Environmental Product Declaration

Laminated Veneer Lumber

ROSEBURG FOREST PRODUCTS COMPANY

Roseburg

Founded in 1936, Roseburg is a privately-owned, vertically integrated company that owns and sustainably manages more than 600,000 acres of timberland in the U.S. The company converts those renewable resources into high quality, durable wood products including lumber, softwood and hardwood plywood panels, I-joists, laminated veneer lumber, and medium density fiberboard. Roseburg products are widely distributed throughout North America.

UL CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

Roseburg

Laminated Veneer Lumber

According to ISO 14025, and ISO21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Solutions 333 PFINGSTEN RD., NORTHBROOK, IL 606011 WWW.SPOT.UL.COM
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	UL Environment Environmental Product Declaration Program, GENERAL PROGRAM INSTRUCTIONS, VERSION 2.7, MARCH 2022
MANUFACTURER NAME AND ADDRESS	Roseburg Forest Products 3660 Gateway Street Springfield, OR 97477
DECLARATION NUMBER	4791157806.101.1
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	1 cubic meter (m^3) of laminated veneer lumber
REFERENCE PCR AND VERSION NUMBER	ISO 21930:2017 – serves as the core PCR and: UL Part A: Product Category Rules for Building-Related Products and Services - Part A: Life Cycle Assessment Calculation Rules and Report Requirements, v3.2. UL Part B: Product Category Rule Guidance for Building-Related Products and Services, Part B: Structural and Architectural Wood Products, EPD Requirements UL 10010-9 v.1.0.
MARKETS OF APPLICABILITY	North America
DATE OF ISSUE	May 1, 2024
PERIOD OF VALIDITY	5 Years
EPD TYPE	Product specific
EPD SCOPE	Cradle-to-gate
YEAR(S) OF REPORTED PRIMARY DATA	2022
LCA SOFTWARE & VERSION NUMBER	SimaPro V9
LCI DATABASE(S) & VERSION NUMBER	Ecoinvent 3.9.1, USLCI
LCIA METHODOLOGY & VERSION NUMBER	TRACI 2.1, IPCC AR5
The UL Part A PCR review was conducted by:	Lindita Bushi, PhD, Chair Athena Sustainable Materials Institute Lindita.bushi@athenasmi.org
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	Dr. Indro Ganguly University of Washington
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This declaration was independently verified in accordance with ISO 14025: 2006. ☐ INTERNAL ☒ EXTERNAL	Cooper McCollum Cooper McCollum, UL Solutions
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	WAP Sustainability

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This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Jack Geibig, Ecoform

LIMITATIONS

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

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

Comparability: EPDs from different programs may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered, when they comply with all referenced standards, use the same sub-category PCR, and use equivalent scenarios with respct to construction works. However, variations and deviations are possible". Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared. Comparison of the environmental performance of Structural and Architectural Wood Products using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the building energy phase as instructed under this PCR.

Foreword

This Type III environmental declaration is developed according to ISO 21930 and 14025 for Laminated Veneer Lumber (LVL). This EPD reports environmental impacts based on established life cycle impact assessment methods. The reported enviromental impacts are estimates, and their level of accuracy may differ for a particular product line and reported impact. LCAs do not generally address site-specific environmental issues related to resource extraction or toxic effects of products on human health. Unreported environmental impacts include (but are not limited to) factors attributable to human health, land use change and habitat destruction. Forest certification systemsand government regulations address some of these issues. The product in this EPD conforms to ASTM D9-09ae1. EPDs do not report product environmental performance against any benchmark.

Product System

Product Description

Roseburg's LVL is manufactured in Riddle, Oregon and Chester, SC in a variety of dimensions and grades and marketed and sold under the trademark name RigidLam® LVL. Primary application categories of LVL include window and door headers, beams, columns, studs, and stair stringers in residential construction, mobile homes, residential upkeep and improvements, and non-residential improvements. The 2022 production data used in this EPD considers all LVL produced during the year and is therefore weighted based on material output. The production data used in this EPD is presented in cubic meters, but includes the following possible dimensions:

- Lengths: 12' – 66' (even-numbered feet only)
- Widths: 3-1/2", 4-3/8", 5-1/2", 7-1/4", 9-1/4", 9-1/2", 11-1/4", 11-7/8", 14", 16", 18", 20", 22", 24"
- Thicknesses: 1-1/2", 1-3/4", 3-1/2", 5-1/4", 7"

Roseburg's LVL is made from Douglas-fir, which is abundant in the Pacific Northwest, and Southern pine, which is abundant in the Southeast where Roseburg's log and veneer supply originate.

