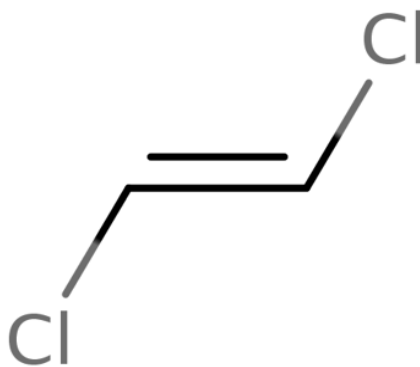




United States
Environmental Protection Agency

Draft Risk Evaluation for *trans*-1,2-Dichloroethylene

CASRN 156-60-5



August 2026

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ACKNOWLEDGEMENTS

The Assessment Team gratefully acknowledges participation, input, and review comments from U.S. Environmental Protection Agency (EPA or the Agency) Office of Pollution Prevention and Toxics (OPPT) and Office of Chemical Safety and Pollution Prevention (OCSPP) senior managers and science advisors as well as the Office of General Counsel. The Agency is also grateful for assistance from the following EPA contractors: Eastern Research Group (Contract Nos. HHSN316201200013W and 68HERD24A0001); General Dynamics Information Technology, Inc. (Contract Nos. HHSN316201200013W and 68HERD24A000 1-4); ICF, Inc. (Contract Nos. 68HERC23D0007 and 68HERC24D0001); SpecPro Professional Services, LLC (Contract No. 68HERC20D0021); SpecPro Sustainable and Environmental, Inc. (Contract No. 68HERC25D0004); and SRC, Inc. (Contract No. 68HERC25D0001).

Docket

Supporting information can be found in the public docket, Docket ID ([EPA-HQ-OPPT-2018-0465](#)).

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EXECUTIVE SUMMARY

In December 2019, EPA designated *trans*-1,2-dichloroethylene (CASRN 156-60-5) as a high-priority substance for Toxic Substances Control Act (TSCA) evaluation and in September 2020 released the final scope document ([U.S. EPA, 2020b](#)). This draft risk evaluation assesses human health risk to workers, including occupational non-users (ONUs¹); consumers, including bystanders; and the general population, including fenceline communities, from environmental releases of *trans*-1,2-dichloroethylene. It also assesses environmental risk. All supporting files, including draft technical support documents (TSDs), are being released for public comment, while the *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* (also referred to as the “draft hazards assessment TSD”) ([U.S. EPA, 2026w](#)) underwent independent, expert peer review on August 3–7, 2026, through the Science Advisory Committee on Chemicals (SACC). EPA will consider all public comments and peer reviewer recommendations and issue a final risk evaluation that includes the Agency’s determination as to whether *trans*-1,2-dichloroethylene presents unreasonable risk of injury to human health or the environment from the conditions of use (COUs).

EPA evaluated the human health and environmental risks of *trans*-1,2-dichloroethylene across its COUs, ranging from manufacture to disposal, under section 6 of TSCA. In this draft risk evaluation, 20 of 25 assessed COUs for *trans*-1,2-dichloroethylene significantly contribute to a preliminary determination of unreasonable risk of injury to human health. As shown in Table ES-1, of the 20 COUs for *trans*-1,2-dichloroethylene that significantly contribute to a preliminary determination of unreasonable risk, 19 COUs significantly contribute to inhalation risk to workers, including 13 COUs that significantly contribute to inhalation risk to ONUs. As shown in Table ES-2, one of two assessed COUs for *trans*-1,2-dichloroethylene significantly contributes to inhalation risk to consumers (but not bystanders). EPA has preliminarily determined that no COU for *trans*-1,2-dichloroethylene significantly contributes to unreasonable risk to the general population, including potentially exposed or susceptible subpopulations (PESS) such as fenceline communities, or the environment.

trans-1,2-Dichloroethylene is a volatile chlorinated compound that is a clear, colorless liquid under normal (ambient) conditions. Manufacturers, based on the 2024 Chemical Data Reporting (CDR) ([U.S. EPA, 2026a](#)), report the national aggregate production volume of *trans*-1,2-dichloroethylene is between 1 and 5 million pounds (lb). *trans*-1,2-Dichloroethylene is also imported and processed as a reactant and solvent. Industrial and commercial uses of *trans*-1,2-dichloroethylene include use as a cleaning agent (degreaser), surface modifier, and processing aid (Section 1.1). Workers may be exposed to *trans*-1,2-dichloroethylene through inhalation and dermal routes (Section 4.1.1). EPA also assessed inhalation exposure for ONUs who may be exposed to *trans*-1,2-dichloroethylene in the workplace (Section 4.1.1).

Consumer uses of *trans*-1,2-dichloroethylene include as a cleaning agent and as a propellant in foam insulations, which were assessed for inhalation and dermal exposure to consumers and inhalation exposure to bystanders (Section 4.1.2). Industrial and commercial uses of *trans*-1,2-dichloroethylene can lead to environmental releases to ambient air through stack and fugitive emissions, surface water, and landfills (Section 3).

trans-1,2-Dichloroethylene is not anticipated to partition to sediment based on its physical and chemical properties (Sections 2.2 and 3.3.2). Exposure to the general population through surface water was assessed for oral and dermal exposures during swimming (Sections 4.1.3.2 and 4.1.3.3). Chronic exposure to the general population through drinking water was also assessed for facility-specific

¹ ONUs do not directly handle *trans*-1,2-dichloroethylene but may be indirectly exposed to it in the workplace as part of their employment.

releases, generic scenario releases, and through groundwater via releases from landfills or biosolids (Section 4.1.3.4).

The environmental assessment considered *trans*-1,2-dichloroethylene surface water exposures to aquatic vertebrates, aquatic invertebrates, and aquatic plants (Section 5.1.1). Exposure to ecological taxa was not considered for sediments because *trans*-1,2-dichloroethylene is not anticipated to partition to sediment (Section 5.1.2). EPA considered exposures to *trans*-1,2-dichloroethylene through the ambient air pathway for terrestrial plants by direct contact exposure and for terrestrial mammalian wildlife by inhalation (Section 5.1.3). EPA also considered exposure to *trans*-1,2-dichloroethylene through soil for terrestrial plants and soil-dwelling invertebrates (Section 5.1.4).

Human or environmental exposure to *trans*-1,2-dichloroethylene through uses that are not subject to TSCA (e.g., use in cosmetics, medical devices, food additives) were not specifically evaluated by the Agency in reaching its preliminary determination. This is because these uses are excluded from TSCA's definition of a "chemical substance." Thus, conclusions in this draft risk evaluation cannot be extrapolated to form conclusions about uses of *trans*-1,2-dichloroethylene that are not subject to TSCA and that EPA did not evaluate.

Determining Unreasonable Risk to Human Health

In TSCA existing chemical risk evaluations, EPA must determine whether a chemical substance does or does not present unreasonable risk of injury to human health or the environment under the COUs. The unreasonable risk determination must be consistent with the best available science. The Agency, in determining whether *trans*-1,2-dichloroethylene presents unreasonable risk to human health and the environment, considered risk-related factors as described in its risk evaluation framework rule and as required under TSCA (see TSCA section 6(b)(4)(F); 89 FR 37028, 37037 [May 3, 2024]). Risk-related factors include but are not limited to the type of health effect under consideration; the reversibility of the health effect being evaluated; exposure-related considerations (e.g., duration, magnitude, frequency of exposure); and populations exposed (including any PESS). The Agency considers risk-related factors when determining whether each COU significantly contributes to unreasonable risk of injury to human health or the environment. EPA must also consider confidence in the information used to inform the hazard and exposure values. If an estimate of risk for a specific scenario exceeds the standard risk benchmarks, then the determination of whether those risks significantly contribute to the unreasonable risk of *trans*-1,2-dichloroethylene under TSCA is both case-by-case and context-driven.

EPA evaluated the risks to people from being exposed to *trans*-1,2-dichloroethylene at work, indoors, and outdoors. Human health risk to workers and ONUs were assessed via inhalation exposure and/or dermal routes (Section 4.3.2); risk to consumers via inhalation and dermal routes (Section 4.3.3); and risk to bystanders via the inhalation route (Section 4.3.3). Workers with the greatest potential for exposure are those who work directly with the chemical in environments where *trans*-1,2-dichloroethylene is manufactured, processed, and/or used. Human health risks were evaluated for acute (15-minute and 8-hour), intermediate, and chronic exposure scenarios, as applicable based on reasonably available exposure and hazard data for *trans*-1,2-dichloroethylene.

As described in Section 4.3.4, EPA assessed risks to the general population—including PESS such as fenceline communities—from environmental releases of *trans*-1,2-dichloroethylene to air, surface water, and landfills, which included risk from exposure through inhalation of ambient air, dermal contact and incidental ingestion of surface water, and ingestion of drinking water.

The draft human health hazard assessment for *trans*-1,2-dichloroethylene was informed by a review of the available literature, including recent assessments by other authoritative bodies. EPA concluded that the weight of scientific evidence shows that exposure to *trans*-1,2-dichloroethylene can lead to increased risk of sensory irritation, acute neurotoxicity resulting from acute inhalation exposure, and increased risk of an immune response resulting from intermediate and chronic oral, dermal, and inhalation exposures (Section 4.2). No acute non-cancer hazards were identified for acute dermal or oral exposure to *trans*-1,2-dichloroethylene. Based on the weight of scientific evidence, EPA has preliminarily concluded that quantitative cancer risk assessment of *trans*-1,2-dichloroethylene is not warranted (Section 4.2).

EPA's assessment of *trans*-1,2-dichloroethylene preliminarily shows significant contributions to unreasonable risks to workers and ONUs from non-cancer health effects from acute (15-minute or 8-hour durations), intermediate, and/or chronic non-cancer inhalation exposure driven by the following 19 COUs (Table ES-1):

- Manufacture – Domestic manufacture [intermediate and chronic non-cancer inhalation for workers]
- Manufacture – Import [acute, intermediate, and chronic non-cancer inhalation for workers; chronic non-cancer inhalation for ONUs]
- Processing – Processing as a reactant – Intermediate [acute inhalation for workers]
- Processing – Incorporation into a formulation, mixture, or reaction product – Solvents (which become part of a product formulation or mixture) [acute, intermediate, and chronic non-cancer inhalation for workers; intermediate inhalation for ONUs]
- Processing – Incorporation into a formulation, mixture, or reaction product – Solvent purification (for semiconductor manufacturing) [intermediate and chronic non-cancer inhalation for workers]
- Processing – Incorporation into articles [intermediate and chronic non-cancer inhalation for workers and ONUs]
- Processing – Repackaging [acute, intermediate, and chronic non-cancer inhalation for workers; chronic non-cancer inhalation for ONUs]
- Processing – Recycling [acute inhalation for workers]
- Industrial/Commercial use – Cleaning agent – Vapor degreasing [intermediate and chronic non-cancer inhalation for workers; chronic non-cancer inhalation for ONUs]
- Industrial/Commercial use – Cleaning agent – Aerosol spray cleaner/degreaser [intermediate and chronic non-cancer inhalation for workers]
- Industrial/Commercial use – Cleaning agent – Non-aerosol spray cleaner/degreaser [acute, intermediate, and chronic non-cancer inhalation for workers; intermediate and chronic non-cancer inhalation for ONUs]
- Industrial/Commercial use – Anti-adhesive/cohesive – Mold release [intermediate and chronic non-cancer inhalation for both workers and ONUs]
- Industrial/Commercial use – Paints and coatings – Urethane coatings [intermediate and chronic non-cancer inhalation for both workers and ONUs]
- Industrial/Commercial use – Lubricants and greases [acute, intermediate, and chronic non-cancer inhalation for workers]
- Industrial/Commercial use – Adhesion/cohesion – Solvent-based adhesives, sealants, and adhesive accelerants [acute, intermediate, and chronic non-cancer inhalation for workers; intermediate and chronic non-cancer inhalation for ONUs]
- Industrial/Commercial use – Surface modifier – Smoothing fluid in additive manufacturing [intermediate and chronic non-cancer inhalation for workers; chronic non-cancer inhalation for ONUs]

- Industrial/Commercial use – Refrigerants [intermediate and chronic non-cancer for both workers and ONUs]
- Industrial/Commercial use – Other uses – Specialized detection indicator materials [intermediate and chronic non-cancer for both workers and ONUs]
- Industrial/Commercial use – Propellants, non-motive (blowing agent) – Polymer foam [acute, intermediate, and chronic non-cancer inhalation for workers; intermediate and chronic non-cancer inhalation for ONUs].

