freedom®

Saddle

Pony Saddle

Active Pony

# Life Cycle Assessment

Study Completed: May 2023
Critical Review Completed: August 2023
Critical Review Completed By: WAP Sustainability

| LIFE CYCLE ASSESSMENT | | | | | |
|---|---|---|---|---|---|
| **Manufacturer** | Humanscale | | | | |
| **Product Name(s)** | Freedom® Saddle, Freedom® Pony Saddle, Freedom® Active Pony | | | | |
| **Product Type** | Task Stool | | | | |
| **Product Description** | Where traditional stools are often uncomfortable, static and stiff, Freedom® Saddle, Pony Saddle and Active Pony task stools incorporate the same ergonomic design considerations as every other Humanscale product. The result is a fun, versatile, and ergonomic stool that encourages movement while remaining comfortable and promoting workspace wellbeing. | | | | |
| **LCA Scope, Overall** | Cradle to Grave | | | | |
| **LCA Scope, Included Life Cycle Modules** | **Sourcing and Manufacturing Modules** | **Delivery and Installation Modules** | **Use Phase Modules** | | **End of life Modules** |
| | ☒ A1<br>☒ A2<br>☒ A3 | ☒ A4<br>☒ A5 | ☒ B1<br>☒ B2<br>☒ B3<br>☒ B4 | ☒ B5<br>☒ B6<br>☒ B7 | ☒ C1<br>☒ C2<br>☒ C3<br>☒ C4 |
| | **Benefits and Loads beyond System Boundary:** ☐ D | | | | |
| **Functional or Declared Unit** | The functional unit is one stool. | | | | |
| **Summary of Impact Categories Measured** | ☒ Global Warming Potential<br>☒ Acidification Potential<br>☒ Eutrophication Potential<br>☒ Smog Creation | | ☒ Ozone Depletion Potential<br>☒Water Consumption<br>☒ Fossil Resource Scarcity | | |

| | | | |
|---|---|---|---|
| **Reference Standards** | ☒ ISO 14040<br>☒ ISO 14044 | ☐ ISO 21930<br>☐ EN 15804 | ☐ Others (Specify Below): |
| **Reference PCR (If Applicable)** | BIFMA PCR for Seating: UNCPC 3811 | | |
| **LCA Study Conducted by** | **Date Completed** | May, 2023 | |
| | **LCA Practitioner** | Stephanie Richardson, Sustainability Manager, Humanscale | |
| **Independent LCA Review Details** | **Date of Final Approval** | 15 August, 2023 | |
| | **LCA Reviewer** | Manasa Rao, Sustainability Manager, WAP Sustainability | |
| | **Type of Review** | ☐ Internal | ☒ External |
| **LCA Expiration Date** | August 14, 2026 | | |
| **LCA Software and Version** | OpenLCA | | |
| **LCA Database(s) and Version(s)** | Ecoinvent database, version 3.8 cut off regionalized | | |
| **Applicable Region(s)** | Global | | |
| **Link to Publicly Available Version of LCA (If Applicable)** | https://www.humanscale.com/resources/designer-toolkit/green-design.cfm | | |

**Freedom® Saddle**

**Freedom® Pony Saddle**

**Freedom® Active Pony**

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# 1 EXECUTIVE SUMMARY

This critical review is being done by WAP Sustainability. The objective of the critical review is to ensure that this assessment meets the intent of the relevant imperatives within the Living Product Challenge; Water Footprint 04, Energy Footprint 06, and Net Positive Carbon 14, for greenhouse gas calculations for Scope 3, category 1: Purchased Goods and Services and to increase LEED credit contribution for this product.

The results presented herein will not be used as the sole basis for a comparative assertion.

# 2 GENERAL INFORMATION

## 2.1 COMPANY PROFILE

Humanscale was founded in 1983 by CEO Bob King with a focus on high-performance tools that support a healthy, more active way of working. Humanscale is now a global ergonomics and furniture leader with a reputation for designing intuitive products which improve the comfort and health of office workers. Humanscale's global headquarters is located in New York, NY and the company has offices and manufacturing throughout North America, Latin America & The Caribbean, Europe, Asia Pacific, Oceania, The Middle East and Africa.

- The LCA commissioner: Humanscale
- The LCA practitioner(s): Stephanie Richardson, Sustainability Manager; an employee of Humanscale.

The LCA modeling, results interpretation and report have been conducted according to the relevant requirements of the International Standards on LCA, including ISO 14040 and ISO 14044.

In addition, the LCA modeling, results interpretation and report have been conducted in conformance with established Product Category Rules (PCR). Specifically, this LCA followed the PCR for seating (BIFMA PCR for Seating - Version 3 UNCPC 3811).

## 2.2 REPORTING DATE

The LCA study commenced in April 2023 and a draft was submitted for critical review to WAP Sustainability in May 2023. The final approval of the document took place on 15 August 2023.

## 2.3 GOAL OF THE STUDY AND INTENDED APPLICATION

The intended application of this LCA is to support Humanscale in applying "life cycle thinking" to discover potential ways to further improve the environmental performance of the Freedom® Saddle task stool, Freedom® Pony Saddle task stool, and Freedom® Active Pony Saddle task stool with a particular focus on one or more of the following impact categories: energy consumption, water consumption, and climate change, including the emissions and the possible sequestration of greenhouse gases.

Additionally, the study was also conducted to support the following certifications, reporting schemes and programs.

1. Living Product Challenge certification:
   Some of the certification criteria within Living Product Challenge, which are referred to as "imperatives", include a requirement related to the characterization of the product's cradle-to-gate footprint on specific impact categories. The required impact categories include climate change, water consumption and energy consumption. Additionally, the imperatives go on to call on manufacturers to identify the five major determinants, referred to as Hotspots, of a product's cradle-to-gate environmental footprints. Ultimately companies are required to establish plans to reduce these footprints and to create positive impacts (called "handprints") which are larger than the remaining footprint. Accomplishing the above requires a company to complete a life cycle assessment (LCA) on the products they are seeking certification for.

2. Greenhouse gas calculations for Scope 3, category 1: Purchased Good and Services:
   The LCA model and results will be used to calculate upstream Greenhouse Gas (GHG) impacts related to the production of Humanscale products. This calculation will then be used to disclosure Scope 3 emissions related to material extraction in Humanscale's annual Carbon Disclosure Project (CDP) submittal.

3. ANSI/BIFMA LEVEL e3 certification:
   LEVEL certification is based on the ANSI/BIFMA e3 standard and includes several credit points for calculation of product impacts through various phases of the life cycle. This LCA will be used to achieve these credits.

4. USGBC LEEDv4.1 MR credit:
   LEEDv4.1 awards point contribution to products that have a third-party verified LCA in accordance to ISO14040. The LCA must be publicly available and include a scope of at least cradle-to-gate. This LCA will be posted publicly and will be used by Humanscale to support their customer's point contribution to this credit.

5. Calculations toward Net Positive impact:
   Humanscale aims to have a net positive impact while manufacturing mass produced goods. Along with reductions in negative impacts from manufacturing, additional positive impacts are created with restorative initiatives. The LCA is used to understand the full amount of negative impacts, and therefore the minimum required amount of positive impacts required to achieve a state of net positive impact.

## 2.4 TARGET GROUP / AUDIENCE

The intended audience of the study includes:

- Customers, particularly those looking to achieve LEED credits related to product specific LCAs.
- Third-party verification professionals who will confirm compliance to ISO14040/44 and the product category PCR.

- Third-party verification professionals who will review the documentation to assure conformance to certifications and reporting schemes listed in the Goal and Intended Application section above.
- Employees of Humanscale who will use the LCA information to inform product design and company strategy.

### 2.5 COMPARATIVE ASSERTIONS AND PUBLIC DISCLOSURE

This LCA will be publicly available; however, this study was not completed with the intent that comparative assertions would be made using its results. Additionally, the study is not comparative in nature and only discloses the impacts associated with single products or groups of products and makes no claims of the environmental performance of the products in the study against other products.

### 2.6 ISO 14040/44 AND PCR COMPLIANCE

This LCA has been critically reviewed for compliance with;

- ISO 14040/44
- BIFMA PCR for Seating: UNCPC 3811, Version 3

The critical review statement and checklist are included in the appendix of this document.

# 3 SCOPE OF THE STUDY

## 3.1 FUNCTIONAL UNIT

The primary function of the product is to provide seating to one individual.

The functional unit for this LCA study follows the requirements for defining a function unit according to the BIFMA PCR for Seating: UNCPC 3811 version 3. This PCR states that "the functional unit shall be one unit of seating to seat one individual, maintained for a 10-year period." Although the warranty for Freedom® Saddle, Freedom® Pony Saddle and Freedom® Active Pony is 15 years, and they are expected to perform at least as long as its warranty period, this LCA follows the PCR requirement, and the functional life of the product is assumed to be ten years. In addition, Freedom® Saddle and Freedom® Pony Saddle have been certified to the ANSI/BIFMA X5.1 standard.

## 3.2 PRODUCT DESCRIPTION

### *3.2.1 Product Description and Specifications*

Part of Humanscale's award-winning Freedom® seating line, the Saddle, Pony and Active Pony task stools are the most comfortable, versatile and ergonomic stools ever made. Complementing our Freedom task chairs, our Freedom Ergonomic Stools are the most comfortable and versatile stools ever made. Each stool features a unique triangular seat design with contour cushion that encourages users to sit in a saddle posture that supports a healthy lumbar spine, reducing pressure points and increasing circulation. Sitting on stools in this position lowers the thighs, opens up the hips and allows for increased circulation. The posture also reduces pressure points on the tailbone, enabling long-term comfort.

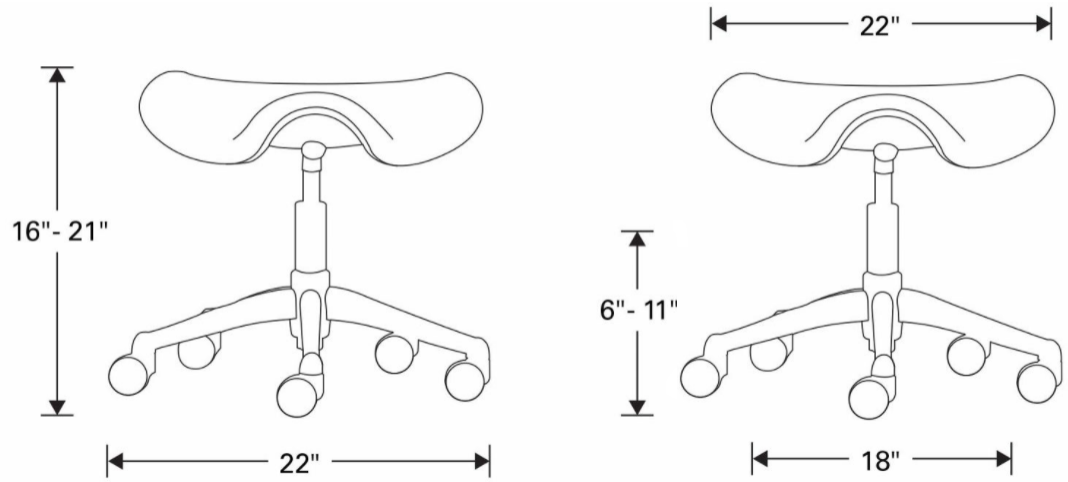
Model numbers for Freedom® Saddle begin with ‘F30’, for Freedom® Pony Saddle ‘F40’ and for Freedom® Active Pony ‘F50’.

Both Saddle and Pony Saddle models in this LCA have the following features; polished aluminum bases, standard hard casters, and corde 4 textile. Active Pony has a powder-coated graphite base, standard hard casters, and corde 4 textile. For this report, the most popular configurations were chosen. Data availability in the Ecoinvent database was also a factor in configuration selection.