Application and Technical Data

In North America, LVL is applicable in a variety of end uses, including headers, beams and rimboard in new construction, repairs and remodels both for residential and non-residential projects.

Production

The upstream forest operations include forest management, logging, planting, and loading the harvested roundwood onto a truck. The roundwood is then transported from the forest road to the mill. The logs are lathed with a rotating drive to the necessary dimensional specifications. The manufacturing process for LVL involves a staggered layup of veneers that provide more structural integrity than a solid wood beam due to the dispersal of naturally occurring defects in the wood. Finally, the product is packaged for shipping. All of these processes require electricity, fuels, and wood inputs as biomass fuel.

The raw materials for the product were obtained from various parts of the US depending on the location of the facility and the product type. In general, the product systems are built using wood and resin inputs. The materials are delivered to the manufacturing facility via truck. The distances were modeled by material and were calculated using the supplier location and the location of manufacturing. All products produced are packaged on-site on shipping crates using plastic packaging.

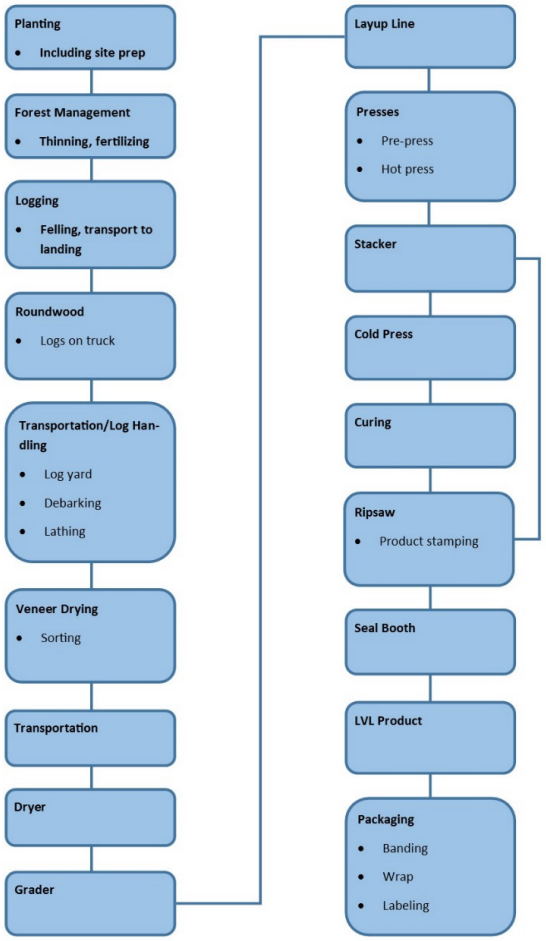

Figure 1: Cradle-to-gate product system for laminated veneer lumber

Methodology of the Underlying LCA

Declared Unit

The declared unit is one cubic meter (1 m^3) of LVL Table 1 shows additional details related to the functional unit.

Table 1: Declared Unit Details

	VALUE	UNIT
Declared Unit	1	m^3
Mass	570	Dry kg
Density (dry)	570	kg/m^3
Moisture Content	6	%

The general compositions of LVL at both the Riddle and Chester facilities are represented in Table 2. The production-weighted average was calculated with 56.7% Riddle and 43.4% Chester.

Table 2: Material Composition per Functional Unit

	WEIGHTED COMPOSITION [%]
Veneer	93.1
Resin	6.17
Other	0.730

Roseburg's LVL products are packaged in plastic strapping made of plastic, paper wrap made of paper, and lathes and battens made of wood. It is recommended the packaging materials are reused where possible. The resins used in LVL product are phenolic and melamine resin.

No hazardous materials are contained in, or result from the production of, any of the products assessed in this study.

Information pertaining to the classification of the substances used to manufacture any of Roseburg's LVL products including composition information, first aid measures, fire fighting measures, accidental release measures, handling and storage, exposure controls/PPE, physical and chemical properties, stability and reactivity, toxicological information, ecological information, disposal considerations, transport information, and regulatory information are contained in the product Safety Data Sheet which is available to download from the Roseburg website at www.roseburg.com.

