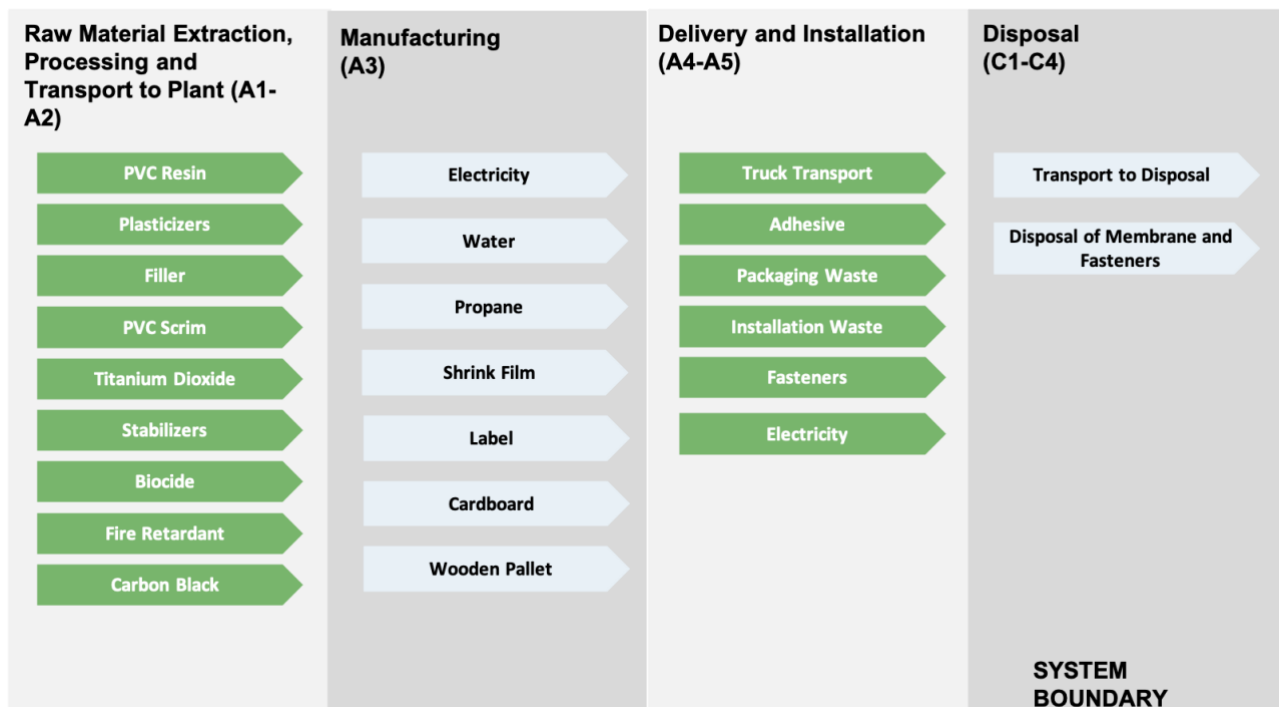
The environmental impacts are declared based on 1 m<sup>2</sup> of installed EverGuard® Extreme TPO membrane.

*Table 3: Reference Flow for a Reference Service Life*

EverGuard® Extreme TPO Smooth Back Membrane				
Functional Unit	1 m <sup>2</sup> of installed roofing membrane with a thickness listed below for a RSL.			
Thickness [mm]	1.2 mm	1.5 mm	1.8 mm	2.0 mm
Installation Option	Mechanical Fixing			
Mass [kg]	1.50	1.80	2.10	2.37
Fasteners [kg]	0.0922			

**System Boundary**

The overall system boundary is identified in the flow chart below. This EPD discloses impacts for the required cradle-to-gate lifecycle modules and the optional end of life modules. The optional use phase modules are not declared due to the uncertainty around the product service life and the number of replacement cycles.





### **Cut-Off Rules**

All inputs for which data were 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. Cumulative excluded material inputs and environmental impacts are less than 5% based on total weight of the functional unit. Some raw materials were excluded. This was due to lack of adequate representative secondary data within GaBi. However, the excluded materials were significantly below the cut off criteria and include minor additives such as proprietary binders.

### **Estimates and Assumptions**

The compositional data of EverGuard® Extreme TPO membrane is based upon typical product performance and is subject to normal manufacturing tolerance and variance. The LCA study is based on nominal values.

### **Background data**

Primary data was collected onsite by the manufacturing facilities' associates. This includes electrical and thermal energy, water consumption, waste generation, bill of materials and suppliers.

Secondary data was sourced from GaBi Database Version 8.7, Service Pack 35.

### **Data Quality**

The geographical scope of the manufacturing portion of the life cycle is Gainesville of Texas USA and New Columbia of Pennsylvania, USA. Site-specific data are collected, and the average are weighted based on the production at each facility. All primary data were collected by the manufacturing facilities. The geographic coverage of primary data is considered excellent. The primary data provided by the manufacturer represent all information for calendar year 2018. Using this data meets the PCR requirements. Time coverage of this data is considered good. Primary data provided by the manufacturer is specific to the technology that the facilities use 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.

### **Period under Review**

Data used in this study was representative of production in calendar year 2018.