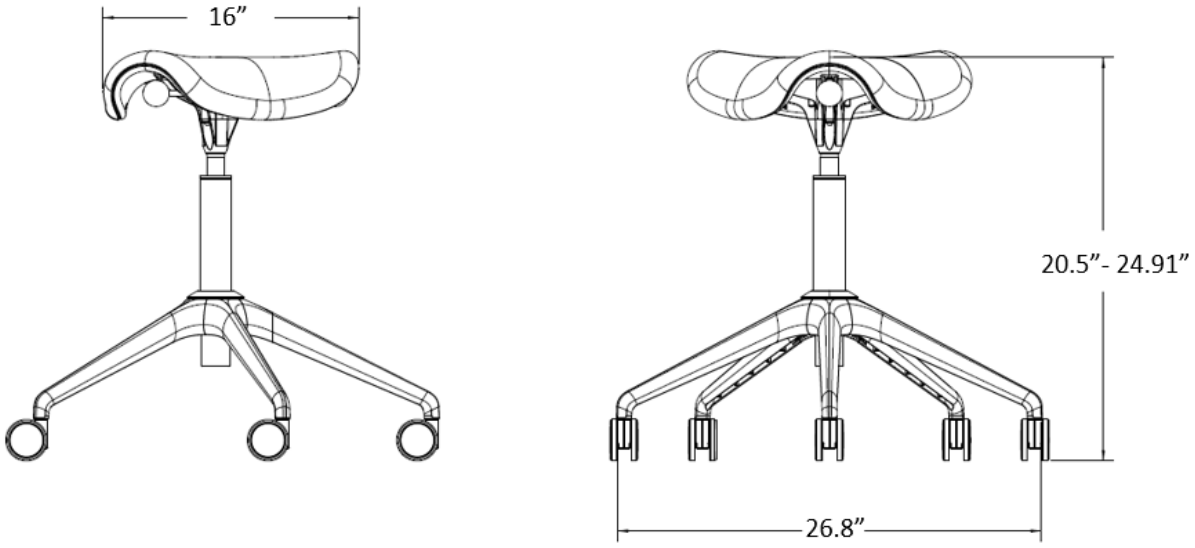
Figure 1: Product Specifications

Saddle and Pony Saddle

* Pony Saddle seat is 16” wide




Active Pony



*3.2.2 Technical Data*

| Table 1: Technical Details | |
|---|---|
| ANSI/BIFMA X5.1 | Certification # 20180814-MH62209 |
| Sustainability certification | Declare: HSC-0006, HSC-2049 |
| | ANSI/BIFMA LEVEL® 3: SCS-SCF-05108 |
| | HPD Label: Freedom® Saddle / Freedom® Pony Saddle |
| | Living Product Challenge: HSC-LP015, HSC-LP016, |
| VOC emission | Indoor Advantage Gold: SCS-IAQ-05426 |

## 3.3 SYSTEM BOUNDARY

For full cradle-to-grave analysis, the upstream system boundary includes the full cradle-to-gate supply chains of all inputs beginning with material extraction and ending with final assembly of the product by Humanscale. The downstream system boundary begins with shipping of the product to the customer and terminates with product disposal which follows the solid waste treatment percentages of the most current version of the USEPA Municipal Solid Waste data for North America.

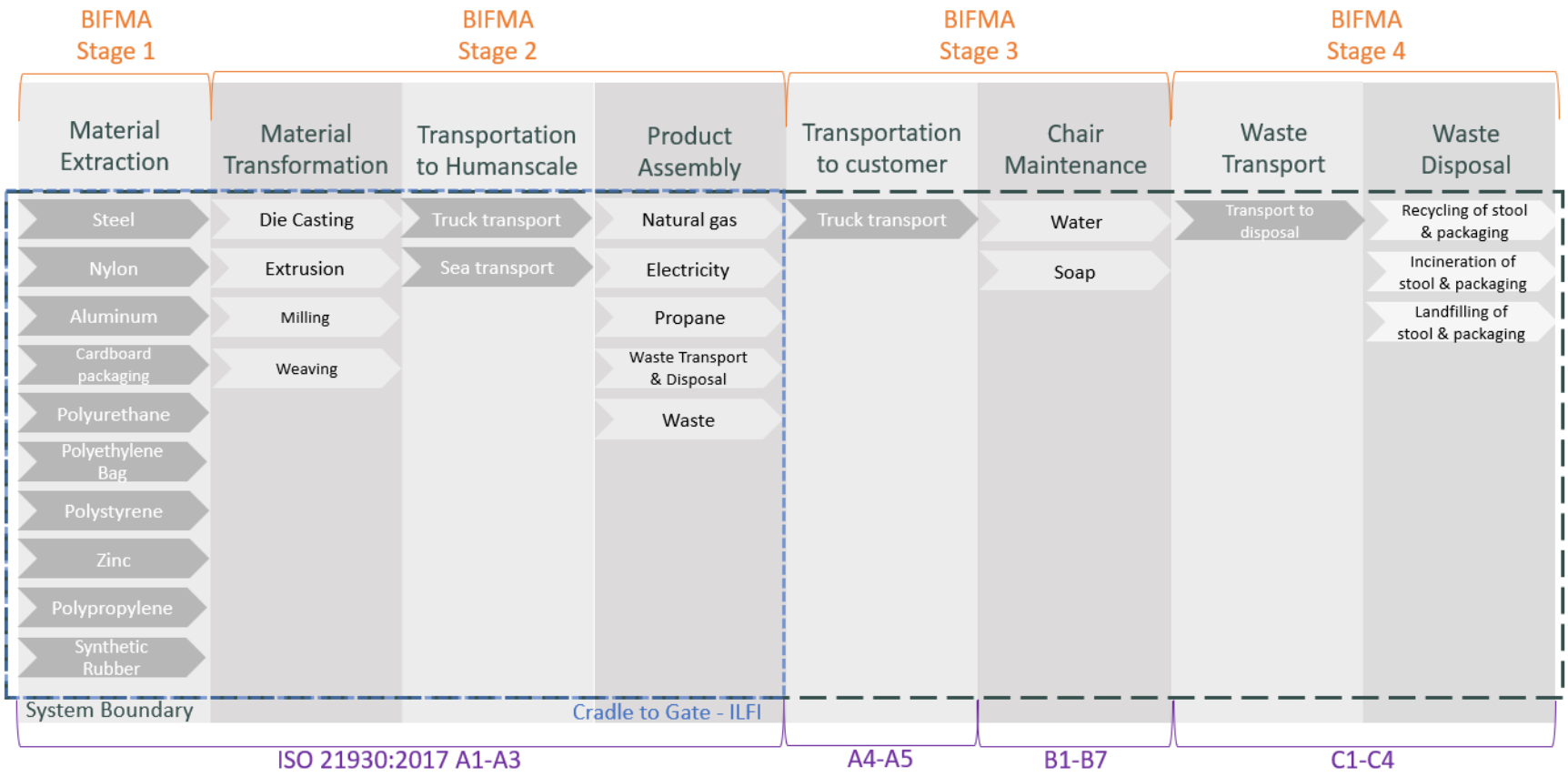
| Table 2: Summary of Included Life Cycle Stages | | | |
|---|---|---|---|
| Module Name | BIFMA Seating PCR Life Cycle Stage Name | Analysis Period | Summary of Included Elements |
| Freedom Saddle MatExtract | **Material Acquisition and Pre-processing** | 2022 | Raw material extraction, transportation and refining including packaging as defined by secondary data. |
| Freedom Saddle MatTrans | **Production (Manufacturing / Assembly)** | 2022 | Manufacturing of components. |
| Freedom Saddle Trspt to HS | **Production (Manufacturing / Assembly)** | 2022 | Transportation of product components to Humanscale. Primary data is used. |
| Assembly | **Production (Manufacturing / Assembly)** | 2022 | Final assembly and packing at Humanscale facility. Primary data is used for electricity, natural gas and waste. |
| Freedom Saddle Trspt to Cust | **Distribution, storage, and use** | 2022 | Transportation to customer. Farthest shipping distance via frieght truck is assumed. |

| | | | |
|---|---|---|---|
| Chair Maintenance | **Distribution, storage, and use** | 2022 | Cleaning of product. |
| Freedom Saddle EOL Trspt | **End of life** | 2022 | Transportation of product and product packaging to disposal facility. |
| Freedom Saddle EOL Disposal | **End of Life** | 2022 | Landfilling and incernerating of packaging and product parts. |

Figure 2: System Boundary Diagram shows the full scope of the model which has been developed using primary and secondary data. All secondary data used in the model have multiple inputs from the ecoinvent database, and ultimately the full system (with foreground and background data) contains thousands of unit processes.

The system model includes production of raw materials, as well as all inputs of energy, inbound transport, and waste, outbound transportation to customer, use phase, and end of life including transportation and treatment of waste. Water is not used in the final assembly of these Freedom® products except for the production of the seat cushion which is done by Humanscale with harvested rainwater on site.

Figure 2: System Boundary Diagram



## 3.4 MATERIAL ACQUISITION AND PRE-PROCESSING STAGE

This stage includes raw material extraction, transportation to suppliers' facilities, material refining including:

- Material extraction including scrap material
- Waste created during material processing, including the transportation of the waste created to landfill or recycling facility
- Material primary processing
- Interfacility transportation
- Materials used in packaging of the final product
- Transportation to the production stage

| Table 3: Material Composition (grams) | | | |
|---|---|---|---|
| | Freedom Saddle | Freedom Pony Saddle | Freedom Active Pony |
| Plastic | 3,175.89 | 2,042.96 | 2,555.46 |
| Aluminum | 1,892.39 | 1,892.39 | 1,289.42 |
| Steel | 1,958.04 | 1,958.04 | 2,255.04 |
| Zinc | 0 | 0 | 400 |
| Packaging | 5,267.59 | 5,267.59 | 5,267.59 |
| Other / Omitted | 9.07 | 9.07 | 9.07 |
| **Total** | **12,302.98** | **11,170.05** | **11,776.58** |

In this phase, primary data was used for the amount of scrap generated during each process. Humanscale has gathered scrap information from first-tier suppliers. This material has been accounted for in Section 3.4. For waste generation and transportation, default values within the ecoinvent dataset were used.

For transportation to the production stage, default values in the ecoinvent database were used.

## 3.5 PRODUCTION

This stage includes manufacturing of main parts and components, transportation to Humanscale location, final assembly and packaging, including:

- Manufacturing of main furniture components from basic raw materials
- Transportation to Humanscale's factory gate for assembly
- Transportation between Humanscale facilities, if applicable
- Product assembly, including the use of ancillary materials necessary for production, if applicable
- Product packaging
- Waste creation and processing
- Energy inputs

Preparation of the final product, including forming, surface treatment, machining and/or other processes are included as applicable.

In this phase, primary data for waste material transportation was calculated using the PCR required default value of 32 kilometers (20 miles) since primary data was not available. For secondary data, waste transportation values were embedded in the LCA dataset used.

Waste generated at Humanscale facilities were based on primary data. For secondary data, waste destination parameters were embedded within the datasets used.

The are no additional inputs beyond what has been accounted for in the product's raw materials that are required for the assembly and install of the product.

### 3.6 DISTRIBUTION, STORAGE, AND USE

This stage includes all materials, energy and waste related to product transport to customer and stool use/maintenance.

- Transportation from manufacturing gate to customer
- Product maintenance (cleaning with mild soap and water)

In some cases, the product is shipped to a distributor or dealer before being transported to final customer. This is not included in the model, however, due to uncertainty and lack of primary data. As such, storage is not included. The models in this report assume the product is being shipped direct to the consumer. Transportation mode and distances in this phase were based on primary data. The value utilized represents the furthest customer from the assembly location. The average farthest shipping distance for both final assembly locations is 3,689 kilometers.

Additionally, aside from regular cleaning, there is no energy or additional inputs required for operation and use and the product does not change the operational efficiency of the building. This same statement can be said for water. Repair and refurbishment happens infrequently and did not need to be accounted for.