System Boundaries

As shown in Figure 2, the cradle-to-gate system boundary includes the extraction of raw materials and processing; the transportation of raw materials, secondary materials, and any fuels from the extraction site ot the manufacturing site; and the manufacturing of the wood construction product, including any necessary packaging. All other life cycle stages are excluded from the analysis, denoted by MND or "module not declared."

	PRODUCT STAGE			CONSTRUCT-ION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Raw material supply	Transport	Manufacturing	Transport from gate to site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Building Operational Energy Use During Product Use	Building Operational Water Use During Product Use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential
EPD Type	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Figure 2: Life cycle stages of wood products (those included are marked with an 'x')

Cut-off Rules

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

The list of excluded materials and energy inputs include:

- Some material inputs may have been excluded within the datasets used for this project. All datasets have been critically reviewed and conform to the exclusion requirement of the PCR.
- Capital material and infrastructure

Beyond this, no inputs or outputs were actively excluded.

Background Data

Background data for upstream and downstream data are representative for 2022 Ecoinvent 3.9.1, and SLCI.

Data Quality

Overall data quality is considered good. Improvements can be made through the modification of datasets to incorporate more regional specificity, both in terms of energy and technology. However, the data were considered

appropriate in relation to the goal, scope, and budget of the project.

Primary data in the form of energy consumption and water consumption were normalized based on total mass of production during the same time frame. The resulting energy and water per unit were used for product manufactured at the facilities under study. Overall, primary energy and water data quality are considered good.

Primary data also includes the bills of materials used to formulate the products that are included in the study. Overall, this data is considered excellent. Upstream data quality can be increased through the use of supplier-specific secondary datasets.

Period under Review

This study is intended to represent production for the year 2022.

Region under Review

LVL production occurs in Riddle, Oregon and Chester, South Carolina.

Treatment of Biogenic Carbon

The product system represented in this EPD includes the information modules A1, A2 and A3. According to ISO 21930 7.2.7, if a bio-based material containing biogenic carbon leaves the studied product system at the system boundary between product systems in information modules C1 to C4 (or any other information module), this export of bio-based material and associated flow of biogenic carbon is reported as an export of biogenic carbon expressed in CO2 in the LCI and characterized with +1 kg CO2e/kg CO2 of biogenic carbon in the calculation of the GWP in the respective information module C1 to C4 (or any other information module). The following results apply this methodology to the biogenic carbon present in the primary product as it leaves the manufacturer in module A3.

Allocation

Multi-output allocation generally follows the requirements of ISO 14044, Section 4.3.2.2. The method of multi-output allocation was determined based on the requirements and guidance of UL Part A, section 3.3 and additionally considers the following as per the PCR:

“Mass should be used as the primary basis for co-product allocation in this Part B. Allocation methods deemed more appropriate than on the basis of mass may be used but only when justified.”

This allocation method applies both to wood waste as an output and as an input (i.e. wood waste used in particleboard manufacturing). Co-product, ancillary material, and energy allocation were done using mass. This method aligns with industry-average EPDs on the products under study.

Comparability

This PCR allows EPD comparability only when the same functional requirements between products are ensured and the requirements of ISO 21930:2017 §5.5 are met. It should be noted that different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared. Comparison of the environmental performance using EPD information shall consider all relevant information modules over the full life cycle of the products within the building.

Additional Statements

While this EPD does not address landscape level forest management impacts, potential impacts may be addressed through requirements put forth in regional regulatory frameworks, ASTM 7612-15 guidance, and ISO 21930 Section 7.2.11 including notes therein. These documents, combined with this EPD, may provide a more complete picture of environmental and social performance of wood products.

While this EPD does not address all forest management activities that influence forest carbon, wildlife habitat, endangered species, and soil and water quality, these potential impacts may be addressed through other mechanisms such as regulatory frameworks and/or forest certification systems which, combined with this EPD, will give a more complete picture of environmental and social performance of wood products.

EPDs can complement but cannot replace tools and certifications that are designed to address environmental impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, etc.

National or regional life cycle averaged data for raw material extraction does not distinguish between extraction practices at specific sites and can greatly affect the resulting impacts.

EPDs can complement but cannot replace tools and certifications that are designed to address environmental impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, etc.

Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact when averaging data. Variability was estimated in this EPD by using a weighted average.