EPA's assessment of *trans*-1,2-dichloroethylene preliminarily shows significant contributions to unreasonable risks to consumers from non-cancer health effects from acute and intermediate inhalation exposure driven by the following COU (Table ES-2):

- Consumer use – Cleaning agent – Cleaner/degreaser (aerosol and non-aerosol) [acute and intermediate inhalation for consumers].

EPA has preliminarily determined that the following five (5) COUs do not significantly contribute to unreasonable risk to human health (Table ES-1 and Table ES-2):

- Industrial/Commercial use – Processing aids – Semiconductor and photovoltaic agents for etching and cleaning processes in electronic articles;
- Industrial/Commercial use – Other uses – Laboratory chemical;
- Distribution in commerce;
- Disposal; and
- Consumer use – Propellants, non-motive (blowing agent) – Polymer foam.

In addition, no unreasonable risks were preliminarily identified for dermal exposure to workers, including ONUs, or consumers.

EPA considered the weight of scientific evidence to determine confidence levels in underlying datasets and risk estimates of *trans*-1,2-dichloroethylene for human health (Section 4.3). For the general population, the Agency has robust confidence that the inhalation risk estimates from ambient air represent the upper bound of exposures to actual exposed populations. The Agency also has robust confidence that oral and dermal risk estimates from other pathways (drinking water intake and incidental dermal and ingestion via swimming) are protective of highly exposed populations. The Agency did not preliminarily identify significant contributions to unreasonable risk to the general population for *trans*-1,2-dichloroethylene for any COU.

Workers with the greatest potential for exposure are those who work directly with the chemical in environments where *trans*-1,2-dichloroethylene is manufactured, processed, used, or disposed of. For workers and ONUs, EPA has moderate-to-robust confidence in the risk estimates calculated for acute and chronic non-cancer inhalation and/or dermal exposure scenarios (Section 4.3.2). For consumers and bystanders, EPA has robust confidence in the risk estimates calculated for inhalation and dermal exposure scenarios and robust confidence that the consumer and bystander exposure scenarios are protective of a range of potential inhalation and dermal exposures (Section 4.3.3).

Determining Unreasonable Risk to the Environment

In preliminarily determining whether *trans*-1,2-dichloroethylene presents unreasonable risk of injury to the environment, EPA considered the following groups of organisms in its assessment: aquatic vertebrates, invertebrates, plants, and algae; terrestrial mammals and plants; and soil invertebrates. Specifically, the Agency assessed *trans*-1,2-dichloroethylene exposures to the environment through manufacturing, processing as a reactant, processing aid, use of laboratory chemical, repackaging, waste

handling, disposal, and treatment (*i.e.*, life cycle components of COUs; see Table 1-1). For aquatic plants and organisms inhabiting the water column and benthic (sediment) zone, EPA estimated exposures from surface water (Section 5.3.2). Inhalation exposure of terrestrial mammals to *trans*-1,2-dichloroethylene was assessed for the ambient air pathway (Section 5.3.3). Terrestrial plants and soil-dwelling invertebrates were assessed for direct contact through ambient air and/or soil (Sections 5.3.3). The environmental hazard thresholds were developed using data on *trans*-1,2-dichloroethylene as well as data from an analog, trichloroethylene (Section 5.2), which were determined to be relevant to these exposure scenarios.

The Agency weighed the scientific evidence to determine confidence levels in underlying datasets and risk estimates for the environment (Section 5.3). EPA has robust confidence that its environmental risk estimates represent an upper estimate of exposure that is protective of actual exposure scenarios (Section 5.3.5). The Agency did not identify significant contributions to unreasonable risk to the environment for *trans*-1,2-dichloroethylene for any COU.

Summary and Conclusions

Table ES-1 and Table ES-2 list all 25 COUs assessed for *trans*-1,2-dichloroethylene (see also Table 1-1 and Appendix E) in this draft risk evaluation. Table ES-1 shows the COUs that significantly contribute to the preliminary determination of unreasonable risk of injury to human health due to acute, intermediate, and chronic non-cancer inhalation risk for workers and ONUs (19 COUs for workers; 13 of which also include ONUs). Note that Table ES-1 includes four (4) assessed COUs that do not contribute to the preliminary risk determination of unreasonable risk for workers. Table ES-2 shows COUs that significantly contribute to the preliminary determination of unreasonable risk of injury to human health due to acute and intermediate non-cancer inhalation risk for consumers and bystanders (1 COU for consumers). Table ES-2 also includes one (1) assessed COU that does not contribute to the preliminary determination of unreasonable risk for consumers.

Table ES-1. Preliminary Determination of Unreasonable Risk to Workers and ONUs for the Assessed Conditions of Use (COUs) of *trans*-1,2-Dichloroethylene

Conditions of Use	Worker			ONUs		
	Inhalation ^a			Inhalation		
	Non-Cancer			Non-Cancer		
	A	I	C	A	I	C
Manufacturing – Domestic manufacture		×	×			
Manufacturing – Import	×	×	×			×
Processing – Processing as a reactant – Intermediate	×					
Processing – Incorporation into formulation, mixture, or reaction product – Solvent (which become part of product formulation or mixture)	×	×	×		×	
Processing – Incorporation into formulation, mixture, or reaction product – Solvent purification (for semiconductor manufacturing)		×	×			
Processing – Incorporation into articles		×	×		×	×
Processing – Repackaging	×	×	×			×
Processing – Recycling	×					
Distribution in commerce						
Industrial/Commercial use – Cleaning agent – Vapor degreasing		×	×			×
Industrial/Commercial use – Cleaning agent – Aerosol spray cleaner/degreaser		×	×			
Industrial/Commercial use – Cleaning agent – Non-aerosol cleaner/degreaser	×	×	×		×	×

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Conditions of Use	Worker			ONUs		
	Inhalation ^a			Inhalation		
	Non-Cancer			Non-Cancer		
	A	I	C	A	I	C
Industrial/Commercial use – Anti-adhesive/cohesive – Mold release		×	×		×	×
Industrial/Commercial use – Paints and coatings – Urethane coatings		×	×		×	×
Industrial/Commercial use – Lubricants and greases	×	×	×			
Industrial/Commercial use – Adhesion/cohesion promoter – Solvent-based adhesives, sealants, and adhesive accelerants	×	×	×		×	×
Industrial/Commercial use – Surface modifier – Smoothing fluid in additive manufacturing		×	×			×
Industrial/Commercial use – Refrigerants		×	×		×	×
Industrial/Commercial use – Processing aids – Semiconductor and photovoltaic agents for etching and cleaning processes in electronic articles						
Industrial/Commercial use – Other uses – Laboratory chemical						
Industrial/Commercial use – Other uses – Specialized detection indicator materials		×	×		×	×
Industrial/Commercial use – Propellants, non-motive (blowing agent)	×	×	×		×	×
Disposal						
A = acute; C = chronic; I = intermediate; ONU = occupational non-user						
^a Dermal exposure was assessed for workers but not ONUs. No unreasonable risk to workers through dermal exposure was identified and is not included in this table as a result.						
Shaded cells with × are COUs that significantly contribute to a preliminary determination of unreasonable risk of injury for workers and/or ONUs from <i>trans</i> -1,2-dichloroethylene.						

Table ES-2. Preliminary Determination of Unreasonable Risk for Consumers and Bystanders for the Assessed Conditions of Use (COUs) of *trans*-1,2-Dichloroethylene

Condition of Use	Consumer			Bystander ^a
	Inhalation		Dermal	Inhalation
	Non-Cancer	Non-Cancer	Non-Cancer	Non-Cancer
	Acute	Inter.	Inter.	Inter.
Consumer use – Cleaning agent – Cleaner/degreaser (aerosol and non-aerosol)	×	×		
Consumer use – Propellants, non-motive (blowing agent) – Polymer foam				
Inter. = intermediate				
^a Dermal exposure was not assessed for bystanders.				
Shaded cells with × are COUs that significantly contribute to a preliminary determination of unreasonable risk of injury for consumers.				

Next Steps and Public Input

This draft risk evaluation—including EPA’s preliminary determination that 20 of 25 assessed COUs for *trans*-1,2-dichloroethylene significantly contribute to unreasonable risk of injury to human health (Section 6.1) as well as the accompanying TSDs and supplemental files (see Appendix E)—have been

released for public comment. The draft hazards assessment TSD ([U.S. EPA, 2026w](#)) underwent independent, expert peer review through the SACC on August 3–7, 2026.

Recommendations from the SACC, as well as public comments on the draft risk evaluation package, will inform the final risk evaluation of *trans*-1,2-dichloroethylene—including the Agency’s determination of whether *trans*-1,2-dichloroethylene presents unreasonable risk of injury to human health or the environment, under the COUs. If, in the final risk evaluation, the Agency determines that *trans*-1,2-dichloroethylene presents unreasonable risk of injury to human health or the environment, EPA will initiate regulatory action under TSCA section 6(a) to the extent necessary so that *trans*-1,2-dichloroethylene no longer presents such risk.

The Agency seeks public comment on all aspects of this draft risk evaluation and seeks additional information on the following topics:

1. Information that may inform exposure assumptions for occupational exposure scenarios (OESs) (*e.g.*, whether and how exposure controls and personal protective equipment [PPE] are used for each of the COUs, the frequency of occupational task[s] per shift), especially those related to the use of *trans*-1,2-dichloroethylene as a blowing agent;
2. Information on the number of facilities involved in the vapor degreasing COU;
3. Information to inform and refine the occupational exposure assessment of Manufacturing as a Byproduct OES, including monitoring data;
4. Information on the frequency of batch manufacturing within a facility to inform the occupational exposure assessment;
5. Additional information on PPE use for two COUs: (1) Processing – Incorporation into a formulation, mixture, or reaction product – Solvent (which become part of product formulation or mixture), and (2) Processing – Incorporation into a formulation, mixture, or reaction product – Solvent purification (for semiconductor manufacturing); and
6. Other information on any relevant studies or other data sources that were not identified by EPA.

1 INTRODUCTION

EPA has evaluated *trans*-1,2-dichloroethylene (CASRN 107-06-02) under the Toxic Substances Control Act (TSCA) section 6(b). *trans*-1,2-Dichloroethylene conditions of use (COUs) evaluated in this assessment include manufacturing (including import), processing, distribution in commerce, industrial, commercial and consumer uses, and disposal. Processing COUs of *trans*-1,2-dichloroethylene include as a reactant or solvent. Industrial and commercial uses include the use of *trans*-1,2-dichloroethylene as a solvent for cleaning and degreasing or as a component of refrigerant. Consumer uses of *trans*-1,2-dichloroethylene include as a cleaner or degreaser and as a polymer foam.

Figure 1-1 provides an overview of the major inputs, phases/components, and outputs of the TSCA risk evaluation process, from chemical prioritization to scoping to releasing the finalized risk evaluation.