Per Humanscale's cleaning instructions for seating, the following inputs are included in the model during the product use phase over its lifespan;

Table 4: Use Phase Inputs

| Input | Dataset | Amount (grams) |
|---|---|---|
| water | Tap water, at user, ROW | 59.16 |
| mild soap | Soap production, ROW | 187.2 |

### 3.7 END OF LIFE MANAGEMENT

This stage includes transportation of the product and packaging to the end of life facility. Even though Humanscale products are highly recyclable and come with disassembly instructions, the product is assumed to be landfilled, incinerated and recycled based on the BIFMA PCR and EPA Recycling Rates for North America. Collection of end of life product and packaging distances are based on the current USEPA WARM Model per the PCR. All waste materials are assumed to be disposed of in the North America for products assembled in North America facilities. North American EPA data was used for end of life modeling in Dublin as well in absence of European-specific hauling distances and recycling rates.

Geographic specificity of the dataset used to represent product landfilling was global in nature.

| Table 5: End of Life Management | | | | | | |
|---|---|---|---|---|---|---|
| Product | Material Type | Weight (grams) | Recycling Rate* | Weight Recycled (grams) | Weight Landfilled (grams)** | Weight Incinerated (grams)** |
| Freedom® Saddle | Polystyrene | 742.50 | 8.66% | 64.30 | 542.56 | 135.64 |
| | Polypropylene | 1,120.00 | 8.66% | 97.00 | 818.40 | 204.60 |
| | Polyurethane | 620.06 | 8.66% | 53.70 | 453.09 | 113.27 |
| | Other plastic | 803.33 | 8.66% | 69.57 | 587.01 | 146.75 |
| | Steel (ferrous) | 1,958.04 | 33.13% | 648.60 | 1,047.55 | 261.89 |
| | Aluminum | 1,892.39 | 17.22% | 325.94 | 1,253.16 | 313.29 |
| | Paperboard | 5,157.59 | 68.21% | 3,518.24 | 1,311.48 | 327.87 |
| Freedom® Pony Saddle | Polystyrene | 375.00 | 8.66% | 32.48 | 274.02 | 68.50 |
| | Polypropylene | 645.00 | 8.66% | 55.86 | 471.31 | 117.83 |
| | Polyurethane | 329.63 | 8.66% | 28.55 | 240.87 | 60.22 |
| | Other plastic | 803.33 | 8.66% | 69.57 | 587.01 | 146.75 |
| | Steel (ferrous) | 2,041.84 | 33.13% | 676.36 | 1,092.38 | 273.10 |
| | Aluminum | 1,892.39 | 17.22% | 325.94 | 1,253.16 | 313.29 |
| | Paperboard | 5,157.59 | 68.21% | 3,518.24 | 1,311.48 | 327.87 |
| Freedom® Active Pony | Polystyrene | 375.00 | 8.66% | 32.48 | 274.02 | 68.50 |
| | Polypropylene | 662.00 | 8.66% | 57.33 | 483.73 | 120.93 |
| | Polyurethane | 332.67 | 8.66% | 28.81 | 243.09 | 60.77 |
| | Other plastic | 1295.79 | 8.66% | 112.22 | 946.86 | 236.71 |
| | Steel (ferrous) | 2255.04 | 33.13% | 746.98 | 1,206.45 | 301.61 |
| | Zinc (non-ferrous) | 400.00 | 67.33% | 269.32 | 104.54 | 26.14 |
| | Aluminum | 1289.42 | 17.22% | 222.09 | 853.87 | 213.47 |
| | Paperboard | 5157.59 | 68.21% | 3,518.24 | 1,311.48 | 327.87 |

*Recycling rates from the 2018 EPA Sustainable Materials Management (SMM) – Materials and Waste Management in the United States Key Facts and Figures.
** Per the PCR, 80% of the material not recycled should be modeled using landfill and 20% using incineration.

## 3.8 CUT-OFF CRITERIA

This LCA follows the cut-off criteria required by the BIFMA PCR for Seating, which allows flows less than 1% to be omitted if their omission is justified. Cumulatively all mass and energy omitted cannot exceed 5%.

For this study, Humanscale attempted to include all known mass and energy flows. Some flows were omitted due to data quality restrictions. Specially, the following flows were omitted:

- The system model omits the tape used in packaging because the Ecoinvent database does not have this input material, nor could one be found that was close enough for use as a substitute. The tape that was omitted was 9.07 grams, less than .1% of the product weight for all three stools.

## 3.9 ALLOCATION PROCEDURES

For primary data, mass allocation was used to model waste and energy inputs. For this, the total weight of the stool was divided by the total weight of all products produced in the Humanscale facility during

the 2022 calendar year to proportionately allocate waste and energy. For background processes we used the Ecoinvent database, version 3.8 cut-off regionalized.

## 3.10 DATA QUALITY REQUIREMENTS

### *3.10.1 Geographical Coverage*

Final manufacturing of the product occurs in one Humanscale facility in North America and one in Europe and the product is shipped to customers globally. For the purpose of this report, six models have been created to represent the impacts of the Freedom® family specific to its final assembly location and their supply chains.

| Unites States | Ireland |
|---|---|
| 220 Circle Dr N,<br>Piscataway, NJ 08854 | IDA Industrial Estate Poppinntree<br>Finglas<br>Dublin 11 |

### *3.10.2 Time Coverage*

The study is meant to reflect current conditions, using primary data from the most recent full calendar year available, 2022.

### *3.10.3 Technical Coverage*

Primary data was retrieved from Humanscale utility and waste hauling bills from the most current complete calendar year (2022), is site-specific and considered of good quality. The energy used in manufacturing includes the overhead energy (lighting, heating, etc.) of the entire facility. Sub-metering was not available to extract process energy use from the total energy use. Sub-metering would improve the technological coverage of data quality.

For secondary data, we use the most current version of the Ecoinvent database, version 3.8.

In cases where proxy data must be used, we compare the available options and use the most conservative option (the one which yields higher cradle-to-gate impacts on one or more of the three impact categories indicated in the goal and scope). Secondary data used in this study are listed in Table 5 below. In general, secondary data was of overall good quality, however regional specificity was lacking. This was due to the lack of availability of regionally specific data in the ecoinvent database.

Table 6: Secondary Dataset Reference

| Dataset | Source | Time Coverage | Geographical Coverage | Technical Coverage | Overall Representativeness |
|---|---|---|---|---|---|
| market for aluminium scrap, new \| Cutoff, U | Ecoinvent | 2010 | RER | Appropriate technology | Good, appropriate technology but not exact geography nor timeframe |
| market for aluminium scrap, post-consumer, prepared for melting Cutoff, U | Ecoinvent | 2011 | GLO | Appropriate technology | Good, appropriate technology but not exact geography nor timeframe |
| market for aluminium, primary, ingot \| Cutoff, U | Ecoinvent | 2019 | IAI Area, North America | Appropriate technology | Good, appropriate technology but not exact timeframe |

| | | | | | |
|---|---|---|---|---|---|
| market for aluminium, primary, ingot \| Cutoff, U | Ecoinvent | 2015 | IAI Area, EU27 & EFTA | Appropriate technology | Good, appropriate technology but not exact timeframe |
| market for corrugated board box production (updated to reflect local electricity grid) | Ecoinvent | 2013 | CA-QC | Appropriate technology | Good, appropriate technology but not exact geography nor timeframe |
| market for iron scrap, sorted, pressed \| Cutoff, U | Ecoinvent | 2011 | RoW | Used as proxy for recycled steel | Fair |
| market for nylon 6 \| Cutoff, U | Ecoinvent | 2011 | RoW | Appropriate technology | Good, appropriate technology but not exact geography nor timeframe |
| market for packaging film, low density polyethylene \| Cutoff, U | Ecoinvent | 2011 | GLO | Appropriate technology | Good, appropriate technology but not exact geography nor timeframe |
| market for plastic granulate, unspecified, recycled \| Cutoff, U | Ecoinvent | 2017 | IN | Appropriate technology | Good, appropriate technology but not exact geography nor timeframe |
| market for polypropylene, granulate \| Cutoff, U | Ecoinvent | 2011 | GLO | Appropriate technology | Good, appropriate technology but not exact geography nor timeframe |
| market for polystyrene, general purpose \| Cutoff, U | Ecoinvent | 2011 | GLO | Appropriate technology | Good, appropriate technology but not exact geography nor timeframe |
| polyurethane production, flexible foam, MDI-based \| Cutoff, U (updated to reflect local electricity grid) | Ecoinvent | 2020 | RER | Appropriate technology | Good, appropriate technology but not exact geography |
| market for steel, unalloyed \| Cutoff, U | Ecoinvent | 2011 | GLO | Appropriate technology | Good, appropriate technology but not exact geography nor timeframe |
| market for synthetic rubber \| Cutoff, U | Ecoinvent | 2011 | GLO | Used as a proxy for TPE and styrene butadiene rubber | Fair |
| market for waste paperboard, sorted \| Cutoff, U | Ecoinvent | 2013 | GLO | Appropriate technology | Good, appropriate technology but not exact geography |
| market for zinc \| Cutoff, U | Ecoinvent | 2011 | GLO | Appropriate technology | Good, appropriate technology but not exact geography nor timeframe |
| aluminium milling, small parts \| Cutoff, U (updated to reflect local electricity grid) | Ecoinvent | 2010 | RoW | Used as proxy for machining | Fair |

| | | | | | |
|---|---|---|---|---|---|
| coating powder production \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Good, appropriate technology but not exact geography nor timeframe |
| coating powder production \| Cutoff, U | Ecoinvent | 2010 | RoW | Used as proxy for painting | Fair |
| magnesium-alloy production, AZ91, diecasting \| Cutoff, U (updated to reflect local electricity grid and removed material input) | Ecoinvent | 2010 | RER | Used as proxy for aluminum diecasting | Fair |
| market for impact extrusion of steel, cold, 1 strokes \| Cutoff, U (updated to reflect local electricity grid) | Ecoinvent | 2011 | GLO | Appropriate technology | Good, appropriate technology but not exact geography nor timeframe |
| injection moulding \| Cutoff, U (updated to reflect local electricity grid) | Ecoinvent | 2013 | CA-QC | Appropriate technology | Good, appropriate technology but not exact geography nor timeframe |
| steel milling, small parts \| Cutoff, U (updated to reflect local electricity grid) | Ecoinvent | 2010 | RER | Used as proxy for machining | Fair |
| weaving of synthetic fibre, for industrial use \| Cutoff, U | Ecoinvent | 2019 | GLO | Appropriate technology | Good, appropriate technology but not exact geography nor timeframe |
| transport, freight, lorry 16-32 metric ton, EURO4 \| Cutoff, U | Ecoinvent | 2019 | RER | Appropriate technology | Good, appropriate technology but not exact geography nor timeframe |
| transport, freight, sea, bulk carrier for dry goods \| Cutoff, U | Ecoinvent | 2018 | GLO | Appropriate technology | Good, appropriate technology but not exact geography nor timeframe |
| market for electricity, low voltage \| Cutoff, U | Ecoinvent | 2012 | IE | Appropriate technology | Fair, appropriate technology but not exact timeframe |
| market for electricity, low voltage \| Cutoff, U | Ecoinvent | 2012 | RFC | Appropriate technology | Fair, appropriate technology but not exact timeframe |
| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted \| Cutoff, U | Ecoinvent | 2012 | RFC | Appropriate technology | Fair, appropriate technology but not exact timeframe |
| municipal waste collection service by 21 metric ton lorry \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Fair, appropriate technology but not exact geography nor timeframe |
| market for natural gas, low pressure \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Fair, appropriate technology but not exact geography nor timeframe |

| | | | | | |
|---|---|---|---|---|---|
| natural gas production \| propane \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Fair, appropriate technology but not exact geography nor timeframe |
| market for soap \| Cutoff, U | Ecoinvent | 2011 | GLO | Appropriate technology | Good, appropriate technology but not exact timeframe |
| market for tap water \| Cutoff, U | Ecoinvent | 2014 | RoW | Appropriate technology | Good, appropriate technology but not exact timeframe |
| treatment of municipal solid waste, sanitary landfill \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Good, appropriate technology but not exact timeframe |
| treatment of municipal solid waste, incineration \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Good, appropriate technology but not exact timeframe |
| treatment of scrap aluminium, municipal incineration \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Good, appropriate technology but not exact timeframe |
| treatment of scrap steel, municipal incineration \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Good, appropriate technology but not exact timeframe |
| treatment of scrap steel, inert material landfill \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Good, appropriate technology but not exact timeframe |
| treatment of waste aluminium, sanitary landfill \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Good, appropriate technology but not exact timeframe |
| treatment of waste paperboard, municipal incineration \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Good, appropriate technology but not exact timeframe |
| treatment of waste paperboard, sanitary landfill \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Good, appropriate technology but not exact timeframe |
| treatment of waste plastic, mixture, municipal incineration \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Good, appropriate technology but not exact timeframe |
| treatment of waste plastic, mixture, sanitary landfill \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Good, appropriate technology but not exact timeframe |
| treatment of waste polypropylene, sanitary landfill \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Good, appropriate technology but not exact timeframe |
| treatment of waste polypropylene, municipal incineration \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Good, appropriate technology but not exact timeframe |
| treatment of waste polystyrene, municipal incineration \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Good, appropriate technology but not exact timeframe |
| treatment of waste polystyrene, sanitary landfill \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Good, appropriate technology but not exact timeframe |
| treatment of waste polyurethane, sanitary landfill \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Good, appropriate technology but not exact timeframe |
| treatment of waste polyurethane, municipal incineration \| Cutoff, U | Ecoinvent | 2010 | RoW | Appropriate technology | Good, appropriate technology but not exact timeframe |