### **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. To derive a per-unit value for manufacturing inputs such as electricity, water, propane and natural gas, a series of allocation calculations were adopted. The facility level of utility data was allocated based on production values of different type of membrane products in the same manufacturing facility. Then the data is further allocated among membranes of different thickness based on the mass

### **Comparability**

The user of the EPD should take care when comparing EPDs from different companies. Assumptions, data sources, and assessment tools may all impact the uncertainty of the final results and make comparisons misleading. Even for similar products, differences in use and end-of-life stage assumptions and data quality may produce incomparable results. The user should not compare EPDs unless they are experts in the nuances of Life Cycle Assessment (LCA) practice and methodology and follow comparability best practices.



## Scenarios and Additional Technical Information

### Transportation to the Construction Site (A4)

Parameter	Value for Truck Usage in the US	Value for freight ship usage	Value for Truck Usage in Europe	Unit
Fuel type	Diesel	Heavy fuel oil	Diesel	-
Distance	613.16	9947.4	804.67	km
Liters of fuel	39.0625	0.00023	33.1	l/100km for truck kg/100km for freight ship
Vehicle type	Truck – Trailer, basic enclosed/ 45,000 lb. payload	Container ship, 5,00 to 200, 000 dwt payload capacity, ocean going	Truck-trailer, Euro 0 - 6 mix, 34 - 40t gross weight / 27t payload capacity	-
Capacity Utilization	78	70	61	%
Gross density of products transported	175.75	-	353.36	kg/m <sup>3</sup>
Maximum weight of products transported	20,411.657	-	27,000	kg
Volume of products transported	116.14	-	76.41	m <sup>3</sup>
Capacity utilization volume factor	1	-	1	-

### Installation into the Building (A5)

Name	Value	Unit
Metal Fasteners	0.0922	kg
Water Consumption	0	kg
Adhesive	0	kg
Electricity Consumption	0.0132	kWh
Other Energy Carriers	0	MJ
Packaging Waste-Cardboard	0.0327	kg
Packaging Waste-Plastic	4.54E-03	kg
Packaging Waste-Metal	9.08E-04	kg

Name	Value	Unit
Packaging Waste-Wood	6.81E-02	kg
Material Loss	10	%
Output Substances Following Waste Treatment on Site	0	kg
Dust in the Air	0	kg
Installation Losses	0	kg
VOC in the air	-	kg
Overlap (membrane)	8.3	%





**End-of-Life Stage (C1-C4)**

Name	1.2 mm	1.5 mm	1.8 mm	2.0 mm	Unit
Collected as Mixed Construction Waste	1.44	1.71	1.98	2.23	kg
Reuse	0	0	0		kg
Recycling	100*				%
Energy Recovery	100*				%
Landfilling	100*				%
*Results of each scenarios are separately declared.					



**LCA Results**

All results in this section are given per functional unit, as shown in Table 3. The results of stage A5 and C2-C4 vary with the end-of-disposal methods. Their results are reported separately based on the disposal methods—Landfilling (L), Recycling (R), and Incineration (I). Environmental Impacts were calculated using the GaBi software platform. Impact results have been calculated using CML 2001-Jan 2016 characterization factors. LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks

Description of the System Boundary

Product Stage			Construction Process Stage		Use Stage*							End of Life Stage				Benefits and Loads Beyond the System Boundaries
Raw Material Supply	Transportation	Manufacturing	Transportation	Installation	Use	Maintenance	Repair	Refurbishment	Replacement	Operational Energy Use	Operational Water Use	De-construction	Transportation	Waste Processing	Disposal	Reuse-Recovery-Recycling-Potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	MNR*	MNR	MNR	X	X	X	X	X	X	MND**
*MNR=Module not relevant, **MND=Module not declared																



### Impact Indicators

Abbreviation	Parameter (unit)
CML 2001-Jan 2016	
ADP-elements	Abiotic depletion potential for non-fossil resources (kg Sb eq)
ADP-fossil	Abiotic depletion potential for fossil resources (MJ, net calorific value)
AP	Acidification potential of soil and water (kg SO <sub>2</sub> eq)
EP	Eutrophication potential (kg Phosphate eq)
GWP	Global warming potential (kg CO <sub>2</sub> eq)
ODP	Depletion of stratospheric ozone layer (kg CFC 11 eq)
POCP	Photochemical ozone creation potential (kg Ethene eq)

Abbrev.	Parameter (Unit)
Resource Use Parameters	
PERE	Renewable primary energy as energy carrier (MJ, net calorific value)
PERM	Renewable primary energy resources as material utilization (MJ, net calorific value)
PERT	Total use of renewable primary energy resources (MJ, net calorific value)
PENRE	Non-renewable primary energy as energy carrier (MJ, net calorific value)
PENRM	Non-renewable primary energy as material utilization (MJ, net calorific value)
PENRT	Total use of non-renewable primary energy resources (MJ, net calorific value)
SM	Use of secondary material (kg)
RSF	Use of renewable secondary fuels (MJ, net calorific value)
NRSF	Use of non-renewable secondary fuels (MJ, net calorific value)
FW	Use of fresh water (m <sup>3</sup> )
Output Flows and Waste Parameters	
HWD	Hazardous waste disposed (kg)
NHWD	Non-hazardous waste disposed (kg)
RWD	Radioactive waste disposed (kg)
CRU	Components for reuse (kg)
MFR	Materials for recycling (kg)
MER	Materials for energy recovery (kg)
EEE	Exported electrical energy (MJ)
EET	Exported thermal energy (MJ)