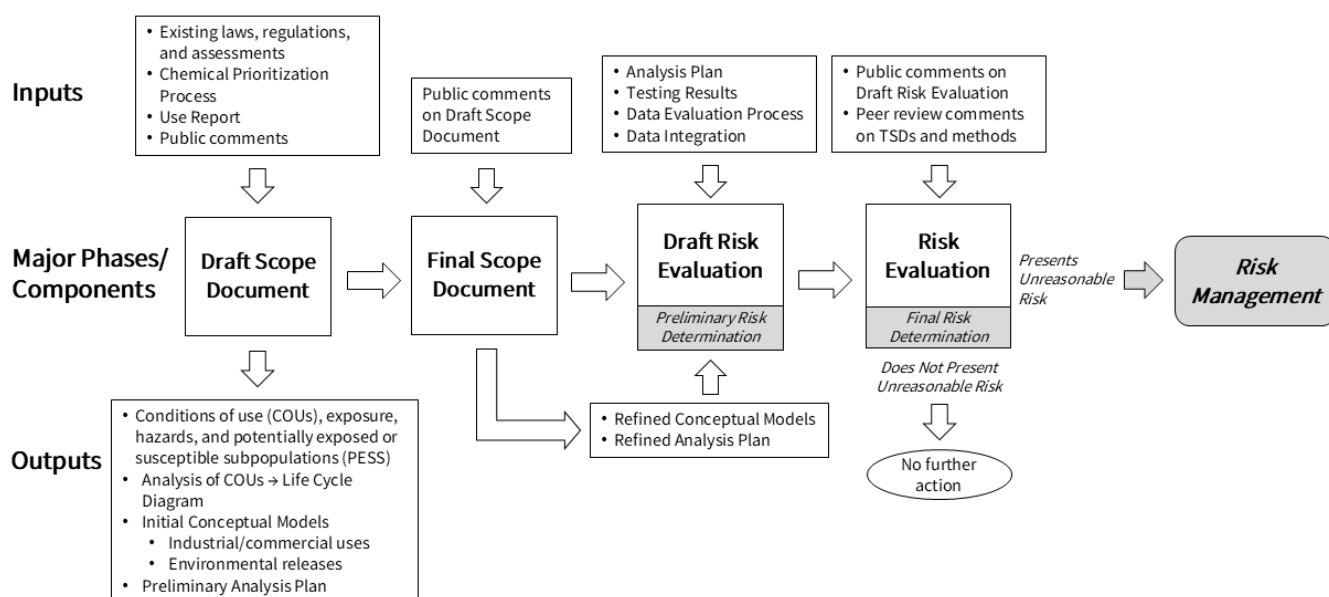


Figure 1-1. Overview of TSCA Existing Chemical Risk Evaluation Process

1.1 Scope of the Risk Evaluation

EPA evaluated risk to human and environmental populations for *trans*-1,2-dichloroethylene. This draft risk evaluation for *trans*-1,2-dichloroethylene comprises a package of technical support documents (TSDs) and supplemental files. The *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* (also referred to as the “draft hazards assessment TSD”) ([U.S. EPA, 2026w](#)) was released for public comment and peer review by the Science Advisory Committee on Chemicals (SACC) ([EPA-HQ-OPPT-2026-2246](#)) ahead of the public release of this draft risk evaluation. A basic diagram showing the layout and relationship of these assessments is provided below in Figure 1-2 (see also Appendix C).

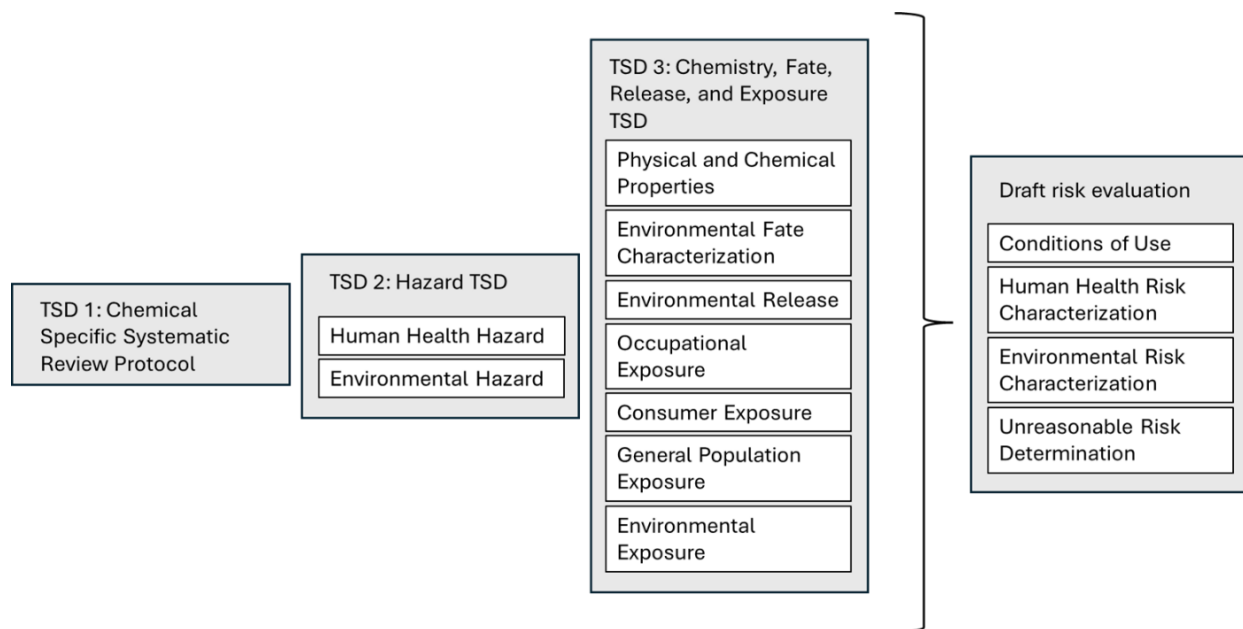


Figure 1-2. Draft Risk Evaluation Document Summary Map

1.1.1 Life Cycle and Production Volume

The life cycle diagram (LCD) shown in Figure 1-3 depicts the COUs that are within the scope of the risk evaluation during various life cycle stages, including manufacturing, processing, use, distribution and disposal. The information in the LCD is grouped according to the Chemical Data Reporting (CDR) processing codes and use categories (including functional use codes for industrial uses and product categories for industrial and commercial users). The CDR Rule under TSCA (see 40 CFR part 711) requires U.S. manufacturers (including importers) to provide EPA with information on the chemicals they manufacture or import into the United States. The Agency collects CDR data approximately every 4 years with the latest collections occurring in 2016, 2020, and 2024.

The production volume reported in the *Final Scope of the Risk Evaluation for trans-1,2-Dichloroethylene (CAS RN 156-60-5)* (also called the “final scope document”) (U.S. EPA, 2020b) was between 1 and 10 million pounds (lb), based on total production volume of *trans*-1,2-dichloroethylene in 2015 from the 2016 CDR reporting period (U.S. EPA, 2016). The range decreased in the 2024 CDR reporting period with the national aggregate production volume of *trans*-1,2-dichloroethylene in 2023 reported as 1,000,000 to less than 5,000,000 lb (U.S. EPA, 2026a). Production volume is described here as a range to protect production volumes that are claimed as confidential business information (CBI). For each CDR cycle, data collected per chemical included the company name, volume of each chemical manufactured/imported, the number of workers at each site, and information on whether the chemical is used in the commercial, industrial, and/or consumer sector(s).

1.2 Conditions of Use Included in the Risk Evaluation

The final scope document (U.S. EPA, 2020b) identified and described the life cycle stages, categories, and subcategories that comprise COUs that EPA planned to consider in the risk evaluation. In this draft risk evaluation, the Agency made updates to the COUs listed in the final scope document (U.S. EPA, 2020b) (see also Appendix D). The COUs included in this draft risk evaluation are reflected in the LCD (Figure 1-3) and conceptual models (Section 1.2.1). These COUs are evaluated for acute, intermediate, chronic, and lifetime exposures, as applicable, based on reasonably available exposure and hazard data as well as the relevant study populations for each. Table 1-1 presents the full list of COUs (see also Appendix E), including Distribution in Commerce, which is not included in the LCD (Figure 1-3).

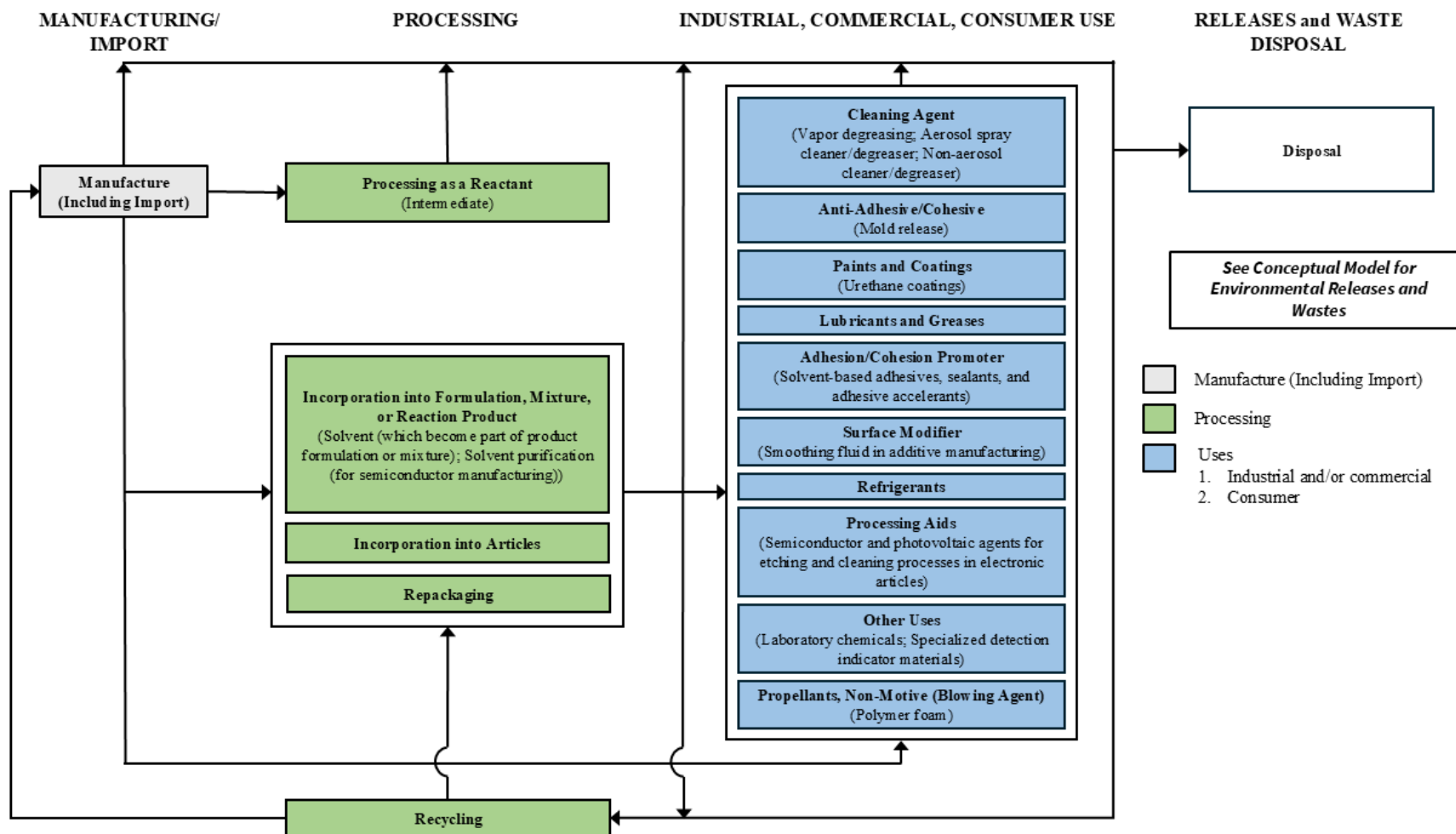


Figure 1-3. *trans*-1,2-Dichloroethylene Life Cycle Diagram

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Table 1-1. Conditions of Use in the Risk Evaluation for *trans*-1,2-Dichloroethylene