### *3.10.4 Treatment of Missing Data*

We leave the amount of upstream supply chain electricity used in modeling (embedded within the background database) unaltered. However, we updated the source of the electricity in some upstream models to reflect the electricity grid local to our suppliers to improve geographic specificity of the model. The recycled content amounts are supplied to Humanscale directly from the vendor of each material. We did not have primary data on customer use, however it was assumed that the customer will wash their Freedom® task stools in accordance with Humanscale's Cleaning Instructions for Humanscale Seating Products. All Humanscale products come with Disassembly Instructions and are highly recyclable, however per the PCR, the model assumes the product is landfilled, incinerated and recycled based on the current USEPA WARM Model.

### *3.10.5 Completeness*

No flows were knowingly excluded from the study. Cumulatively all mass and energy omitted cannot exceed 5%.

### *3.10.6 Precision*

Precision of this study is considered reasonable because primary product data is pulled from product bill of materials. Primary facility data was retrieved from Humanscale utility and waste hauling bills, is site-specific and considered of good quality. The energy used in manufacturing includes power tools and the overhead energy (lighting, heating, etc.) of the entire facility.

For secondary data, we use the most current version of the Ecoinvent database, version 3.8.

### *3.10.7 Consistency*

Bill of materials is provided by our product engineers, maintained and updated as needed. Products come with assembly instructions and maintenance guidelines that are publicly available. Assumptions and value judgements are consistent throughout the study.

### *3.10.8 Reproducibility*

This report is transparent and discloses the data and assumptions made throughout. This would allow another practitioner to produce similar results for the potential environmental impacts of these products.

### *3.10.9 Uncertainty*

There were some uncertainties within the study. Because of this, a sensitivity analysis was completed for areas in which we could evaluate further. These uncertainties include;

- Utilizing proxies where material or process flows are not available
- Using mass allocation for to account for the products' contribution to the waste, water, and energy inputs during assembly at Humanscale's manufacturing locations.
- The models in this report assume that the task stools are being shipped to the furthest customer relative to their manufacturing location.

# 4 LIFE CYCLE INVENTORY ANALYSIS

## 4.1 DATA COLLECTION AND CALCULATION PROCEDURES

Primary data was used for all bill-of-material items, as well as all inputs of energy, inbound transport, waste, and outbound transportation.

Primary data were obtained from the following sources. Solidworks CAD models were used to provide a full bill of materials, listing each part, it's material, and part weight. Infor, Humanscale's ERP system, which is used for ordering components, provided the name of supplier, their address, and common shipping method for all components ordered. Trucking distances were calculated using Google Maps, and ocean freight distances were estimated by using Sea-Distances.org. Amount of scrap was provided by the suppliers directly or estimated. Energy use in the facility of final assembly was calculated based on primary data.

Neither normalization nor weighting have been used in this study. Results are presented at the midpoint level. We include the ISO-required LCIA disclaimer here: "ISO 14044 does not specify any specific methodology or support the underlying value choices used to group the impact categories. Any value-choices and judgments embedded within the grouping procedures are the sole responsibilities of the commissioner of the study (e.g. government, community, organization, etc.)"

## 4.2 LIMITATIONS OF THE STUDY

LCA is a method used to assess potential rather than actual impacts. Consistent with our Goal and Scope, we obtained primary data for the final manufacturing step, and used secondary data for the background processes including the supply chain processes.

Due to the assumptions and value choices listed above, these do not reflect real-life scenarios and hence they cannot assess actual and exact impacts, but only potential environmental impacts. The results presented here should not be used as-is in a comparative assessment with competing products.

Some limitations to the study have been identified as follows:

- A significant limitation of the study was the availability of geographically appropriate datasets. More accurate datasets would have improved the accuracy of the study.
- Availability of primary data for suppliers' energy use, waste and transportation values would have been ideal but was not available.
- The system model omits the tape used in packaging because the Ecoinvent database does not have this input material, nor could one be found that was close enough for use as a substitute. The tape that was omitted was 9.07 grams, less than .1% of the product weight for all three stools. If there was a close match available in the database, this would have improved accuracy of the study.

# 5 LIFE CYCLE IMPACT ASSESSMENT

## 5.1 SELECTION OF IMPACT PARAMETERS

Environmental Impacts were calculated using the OpenLCA software platform. Impact results have been calculated using both TRACI 2.1 and ReCiPe 2016 Midpoint (H) characterization factors. This LCA uses TRACI 2.1 per the requirements of the BIFMA PCR. ReCipe 2016 Midpoint (H) is also used as it is required by ILFI. Specific impact parameters were selected based on the requirements of the ILFI Living Product Challenge Certification requirements and requirements listed for LCA in the LEED V4.1 standard. Per ISO 14040/44: LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

**Table 7: Impact Parameters**

| Requirement of | Abbreviation | Parameter | Unit |
|---|---|---|---|
| **TRACI 2.1** | | | |
| BIFMA | AP | Acidification Potential | kg SO2 eq |
| BIFMA | EP | Eutrophication Potential | kg N eq |
| BIFMA / ILFI | GWP | Global Warming Potential | kg CO2 eq |
| BIFMA | OD | Ozone Depletion | kg CFC-11 eq |
| BIFMA | Smog | Smog | kg O3 eq |
| **ReCiPe 2016 Midpoint (H)** | | | |
| ILFI | WC | Water Consumption | m3 |
| ILFI | FS | Fossil Resource Scarcity | kg oil eq |

## 5.2 LCA RESULTS

All results are given per functional unit as stated in in Section 3.1, which is one stool to provide seating to one individual.

*5.2.1 Freedom® Saddle*

| Table 8: Freedom Saddle Piscataway LCA Results | | | | | | |
|---|---|---|---|---|---|---|
| | | LPC Boundary | | | | |
| Method | Impact Category | Material Acquisition and Pre-processing | Production (Manufacturing / Assembly) | Distribution, storage, and use | End of Life | Cradle to Grave Total |
| **TRACI 2.1** | AP (kg SO2 eq) | 7.83E-02 | 5.11E-02 | 3.53E-02 | 1.95E-03 | 1.67E-01 |
| | EP (kg N eq) | 5.04E-02 | 3.47E-02 | 4.12E-02 | 5.08E-02 | 1.77E-01 |
| | GWP (kg CO2 eq) | 1.91E+01 | 1.16E+01 | 8.20E+00 | 3.49E+00 | 4.24E+01 |
| | OD (kg CFC 11 eq) | 1.19E-06 | 1.80E-06 | 1.87E-06 | 1.37E-07 | 4.99E-06 |
| | Smog (kg O3 eq) | 1.04E+00 | 7.92E-01 | 8.40E-01 | 3.55E-02 | 2.70E+00 |
| **ReCiPe 2016 Midpoint (H)** | WC (m3) | 2.76E-01 | 5.45E-02 | 6.89E-02 | 3.96E-03 | 4.03E-01 |
| | FS (kg oil-Eq) | 7.63E+00 | 3.72E+00 | 2.62E+00 | 2.03E-01 | 1.42E+01 |

| Table 9: Freedom Saddle Dublin LCA Results | | | | | | |
|---|---|---|---|---|---|---|
| | | LPC Boundary | | | | |
| Method | Impact Category | Material Acquisition and Pre-processing | Production (Manufacturing / Assembly) | Distribution, storage, and use | End of Life | Cradle to Grave Total |
| TRACI 2.1 | AP (kg SO2 eq) | 7.81E-02 | 5.22E-02 | 3.63E-02 | 1.95E-03 | 1.69E-01 |
| | EP (kg N eq) | 5.00E-02 | 3.18E-02 | 4.14E-02 | 5.08E-02 | 1.74E-01 |
| | GWP (kg CO2 eq) | 1.91E+01 | 1.10E+01 | 8.44E+00 | 3.49E+00 | 4.20E+01 |
| | OD (kg CFC 11 eq) | 1.18E-06 | 1.27E-06 | 1.93E-06 | 1.37E-07 | 4.52E-06 |
| | Smog (kg O3 eq) | 1.03E+00 | 7.50E-01 | 8.66E-01 | 3.55E-02 | 2.68E+00 |
| ReCiPe 2016 Midpoint (H) | WC (m3) | 2.76E-01 | 5.22E-02 | 6.93E-02 | 3.96E-03 | 4.01E-01 |
| | FS (kg oil-Eq) | 7.62E+00 | 3.30E+00 | 2.71E+00 | 2.03E-01 | 1.38E+01 |

*5.2.2 Freedom® Pony Saddle*

| Table 10: Freedom Pony Saddle Piscataway LCA Results | | | | | | |
|---|---|---|---|---|---|---|
| | | LPC Boundary | | | | |
| Method | Impact Category | Material Acquisition and Pre-processing | Production (Manufacturing / Assembly) | Distribution, storage, and use | End of Life | Cradle to Grave Total |
| **TRACI 2.1** | AP (kg SO2 eq) | 6.36E-02 | 3.88E-02 | 3.23E-02 | 1.73E-03 | 1.36E-01 |
| | EP (kg N eq) | 4.34E-02 | 3.15E-02 | 4.05E-02 | 3.55E-02 | 1.51E-01 |
| | GWP (kg CO2 eq) | 1.52E+01 | 8.89E+00 | 7.53E+00 | 3.30E+00 | 3.49E+01 |
| | OD (kg CFC 11 eq) | 1.01E-06 | 1.20E-06 | 1.70E-06 | 1.24E-07 | 4.03E-06 |
| | Smog (kg O3 eq) | 8.35E-01 | 5.65E-01 | 7.66E-01 | 2.99E-02 | 2.20E+00 |
| **ReCiPe 2016 Midpoint (H)** | WC (m3) | 2.11E-01 | 4.70E-02 | 6.77E-02 | 3.40E-03 | 3.29E-01 |
| | FS (kg oil-Eq) | 5.50E+00 | 2.73E+00 | 2.39E+00 | 1.83E-01 | 1.08E+01 |

| Table 11: Freedom Pony Saddle Dublin Results | | | | | | |
|---|---|---|---|---|---|---|
| | | LPC Boundary | | | | |
| Method | Impact Category | Material Acquisition and Pre-processing | Production (Manufacturing / Assembly) | Distribution, storage, and use | End of Life | Cradle to Grave Total |
| **TRACI 2.1** | AP (kg SO2 eq) | 6.36E-02 | 3.85E-02 | 2.67E-02 | 1.73E-03 | 1.31E-01 |
| | EP (kg N eq) | 4.34E-02 | 2.88E-02 | 3.92E-02 | 3.55E-02 | 1.47E-01 |
| | GWP (kg CO2 eq) | 1.52E+01 | 7.77E+00 | 6.26E+00 | 3.30E+00 | 3.26E+01 |
| | OD (kg CFC 11 eq) | 1.01E-06 | 9.03E-07 | 1.38E-06 | 1.24E-07 | 3.42E-06 |
| | Smog (kg O3 eq) | 8.35E-01 | 5.24E-01 | 6.26E-01 | 2.99E-02 | 2.01E+00 |
| **ReCiPe 2016 Midpoint (H)** | WC (m3) | 2.11E-01 | 4.27E-02 | 6.56E-02 | 3.40E-03 | 3.23E-01 |
| | FS (kg oil-Eq) | 5.50E+00 | 2.28E+00 | 1.94E+00 | 1.83E-01 | 9.91E+00 |