Life Cycle Assessments Results

The impact categories presented represent impact potentials, i.e., they are approximations of environmental impacts that could occur if the emissions would (a) actually follow the underlying impact pathway and (b) meet certain conditions in the receiving environment while doing so. In addition, the inventory only captures that fraction of the total environmental load that corresponds to the functional unit (relative approach). LCIA results are therefore relative expressions only and do not predict actual impacts, exceeding thresholds, safety margins, or risks.

The LCIA results are presented for 1 m^3 of the weighted average laminated veneer lumber product in Table 3.

Table 3: Weighted average LCIA Results for 1 m^3 of Laminated Veneer Lumber produced by Roseburg

IMPACT CATEGORY	TOTAL	A1	A2	A3
LCIA Impact Indicators – TRACI 2.1 and IPCC AR5				
IPCC AR5 GWP incl. bio [kg CO_2 eq]	**-7.43E+02**	-8.53E+02	1.84E+01	9.13E+01
IPCC AR5 GWP excl. bio [kg CO_2 eq]	**2.54E+02**	1.43E+02	1.84E+01	9.26E+01
GWP TRACI excl. bio [kg CO2e]	**2.49E+02**	1.40E+02	1.82E+01	9.00E+01

IMPACT CATEGORY	TOTAL	A1	A2	A3
AP [kg SO_2 eq]	**1.15E+00**	9.12E-01	1.01E-01	1.34E-01
EP [kg N eq]	**1.31E-01**	3.95E-02	8.07E-03	8.31E-02
ODP [kg CFC 11 eq]	**2.66E-06**	2.21E-06	3.20E-08	4.22E-07
SFP [kg O3 eq]	**1.87E+01**	1.32E+01	2.90E+00	2.60E+00
Resource Use Parameters				
RPRE [MJ]	**1.10E+02**	2.24E+01	4.18E-01	8.71E+01
RPRM [MJ]	**1.37E+04**	1.37E+04	1.08E-01	1.84E+01
NRPRE [MJ]	**3.85E+03**	2.22E+03	2.31E+02	1.39E+03
NRPRM [MJ]	**1.11E+03**	1.08E+03	0.00E+00	2.63E+01
SM [kg]	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00
RSF [MJ]	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00
RE [MJ]	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00
FW [m3]	**9.93E+00**	7.57E-01	3.00E+00	6.17E+00
ADPF [MJ]	**4.61E+03**	2.24E+03	2.28E+02	2.14E+03
Waste Parameters and Output Flows				
HWD [kg]	**1.09E-01**	8.35E-02	2.72E-04	2.56E-02
NHWD [kg]	**1.16E+01**	7.95E+00	3.19E-01	3.34E+00
HLRW [kg]	**5.67E-08**	3.08E-08	1.80E-09	2.41E-08
ILLRW [kg]	**3.58E-07**	1.48E-07	8.69E-09	2.02E-07
CRU [kg]	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00
MR [kg]	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00
MER [kg]	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00
EE [kg]	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00
Biogenic Carbon Indicators				
BCRP [kg CO2]	**1.90E+03**	1.90E+03	0.00E+00	0.00E+00

IMPACT CATEGORY	TOTAL	A1	A2	A3
BCEP [kg CO2]	**1.88E+03**	0.00E+00	0.00E+00	1.88E+03
BCRK [kg CO2]	**-3.22E+00**	0.00E+00	0.00E+00	-3.22E+00
BCEK [kg CO2]	**3.22E+00**	0.00E+00	0.00E+00	3.22E+00
BCEW [kg CO2]	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00
CCE [kg CO2]	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00
CCR [kg CO2]	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00
CWNR [kg CO2]	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00

A dominance analysis was performed to show which of the life cycle modules contributes to the majority of the impacts.