Conditions of Use (COUs)			References ^d
Life Cycle Stage ^a	Category ^b	Subcategory ^c	
Manufacture	Domestic manufacture ^e	N/A	(U.S. EPA, 2026a; Exponent, 2023; U.S. EPA, 2020a, 2019a, 2016)
	Import	N/A	U.S. EPA (2026a, 2019a, 2016)
Processing	Processing as a reactant	Intermediate ^d	U.S. EPA (2026a, 2019a); Axiall (2016); Dreher et al. (2014)
	Incorporation into formulation, mixture, or reaction product	Solvent (Which become part of product formulation or mixture)	Miller-Stephenson (2023); U.S. EPA (2020a, 2019a); Permabond Engineering Adhesives (2018); Wilsonart (2017); U.S. EPA (2016), EPA-HQ-OPPT-2018-0465-0009
		Solvent purification (for semiconductor manufacturing) ^f	Exponent (2023)
	Incorporation into articles	N/A	U.S. EPA (2020a, 2019a, 2016), SNAP Regulation (accessed August 19, 2026)
	Repackaging	N/A	U.S. EPA (2026a); Exponent (2023); U.S. EPA (2019a)
	Recycling	N/A	U.S. EPA (2026a); Exponent (2023); U.S. EPA (2019a)
Distribution in commerce	N/A	N/A	U.S. EPA (2026a, 2019a)
Industrial/ Commercial use	Cleaning agent ^d	Vapor degreasing	Enviro Tech International (2024); Exponent (2023); U.S. EPA (2020a, 2016), EPA-HQ-OPPT-2018-0465-0006, EPA-HQ-OPPT-2018-0465-0038, CDR 2024 (accessed August 20, 2026)
	Cleaning agent ^d	Aerosol spray cleaner/degreaser	U.S. EPA (2026a); Exponent (2023); Miller-Stephenson (2023); ITW Pro Brands (2022); U.S. EPA (2020a, 2019a); Albatross USA Inc. (2017); ACL Inc (2016); U.S. EPA (2016), EPA-HQ-OPPT-2018-0465-0003, EPA-HQ-OPPT-2018-0465-0006, EPA-HQ-OPPT-2018-0465-0009, EPA-HQ-OPPT-2018-0465-0038, EPA-HQ-OPPT-2018-0465-0031,

Conditions of Use (COUs)			References ^d
Life Cycle Stage ^a	Category ^b	Subcategory ^c	
Industrial/ Commercial use	Cleaning agent ^d	Non-aerosol cleaner/degreaser	(U.S. EPA, 2026a ; Chemours, 2024 ; Hydro-Balance, 2024 ; Exponent, 2023 ; Techspray, 2023 ; U.S. EPA, 2020a ; Albatross USA Inc., 2017 ; Belzona, 2017 ; U.S. EPA, 2016 ; ACE, 2015), EPA-HQ-OPPT-2018-0465-0031 , EPA-HQ-OPPT-2018-0465-0038 , EPA-HQ-OPPT-2018-0465-0030
	Anti-adhesive/cohesive ^d	Mold release	U.S. EPA (2026a) ; Miller-Stephenson (2024) , EPA-HQ-OPPT-2018-0465-0006
	Paints and coatings	Urethane coatings	Miller-Stephenson (2023) ; Chemical (2016a, 2016b) , EPA-HQ-OPPT-2018-0465-0006
	Lubricants and greases	N/A	QuestSpecialty (2026) ; U.S. EPA (2026a) ; American Gas & Chemical Co (2023) ; Kimball Midwest (2022) , EPA-HQ-OPPT-2018-0465-0006
	Adhesion/cohesion promoter ^d	Solvent-based adhesives, sealants, and adhesive accelerants	U.S. EPA (2026a) ; Permabond Engineering Adhesives (2018) ; Wilsonart (2017)
	Surface modifier ^d	Smoothing fluid in additive manufacturing	U.S. EPA (2026a) ; MicroCare (2025, 2018)
	Refrigerants ^d	N/A	U.S. EPA (2026a) ; Chemours (2023) ; U.S. EPA (2016)
	Processing aids	Semiconductor and photovoltaic agents for etching and cleaning processes in electronic articles ^{d,f}	U.S. EPA (2026a) , EPA-HQ-OPPT-2018-0465-0036
	Other uses	Laboratory chemical	Scientific (2018) , EPA-HQ-OPPT-2018-0465-0036
Industrial/ Commercial use	Other uses	Specialized detection indicator materials ^f	American Gas & Chemical Co (2023) ; LA-CO Industries (2020)

Conditions of Use (COUs)			References ^d
Life Cycle Stage ^a	Category ^b	Subcategory ^c	
	Propellants, non-motive (blowing agent) ^d	Polymer foam	U.S. EPA (2026a, 2020a) ; Inc (2017a, 2017b) ; LLC (2016) ; U.S. EPA (2016)
Consumer use	Cleaning agent ^d	Cleaner/degreaser (aerosol and non-aerosol) ^d	U.S. EPA (2026a) ; Nu-Calgon (2025) ; CRC Industries Inc. (2017)
	Propellants, non-motive (blowing agent) ^d	Polymer foam	U.S. EPA (2026a) ; DAP Global (2022a) ; Inc (2017a, 2017b) ; LLC (2016)
Disposal	N/A	N/A	U.S. EPA (2026a)

^a Life cycle stage use definitions (40 CFR 711.3)
– “Industrial use” means use at a site at which 1 or more chemicals or mixtures are manufactured (including imported) or processed.
– “Commercial use” means the use of a chemical or a mixture containing a chemical (including as part of an article) in a commercial enterprise providing saleable goods or services.
– “Consumer use” means the use of a chemical or a mixture containing a chemical (including as part of an article, such as furniture or clothing) when sold to or made available to consumers for their use. Although EPA has identified both industrial and commercial uses here for purposes of distinguishing scenarios in this document, the Agency interprets the authority over “any manner or method of commercial use” under TSCA section 6(a)(5) to reach both.
– “N/A” means not applicable where the category name, subcategory name, or both are duplicative and therefore unnecessary for identifying the COU.

^b These categories COUs appear in the life cycle diagram, reflect CDR codes, and broadly represent COUs of *trans*-1,2-dichloroethylene in industrial and/or commercial settings and for consumer use.

^c These subcategories represent more specific activities within the life cycle stage and category of the conditions of use of *trans*-1,2-dichloroethylene.

^d The 2024 CDR guide ([U.S. EPA, 2024b](#)) and 2024 CDR submissions were reviewed to evaluate whether the 2024 CDR cycle would further inform the COU categories and descriptions. If EPA receives new information on the *trans*-1,2-dichloroethylene COUs during the comment period for this draft risk evaluation, then that information will be considered and if appropriate, incorporated into the final risk evaluation COU categories and descriptions. See Appendix F of this draft risk evaluation for COU descriptions.

^e The final scope document ([U.S. EPA, 2020b](#)) indicated that EPA intended to evaluate *trans*-1,2-dichloroethylene produced as a byproduct from the manufacture of 1,2-dichloroethane (CASRN 107-06-2) in the risk evaluation for 1,2-dichloroethane. Instead, EPA is evaluating *trans*-1,2-dichloroethylene produced as a byproduct during the manufacture of 1,2-dichloroethane in this *trans*-1,2-dichloroethylene draft risk evaluation. Manufacture of *trans*-1,2-dichloroethylene as a byproduct is assessed under the Domestic manufacture COU.

^f New COU added to the draft risk evaluation for *trans*-1,2-dichloroethylene after publication of the final scope document. See Table_Apx D-1 for revisions to categories and subcategories of COUs.

1.2.1 Conceptual Models

The conceptual model in Figure 1-4 presents the exposure pathways, exposure routes, and hazards to human populations from industrial and commercial activities and uses of *trans*-1,2-dichloroethylene. There is potential for exposures to workers and ONUs via the inhalation route, though exposures via dermal contact are expected to only occur in workers. EPA evaluated activities resulting in exposures associated with distribution in commerce (e.g., loading, unloading) throughout the various life cycle stages and COUs (e.g., manufacturing, processing, industrial use, commercial use, disposal). Figure 1-5 presents the conceptual model for consumer activities and uses, and Figure 1-6 presents the conceptual model for ecological exposures and hazards from environmental releases and wastes. The rationale for

746 why exposure pathways and routes were not quantified is available in the *Draft Chemistry, Fate,*
747 *Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

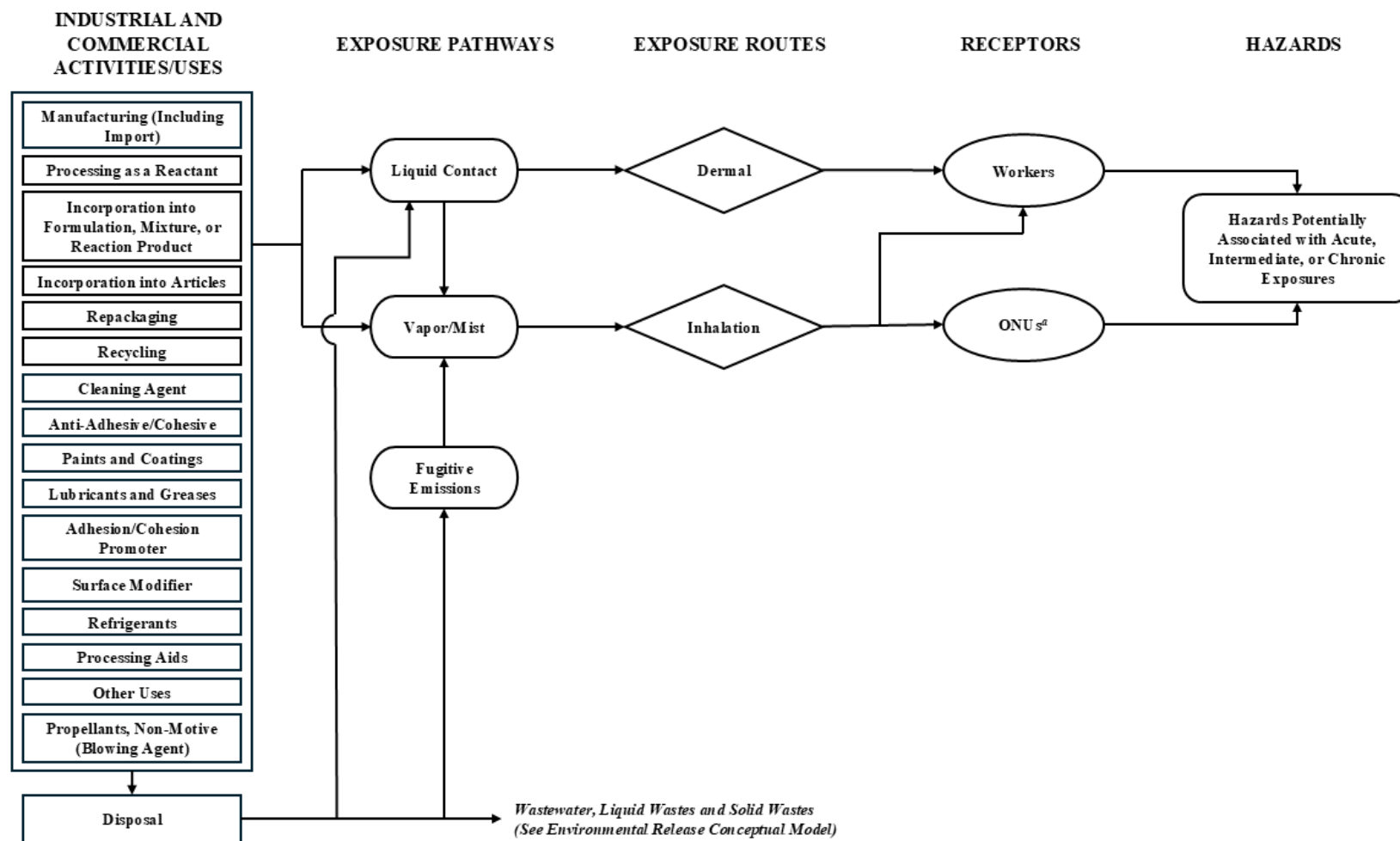


Figure 1-4. *trans*-1,2-Dichloroethylene Occupational Exposure Conceptual Model for Industrial and Commercial Activities and Uses: Worker and Occupational Non-User (ONU) Exposures and Hazards