*5.2.3 Freedom® Active Pony*

| Table 12: Freedom Active Pony Piscataway LCA Results | | | | | | |
|---|---|---|---|---|---|---|
| | | LPC Boundary | | | | |
| Method | Impact Category | Material Acquisition and Pre-processing | Production (Manufacturing / Assembly) | Distribution, storage, and use | End of Life | Cradle to Grave Total |
| **TRACI 2.1** | AP (kg SO2 eq) | 8.18E-02 | 3.99E-02 | 3.39E-02 | 4.00E-03 | 1.60E-01 |
| | EP (kg N eq) | 5.95E-02 | 4.02E-02 | 4.09E-02 | 4.12E-02 | 1.82E-01 |
| | GWP (kg CO2 eq) | 1.86E+01 | 1.02E+01 | 7.89E+00 | 3.34E+00 | 4.00E+01 |
| | OD (kg CFC 11 eq) | 1.44E-06 | 1.44E-06 | 1.79E-06 | 1.34E-07 | 4.80E-06 |
| | Smog (kg O3 eq) | 1.10E+00 | 5.94E-01 | 8.05E-01 | 1.03E-01 | 2.60E+00 |
| **ReCiPe 2016 Midpoint (H)** | WC (m3) | 2.81E-01 | 8.43E-02 | 6.84E-02 | 3.26E-03 | 4.37E-01 |
| | FS (kg oil-Eq) | 6.85E+00 | 3.15E+00 | 2.51E+00 | 1.98E-01 | 1.27E+01 |

| Table 13: Freedom Active Pony Dublin Results | | | | | | |
|---|---|---|---|---|---|---|
| | | LPC Boundary | | | | |
| Method | Impact Category | Material Acquisition and Pre-processing | Production (Manufacturing / Assembly) | Distribution, storage, and use | End of Life | Cradle to Grave Total |
| TRACI 2.1 | AP (kg SO2 eq) | 8.18E-02 | 4.11E-02 | 3.33E-02 | 4.00E-03 | 1.60E-01 |
| | EP (kg N eq) | 5.95E-02 | 3.47E-02 | 4.07E-02 | 4.12E-02 | 1.76E-01 |
| | GWP (kg CO2 eq) | 1.86E+01 | 1.01E+01 | 7.75E+00 | 3.34E+00 | 3.97E+01 |
| | OD (kg CFC 11 eq) | 1.44E-06 | 1.31E-06 | 1.75E-06 | 1.34E-07 | 4.63E-06 |
| | Smog (kg O3 eq) | 1.10E+00 | 5.89E-01 | 7.90E-01 | 1.03E-01 | 2.58E+00 |
| ReCiPe 2016 Midpoint (H) | WC (m3) | 2.81E-01 | 7.89E-02 | 6.81E-02 | 3.26E-03 | 4.31E-01 |
| | FS (kg oil-Eq) | 6.85E+00 | 3.03E+00 | 2.47E+00 | 1.98E-01 | 1.25E+01 |

## 5.3 TOP 5 PROCESSES CONTRIBUTING TO ENERGY CONSUMPTION

In connection with the Living Product Challenge Impetrative 06 Energy Footprint, the table below presents the five processes that make the largest contributions to the cradle-to-gate (as defined by the ILFI) energy footprint of Freedom® Saddle, Freedom® Pony Saddle and Freedom® Active Pony. From the results below, it is clear that polypropylene used for the seat shell is the most significant contributor for Saddle and Pony Saddle. For Active Pony, it is synthetic rubber that was used as a proxy for TPE and styrene butadiene rubber. TPE is used in the knob and styrene butadiene rubber is used in the elastic sector. This proxy is discussed in more depth in the Interpretation section below. Furthermore, the relative impacts of the top contributors are roughly the same across both assembly locations for the Freedom® stools.

**Table 14: Top 5 Processes Contributing to Energy Consumption ReCiPe 2016 Midpoint (H)**

| | Final Assembly Location | Process | % | Kg oil-Eq |
|---|---|---|---|---|
| **Freedom® Saddle** | Piscataway, NJ | market for polypropylene, granulate | 16.90% | 1.92E+00 |
| | | market for polystyrene, general purpose | 12.23% | 1.39E+00 |
| | | polyurethane production, flexible foam, MDI-based | 11.69% | 1.33E+00 |
| | | transport, freight, lorry 16-32 metric ton, EURO4 | 9.71% | 1.10E+00 |
| | | injection moulding | 8.05% | 9.14E-01 |
| | Dublin, IE | market for polypropylene, granulate | 17.56% | 1.92E+00 |
| | | market for polystyrene, general purpose | 12.71% | 1.39E+00 |
| | | polyurethane production, flexible foam, MDI-based | 12.14% | 1.33E+00 |
| | | market for nylon 6 | 7.72% | 8.43E-01 |
| | | injection moulding | 6.21% | 6.78E-01 |
| **Freedom® Pony Saddle** | Piscataway, NJ | market for polypropylene, granulate | 13.41% | 1.10E+00 |
| | | market for nylon 6 | 10.23% | 8.43E-01 |
| | | polyurethane production, flexible foam, MDI-based | 8.56% | 7.05E-01 |
| | | market for polystyrene, general purpose | 8.52% | 7.01E-01 |
| | | market for steel, unalloyed | 8.01% | 6.59E-01 |
| | Dublin, IE | market for polypropylene, granulate | 14.19% | 1.10E+00 |
| | | market for nylon 6 | 10.83% | 8.43E-01 |
| | | polyurethane production, flexible foam, MDI-based | 9.06% | 7.05E-01 |
| | | market for polystyrene, general purpose | 9.01% | 7.01E-01 |
| | | market for steel, unalloyed | 8.47% | 6.59E-01 |
| **Freedom® Active Pony** | Piscataway, NJ | market for synthetic rubber | 13.72% | 1.37E+00 |
| | | market for polypropylene, granulate | 11.03% | 1.10E+00 |
| | | market for nylon 6 | 9.94% | 9.95E-01 |
| | | market for steel, unalloyed | 7.41% | 7.41E-01 |
| | | polyurethane production, flexible foam, MDI-based | 7.04% | 7.05E-01 |

| | | | | |
|---|---|---|---|---|
| **Freedom® Active Pony** | Dublin, IE | market for synthetic rubber | 13.90% | 1.37E+00 |
| | | market for polypropylene, granulate | 11.18% | 1.10E+00 |
| | | market for nylon 6 | 10.07% | 9.95E-01 |
| | | market for steel | 7.50% | 7.41E-01 |
| | | polyurethane production, flexible foam, MDI-based | 7.14% | 7.05E-01 |

## 5.4 TOP 5 PROCESSES CONTRIBUTING TO CARBON FOOTPRINT

In connection with the Living Product Challenge Impetrative 14 Net Positive Carbon, the table below presents the five processes that make the largest contributions to the cradle-to-gate (as defined by the ILFI) carbon footprint of Freedom® Saddle, Freedom® Pony Saddle and Freedom® Active Pony. From the results below, it is clear that polyurethane used in the stool seat, nylon used in the caster wheels and cylinder and steel used in components throughout the products are significant contributors. Furthermore, the relative impacts of the top contributors are roughly the same across all assembly locations for the Freedom® stools with the exception of the upstream shipping impacts from truck transport being greater for Piscataway.

**Table 15: Top 5 Processes Contributing to Carbon Footprint TRACI 2.1**

| | Final Assembly Location | Process | % | Kg CO2-Eq |
|---|---|---|---|---|
| **Freedom® Saddle** | Piscataway, NJ | polyurethane production, flexible foam, MDI-based | 10.43% | 3.20E+00 |
| | | transport, freight, lorry 16-32 metric ton, EURO4 | 10.43% | 3.20E+00 |
| | | market for nylon 6 | 10.22% | 3.14E+00 |
| | | market for steel, unalloyed | 9.36% | 2.87E+00 |
| | | market for polystyrene, general purpose | 8.69% | 2.67E+00 |
| | Dublin, IE | polyurethane production, flexible foam, MDI-based | 10.64% | 3.20E+00 |
| | | market for nylon 6 | 10.43% | 3.14E+00 |
| | | market for steel, unalloyed | 9.56% | 2.87E+00 |
| | | market for polystyrene, general purpose | 8.86% | 2.67E+00 |
| | | injection moulding | 8.34% | 2.51E+00 |
| **Freedom® Pony Saddle** | Piscataway, NJ | market for nylon | 13.00% | 3.14E+00 |
| | | market for steel, unalloyed | 11.91% | 2.87E+00 |
| | | diecast | 9.28% | 2.24E+00 |
| | | market for aluminium, primary, ingot | 8.29% | 2.00E+00 |
| | | polyurethane production, flexible foam, MDI-based | 7.05% | 1.70E+00 |
| | Dublin, IE | market for nylon | 13.64% | 3.14E+00 |
| | | market for steel, unalloyed | 12.49% | 2.87E+00 |
| | | diecast | 9.74% | 2.24E+00 |
| | | market for aluminium, primary, ingot | 8.69% | 2.00E+00 |
| | | polyurethane production, flexible foam, MDI-based | 7.40% | 1.70E+00 |
| **Freedom® Active Pony** | Piscataway, NJ | market for nylon 6 | 12.88% | 3.70E+00 |
| | | market for steel, unalloyed | 11.24% | 3.23E+00 |
| | | market for synthetic rubber | 7.38% | 2.12E+00 |
| | | market for aluminium, primary, ingot | 6.95% | 2.00E+00 |

| | | | | |
|---|---|---|---|---|
| **Freedom® Active Pony** | | polyurethane production, flexible foam, MDI-based | 5.92% | 1.70E+00 |
| | Dublin, IE | market for nylon 6 | 12.92% | 3.70E+00 |
| | | market for steel, unalloyed | 11.28% | 3.23E+00 |
| | | market for synthetic rubber | 7.41% | 2.12E+00 |
| | | market for aluminium, primary, ingot | 6.98% | 2.00E+00 |
| | | polyurethane production, flexible foam, MDI-based | 5.94% | 1.70E+00 |

## 5.5 TOP 5 PROCESS CONTRIBUTING TO WATER DEPLETION

In connection with the Living Product Challenge Impetrative 04 Water Footprint, the table below presents the five processes that make the largest contributions to the cradle-to-gate (as defined by the ILFI) water footprint of Freedom® Saddle, Freedom® Pony Saddle and Freedom® Active Pony. From the results below, it is clear that polyurethane for the seat cushion is a significant contributor to the products' water footprint. Aluminum used primarily in the base also contributes significantly here. Furthermore, the relative impacts of the top contributors are roughly the same across all assembly locations for the Freedom® stools.