# 1 EverGuard® Extreme TPO 1.2-mm Smooth Back Membrane

## 1.1 CML Results

Impact Category	A1-A3	A4	A5			B1	B2	B3	B4	B5	B6	B7
			L	R	I							
ADP-elements [kg Sb eq]	7.93E-07	5.02E-08	1.68E-05	1.68E-05	1.68E-05	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
ADP-fossil fuel [MJ]	8.02E+01	4.24E+00	1.16E+01	1.15E+01	1.15E+01	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
AP [kg SO <sub>2</sub> eq]	8.53E-03	6.54E-03	2.24E-03	2.22E-03	2.23E-03	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
EP [kg Phosphate eq]	6.03E-04	7.91E-04	2.44E-04	2.22E-04	2.24E-04	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
GWP [kg CO <sub>2</sub> eq]	2.72E+00	3.24E-01	7.11E-01	7.02E-01	1.12E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
ODP [kg CFC 11 eq]	3.53E-14	3.41E-17	8.62E-12	8.63E-12	6.05E-15	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
POCP [kg Ethene eq]	6.61E-04	1.41E-04	1.76E-04	1.68E-04	1.76E-04	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00

Impact Category	C1	C2			C3			C4			D
		L	R	I	L	R	I	L	R	I	
ADP-elements [kg Sb eq]	0.00E+00	2.72E-10	2.11E-09	2.72E-10	0.00E+00	0.00E+00	2.31E-08	1.87E-08	0.00E+00	0.00E+00	MND
ADP-fossil fuel [MJ]	0.00E+00	4.17E-02	3.24E-01	4.17E-02	0.00E+00	0.00E+00	5.64E-01	1.48E+00	0.00E+00	0.00E+00	MND
AP [kg SO <sub>2</sub> eq]	0.00E+00	1.78E-05	1.38E-04	1.78E-05	0.00E+00	0.00E+00	2.37E-04	2.68E-04	0.00E+00	0.00E+00	MND
EP [kg Phosphate eq]	0.00E+00	4.55E-06	3.54E-05	4.55E-06	0.00E+00	0.00E+00	5.54E-05	2.60E-04	0.00E+00	0.00E+00	MND
GWP [kg CO <sub>2</sub> eq]	0.00E+00	3.05E-03	2.37E-02	3.05E-03	0.00E+00	0.00E+00	4.23E+00	9.80E-02	0.00E+00	0.00E+00	MND
ODP [kg CFC 11 eq]	0.00E+00	7.66E-19	5.95E-18	7.66E-19	0.00E+00	0.00E+00	5.00E-16	3.38E-16	0.00E+00	0.00E+00	MND
POCP [kg Ethene eq]	0.00E+00	-7.87E-06	-6.11E-05	-7.87E-06	0.00E+00	0.00E+00	2.61E-05	2.99E-05	0.00E+00	0.00E+00	MND



## 1.2 Resource Use

Impact Category	A1-A3	A4	A5			B1	B2	B3	B4	B5	B6	B7
			L	R	I							
PERE [MJ]	6.03E+00	8.52E-02	1.13E+00	1.12E+00	1.13E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PERM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PERT [MJ]	6.03E+00	8.52E-02	1.13E+00	1.12E+00	1.13E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PENRE [MJ]	8.40E+01	4.26E+00	1.22E+01	1.21E+01	1.21E+01	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PENRM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PENRT [MJ]	8.40E+01	4.26E+00	1.22E+01	1.21E+01	1.21E+01	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
SM [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
FW [m³]	1.26E-02	2.25E-04	1.86E-03	1.87E-03	2.79E-03	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00

Impact Category	C1	C2			C3			C4			D
		L	R	I	L	R	I	L	R	I	
PERE [MJ]	0.00E+00	2.49E-03	1.94E-02	2.49E-03	0.00E+00	0.00E+00	1.13E-01	1.05E-01	0.00E+00	0.00E+00	MND
PERM [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	0.00E+00	0.00E+00	MND
PERT [MJ]	0.00E+00	2.49E-03	1.94E-02	2.49E-03	0.00E+00	0.00E+00	1.13E-01	1.05E-01	0.00E+00	0.00E+00	MND
PENRE [MJ]	0.00E+00	4.19E-02	3.26E-01	4.19E-02	0.00E+00	0.00E+00	6.80E-01	1.53E+00	0.00E+00	0.00E+00	MND
PENRM [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	0.00E+00	0.00E+00	MND
PENRT [MJ]	0.00E+00	4.19E-02	3.26E-01	4.19E-02	0.00E+00	0.00E+00	6.80E-01	1.53E+00	0.00E+00	0.00E+00	MND
SM [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	MND
RSF [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	0.00E+00	0.00E+00	MND
NRSF [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	0.00E+00	0.00E+00	MND
FW [m³]	0.00E+00	4.20E-06	3.26E-05	4.20E-06	0.00E+00	0.00E+00	9.26E-03	2.60E-05	0.00E+00	0.00E+00	MND