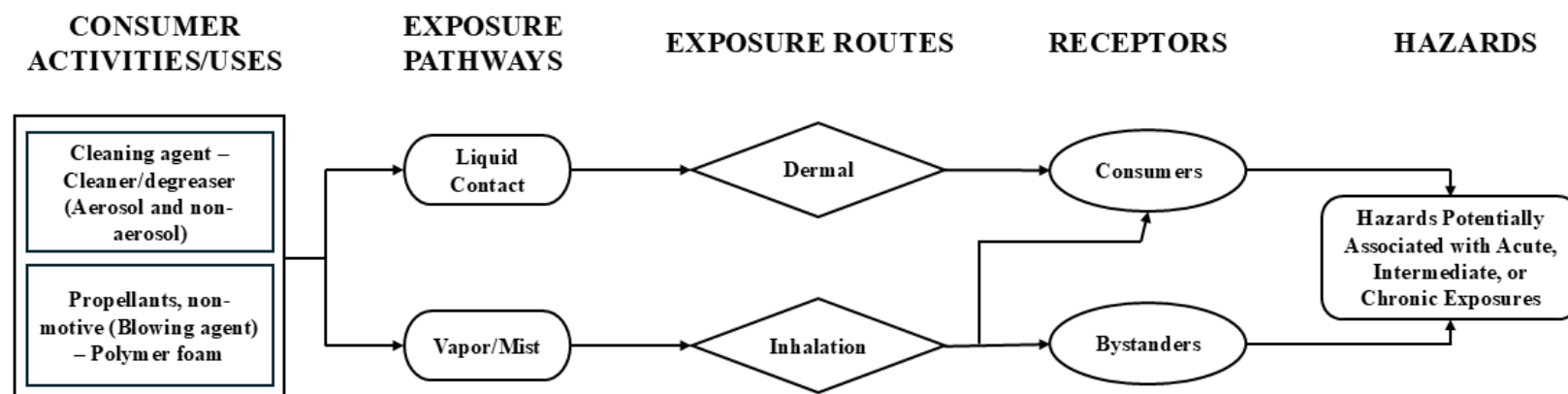


Figure 1-5. *trans*-1,2-Dichloroethylene Conceptual Model for Consumer Activities and Uses: Consumer Exposures and Hazards

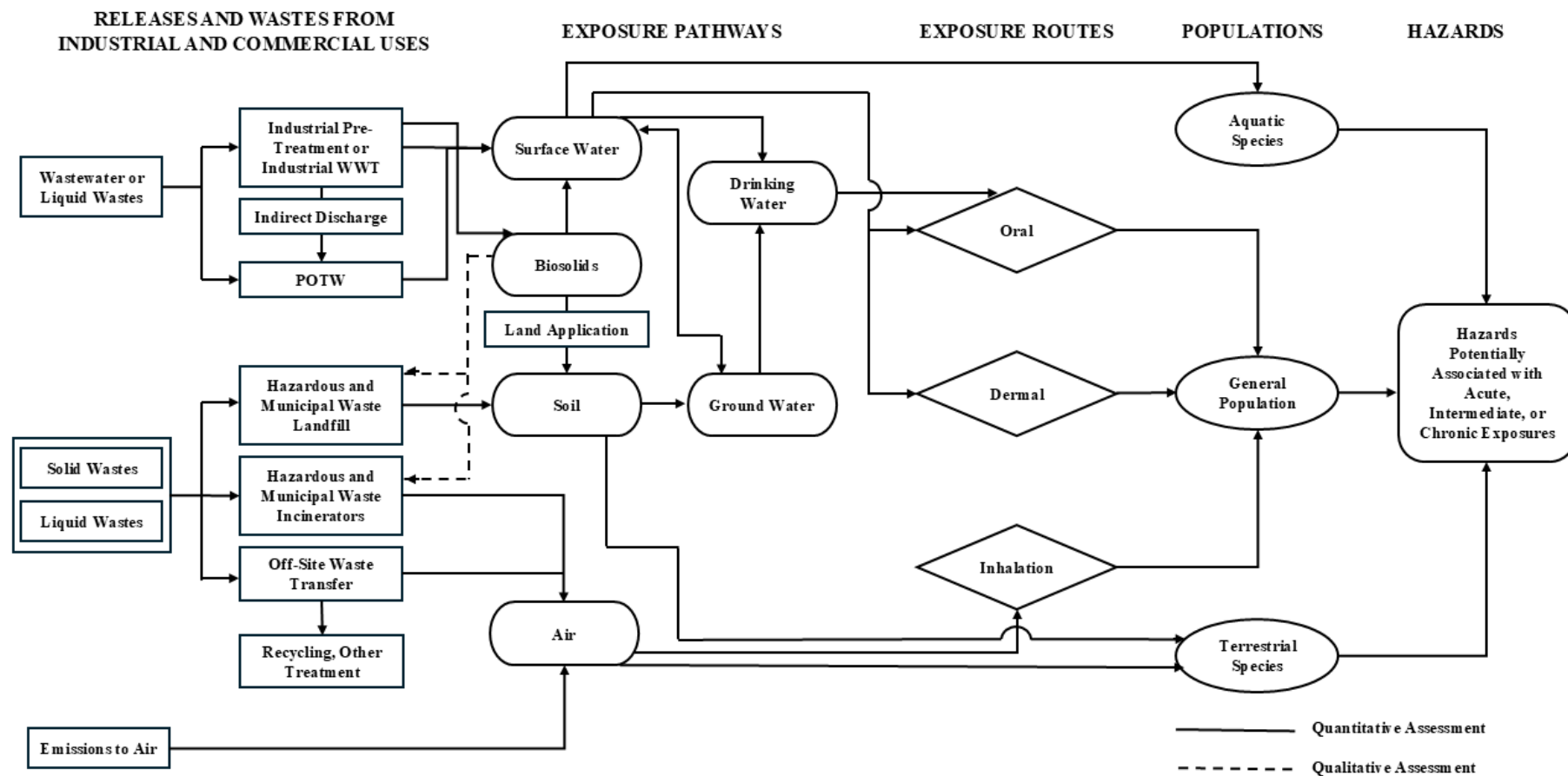


Figure 1-6. *trans*-1,2-Dichloroethylene Conceptual Model for Environmental Releases and Wastes: Environmental and General Population Exposures and Hazards

1.2.2 Populations and Durations of Exposures Assessed

Based on the conceptual models presented in Section 1.2.1, EPA evaluated risk to environmental and human populations. Environmental risks were evaluated for acute and chronic exposure scenarios for aquatic and terrestrial species, as appropriate. Human health risks were evaluated for acute, intermediate, chronic, and lifetime exposure scenarios, as applicable based on reasonably available exposure and hazard data as well as the relevant populations for each.

Human populations assessed include the following:

- workers, including average adults and women of reproductive age;
- occupational non-users (ONUs), including average adults and women of reproductive age;
- consumers, including youths (16–20 years) and adults (21+ years);
- bystanders of all ages; and
- general population (ages 6–15 and 21+ years for oral and dermal exposures from swimming, all ages otherwise).

1.2.2.1 Potentially Exposed or Susceptible Subpopulations

TSCA section 6(b)(4)(A) requires that risk evaluations “determine whether a chemical substance presents an unreasonable risk of injury to health or the environment, without consideration of costs or other non-risk factors, including an unreasonable risk to a potentially exposed or susceptible subpopulation identified as relevant to the risk evaluation by the Administrator, under the conditions of use.” TSCA section 3(12) states that “the term ‘potentially exposed or susceptible subpopulation’ [PESS] means a group of individuals within the general population identified by the Administrator who, due to either greater susceptibility or greater exposure, may be at greater risk than the general population of adverse health effects from exposure to a chemical substance or mixture, such as infants, children, pregnant women, workers, or the elderly.”

This draft risk evaluation considers PESS throughout the human health risk assessment (Section 4), including throughout the exposure assessment, hazard identification, and dose-response analysis supporting this assessment. PESS considered in this assessment of *trans*-1,2-dichloroethylene include people with increased susceptibility to *trans*-1,2-dichloroethylene; women of reproductive age; pregnant women; infants; children; people who frequently use consumer products and/or articles containing high concentrations of *trans*-1,2-dichloroethylene; people exposed to *trans*-1,2-dichloroethylene in the workplace; and people in close proximity to releasing facilities, including fenceline communities.

Section 4.3.5 describes details on how PESS considerations were incorporated into risk estimates, along with any underlying uncertainties.

1.3 Systematic Review

EPA/OPPT applies systematic review principles in the development of risk evaluations under the amended TSCA. Section 26(h) and (i) of TSCA require EPA to use scientific information, technical procedures, measures, methods, protocols, methodologies, and models consistent with the best available science and base decisions under section 6 on the weight of scientific evidence.

The systematic review process steps are briefly described below in Figure 1-7. The searches for peer-reviewed and gray literature relevant references were completed in September and May 2019, respectively. An updated literature search for potential additional sources of information and data that might support the *trans*-1,2-dichloroethylene risk evaluation was conducted in April 2025. Additional

details regarding these literature searches and the systematic review steps are available in the *Draft Systematic Review Protocol Supporting TSCA Risk Evaluations for Chemical Substances, Version 1.0: A Generic TSCA Systematic Review Protocol with Chemical-Specific Methodologies* (also called “[2021] Draft Systematic Review Protocol”) ([U.S. EPA, 2021b](#)) and the *Draft Systematic Review Protocol for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026ak](#)). The latter provides additional information on the steps in the systematic review process, including literature inventory trees and evidence maps for each discipline (e.g., human health hazard) containing results of the literature search and screening as well as sections summarizing data evaluation, extraction, and evidence integration.