**Table 16: Top 5 Processes Contributing to Water Consumption ReCiPe 2016 Midpoint (H)**

| | Final Assembly Location | Process | % | m3 |
|---|---|---|---|---|
| **Freedom® Saddle** | Piscataway, NJ | polyurethane production, flexible foam, MDI-based | 23.19% | 7.66E-02 |
| | | market for aluminium, primary, ingot | 13.43% | 4.44E-02 |
| | | market for polystyrene, general purpose | 11.80% | 3.90E-02 |
| | | corrugated board box production | 9.51% | 3.14E-02 |
| | | market for polypropylene, granulate | 7.03% | 2.32E-02 |
| | Dublin, IE | polyurethane production, flexible foam, MDI-based | 23.37% | 7.66E-02 |
| | | market for aluminium, primary, ingot | 13.54% | 4.44E-02 |
| | | market for polystyrene, general purpose | 11.89% | 3.90E-02 |
| | | corrugated board box production | 9.49% | 3.11E-02 |
| | | market for polypropylene, granulate | 7.08% | 2.32E-02 |
| **Freedom® Pony Saddle** | Piscataway, NJ | market for aluminium, primary, ingot | 17.21% | 4.44E-02 |
| | | polyurethane production, flexible foam, MDI-based | 15.80% | 4.07E-02 |
| | | corrugated board box production | 12.18% | 3.14E-02 |
| | | market for nylon 6 | 8.98% | 2.32E-02 |
| | | market for polystyrene, general purpose | 7.64% | 1.97E-02 |
| | Dublin, IE | market for aluminium, primary, ingot | 17.50% | 4.44E-02 |
| | | polyurethane production, flexible foam, MDI-based | 16.06% | 4.07E-02 |
| | | corrugated board box production | 12.39% | 3.14E-02 |
| | | market for nylon 6 | 9.13% | 2.32E-02 |
| | | market for polystyrene, general purpose | 7.76% | 1.97E-02 |
| **Freedom® Active Pony** | Piscataway, NJ | market for aluminium, primary, ingot | 12.15% | 4.44E-02 |
| | | polyurethane production, flexible foam, MDI-based | 11.15% | 4.07E-02 |
| | | market for synthetic rubber | 9.95% | 3.63E-02 |

| | | | | |
|---|---|---|---|---|
| **Freedom® Active Pony** | | market for zinc | 9.32% | 3.41E-02 |
| | | corrugated board box production | 8.60% | 3.14E-02 |
| | Dublin, IE | market for aluminium, primary, ingot | 12.33% | 4.44E-02 |
| | | polyurethane production, flexible foam, MDI-based | 11.32% | 4.07E-02 |
| | | market for synthetic rubber | 10.10% | 3.63E-02 |
| | | market for zinc | 9.46% | 3.41E-02 |
| | | corrugated board box production | 8.73% | 3.14E-02 |

## 5.6 SENSITIVITY ANALYSIS

**Table 17: Sensitivity Analysis Results**

| Factor | BIFMA Life Cycle Stage Name | Model | FRS (kg oil-Eq) | | % Change |
|---|---|---|---|---|---|
| | | | Original | After Change | |
| TPE and styrene butadiene rubber input: using polyurethane rigid foam in place of synthetic rubber as substitution | Material Acquisition and Pre-processing | Active Pony | 1.27E+01 | 1.21E+01 | -5.03% |
| | | | GWP (kg CO2 eq) | | % Change |
| | | | Original | After Change | |
| | | | 4.00E+01 | 3.93E+01 | -1.64% |
| Electricity used in assembly: 100% grid electricity rather than a portion coming from onsite solar | Production (Manufacturing / Assembly) | Saddle | 4.24E+01 | 4.26E+01 | 0.51% |
| | | Pony Saddle | 3.49E+01 | 3.51E+01 | 0.56% |
| | | Active Pony | 4.00E+01 | 4.02E+01 | 0.47% |
| Allocation method: economic instead of mass allocation | Production (Manufacturing / Assembly) | Saddle | 4.24E+01 | 4.23E+01 | -0.23% |
| | | Pony Saddle | 3.49E+01 | 3.49E+01 | -0.01% |
| | | Active Pony | 4.00E+01 | 4.01E+01 | 0.37% |
| Shipping Distance: half the mileage. (Original model assumes farthest shipping distance to customer) | Distribution, storage, and use | Saddle | 4.24E+01 | 3.87E+01 | -8.59% |
| | | Pony Saddle | 3.49E+01 | 3.16E+01 | -9.45% |
| | | Active Pony | 4.00E+01 | 3.65E+01 | -8.71% |

| | | | | | |
|---|---|---|---|---|---|
| Chair maintenance: model assumes chair is cleaned half as often | Distribution, storage, and use | Saddle | 4.24E+01 | 4.19E+01 | -1.09% |
| | | Pony Saddle | 3.49E+01 | 3.45E+01 | -1.32% |
| | | Active Pony | 4.00E+01 | 3.95E+01 | -1.16% |

# 6 INTERPRETATION

As shown in Section 5.3, 5.4 and 5.5, the top five processes within the cradle-gate (as defined by the International Living Future Institute) life cycle stages of the Freedom® task stools, that rank highest in terms of their total contributions to carbon, energy and water consumption, all take place during the Extraction and Pre-Processing life cycle stage.

The extraction and pre-processing of polypropylene (Freedom Saddle and Freedom Pony Saddle) and synthetic rubber (Active Pony) are the two top contributors to the products' cradle to gate energy footprint. On average, polypropylene is responsible for 14.05% of the products' upstream energy consumption. Polypropylene is used in the seat shell of all three variations of the stool. Increasing the amount of recycled polypyrene content would lower the products' cradle to gate footprint. Synthetic rubber is the top contributor to the upstream energy impacts of Active Pony, representing 13.81% on average for both assembly locations. Synthetic rubber was used as a proxy material for the TPE and styrene butadiene rubber that is used in Active Pony since neither material exists in the ecoinvent database. In the Sensitivity Analysis, polyurethane rigid foam was chosen in place of synthetic rubber which produced a 5.03% decrease of kg oil-Eq from cradle to grave. This decline shows that synthetic rubber is the more conservative option.

The extraction and pre-processing of nylon and steel are the two top contributors to the products' cradle to gate carbon footprint. On average, nylon represents 12.18% of the carbon footprint for all three stool varieties and both assembly locations. Steel represents 10.97%. Increasing the recycled content values for these materials would be helpful in reducing the embodied carbon of the stools.

Polyurethane foam production and aluminum use in the products are the two top contributors to the products' cradle to gate water footprint. Polyurethane foam production represents 16.82% on average and aluminum represents 14.36%. Since utilizing recycled polyurethane foam is not yet a viable option, opting for using less of it or finding an alternative material could be beneficial to reducing the embodied water of these products. Incorporating more recycled aluminum and utilizing less virgin material would also help in reducing the water footprint of the Freedom task stools.

The models in this report assume that the task stools are being shipped to the furthest customer relative to their manufacturing location. In the Sensitivity Analysis, the shipping distance was reduced by 50% which had a significant impact to the Global Warming Potential of the product. The results show an average reduction of 8.92% in the products' cradle to grave carbon footprint when being shipped to a customer half as far.

The Sensitivity Analysis shows that the models are not sensitive to the Allocation Method used; mass vs economic. The models in this report use mass allocation to account for their contribution to the waste, water, and energy inputs during assembly at Humanscale's manufacturing locations. The analysis shows

only a 0.23% benefit to the Global Warming Potential for Freedom® Saddle, and a .01% benefit for Freedom® Pony Saddle when using an economic allocation method over a mass allocation method. Interestingly, Freedom® Active Pony saw a 0.37% detriment when using an economic allocation method.

Limitations of the study include the following:
Availability of primary data for suppliers' energy use, waste generated, and transportation values would have been ideal but was not available. Using primary data could have adjusted the results slightly.

In general, secondary data was of overall good quality, however the data was of poor geographic coverage and was slightly outdated. This was due to the lack of availability of regionally-specific data and current data in the ecoinvent database. For many inputs, Global averages were used.

# 7 WORKS CITED


ecoinvent, Allocation, cut-off, regionalized, ecoinvent database version 3.8 (2021)

ISO (the International Organization for Standardization) ISO 14040 Environmental management — Life cycle assessment — Principles and framework 2006

ISO (the International Organization for Standardization) ISO 14044 Environmental management — Life cycle assessment — Requirements and guidelines 2006

openLCA 2.0 (https://openlca.org)

RIVM, Radboud University, Norwegian University of Science and Technology and PRé Consultants ReCiPe 2016 Midpoint (H)

Sea-Distances. [online] Available from sea-distances.org

U.S. Environmental Protection Agency (2017) Waste Reduction Model (WARM). Available from http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html

U.S. Environmental Protection Agency Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI 2.1)

Wernet, G., Bauer, C., Steubing, B., Reinhard, J., Moreno-Ruiz, E., and Weidema, B., 2016. The ecoinvent database version 3 (part I): overview and methodology. The International Journal of Life Cycle Assessment, [online] 21(9), pp.1218–1230. Available at: <http://link.springer.com/10.1007/s11367-016-1087-8> [Accessed 19 16 2020].


# APPENDIX B. VERIFICATION DOCUMENTS

# LCA VERIFICATION REPORT

**Client:**
Humanscale

**Name of Study:**
Freedom® Saddle, Pony Saddle and Active Pony Chair Life Cycle Assessment

**Products Included in LCA Report:**
Freedom® Saddle, Freedom® Pony Saddle, Freedom® Active Pony

**Review Completed:**
August 15, 2023

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# CONFORMANCE STATEMENT

In June of 2023, WAP Sustainability Consulting commenced an LCA critical review and verification of the Life Cycle Assessment of the Freedom Saddle, Freedom Pony Saddle and Active Pony Chairs. The Life Cycle Assessment (LCA) was commissioned by Humanscale. Stephanie Richardson from Humanscale was the lead LCA practitioner.

The LCA was conducted as a cradle-to-grave assessment with the goal that the LCA would be submitted for Living Product Challenge (LPC) certification and LEED 2.1 MRc point contribution. After several rounds of reviews and modifications, the critical review was finalized in August 2023.

The review process was conducted over a week and included couple of rounds of comments and responses. WAP Sustainability reviewed the LCA to ISO14040/44 and BIFMA PCR for Seating: UNCPC 3811. In addition to the LCA report, primary data and calculation methods were provided to and reviewed by WAP Sustainability. The LCA model, which was created in OpenLCA, was reviewed as well. All data that was requested by WAP Sustainability was provided in a timely manner.

Critical inputs and assumptions were discussed in depth. Concerns related to these critical assumptions were alleviated through additional information provided by both the manufacture and the LCA practitioner. Additionally, a sensitivity analysis was conducted to compare allocation methods, dataset choices, and shipping and waste assumptions.

The full LCA review checklists are included in the following pages of the report. In summary, the report is a well-written LCA that does not exclude material impacts that would be expected within the life cycle of Humanscale's Freedom Saddle, Freedom Pony Saddle and Active Pony. It is our opinion that the LCA study and LCA report were found to be in compliance with LCA to ISO14040/44. Additionally, the requirements for compliance with ILFI's Living Product Challenge and USGBC LEED 2.1 Material Resources Credits have been met.