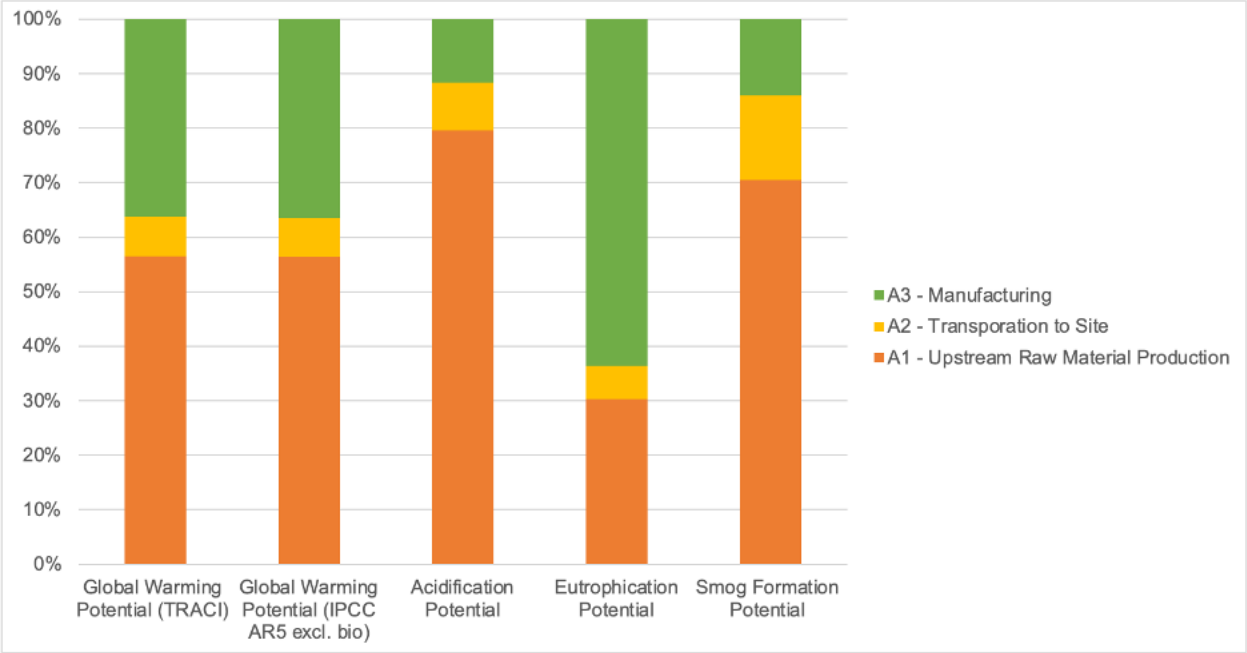

Figure 3 : Dominance analysis for 1 cubic meter of laminated veneer lumber produced by Roseburg (weighted average).

The results are primarily driven by upstream production of raw materials and manufacturing at the facility across all indicators except for eutrophication potential. The upstream raw material impact category is driven mostly by the veneer and resin at each facility. The manufacturing impacts are driven primarily by the energy required for manufacturing. This includes purchased electricity and other fuels. Neither of the LVL facilities generate their own

electricity or steam. For the global warming potential indicator, 32.8% of the impacts are driven by veneer, 21.5% are driven by resin, and 1.8% by other materials making up all of the upstream raw material production impacts. 17.8% of the impacts are driven by natural gas, 14.4% of the impacts are driven by purchased electricity, 0.5% of the imapcts are driven by other energy, and the remaining 1.2% of the manufacturing impacts are driven by ancillary, packaging, water, wastewater, and waste. Transportation to site impacts account fro 10.0% of the GWP indicator.

Throughout this report, value choices and judgments that may have affected the LCA have been described. Additional decisions are summarized below:

- The inclusion of overhead energy data was determined appropriate due to the inability to sub-meter and isolate manufacturing energy from overhead energy.
- The use and selection of secondary datasets – The selection of which generic dataset to use to represent an aspect of a supply chain is a significant value choice. Collaboration between the LCA practitioner, the manufacturer, and data experts was invaluable in determining best-case scenarios in the selection of data. However, no generic data can be a perfect fit. Improved supply chain-specific data would improve the accuracy of results, however budgetary and time constraints also must be considered.

Some limitations to the study have been identified as follows:

- The availability of geographically more accurate datasets would have improved the accuracy of the study.
- Only known and quantifiable environmental impacts are considered.
- 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.

References

1. Life Cycle Assessment, LCA Report for Roseburg. WAP Sustainability Consulting. April 2024.
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3. ISO 14044: 2006/ Amd 1:2017 Environmental Management – Life cycle assessment – Requirements and Guidelines – Amendment 1.
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5. ISO 14025: 2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
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7. TRACI: The Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts. Version 2.1 – User Guide – https://nepis.epa.gov/Adobe/PDF/P100HN53.pdf.
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11. UL Environment Program Operator Rules v2.7 March 2022