### 1.3 Waste

Impact Category	A1-A3	A4	A5			B1	B2	B3	B4	B5	B6	B7
			L	R	I							
HWD [kg]	3.47E-08	5.05E-08	1.24E-08	1.33E-08	1.18E-08	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
NHWD [kg]	2.90E-02	1.35E-04	1.69E-01	2.53E-02	2.82E-02	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
RWD [kg]	1.49E-03	8.73E-06	2.28E-04	2.26E-04	2.30E-04	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	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	MNR	MNR	MNR	0.00E+00	0.00E+00
MFR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	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	MNR	MNR	MNR	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.83E-01	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.73E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00

Impact Category	C1	C2			C3			C4			D
		L	R	I	L	R	I	L	R	I	
HWD [kg]	0.00E+00	2.33E-09	1.81E-08	2.33E-09	0.00E+00	0.00E+00	5.14E-10	6.48E-09	0.00E+00	0.00E+00	MND
NHWD [kg]	0.00E+00	3.53E-06	2.75E-05	3.53E-06	0.00E+00	0.00E+00	2.82E-02	1.44E+00	0.00E+00	0.00E+00	MND
RWD [kg]	0.00E+00	8.59E-08	6.67E-07	8.59E-08	0.00E+00	0.00E+00	4.63E-05	2.03E-05	0.00E+00	0.00E+00	MND
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	MND
MFR [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	MND
MER [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	MND
EEE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.01E+00	0.00E+00	0.00E+00	0.00E+00	MND
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.60E+01	0.00E+00	0.00E+00	0.00E+00	MND



## 2 EverGuard® Extreme TPO 1.5-mm Smooth Back Membrane

### 2.1 CML Results

Impact Category	A1-A3	A4	A5			B1	B2	B3	B4	B5	B6	B7
			L	R	I							
ADP-elements [kg Sb eq]	9.29E-07	5.96E-08	1.68E-05	1.68E-05	1.68E-05	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
ADP-fossil fuel [MJ]	9.52E+01	5.03E+00	1.32E+01	1.30E+01	1.31E+01	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
AP [kg SO <sub>2</sub> eq]	1.02E-02	7.76E-03	2.53E-03	2.51E-03	2.52E-03	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
EP [kg Phosphate eq]	7.03E-04	9.38E-04	2.74E-04	2.47E-04	2.50E-04	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
GWP [kg CO <sub>2</sub> eq]	3.23E+00	3.84E-01	7.69E-01	7.60E-01	1.27E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
ODP [kg CFC 11 eq]	3.86E-14	4.05E-17	8.63E-12	8.63E-12	6.38E-15	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
POCP [kg Ethene eq]	7.72E-04	1.67E-04	1.90E-04	1.80E-04	1.90E-04	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00

Impact Category	C1	C2			C3			C4			D
		L	R	I	L	R	I	L	R	I	
ADP-elements [kg Sb eq]	0.00E+00	3.23E-10	2.51E-09	3.23E-10	0.00E+00	0.00E+00	2.76E-08	2.23E-08	0.00E+00	0.00E+00	MND
ADP-fossil fuel [MJ]	0.00E+00	4.95E-02	3.85E-01	4.95E-02	0.00E+00	0.00E+00	6.52E-01	1.76E+00	0.00E+00	0.00E+00	MND
AP [kg SO <sub>2</sub> eq]	0.00E+00	2.11E-05	1.64E-04	2.11E-05	0.00E+00	0.00E+00	2.92E-04	3.19E-04	0.00E+00	0.00E+00	MND
EP [kg Phosphate eq]	0.00E+00	5.40E-06	4.20E-05	5.40E-06	0.00E+00	0.00E+00	6.69E-05	3.12E-04	0.00E+00	0.00E+00	MND
GWP [kg CO <sub>2</sub> eq]	0.00E+00	3.62E-03	2.82E-02	3.62E-03	0.00E+00	0.00E+00	5.08E+00	1.17E-01	0.00E+00	0.00E+00	MND
ODP [kg CFC 11 eq]	0.00E+00	9.10E-19	7.07E-18	9.10E-19	0.00E+00	0.00E+00	5.79E-16	4.03E-16	0.00E+00	0.00E+00	MND
POCP [kg Ethene eq]	0.00E+00	-9.35E-06	-7.26E-05	-9.35E-06	0.00E+00	0.00E+00	3.17E-05	3.56E-05	0.00E+00	0.00E+00	MND



## 2.2 Resource Use

Impact Category	A1-A3	A4	A5			B1	B2	B3	B4	B5	B6	B7
			L	R	I							
PERE [MJ]	6.72E+00	1.01E-01	1.20E+00	1.19E+00	1.21E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PERM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PERT [MJ]	6.72E+00	1.01E-01	1.20E+00	1.19E+00	1.21E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PENRE [MJ]	9.96E+01	5.05E+00	1.39E+01	1.37E+01	1.38E+01	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PENRM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PENRT [MJ]	9.96E+01	5.05E+00	1.39E+01	1.37E+01	1.38E+01	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
SM [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
FW [m³]	1.48E-02	2.67E-04	2.08E-03	2.08E-03	3.19E-03	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00