W. Brad McAllister
Director
WAP Sustainability Consulting

Manasa Rao
LCA Reviewer
WAP Sustainability Consulting

# ISO 14044:2006

| | Element | Applicability | Conformance Status | Review Comments (Reviewer Comments in Black. LCA Practitioner Comments in Red) | Approval Date |
|---|---|---|---|---|---|
| 1 | **Review of General Elements of Report** | | | | |
| 1.1 | Name of commissioner of study. | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 2.1 | 6/13/2023 |
| 1.2 | Name of practitioner of study. | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 2.1 | 6/13/2023 |
| 1.3 | Date study was conducted. | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 2.2 | 6/13/2023 |
| 1.4 | Does study include a Goal and Scope section? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 2.3 Confirmed appropriate in interviews with practitioner. | 6/13/2023 |
| 1.5 | Does study include an Inventory Analysis section? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 4 | 6/13/2023 |
| 1.6 | Does study include an Impact Assessment Section? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 5 | 6/13/2023 |
| 1.7 | Does the study include an interpretation of results? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 6 | 6/13/2023 |
| 1.8 | Does the study include a discussion on limitations? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 4.2 | 6/13/2023 |
| 1.9 | Does the study include a data quality assessment? Are these sufficient to enable goal and scope to be met? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 3.10. Add sections for precision, completeness, consistency, reproducibility, and uncertainty. See ISO 14044 Section 4.2.3.6.2 for guidance.<br>WAP: Closed. | 8/15/2023 |

| | | | | | |
|---|---|---|---|---|---|
| 1.10 | Does the study include a statement on ISO compliance? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 2.6 | 6/13/2023 |
| 1.11 | Goal clearly defined and consistent with intended application? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 2.3 | 6/13/2023 |
| 1.12 | Reason for study stated? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 2.3 | 6/13/2023 |
| 1.13 | Intended application stated? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 2.3 | 6/13/2023 |
| 1.14 | Function of product system clearly described. | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 3.1 – one unit of seating to seat one individual, maintained for a 10-year period | 6/13/2023 |
| 1.15 | Functional unit adequately described and appropriate? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 3.1 – one unit of seating to seat one individual, maintained for a 10-year period | 6/13/2023 |
| 1.16 | System boundary adequately described and appropriate? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 3.3 – Defined in Section 3.3. | 6/13/2023 |
| 1.18 | Are allocation procedures described and appropriate? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 3.9 – discussed with practitioner. | 6/13/2023 |
| 1.18 | Geographical coverage stated and appropriate? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes, some limitations due to data but appropriate based on data availability. | 6/13/2023 |
| 1.19 | Is the cut-off criteria stated and appropriate? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 3.8 | 6/13/2023 |
| 1.20 | Are the impact categories described and appropriate? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 5.1 | 6/13/2023 |
| 1.21 | Are the impact assessment and interpretation methods described and appropriate? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 5.1 | 6/13/2023 |
| 1.22 | Source of background data stated and clear? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 3.10.3 | 6/13/2023 |

| | | | | | |
|---|---|---|---|---|---|
| 1.23 | Are the data quality requirements of background data described and appropriate? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 3.10.3. See comment 1.9.<br>WAP: Closed | 8/15/2023 |
| 1.24 | Source of foreground data stated and clear? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 3.4, 3.5, 3.10.3 | 6/13/2023 |
| 1.25 | Are the data quality requirements of foreground data described and appropriate? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 3 and in supplemental information provided by practitioner. | 6/13/2023 |
| 1.26 | Were assumptions and limitations adequately described? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 4.2 and discussed with practitioner. Please add the excluded materials to the limitations/ assumptions section.<br>WAP: Closed | 8/15/2023 |
| 1.27 | Did the report include an appropriate statement on critical review? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 2.6 | 6/13/2023 |
| 1.28 | Is the report format described (i.e. table of contents, list of figures, etc)? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes | 6/13/2023 |
| 1.29 | Were any additional functions of product system omitted? If so, were the reasons for the omission stated? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | No functions omitted. | 6/13/2023 |
| 1.30 | Did the review find that the justification to be appropriate? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | No functions omitted. | 6/13/2023 |
| 1.31 | Were unit processes described adequately? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes, also described during the verification and review process directly with reviewer. | 6/13/2023 |
| 1.32 | Did the reviewer find that the methods used were scientifically and technically valid? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes, technical validity was achieved. | 6/13/2023 |
| 1.33 | If the LCA was comparative in nature, were the product systems of the compared products deemed to be equivalent? | ☐ Requirement<br>☒ Not Applicable | ☐ Conformance<br>☐ Non-Conformance | | |
| 1.34 | If the LCA was comparative in nature, were the functional units of the compared products deemed to be equivalent? | ☐ Requirement<br>☒ Not Applicable | ☐ Conformance<br>☐ Non-Conformance | | |

| | | | | | |
|---|---|---|---|---|---|
| 1.35 | If the LCA was comparative in nature were the data collection and use choices reasonable to allow for a fair and equivalent comparison? | ☐ Requirement<br>☒ Not Applicable | ☐ Conformance<br>☐ Non-Conformance | | |
| 1.36 | If the LCA was comparative in nature, were the environmental impact category choices reasonable to allow for a fair and equivalent comparison? | ☐ Requirement<br>☒ Not Applicable | ☐ Conformance<br>☐ Non-Conformance | | |
| 2 | **Review of General Elements of Report** | | | | |
| 2.1 | Are the collection methods used for primary data described and reasonable? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes, throughout the report, supplemental information and discussion with practitioner. | 6/13/2023 |
| 2.2 | Are sources/published literature adequately referenced? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Please add references to ecoinvent and OpenLCA.<br>WAP: Closed. | 8/15/2023 |
| 2.3 | Is the reference unit of data stated for each input? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes | 6/13/2023 |
| 2.4 | Is the geographical representativeness of data for each input clear? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes, Section 3.10.3. | 6/13/2023 |
| 2.5 | Is the technological representativeness of the data for each input clear? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes, Section 3.10.3.<br>Couldn't find "magnesium-alloy production, AZ91, diecasting" process in the background data sheet. Where is this process used?<br>WAP: Closed. | 8/15/2023 |
| 2.6 | Is data relevant and appropriate for the allocation among co-products? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | No co-products. | 6/13/2023 |
| 2.7 | Is the period of data collection clear and appropriate? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes – Table 2 | 6/13/2023 |
| 2.8 | What time period does the data represent and is it consistent for all inputs? If it is inconsistent across all inputs, is the reason for the inconsistency stated and reasonable? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes - 2022 | 6/13/2023 |
| 2.9 | Were any data excluded? If yes, what is the justification of the excluded data. Is the justification adequate and warranted? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes, however within cut-off criteria of below 5% by mass. | 6/13/2023 |

| | | | | | |
|---|---|---|---|---|---|
| 2.10 | Is the source of each data input clear? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes, Section 3 and 4. | 6/13/2023 |
| 2.11 | Did the practitioner state data quality requirements? Does all data meet initial stated quality requirements? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes Section 3.10 and discussed. | 6/13/2023 |
| 2.12 | Was the choice of data unbiased so that it did not favor those participating in or financing study? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes, reviewer found that that the choice of data did not bias the study. | 6/13/2023 |
| 2.13 | Were quality assurance and validation procedures used? Does the reviewer consider them to be adequate to meet the goal of the study? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Discussed and found to be appropriate. | 6/13/2023 |
| 2.14 | Were the results of validation methods reviewed by someone other than the LCA practitioner? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Reviewed by reviewers in critical review process. | 6/13/2023 |
| 2.15 | Overall, is data reasonable and appropriate in relation to the goal of the study? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes | 6/13/2023 |
| 2.16 | If allocation was used, was the basis of allocation clear (i.e physical or economical)? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes – mass based and checked in sensitivity analysis while comparing with economic allocation. | 6/13/2023 |
| 2.17 | If allocation was used, were the allocation methods described, documented and justified for each unit process in which allocation was made? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes. Section 3.9 | 6/13/2023 |
| 2.18 | If allocation was used, were the allocation methods applied in a way that did not bias the study so that it did not favor those participating in or financing study? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes. Section 3.9 | 6/13/2023 |
| 2.20 | Was a sensitivity analysis conducted to compare alternative allocation methods? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Section 5.6. Yes - mass based and checked in sensitivity analysis with economic allocation. | 6/13/2023 |
| 2.20 | If allocation was used, were the allocation methods used consistently across the entire product system? Did the LCA Reviewer find the inconsistencies to be warranted? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes – found to be consistent. | 6/13/2023 |
| 3 | Review of Impact Assessment | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 3.1 | Is there a statement that explains the relative expression of results? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes – Section 5.1. | 6/13/2023 |
| 3.2 | Are the chosen impact categories justified and valid? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes – Section 5.1. | 6/13/2023 |
| 3.3 | Was the impact assessment carried out in a way that is scientifically and technically valid? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes – TRACI and ReCiPe | 6/13/2023 |
| 3.4 | Were methods, such as weighting, used to group or analyze results? If used were the methods described adequately? Additionally, were the methods applied in a way that did not bias the results of the study? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes – weighting not used. | 6/13/2023 |
| 3.5 | Does the interpretation include a data quality assessment or a discussion of the data quality assessment? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes – Section 6 | 6/13/2023 |
| 3.6 | Does the interpretation include a sensitivity analysis or a discussion of a sensitivity analysis that was conducted, if necessary? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes – Section 5.6 | 6/13/2023 |
| 3.7 | Did the LCA reviewer find that significant findings were discussed adequately. | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes – Section 5 and 6 | 6/13/2023 |
| 3.8 | Did the LCA reviewer find that the role of excluded elements was evaluated and discussed adequately. | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes – Section 3.10.4 | 6/13/2023 |
| 3.9 | Did the LCA reviewer find that the study included an adequate discussion of the consistency and reproducibility of the methods applied in the LCA? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes – Section 3 and 4. | 6/13/2023 |
| 3.10 | Did the LCA reviewer find that the study included an adequate discussion of the precision, completeness and representativeness of data used in the study? | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | No – See comment 1.9<br>WAP: Closed. | 8/15/2023 |
| 3.11 | Did the LCA reviewer find that the study included an adequate discussion related to the impact of value judgments on the results | ☒ Requirement<br>☐ Not Applicable | ☒ Conformance<br>☐ Non-Conformance | Yes – Section 5.6, sensitivity analysis has been conducted. | 6/13/2023 |

# COMPLIANCE TO LIVING PRODUCT CHALLENGE 2.0 LCA-BASED REQUIREMENTS

| | Element | Applicability | Conformance Status | Review Comments (Reviewer Comments in Black. LCA Practitioner Comments in Red) | Approval Date |
|---|---|---|---|---|---|
| **1** | **G-04 Life Cycle Assessment General Requirements** | | | | |
| 1.1 | All manufacturers must produce and maintain an LCA Model demonstrating the product's cradle-to-grave impacts. | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Model collected and reviewed. | 6/13/2023 |
| 1.2 | Performed in accordance with a relevant product category rule (PCR) to ISO 14040/44. | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | LCA complies with BIFMA PCR for Seating. | 6/13/2023 |
| 1.3 | Critically reviewed by a third party for conformance with IS0 14044. | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Review conducted and passed. | 6/13/2023 |
| 1.4 | Has either been performed by an LCA Certified Practitioner certified by ACLCA (https://aclca.org/lcacp-certification/) or by an ILFI-approved LCA practitioner or consultancy? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Yes, ILFI-approved LCA consultancy. Please update Manasa's title to "Sustainability Manager".<br>WAP: Closed. | 8/15/2023 |
| 1.5 | Has either been performed by an LCA Certified Practitioner certified by ACLCA (https://aclca.org/lcacp-certification/) or by an ILFI-approved LCA practitioner or consultancy? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Hotspots identified. 5.3,5.4,5.5 | 6/13/2023 |
| 1.6 | The LCA should clearly demonstrate the product's contributions to, at minimum, fossil-based energy, water, and greenhouse gas (GHG) emissions | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | LCA valid for 3 years. | 6/13/2023 |
| 1.7 | LCA models must be valid at the time of certification and for the duration of the 3-Year certification period. If the LCA will expire before recertification, an updated LCA must be resubmitted at the next annual check-in following its expiration. | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Any updates in the LCA will be communicated to the reviewer and verified before applying for recertification. | 6/13/2023 |

| | | | | | |
|---|---|---|---|---|---|
| **2** | **I04-5 Water Hotspot Identification** | | | | |
| 2.1 | A table of process contributions to cradle-to-gate life cycle water consumption, listing at least the top 5 processes ranked in terms of water consumption. | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 5.5 | 6/13/2023 |
| 2.2 | A brief 1-2 paragraph narrative that interprets the main results and identifies the 5 main drivers of the product's water consumption footprints. | ☐ Requirement<br>☒ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 5.5 | 6/13/2023 |
| **3** | **I06-6 Energy Hotspot Identification** | | | | |
| 3.1 | A table of process contributions to cradle-to-gate life cycle water consumption, listing at least the top 5 processes ranked in terms of energy consumption. | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 5.3 | 6/13/2023 |
| 3.2 | A brief one- to two-page narrative that interprets the results and identifies the five main drivers of the product's cradle-to-gate fossil energy consumption footprints. | ☐ Requirement<br>☒ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 5.3 | 6/13/2023 |
| **4** | **I14-4 Carbon Hotspot Identification** | | | | |
| 4.1 | A table of process contributions to cradle-to-gate life cycle water consumption, listing at least the top 5 processes ranked in terms of GHG emissions. | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 5.4 | 6/13/2023 |
| 4.2 | A brief narrative that interprets the results and identifies the 5 main drivers of the product's cradle-to-gate carbon Footprints, and their relevance. | ☐ Requirement<br>☒ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 5.4 | 6/13/2023 |