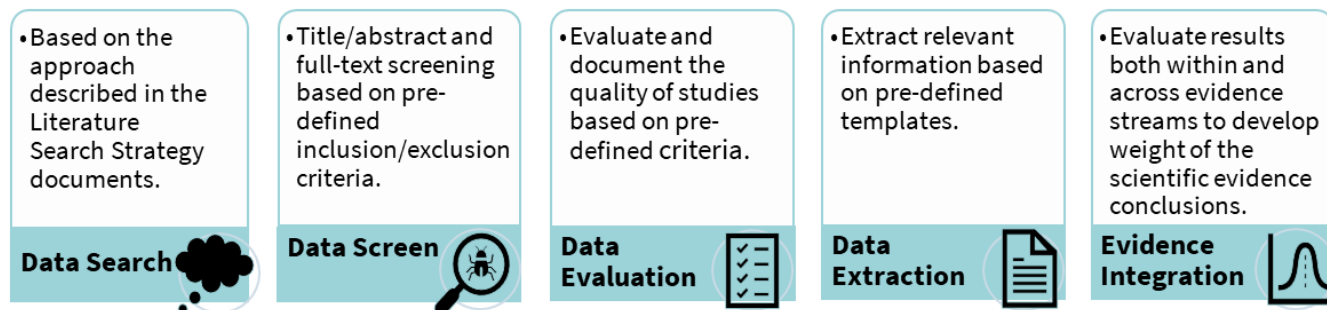


Figure 1-7. Diagram of the Systematic Review Process

EPA also identified key assessments conducted by other Agency programs and other U.S. and international organizations (authoritative bodies). Depending on the source, these assessments may include information on COUs (or the equivalent), hazards, exposures, and PESS. Some of the most pertinent assessments that were consulted for this draft *trans-1,2-dichloroethylene* risk evaluation are listed below:

- EPA: *Integrated Risk Information System (IRIS), Chemical Assessment Summary, trans-1,2-Dichloroethylene; CASRN 156-60-5* ([U.S. EPA, 1988a](#))
- EPA: *Provisional Peer-Reviewed Toxicity Values for trans-1,2-Dichloroethylene (CASRN 156-60-5)* ([U.S. EPA, 2020c](#)), and
- U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry (ATSDR): *Toxicological Profile for 1,2-Dichloroethene* ([ATSDR, 2025](#))
- EPA: Acute Exposure Guideline Levels (AEGL) document ([U.S. EPA, 2022c](#))
- CalEPA/ Office of Environmental Health Hazard Assessment (OEHHA): Public Health Goals document ([CalEPA, 2018](#)).

2 CHEMISTRY AND FATE AND TRANSPORT

Physical and chemical properties determine the behavior and characteristics of a chemical that inform its condition of use, environmental fate and transport, potential toxicity, exposure pathways, routes, and hazards. Environmental fate and transport include environmental partitioning, accumulation, degradation, and transformation processes. Environmental transport is the movement of the chemical within and between environmental media, such as air, water, soil, and sediment. Thus, understanding the environmental fate of *trans*-1,2-dichloroethylene informs the specific exposure pathways as well as the potential human and environmental exposed populations that EPA considered in this draft risk evaluation.

Sections 2.1 and 2.2 summarize the physical and chemical properties and environmental fate and transport of *trans*-1,2-dichloroethylene respectively. For detailed information, *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

2.1 Summary of Physical and Chemical Properties

trans-1,2-Dichloroethylene is a volatile organic compound (VOC; vapor pressure = 331 mmHg at 25 °C) and is a clear, colorless liquid at standard temperature and pressure. It has a water solubility of 4,520 mg/L at 25 °C, is readily soluble in organic solvents, and has Henry's Law constant of 7.51×10^{-3} atm·m³/mol at 25 °C. EPA evaluated physical and chemical property data ([U.S. EPA, 2026g](#)) and information according to the process described in the *Draft Systematic Review Protocol for trans-1,2-Dichloroethylene* TSD ([U.S. EPA, 2026ak](#)). The Agency considered both measured and estimated physical and chemical property data/information as described in the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)). The selected values are summarized in Table 2-1. Information on the full extracted dataset is available in the *Draft Data Quality Evaluation and Data Extraction Information for Physical and Chemical Properties for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026n](#)).

Table 2-1. Physical and Chemical Properties of *trans*-1,2-Dichloroethylene^a

Property	Selected Value(s)	Source(s)	Overall Data Quality Determination
Molecular formula	C ₂ H ₂ Cl ₂	N/A	N/A
Molecular weight	96.94 g/mol	N/A	N/A
Physical form	Clear, colorless liquid at ambient conditions with a sweetish scent	NLM (2018) ; Dreher et al. (2014) ; Belpoggi et al. (2012) ; Lewis (2012)	High
Melting point	-49.8 °C	Rumble (2018b)	High
Boiling point	47.64 °C	Rumble (2018b)	High
Density	1.2565 g/cm ³	O'Neil (2013)	High
Vapor pressure	331 mmHg	NLM (2018)	High
Vapor density	3.34 (unitless; relative to air = 1)	NCBI (2020)	High
Water solubility	4,520 mg/L at 25 °C	NLM (2018)	High
Octanol/water partition coefficient (log K _{ow})	1.93 (unitless)	Rumble et al. (2018)	High
Henry's Law constant	7.51×10^{-3} atm·m ³ /mol	Hovorka and Dohnal (1997)	High
Flash point	4 °C	Dreher et al. (2014)	High

Property	Selected Value(s)	Source(s)	Overall Data Quality Determination
Autoflammability	460 °C	Rumble (2018a)	High
Viscosity	0.425 centipoise (cP) at 20 °C	Elsevier (2019)	High
Refractive index	1.4454	Rumble (2018b)	High
Dielectric constant	2.15	Dreher et al. (2014)	High
^a Additional information on value selection can be found in the <i>Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026g).			

2.2 Summary of Environmental Fate and Transport

Under normal environmental conditions, *trans*-1,2-dichloroethylene (1) is expected to volatilize from water, but a portion will remain dissolved in water due to its solubility (4,520 mg/L); (2) has low bioaccumulation potential in aquatic and terrestrial organisms; and (3) is considered to have limited biodegradability under most aquatic and terrestrial environmental conditions (see Figure 2-1). Fate parameters—including biotic and abiotic biodegradation rates, removal during wastewater treatment, volatilization from water sources, and partition coefficients—are used in the current draft risk evaluation. In assessing the environmental fate and transport of *trans*-1,2-dichloroethylene, EPA considered the full range of results from the available highest quality data sources obtained during systematic review. Information on the full extracted dataset is available in the *Data Quality Evaluation and Data Extraction Information for Environmental Fate and Transport for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026i](#)). Other fate estimates were based on modeling results from EPI Suite™, which is a predictive tool for physical and chemical properties and environmental fate estimation.

EPA evaluated the reasonably available information to characterize the environmental fate and transport of *trans*-1,2-dichloroethylene. The key points of the fate assessment for *trans*-1,2-dichloroethylene are summarized below with additional details available in the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)). Given the consistent results from numerous high-quality studies, there is robust evidence that *trans*-1,2-dichloroethylene

- Will undergo slow indirect photodegradation in air primarily by reaction with hydroxyl radicals (·OH)
- Will not hydrolyze in environmental waters
- Will not sorb to soil/sediment and will therefore be mobile in the environment
- Will biodegrade slowly in anaerobic soils and sediments
- Will not readily biodegrade in surface water
- Has high removal rates during wastewater treatment, with volatilization being the major removal process, and biodegradation and sorption to sludge being minor removal processes
- Is the degradation product of higher chlorinated ethenes (*e.g.*, trichloroethylene and perchloroethylene) and can degrade to form vinyl chloride
- Will not be removed with high efficiency in conventional drinking water treatment processes but will be removed with high efficiency in treatment processes that used packed aeration towers or granular activated carbon (GAC)
- Can biodegrade rapidly in certain aerobic environments, especially when there is previous exposure to *trans*-1,2-dichloroethylene, the presence of methanotrophic bacteria, or the presence of certain nutrients and substrates
- Will not undergo long range transport in air
- Will not bioaccumulate in fish.

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The above conclusions were determined to have a robust weight of evidence supported by two or more high-quality studies that were largely in agreement with each other. The studies were supported by physical-chemical and fate properties and/or model outputs, where applicable.

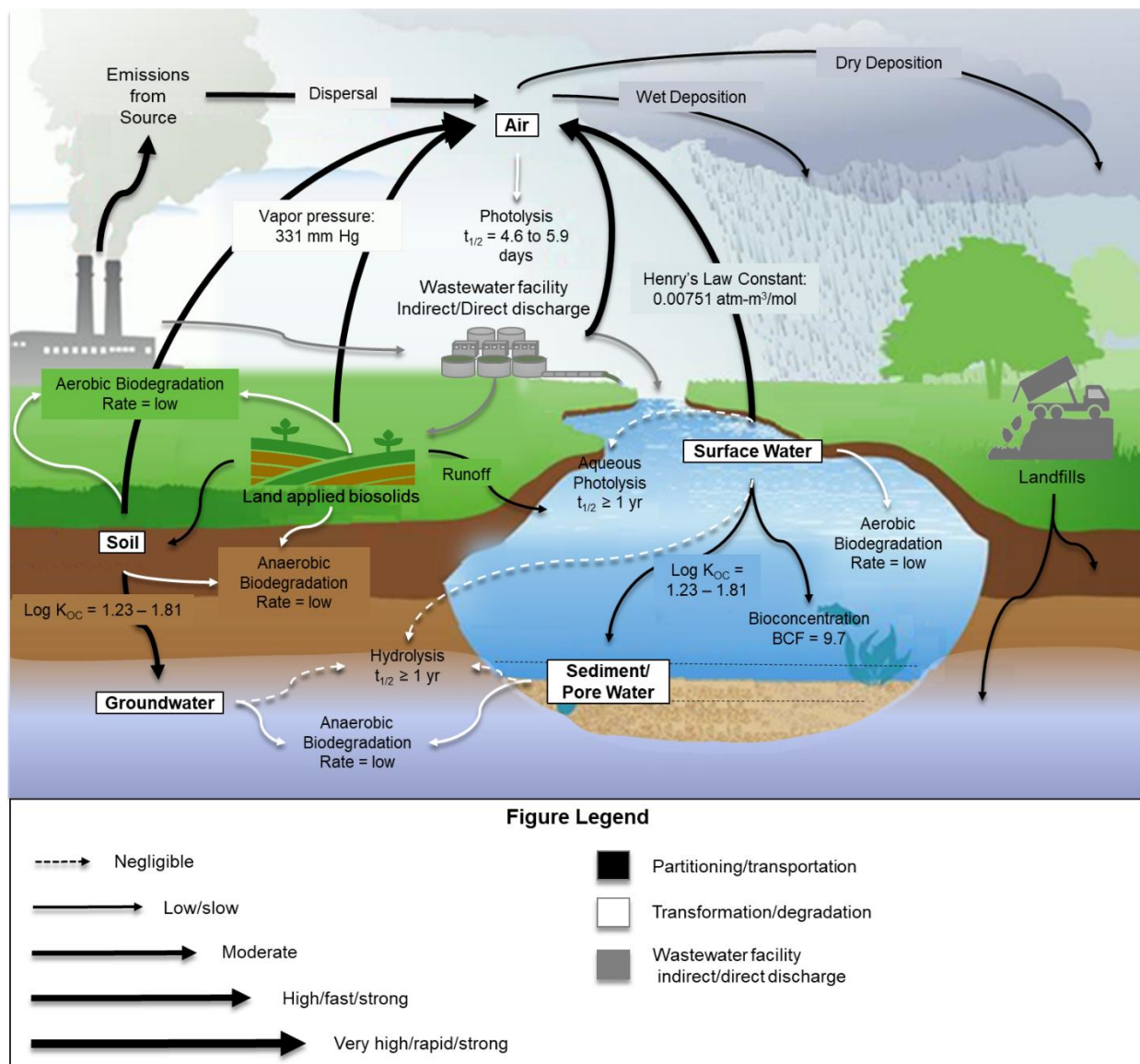


Figure 2-1. Transport, Partitioning, and Degradation of *trans*-1,2-Dichloroethylene in the Environment

2.2.1 Weight of Scientific Evidence Conclusions for Fate and Transport

The partitioning analyses, which incorporate high-quality physical and chemical properties, provide robust evidence that air is likely to be the major medium of exposure for *trans*-1,2-dichloroethylene. TRI data for 2019 to 2023 indicate that reported environmental releases of 1,2-dichloroethene (reported in TRI as the combined *cis*- and *trans*-isomers) were predominantly to air. Air emissions accounted for approximately 99.7% of total reported releases in 2019, 99.8% in 2020, 99.7% in 2021, and 98.8% in 2022—indicating that atmospheric release was the primary disposal pathway during these years. In 2023, the proportion of releases to air decreased to approximately 68% because reported land disposal and off-site disposal increased; however, air remained the single largest reported release pathway. In this assessment, EPA considered the TRI reporting years of 2019 to 2023. The TRI-reported releases show

that, though small compared to air, there are releases to water and land. The partitioning analysis shows that when released to water and land, some *trans*-1,2-dichloroethylene will stay in the media of release. Therefore, land and water pathways could be important depending on the specific release pattern (specific exposure scenarios assessed in the evaluation are discussed in Section 4.1.3).