Impact Category	C1	C2			C3			C4			D
		L	R	I	L	R	I	L	R	I	
PERE [MJ]	0.00E+00	2.96E-03	2.30E-02	2.96E-03	0.00E+00	0.00E+00	1.32E-01	1.25E-01	0.00E+00	0.00E+00	MND
PERM [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	0.00E+00	0.00E+00	MND
PERT [MJ]	0.00E+00	2.96E-03	2.30E-02	2.96E-03	0.00E+00	0.00E+00	1.32E-01	1.25E-01	0.00E+00	0.00E+00	MND
PENRE [MJ]	0.00E+00	4.98E-02	3.87E-01	4.98E-02	0.00E+00	0.00E+00	7.86E-01	1.82E+00	0.00E+00	0.00E+00	MND
PENRM [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	0.00E+00	0.00E+00	MND
PENRT [MJ]	0.00E+00	4.98E-02	3.87E-01	4.98E-02	0.00E+00	0.00E+00	7.86E-01	1.82E+00	0.00E+00	0.00E+00	MND
SM [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	MND
RSF [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	0.00E+00	0.00E+00	MND
NRSF [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	0.00E+00	0.00E+00	MND
FW [m³]	0.00E+00	4.98E-06	3.87E-05	4.98E-06	0.00E+00	0.00E+00	1.11E-02	3.10E-05	0.00E+00	0.00E+00	MND





### 2.3 Waste

Impact Category	A1-A3	A4	A5			B1	B2	B3	B4	B5	B6	B7
			L	R	I							
HWD [kg]	4.05E-08	6.00E-08	1.40E-08	1.51E-08	1.33E-08	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
NHWD [kg]	3.25E-02	1.61E-04	1.96E-01	2.57E-02	2.88E-02	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
RWD [kg]	1.72E-03	1.04E-05	2.52E-04	2.49E-04	2.54E-04	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	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	MNR	MNR	MNR	0.00E+00	0.00E+00
MFR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	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	MNR	MNR	MNR	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.16E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.05E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00

Impact Category	C1	C2			C3			C4			D
		L	R	I	L	R	I	L	R	I	
HWD [kg]	0.00E+00	2.77E-09	2.15E-08	2.77E-09	0.00E+00	0.00E+00	5.98E-10	7.70E-09	0.00E+00	0.00E+00	MND
NHWD [kg]	0.00E+00	4.20E-06	3.26E-05	4.20E-06	0.00E+00	0.00E+00	3.15E-02	1.71E+00	0.00E+00	0.00E+00	MND
RWD [kg]	0.00E+00	1.02E-07	7.92E-07	1.02E-07	0.00E+00	0.00E+00	5.31E-05	2.42E-05	0.00E+00	0.00E+00	MND
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	MND
MFR [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	MND
MER [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	MND
EEE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E+01	0.00E+00	0.00E+00	0.00E+00	MND
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.92E+01	0.00E+00	0.00E+00	0.00E+00	MND



### 3 EverGuard® Extreme TPO 1.8-mm Smooth Back Membrane

#### 3.1 CML Results

Impact Category	A1-A3	A4	A5			B1	B2	B3	B4	B5	B6	B7
			L	R	I							
ADP-elements [kg Sb eq]	1.07E-06	6.90E-08	1.68E-05	1.68E-05	1.68E-05	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
ADP-fossil fuel [MJ]	1.10E+02	5.82E+00	1.48E+01	1.46E+01	1.47E+01	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
AP [kg SO <sub>2</sub> eq]	1.18E-02	8.98E-03	2.82E-03	2.80E-03	2.81E-03	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
EP [kg Phosphate eq]	8.02E-04	1.09E-03	3.04E-04	2.72E-04	2.76E-04	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
GWP [kg CO <sub>2</sub> eq]	3.74E+00	4.45E-01	8.28E-01	8.17E-01	1.41E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
ODP [kg CFC 11 eq]	4.19E-14	4.69E-17	8.63E-12	8.63E-12	6.72E-15	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
POCP [kg Ethene eq]	8.83E-04	1.93E-04	2.04E-04	1.93E-04	2.04E-04	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00

Impact Category	C1	C2			C3			C4			D
		L	R	I	L	R	I	L	R	I	
ADP-elements [kg Sb eq]	0.00E+00	3.74E-10	2.90E-09	3.74E-10	0.00E+00	0.00E+00	3.21E-08	2.59E-08	0.00E+00	0.00E+00	MND
ADP-fossil fuel [MJ]	0.00E+00	5.73E-02	4.45E-01	5.73E-02	0.00E+00	0.00E+00	7.41E-01	2.04E+00	0.00E+00	0.00E+00	MND
AP [kg SO <sub>2</sub> eq]	0.00E+00	2.45E-05	1.90E-04	2.45E-05	0.00E+00	0.00E+00	3.46E-04	3.70E-04	0.00E+00	0.00E+00	MND
EP [kg Phosphate eq]	0.00E+00	6.26E-06	4.86E-05	6.26E-06	0.00E+00	0.00E+00	7.84E-05	3.64E-04	0.00E+00	0.00E+00	MND
GWP [kg CO <sub>2</sub> eq]	0.00E+00	4.20E-03	3.26E-02	4.20E-03	0.00E+00	0.00E+00	5.92E+00	1.35E-01	0.00E+00	0.00E+00	MND
ODP [kg CFC 11 eq]	0.00E+00	1.05E-18	8.18E-18	1.05E-18	0.00E+00	0.00E+00	6.57E-16	4.67E-16	0.00E+00	0.00E+00	MND
POCP [kg Ethene eq]	0.00E+00	-1.08E-05	-8.40E-05	-1.08E-05	0.00E+00	0.00E+00	3.73E-05	4.14E-05	0.00E+00	0.00E+00	MND