# COMPLIANCE TO LEED V4.1 LCA-BASED REQUIREMENTS

| | Element | Applicability | Conformance Status | Review Comments (Reviewer Comments in Black. LCA Practitioner Comments in Red) | Approval Date |
|---|---|---|---|---|---|
| **1** | **BPDO - Environmental Product Declaration – Public Life Cycle Assessment Option (1 pt.)** | | | | |
| 1.1 | Publicly Available | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | https://www.humanscale.com/resources/designer-toolkit/green-design.cfm | 6/13/2023 |
| 1.2 | Critically Reviewed | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Yes. | 6/13/2023 |
| 1.3 | ISO14044 Compliant | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Critical review confirmed conformance. | 6/13/2023 |
| 1.4 | At Least Cradle to Gate in Scope | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Yes, cradle to grave in scope. | 6/13/2023 |
| 1.5 | Cover or Summary Sheet that includes:<br>-All requirements outlined in LEED v4 reference guide for this section<br>-The type of LCA software used to conduct the assessment;<br>-Date of assessment with period of validity or expiration date of life cycle assessment,<br>-URL link to the publicly available version of the document. | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Yes, pages 2 and 3 of the document. | 6/13/2023 |

# BIFMA PCR FOR SEATING: UNCPC 3811 VERSION 3

| | Element | Applicability | Conformance Status | Review Comments (Reviewer Comments in Black. LCA Practitioner Comments in Red) | Approval Date |
|---|---|---|---|---|---|
| 1 | **Goal and Scope Requirements for the LCA study** | | | | |
| 1.1 | Is the scope cradle-to-grave? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 3.3 | 6/13/2023 |
| 1.2 | Does product description include name of manufacturer, model number, general description, and a picture? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 3.2.1 | 6/13/2023 |
| 1.3 | Functional unit equals one unit of seating to seat one individual, for a period of 10 years? (note: results shall not be normalized from a fraction of a chair) | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 3.1 | 6/13/2023 |
| 1.4 | Do products designed for 10 or more years use only 1 unit for ref flow (1 unit for 10 years max)? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 3.1. Yes. | 6/13/2023 |
| 1.5 | Do products that have warranty periods and/or designed for less than 10 yrs report the necessary number of units for the 10 yr period? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 3.1. No | 6/13/2023 |
| 1.6 | If product meets ANSI/BIFMA X5.1, is the service life given as 10 yrs? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Table 1. Yes. | 6/13/2023 |
| 1.7 | If product does not meet ANSI/BIFMA X5.1, and the warranty period is:<br>- 5 years or more, is the product service life given as 5 years<br>- less than 5 years, is service life equal to warranty period? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Not applicable since product meets ANSI/ BIFMA X5.1. | 6/13/2023 |

| | | | | | |
|---|---|---|---|---|---|
| 1.6 | Are all known flows that are knowingly omitted, justified? All known energy flows greater than 1% shall be included. Cumulative mass and energy omissions shall not exceed 5% | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 3.8 and confirmed in background data and LCA practitioner interviews. | 6/13/2023 |
| **2** | **System Boundaries** | | | | |
| 2.1 | Does the LCA report detail the system boundaries, including a description of LC stages for the product? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Figure 2 and throughout the document. | 6/13/2023 |
| 2.3 | Is transportation of materials included in LC impact assessment? This includes transport between stages and within the manufacturing stage between facilities owned by the company. | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Table 2 and LCA practitioner interviews | 6/13/2023 |
| **3** | **Upstream Stage** | | | | |
| 3.1 | Are primary data used for upstream processes, if available? If not, secondary data may be used. | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Ecoinvent secondary data primarily used for upstream data. | 6/13/2023 |
| 3.2 | If using a dataset for upstream without transport embedded, are trans distances consistent with those given in Table 1 of PCR? (NA -based) | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | For the most part, transportation distances embedded. | 6/13/2023 |
| **4** | **Production Stage/EOL stages** | | | | |
| 4.1 | Are primary data used, where available, for production processes under control of mfr? -- Not sure this is required. | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | From primary data review and LCA practitioner interview. For the most part primary data was used where available. | 6/13/2023 |
| 4.2 | Absent primary data, is the trans distance used for process waste recycling/recovery/disposal processes 20 miles (32 km)) within NA? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 3.5 and confirmed in primary data provided during review. | 6/13/2023 |
| 4.3 | If primary data are not used for EOL, is the distribution of materials at EOL aligned with an approved guidance (see PCR)? Are Non recycled materials must be modeled as 80% landfilled/20% incineration? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 3.7 and confirmed in LCA model review. | 6/13/2023 |
| **5** | **Allocation and Units** | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 5.1 | When allocation cannot be avoided, does allocation follow either mass (or other biophysical relationship) or economic allocation methods? If not, are deviations justified? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 3.9 | 6/13/2023 |
| 5.2 | For allocation due to recycling, the recycled content method shall be used. If not, are deviations justified? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 3.9 and confirmed by model review. | 6/13/2023 |
| 5.3 | Are units given in SI units with no more than 3 significant digits? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Yes. Throughout the document. | 6/13/2023 |
| **6** | **Calculation Rules and Data Requirements** | | | | |
| 6.1 | For facilities under the control of the manufacturer, are primary data used? If multiple locations mfr the components, a single source can be used as representative data, or an average, may be used for operations contributing less than 10% of the total prod output. | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Review of primary data and LCA model. | 6/13/2023 |
| 6.2 | For the US, are energy data aligned with region of mfr? Out of the US, is a reasonable and justified source used? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Review of primary data and LCA model. Sources mentioned in Table 5. | 6/13/2023 |
| 6.3 | Are primary data used for unit processes that contribute to the majority of mass and energy flows, or which have the most relevant env emissions? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Yes, primary data has been used when available. Otherwise, third-party verified secondary datasets (ecoinvent) has been used. | 6/13/2023 |
| 6.4 | Is a data quality assessment conforming to ISO 14044 presented? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | See 14044 checklist.<br>WAP: Closed. | 8/15/2023 |
| 6.5 | Are data obtained from the manufacturer considered average monthly data for the year of study? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Yes. Review of primary data and LCA model. | 6/13/2023 |
| 6.6 | Is documentation given for all individual data sources? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Table 5 | 6/13/2023 |
| 6.7 | Are primary energy data or appropriate regional secondary energy sources used? If not, does the source of energy data comply with guidance given in the PCR? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Yes, see Table 5. Was the electricity used for manufacturing appropriate for New Jersey's eGrid and for Dublin's grid mix?<br>WAP: Closed. | 8/15/2023 |

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|---|---|---|---|---|---|
| 6.8 | Are carbon offsets excluded from the inventory? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Yes, no carbon offsets utilized. | 6/13/2023 |
| 6.9 | Do the LCA Impacts include each of the following in TRACI 2.1:<br>Global Warming Potential<br>Acidification<br>Ozone Creations (POCP)<br>Eutrophication<br>Ozone Depletion | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 5.1 | 6/13/2023 |
| 6.10 | Are life cycle impacts reported per life cycle stage and in total? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | See Section 5. | 6/13/2023 |
| 6.11 | Has a sensitivity analysis been performed confirming that an appropriate model was used? | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | See section 5.6 | 6/13/2023 |
| 7 | **Additional Comments** | | | | |
| 7.1 | Production and manufacturing | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 3.5 - Please add manufacturing inputs and outputs as a table in the report.<br>WAP: Closed. | 8/15/2023 |
| 7.2 | Use phase | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 3.6 - Add maintenance scenario with quantities of cleaning inputs as a table.<br>WAP: Closed. | 8/15/2023 |
| 7.3 | Distribution | ☒ Requirement<br>☐ Recommendation | ☒ Conformance<br>☐ Non-Conformance | Section 3.6 - This is contradictory to what is mentioned in the next paragraph? (Para 2 and 3 of Section 3.6 about transport to customer)<br>WAP: Closed. | 8/15/2023 |

# LCA MODEL REVIEW CHECKLIST

| | Plan Hierarchy | Process Name | Appropriate Inputs/outputs | Connection Check | Mass Balance Check | Datasets Appropriate | Notes |
|---|---|---|---|---|---|---|---|
| | Name of final plan: ecoinvent_38_Freedom Stools.zolca | | | | | | |
| 1 | Freedom Pony Saddle | Pony Cradle Gate (Dub) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 2 | | Pony Cradle Gate (Pisc) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 3 | | Pony Cradle Grave (Dub) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 4 | | Pony Cradle Grave (Pisc) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 5 | | Pony EOL Disposal | Confirmed | Confirmed | Confirmed | Confirmed | |
| 6 | | Pony EOL Transport | Confirmed | Confirmed | Confirmed | Confirmed | |
| 7 | | Pony MatExtract (Pisc) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 8 | | Pony MatExtract | Confirmed | Confirmed | Confirmed | Confirmed | |
| 9 | | Pony MatTrans | Confirmed | Confirmed | Confirmed | Confirmed | |
| 10 | | Pony MatTrans (Dub) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 11 | | Pony Trspt to HS (Pisc) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 12 | | Pony Trspt to HS (Dub) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 13 | | Pony Trspt to Cust (Dub) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 14 | | Pony Trspt to Cust (Pisc) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 15 | Freedom Saddle | Saddle Cradle to Gate (Dub) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 16 | | Saddle Cradle to Gate (Pisc) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 17 | | Saddle Cradle to Grave (Dub) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 18 | | Saddle Cradle to Grave (Pisc) | Confirmed | Confirmed | Confirmed | Confirmed | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 19 | | Saddle EOL Disposal | Confirmed | Confirmed | Confirmed | Confirmed | Why is there no EOL for Dublin? Is this the common process between both locations?<br>WAP: Closed |
| 20 | | Saddle EOL Transport | Confirmed | Confirmed | Confirmed | Confirmed | |
| 21 | | Saddle MatExtract (Pisc) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 22 | | Saddle MatExtract (Dub) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 23 | | Saddle MatTrans (Pisc) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 24 | | Saddle MatTrans (Dub) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 25 | | Saddle Trsp to HS (Pisc) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 26 | | Saddle Trsp to HS (Dub) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 27 | | Saddle Trsp to Cust (Dub) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 28 | | Saddle Trsp to Cust (Pisc) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 29 | Freedom Active Pony | Active Pony Cradle to Gate (Dub) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 30 | | Active Pony Cradle to Gate (Pisc) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 31 | | Active Pony Cradle to Grave (Dub) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 32 | | Active Pony Cradle to Grave (Pisc) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 33 | | Active Pony EOL Disposal | Confirmed | Confirmed | Confirmed | Confirmed | |
| 34 | | Active Pony EOL Transport | Confirmed | Confirmed | Confirmed | Confirmed | |
| 35 | | Active Pony MatExtract (Pisc) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 36 | | Active Pony MatExtract (Dub) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 37 | | Active Pony MatTrans (Pisc) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 38 | | Active Pony MatTrans (Dub) | Confirmed | Confirmed | Confirmed | Confirmed | |

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|---|---|---|---|---|---|---|---|
| 39 | | Active Pony Trsp to HS (Pisc) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 40 | | Active Pony Trsp to HS (Dub) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 41 | | Active Pony Trsp to Cust (Dub) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 42 | | Active Pony Trsp to Cust (Pisc) | Confirmed | Confirmed | Confirmed | Confirmed | |
| 43 | All Freedom Chairs | Assembly (Dub) 2022 | Confirmed | Confirmed | Confirmed | Confirmed | |
| 44 | All Freedom Chairs | Assembly (Pisc) 2022 | Confirmed | Confirmed | Confirmed | Confirmed | |
| 45 | All Freedom Chairs | Chair Maintenance | Confirmed | Confirmed | Confirmed | Confirmed | |