When released to air, there is also strong evidence that *trans*-1,2-dichloroethylene will exist as a vapor and will not partition to particulate matter. Modeling suggests that *trans*-1,2-dichloroethylene will not be subject to long-range transport given its atmospheric half-life ($t_{1/2} \approx 5$ days).

In aquatic environments, *trans*-1,2-dichloroethylene is expected to volatilize from surface waters. The Agency did not identify any studies directly measuring volatilization rates and used EPI Suite™ (U.S. EPA, 2012) to estimate a rate for a model lake and stream. There is uncertainty in the volatilization rate because it can vary based on the characteristics of the water body. EPA has strong evidence that *trans*-1,2-dichloroethylene is not readily biodegradable in surface water and that hydrolysis is slow under environmentally relevant conditions. EPA also has strong evidence that *trans*-1,2-dichloroethylene will not sorb strongly to sediment, but given its solubility, there is a possibility that it could be bioavailable in sediment porewater. The Agency identified limited monitoring data with measurable concentrations in surface water but monitoring locations for water samples are not necessarily spatially or temporally aligned with releases from COUs and therefore might not be representative of actual release scenarios. The Agency also identified limited sediment monitoring data with reported concentrations at or below the reported detection limit. EPA identified only one study with an estimated bioaccumulation factor (BAF) of 32.66 L/kg. Modeling using EPI Suite™ (U.S. EPA, 2012) estimated BAF and bioconcentration factor (BCF) values of 9.3 and 8.7 L/kg respectively. Overall, EPA has high confidence the BAF and BCF values for *trans*-1,2-dichloroethylene will be low given available evidence.

In terrestrial environments, *trans*-1,2-dichloroethylene can volatilize from surface soils; however, EPA did not identify any studies measuring volatilization rates from soil; thus, there is uncertainty in the exact volatilization rate as it will depend on the specific soil characteristics and local conditions (e.g., temperature). Soil and groundwater biodegradation studies reported a large range of half-lives. Despite this uncertainty, EPA expects biodegradation rates to be slow in both aerobic and anaerobic soils and groundwater (Table 2-2). The Agency has strong evidence demonstrating that *trans*-1,2-dichloroethylene will migrate to groundwater when released to land, given the amount of data measuring it in groundwater across the United States.

Table 2-2. Summary of Environmental Fate Information for *trans*-1,2-Dichloroethylene^c

Parameter	Value ^a	Source	Data Quality Rating
Indirect photodegradation	$t_{1/2} = 4.57$ days (assuming 12-hour day, $1.5E06$ OH/cm ³)	U.S. EPA (2012)	High
	$t_{1/2} = 5.9$ days (estimated, assuming 12-hour day, $1.5E06$ OH/cm ³)	Klamt (1993)	High
Direct photodegradation	Not expected	NA	N/A
Hydrolysis	$t_{1/2} = 2.1E10$ years	Jeffers et al. (1989)	High
Aerobic biodegradation in water	Negligible biodegradation/24 days (modified shake-flask method and modified river die-away method)	Mudder (1981)	High

Parameter	Value ^a	Source	Data Quality Rating
	0% biodegradation/28 days (OECD 301C)	NCBI (2020)	Medium
	8% biodegradation/28 days (OECD 301D), $t_{1/2}$ = 234 days assuming first-order kinetics	U.S. EPA (2015b)	Medium
Aerobic biodegradation in soil/sediments	$t_{1/2}$ = 21–23 days (contaminated soil and synthetic groundwater samples)	Olaniran et al. (2006)	High
	35% loss/35 days (1 ppm, londo soil); 10% in 280 days (1 ppm, Oklahoma soil); 6% in 400 days (10 ppm, londo soil); $t_{1/2}$ = 68–4,545 days assuming first-order kinetics (no prior exposure history)	Klier et al. (1999)	High
Anaerobic biodegradation in soils/sediments	$t_{1/2}$ = 32 days (reductive dechlorination in pre-exposed aquifer material and groundwater microcosm)	Hunkeler et al. (2002)	High
	$t_{1/2}$ = 132–147 days (dehalogenation to form vinyl chloride)	Barrio-Lage et al. (1986)	High
	0% biodegradation after 20 days (everglades surface water and muck samples)	Dow Chemical (1980)	Medium
	82% loss in 280 days including a lag time of 112 days. (aquifer material beside landfill). $t_{1/2}$ = 68 days assuming first order kinetics.	(NCBI, 2020)	Medium
	73% biodegradation after 180 days (sediments from Florida everglades)	U.S. EPA (2015b)	Medium
	16–40% over 60 days in anoxic sediments	Bradley (2007)	Medium
Bioconcentration factor (BCF)	8.7 ^b L/kg	(U.S. EPA, 2012)	High
Bioaccumulation factor (BAF)	9.3 ^b L/kg	(U.S. EPA, 2012)	High
Organic carbon:water partition coefficient (log K_{OC})	1.23 (unitless)	Lam (1994)	High
	1.64 (estimated; unitless)	RIVM (2007)	Medium
	1.81 ^b (unitless)	U.S. EPA (2012)	High
Organic carbon:air partition coefficient (log K_{OA})	2.56 (unitless)	U.S. EPA (2012)	High
Removal in wastewater treatment	84% (activated sludge system, isomer not specified)	Tansel and Eyma (1999)	Medium

Parameter	Value ^a	Source	Data Quality Rating
	>90% (activated sludge and trickling filter systems)	U.S. EPA (1982)	High
	79% ^b	(U.S. EPA, 2012)	High
	t _{1/2} = 26–27 days (contaminated wastewater samples)	Olaniran et al. (2006)	High
	93–95% loss/28 days of which 26–33% was volatilized (settled sludge amended with yeast extracts); t _{1/2} = 16–21 days assuming first-order kinetics	U.S. EPA (2015b)	Medium
^a Measured unless otherwise noted ^b Information was estimated using EPI Suite™ (U.S. EPA, 2012) ^c Additional information on value selection can be found in the <i>Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene</i> TSD (U.S. EPA, 2026g)			

3 RELEASES AND CONCENTRATIONS IN THE ENVIRONMENT

EPA estimated environmental releases (Sections 3.1 and 3.2) and concentrations (Section 3.2) of *trans*-1,2-dichloroethylene.

3.1 Approach and Methodology for Estimating Releases

3.1.1 Manufacturing, Processing, Industrial, and Commercial Uses

3.1.1.1 Crosswalk of Conditions of Use to Occupational Exposure Scenarios

EPA categorized the COUs listed in Table 1-1 into occupational exposure scenarios (OES). Table 3-1 provides a crosswalk between the COUs and OESs; Table 3-2 provides the reverse: a crosswalk of OESs to COUs. Each OES is developed based on a set of occupational activities and conditions such that similar occupational exposures and environmental releases are expected from the use(s) covered under that OES. For each OES, EPA provided occupational exposure and environmental release results, which are expected to be representative of the entire population of workers and sites for the given OES in the United States. In some cases, the Agency defined only a single OES for multiple COUs, while in other cases the Agency developed multiple OESs for a single COU. EPA made this determination by considering variability in release and use conditions and whether the variability required discrete scenarios or could be captured as a distribution of exposures.

Table 3-1. Crosswalk of Conditions of Use to Assessed Occupational Exposure Scenarios

Condition of Use (COU)			Occupational Exposure Scenario (OES) ^{d e}
Life Cycle Stage(s) ^a	Category ^b	Subcategory ^c	
Manufacture	Domestic manufacture	N/A	Manufacturing as Primary Product (OES #1)
	Import	N/A	Repackaging (OES #3)
Processing	Processing as a reactant	Intermediate	Processing as a Reactant (OES #4)
	Incorporation into formulation, mixture or reaction product	Solvents (which become part of product formulation or mixture)	Incorporation into Formulation, Mixture, or Reaction Product (OES #5)
		Solvent purification (for semiconductor manufacturing)	
	Incorporation into articles	N/A	Blowing Agent in Spray Foam (OES #11)
	Repackaging	N/A	Repackaging (OES #3)
	Recycling ^f	N/A	Processing as a Reactant (OES #4)
Distribution in commerce	N/A	N/A	Distribution in Commerce (OES #16) ^d
Industrial/Commercial use	Cleaning agent	Vapor degreasing	Vapor Degreasing (OES #6)
		Non-aerosol cleaner/degreaser	Miscellaneous Non-Aerosol Industrial and Commercial Uses (Cleaning and Degreasing Agents, Lubricants and Greases, Mold Release) (OES #7)

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Condition of Use (COU)			Occupational Exposure Scenario (OES) ^{d e}
Life Cycle Stage(s) ^a	Category ^b	Subcategory ^c	
		Aerosol spray cleaner/degreaser	Commercial Aerosol Products (Aerosol Degreasing, Aerosol Lubricants, Mold Release) (OES #8)
Industrial/ Commercial use	Anti-adhesive/ cohesive	Mold release	Miscellaneous Non-Aerosol Industrial And Commercial Uses (Cleaning and Degreasing Agents, Lubricants and Greases, Mold Release) (OES #7)
			Commercial Aerosol Products (Aerosol Degreasing, Aerosol Lubricants, Mold Release) (OES #8)
	Paints and coatings	Urethane coatings	Application of Paints and Coatings (OES #9)
	Lubricants and greases	N/A	Commercial Aerosol Products (Aerosol Degreasing, Aerosol Lubricants, Mold Release) (OES #8)
	Adhesion/cohesion promoter	Solvent-based adhesives, sealants, and adhesive accelerants	Application of Adhesives and Sealants (OES #10)
	Surface modifier	Smoothing fluid in additive manufacturing	Vapor Degreasing (OES #6)
	Refrigerants	N/A	Refrigerant Flush (OES #13)
	Processing aids	Semiconductor and photovoltaic agents for etching and cleaning processes in electronic articles	Processing Aid in Semiconductor Manufacturing (OES #14)
	Other uses	Laboratory chemical	Laboratory Use (OES #12)
		Specialized detection indicator paints	Miscellaneous Non-Aerosol Industrial and Commercial Uses (Cleaning and Degreasing Agents, Lubricants and Greases, Mold Release) (OES #7)
			Commercial Aerosol Products (Aerosol Degreasing, Aerosol Lubricants, Mold Release) (OES #8)
	Propellants, non-motive (blowing agent)	Polymer foam	Blowing Agent in Spray Foam (OES #11)
Disposal	N/A	N/A	Waste Handling, Disposal, and Treatment (OES #15) ^f
^a Life Cycle Stage Use Definitions (40 CFR 711.3) – “Industrial use” means use at a site at which 1 or more chemicals or mixtures are manufactured (including imported) or processed. – “Commercial use” means the use of a chemical or a mixture containing a chemical (including as part of an article) in a commercial enterprise providing saleable goods or services. – “Consumer use” means the use of a chemical or a mixture containing a chemical (including as part of an article, such as furniture or clothing) when sold to or made available to consumers for their use.			