### 3.2 Resource Use

Impact Category	A1-A3	A4	A5			B1	B2	B3	B4	B5	B6	B7
			L	R	I							
PERE [MJ]	7.41E+00	1.17E-01	1.28E+00	1.27E+00	1.27E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PERM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PERT [MJ]	7.41E+00	1.17E-01	1.28E+00	1.27E+00	1.27E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PENRE [MJ]	1.15E+02	5.85E+00	1.56E+01	1.54E+01	1.54E+01	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PENRM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PENRT [MJ]	1.15E+02	5.85E+00	1.56E+01	1.54E+01	1.54E+01	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
SM [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
FW [m³]	1.69E-02	3.09E-04	2.30E-03	2.30E-03	2.30E-03	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00

Impact Category	C1	C2			C3			C4			D
		L	R	I	L	R	I	L	R	I	
PERE [MJ]	0.00E+00	3.42E-03	2.66E-02	3.42E-03	0.00E+00	0.00E+00	4.82E-05	1.45E-01	0.00E+00	0.00E+00	MND
PERM [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	0.00E+00	0.00E+00	MND
PERT [MJ]	0.00E+00	3.42E-03	2.66E-02	3.42E-03	0.00E+00	0.00E+00	4.82E-05	1.45E-01	0.00E+00	0.00E+00	MND
PENRE [MJ]	0.00E+00	5.76E-02	4.48E-01	5.76E-02	0.00E+00	0.00E+00	3.74E-04	2.11E+00	0.00E+00	0.00E+00	MND
PENRM [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	0.00E+00	0.00E+00	MND
PENRT [MJ]	0.00E+00	5.76E-02	4.48E-01	5.76E-02	0.00E+00	0.00E+00	3.74E-04	2.11E+00	0.00E+00	0.00E+00	MND
SM [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	MND
RSF [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	0.00E+00	0.00E+00	MND
NRSF [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	0.00E+00	0.00E+00	MND
FW [m³]	0.00E+00	5.77E-06	4.48E-05	5.77E-06	0.00E+00	0.00E+00	3.35E-07	3.59E-05	0.00E+00	0.00E+00	MND

### 3.3 Waste

Impact Category	A1-A3	A4	A5			B1	B2	B3	B4	B5	B6	B7
			L	R	I							
HWD [kg]	4.63E-08	6.94E-08	1.57E-08	1.70E-08	1.49E-08	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
NHWD [kg]	3.60E-02	1.86E-04	2.23E-01	2.60E-02	2.95E-02	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
RWD [kg]	1.96E-03	1.20E-05	2.76E-04	2.73E-04	2.79E-04	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	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	MNR	MNR	MNR	0.00E+00	0.00E+00
MFR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	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	MNR	MNR	MNR	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.37E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00

Impact Category	C1	C2			C3			C4			D
		L	R	I	L	R	I	L	R	I	
HWD [kg]	0.00E+00	3.20E-09	2.49E-08	3.20E-09	0.00E+00	0.00E+00	6.82E-10	8.93E-09	0.00E+00	0.00E+00	MND
NHWD [kg]	0.00E+00	4.86E-06	3.77E-05	4.86E-06	0.00E+00	0.00E+00	3.49E-02	1.97E+00	0.00E+00	0.00E+00	MND
RWD [kg]	0.00E+00	1.18E-07	9.17E-07	1.18E-07	0.00E+00	0.00E+00	5.99E-05	2.81E-05	0.00E+00	0.00E+00	MND
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	MND
MFR [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	MND
MER [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	MND
EEE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E+01	0.00E+00	0.00E+00	0.00E+00	MND
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.24E+01	0.00E+00	0.00E+00	0.00E+00	MND



## 4 EverGuard® Extreme TPO 2.0-mm Smooth Back Membrane

### 4.1 CML Results

Impact Category	A1-A3	A4	A5			B1	B2	B3	B4	B5	B6	B7
			L	R	I							
ADP-elements [kg Sb eq]	1.19E-06	7.76E-08	1.68E-05	1.68E-05	1.68E-05	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
ADP-fossil fuel [MJ]	1.24E+02	6.55E+00	1.63E+01	1.61E+01	1.61E+01	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
AP [kg SO <sub>2</sub> eq]	1.33E-02	1.01E-02	3.08E-03	3.06E-03	3.08E-03	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
EP [kg Phosphate eq]	8.94E-04	1.22E-03	3.32E-04	2.96E-04	3.00E-04	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
GWP [kg CO <sub>2</sub> eq]	4.20E+00	5.00E-01	8.82E-01	8.70E-01	1.54E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
ODP [kg CFC 11 eq]	4.49E-14	5.27E-17	8.63E-12	8.63E-12	7.02E-15	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
POCP [kg Ethene eq]	9.85E-04	2.18E-04	2.17E-04	2.04E-04	2.17E-04	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00

Impact Category	C1	C2			C3			C4			D
		L	R	I	L	R	I	L	R	I	
ADP-elements [kg Sb eq]	0.00E+00	4.20E-10	3.27E-09	4.20E-10	0.00E+00	0.00E+00	3.63E-08	2.92E-08	0.00E+00	0.00E+00	MND
ADP-fossil fuel [MJ]	0.00E+00	6.45E-02	5.01E-01	6.45E-02	0.00E+00	0.00E+00	8.23E-01	2.30E+00	0.00E+00	0.00E+00	MND
AP [kg SO <sub>2</sub> eq]	0.00E+00	2.76E-05	2.14E-04	2.76E-05	0.00E+00	0.00E+00	3.96E-04	4.17E-04	0.00E+00	0.00E+00	MND
EP [kg Phosphate eq]	0.00E+00	7.04E-06	5.47E-05	7.04E-06	0.00E+00	0.00E+00	8.91E-05	4.11E-04	0.00E+00	0.00E+00	MND
GWP [kg CO <sub>2</sub> eq]	0.00E+00	4.72E-03	3.67E-02	4.72E-03	0.00E+00	0.00E+00	6.70E+00	1.53E-01	0.00E+00	0.00E+00	MND
ODP [kg CFC 11 eq]	0.00E+00	1.19E-18	9.21E-18	1.19E-18	0.00E+00	0.00E+00	7.29E-16	5.27E-16	0.00E+00	0.00E+00	MND
POCP [kg Ethene eq]	0.00E+00	-1.22E-05	-9.46E-05	-1.22E-05	0.00E+00	0.00E+00	4.24E-05	4.67E-05	0.00E+00	0.00E+00	MND



## 4.2 Resource Use

Impact Category	A1-A3	A4	A5			B1	B2	B3	B4	B5	B6	B7
			L	R	I							
PERE [MJ]	8.05E+00	1.32E-01	1.34E+00	1.33E+00	1.35E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PERM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PERT [MJ]	8.05E+00	1.32E-01	1.34E+00	1.33E+00	1.35E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PENRE [MJ]	1.29E+02	6.58E+00	1.71E+01	1.69E+01	1.70E+01	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PENRM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
PENRT [MJ]	1.29E+02	6.58E+00	1.71E+01	1.69E+01	1.70E+01	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
SM [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
FW [m³]	1.89E-02	3.47E-04	2.50E-03	2.50E-03	3.96E-03	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00

Impact Category	C1	C2			C3			C4			D
		L	R	I	L	R	I	L	R	I	
PERE [MJ]	0.00E+00	3.85E-03	2.99E-02	3.85E-03	0.00E+00	0.00E+00	1.68E-01	1.64E-01	0.00E+00	0.00E+00	MND
PERM [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	0.00E+00	0.00E+00	MND
PERT [MJ]	0.00E+00	3.85E-03	2.99E-02	3.85E-03	0.00E+00	0.00E+00	1.68E-01	1.64E-01	0.00E+00	0.00E+00	MND
PENRE [MJ]	0.00E+00	6.49E-02	5.04E-01	6.49E-02	0.00E+00	0.00E+00	9.90E-01	2.38E+00	0.00E+00	0.00E+00	MND
PENRM [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	0.00E+00	0.00E+00	MND
PENRT [MJ]	0.00E+00	6.49E-02	5.04E-01	6.49E-02	0.00E+00	0.00E+00	9.90E-01	2.38E+00	0.00E+00	0.00E+00	MND
SM [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	MND
RSF [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	0.00E+00	0.00E+00	MND
NRSF [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	0.00E+00	0.00E+00	MND
FW [m³]	0.00E+00	6.49E-06	5.04E-05	6.49E-06	0.00E+00	0.00E+00	1.46E-02	4.05E-05	0.00E+00	0.00E+00	MND



### 4.3 Waste

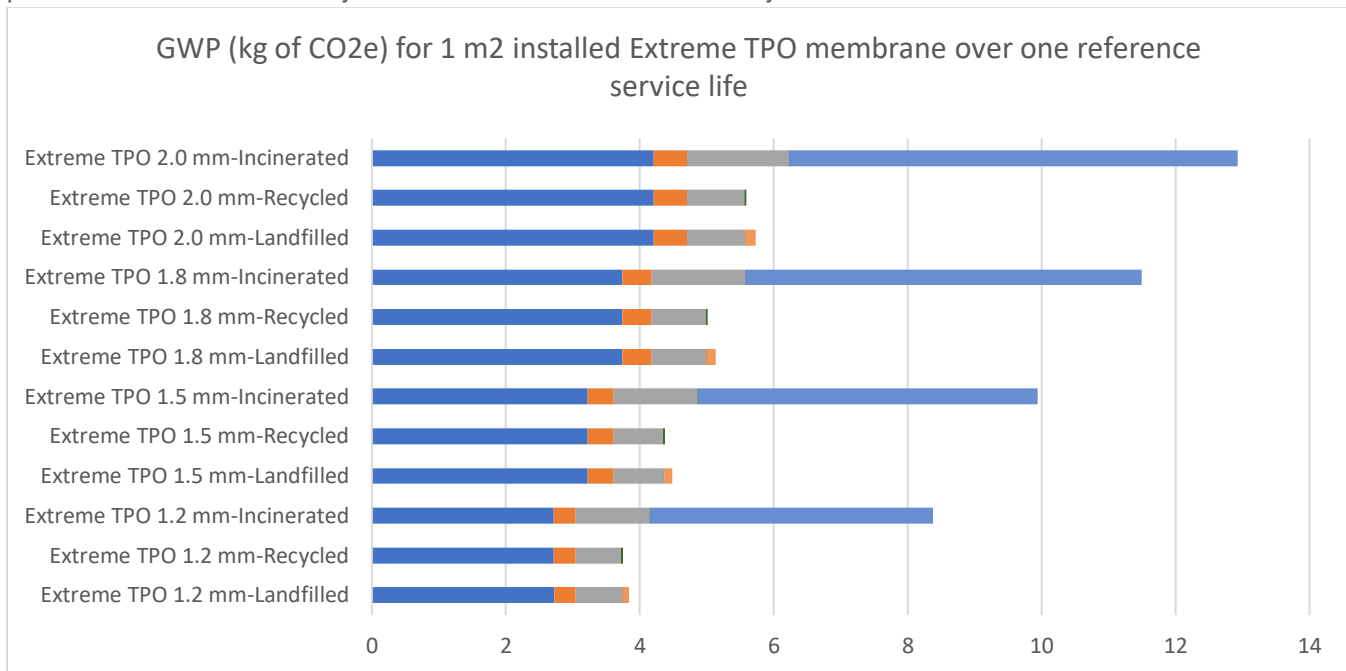
Impact Category	A1-A3	A4	A5			B1	B2	B3	B4	B5	B6	B7
			L	R	I							
HWD [kg]	5.16E-08	7.81E-08	1.73E-08	1.87E-08	1.64E-08	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
NHWD [kg]	3.92E-02	2.09E-04	2.49E-01	2.64E-02	3.02E-02	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
RWD [kg]	2.17E-03	1.35E-05	2.98E-04	2.95E-04	3.01E-04	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	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	MNR	MNR	MNR	0.00E+00	0.00E+00
MFR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	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	MNR	MNR	MNR	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.51E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.66E+00	0.00E+00	0.00E+00	MNR	MNR	MNR	0.00E+00	0.00E+00

Impact Category	C1	C2			C3			C4			D
		L	R	I	L	R	I	L	R	I	
HWD [kg]	0.00E+00	3.60E-09	2.80E-08	3.60E-09	0.00E+00	0.00E+00	7.60E-10	1.01E-08	0.00E+00	0.00E+00	MND
NHWD [kg]	0.00E+00	5.47E-06	4.25E-05	5.47E-06	0.00E+00	0.00E+00	3.80E-02	2.22E+00	0.00E+00	0.00E+00	MND
RWD [kg]	0.00E+00	1.33E-07	1.03E-06	1.33E-07	0.00E+00	0.00E+00	6.61E-05	3.17E-05	0.00E+00	0.00E+00	MND
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	MND
MFR [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	MND
MER [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	MND
EEE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E+01	0.00E+00	0.00E+00	0.00E+00	MND
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.54E+01	0.00E+00	0.00E+00	0.00E+00	MND



## Interpretation

Dominance analyses conducted in the LCA study and described in the project report (see reference #1), indicate that global warming potential and abiotic depletion of fossil fuels are seen to be the largest impact categories. This is a consistent finding across all different thicknesses and determined by the nature of the raw materials. Within the impact categories, A1-A3 stages, which include raw material extraction, transportation and manufacturing, are a remarkable contributor of impacts. For GWP, the disposal method how the product is treated at its end of life also matters. The GWP impact from EOL stages will exceed that from A1-A3 if the product is incinerated when disposed of. This calls out a more detailed study of how the product should be disposed. With the same disposal method, the results increases with the thickness of the product, which is understandable as thicker membrane requires more resources to manufacture, transport and dispose of. Below is an illustration of the products GWP impact of all the products covered in the study for one reference service life – 25 years.



## References

1. Life Cycle Assessment, LCA Report for BMI, WAP Sustainability Consulting, October 2019
2. Product Category Rules for Building-Related Products and Services Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report, Institut Bauen und Umwelt, Version 1.7, March 16th, 2018
3. Part B: Requirements on the EPD for Plastic and elastomer roofing and sealing sheet systems, Institut Bauen und Umwelt, Version 1.0, November 4th, 2013
4. ISO 14044: 2006 Environmental Management – Life cycle assessment – Requirements and Guidelines.
5. ISO 14044: 2006/ Amd 1:2017 Environmental Management – Life cycle assessment – Requirements and Guidelines – Amendment 1.
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.
8. 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)