Condition of Use (COU)			Occupational Exposure Scenario (OES) ^{d e}
Life Cycle Stage(s) ^a	Category ^b	Subcategory ^c	
– Although EPA has identified both industrial and commercial uses here for purposes of distinguishing scenarios in this document, the Agency interprets the authority over “any manner or method of commercial use” under TSCA section 6(a)(5) to reach both. – “N/A” means not applicable where the category name, subcategory name, or both are duplicative and therefore unnecessary for identifying the condition of use (COU). ^b These categories COUs appear in the life cycle diagram, reflect Chemical Data Reporting (CDR) codes, and broadly represent COUs of <i>trans</i>-1,2-dichloroethylene in industrial and/or commercial settings and for consumer use. ^c These subcategories reflect more specific COUs of <i>trans</i>-1,2-dichloroethylene. ^d For the purpose of this draft risk evaluation, distribution in commerce is the transportation of <i>trans</i>-1,2-dichloroethylene and <i>trans</i>-1,2-dichloroethylene-containing products between sites at which <i>trans</i>-1,2-dichloroethylene manufacturing, processing, and use occurs or the transportation of <i>trans</i>-1,2-dichloroethylene - containing wastes for recycling or disposal. EPA expects all of the above materials to be transported in closed system or otherwise to be transported in a form (<i>e.g.</i>, articles containing <i>trans</i>-1,2-dichloroethylene) such that there is negligible potential for occupational exposure except during an incident. ^e Consumer uses are not assigned to OESs but are assessed elsewhere in this draft risk evaluation. ^f The COU of Processing – Recycling was mapped to the OES of Waste Handling, Disposal, Treatment and Recycling in the <i>Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026g). The COU to OES mapping has been updated in this draft risk evaluation, as has the OES name to reflect this change. Both documents will be aligned in the release of the final risk evaluation.			

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Table 3-2. Crosswalk of Assessed Occupational Exposure Scenarios to Conditions of Use

Occupational Exposure Scenario (OES) ^a	Condition of Use (COU)		
	Life Cycle Stage(s) ^b	Category ^c	Subcategory ^{d e f}
Manufacturing as Primary Product (OES #1)	Manufacture	Domestic manufacture	N/A
Manufacturing as Byproduct (OES #2)	Manufacture	Domestic manufacture	N/A
Repackaging (OES #3)	Manufacture	Import	N/A
	Processing	Repackaging	N/A
Processing as a Reactant (OES #4)	Processing	Processing as a reactant	Intermediate
		Recycling ^g	N/A
Incorporation into Formulation, Mixture, or Reaction Product (OES #5)	Processing	Incorporation into formulation, mixture or reaction product	Solvent purification (for semiconductor manufacturing)
			Solvents (which become part of product formulation or mixture)
Vapor Degreasing (OES #6)	Industrial/ Commercial use	Cleaning agent	Vapor degreasing
		Surface modifier	Smoothing fluid in additive manufacturing

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Occupational Exposure Scenario (OES) ^a	Condition of Use (COU)		
	Life Cycle Stage(s) ^b	Category ^c	Subcategory ^{d e f}
Miscellaneous Non-Aerosol Industrial and Commercial Uses (Cleaning and Degreasing Agents, Lubricants and Greases, Mold Release) (OES #7)	Industrial/ Commercial use	Cleaning agent	Non-aerosol cleaner/degreaser
		Anti-adhesive/ cohesive	Mold release
		Other uses	Specialized detection indicator paints
Commercial Aerosol Products (Aerosol Degreasing, Aerosol Lubricants, Mold Release) (OES #8)	Industrial/ Commercial use	Cleaning agent	Aerosol spray cleaner/degreaser
		Anti-adhesive/ cohesive	Mold release
		Lubricants and greases	N/A
		Other uses	Specialized detection indicator paints
Application of Paints and Coatings (OES #9)	Industrial/ Commercial use	Paints and coatings	Urethane coatings
Application of Adhesives and Sealants (OES #10)	Industrial/ Commercial use	Adhesion/ Cohesion promoter	Solvent-based adhesives, sealants, and adhesive accelerants
Blowing Agent in Spray Foam (OES #11)	Industrial/ Commercial use	Propellants, non-motive (blowing agent)	Polymer foam
	Processing	Incorporation into articles	N/A
Laboratory Use (OES #12)	Industrial/ Commercial use	Other uses	Laboratory chemical
Refrigerant Flush (OES #13)	Industrial/ Commercial use	Refrigerants	N/A
Processing Aid in Semiconductor Manufacturing (OES #14)	Industrial/ Commercial use	Processing aids	Semiconductor and photovoltaic agents for etching and cleaning processes in electronic articles
Waste Handling, Disposal and Treatment (OES #15) ^g	Disposal	N/A	N/A
Distribution in Commerce (OES #16) ^e	Distribution in commerce	N/A	N/A
^a An OES is based on a set of facts, assumptions, and inferences that describe how releases and exposures take place within an occupational COU. The occurrence of releases/exposures may be similar across multiple COUs (multiple COUs mapped to single OES), or there may be several ways in which releases/exposures take place for a given COU (single COU mapped to multiple OESs). ^b Life cycle stage use definitions (40 CFR 711.3) – “Industrial use” means use at a site at which 1 or more chemicals or mixtures are manufactured (including imported) or processed.			

Occupational Exposure Scenario (OES) ^a	Condition of Use (COU)		
	Life Cycle Stage(s) ^b	Category ^c	Subcategory ^{d e f}
– “Commercial use” means the use of a chemical or a mixture containing a chemical (including as part of an article) in a commercial enterprise providing saleable goods or services. – “Consumer use” means the use of a chemical or a mixture containing a chemical (including as part of an article, such as furniture or clothing) when sold to or made available to consumers for their use. – Although EPA has identified both industrial and commercial uses here for purposes of distinguishing scenarios in this document, the Agency interprets the authority over “any manner or method of commercial use” under TSCA section 6(a)(5) to reach both. ^c These subcategories reflect more specific COUs of <i>trans</i>-1,2-dichloroethylene. ^d These subcategories represent more specific activities within the life cycle stage and category of the COUs of <i>trans</i>-1,2-dichloroethylene. ^e EPA considers the activities of loading and unloading of chemical product part of distribution in commerce; however, these activities were assessed as part of each COU’s OES. Releases and exposures for the remaining aspects of distribution in commerce are not quantitatively assessed in this draft risk evaluation. ^f Consumer uses are not assigned to OESs but are assessed elsewhere in this draft risk evaluation (see also Appendix E). ^g The COU of Processing – Recycling was mapped to the OES of Waste Handling, Disposal, Treatment and Recycling in the <i>Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026g). The COU to OES mapping has been updated in this draft risk evaluation, as has the OES name to reflect this change. Both documents will be aligned in the release of the final risk evaluation.			

3.1.1.2 Description of Role/Function of *trans*-1,2-Dichloroethylene for Each OES

An understanding of the role/function of *trans*-1,2-dichloroethylene for each OES is important in mapping data to an OES and selecting appropriate modeling approaches to estimate releases and exposures. Brief summaries of the role/function of *trans*-1,2-dichloroethylene for all OES are presented in Table 3-3.

Table 3-3. Description of the Function of *trans*-1,2-Dichloroethylene for Each OES

Occupational Exposure Scenario (OES)	Role/Function of <i>trans</i> -1,2-Dichloroethylene
Manufacturing as a Primary Product (OES #1)	This OES captures part of the Domestic manufacture condition of use (COU) category. <i>trans</i>-1,2-Dichloroethylene is manufactured as a primary product.
Manufacturing as a Byproduct (OES #2)	This OES captures part of the Domestic manufacture COU category. <i>trans</i>-1,2-Dichloroethylene is manufactured as a non-isolated byproduct during the intentional manufacturing of other chlorinated hydrocarbons, such as 1,2-dichloroethane and vinyl chloride.
Repackaging (OES #3)	This OES captures the Repackaging and Import COU categories. <i>trans</i>-1,2-Dichloroethylene may be transported in liquid cargo barges, railcars, tank trucks, tank containers, intermediate bulk containers (IBCs)/totes, and drums. EPA expects that <i>trans</i>-1,2-dichloroethylene will be repackaged from import containers into smaller product containers.
Processing as a Reactant (OES #4)	This OES captures Processing as a reactant and Recycling COU categories. <i>trans</i>-1,2-Dichloroethylene is used as an intermediate in the production of various chemicals.

Occupational Exposure Scenario (OES)	Role/Function of <i>trans</i> -1,2-Dichloroethylene
Incorporation into Formulation, Mixture, or Reaction Product (OES #5)	This OES captures the Processing – Incorporated into formulation, mixture, or reaction product COU category. Incorporation into a formulation, mixture or reaction product refers to the process of mixing or blending of several raw materials to obtain a product or mixture. <i>trans</i>-1,2-Dichloroethylene is mixed or blended into a variety of products of varying uses described by the following OESs.
Vapor Degreasing (OES #6)	This OES captures parts of the Cleaning agent and Surface modifier COU categories. <i>trans</i>-1,2-Dichloroethylene is used as a solvent in vapor degreasing. In vapor degreasing, it functions as a volatilized cleaning solvent that condenses on parts to dissolve and remove greases.
Miscellaneous Non-Aerosol Industrial and Commercial Uses (Cleaning and Degreasing Agents, Lubricants and Greases, Mold Release) (OES #7)	This OES captures parts of the Cleaning agent, Anti-adhesive/cohesive, and Specialized detection indicator paints COU categories. <i>trans</i>-1,2-Dichloroethylene is used as a non-aerosol solvent in cleaning and degreasing, lubricants and greases, mold release, and specialized marking products.
Commercial Aerosol Products (Aerosol Degreasing, Aerosol Lubricants, Mold Release) (OES #8)	This OES captures parts of the Cleaning agent, Anti-adhesive/cohesive, and Specialized detection indicator paints COU categories. <i>trans</i>-1,2-Dichloroethylene is used as an aerosol solvent in cleaning and degreasing, lubricants and greases, mold release, and specialized marking products.
Application of Paints and Coatings (OES #9)	This OES captures the Industrial/Commercial use of paints and coatings COU category. <i>trans</i>-1,2-Dichloroethylene is used as a solvent in urethane coatings.
Adhesives and Sealants (OES #10)	This OES captures the Industrial/Commercial use of adhesives and sealants COU category. <i>trans</i>-1,2-Dichloroethylene is a component of adhesive formulations.
Blowing Agent in Spray Foam (OES #11)	This OES captures the Propellants, non-motive (blowing agent) and Incorporation into articles COU categories. <i>trans</i>-1,2-Dichloroethylene is used as a propellant during the manufacturing of polymer foam.
Laboratory Chemicals (OES #12)	This OES captures the Commercial use of laboratory chemicals COU category. <i>trans</i>-1,2-Dichloroethylene is used in analytical standards, research, equipment calibration, and sample preparation applications.
Refrigerant Flush (OES #13)	This OES captures the Commercial use refrigerants COU category. <i>trans</i>-1,2-Dichloroethylene is used as a refrigerant in commercial heating and cooling system as well as a cleaning aid to flush refrigerants from heating and cooling systems.

Occupational Exposure Scenario (OES)	Role/Function of <i>trans</i> -1,2-Dichloroethylene
Processing Aid in Semiconductor Manufacturing (OES #14)	This OES captures part of the Processing aids – Semiconductor and photovoltaic agents for etching and cleaning processes in electronic articles COU category. <i>trans</i> -1,2-Dichloroethylene is used in oxide furnaces as a source of HCl and other inorganic chlorides during semiconductor manufacturing.
Waste Handling, Disposal, and Treatment (OES #15)	This OES captures the Disposal COU category. Each OES may generate waste streams of <i>trans</i> -1,2-dichloroethylene that are collected and transported to third-party landfill, incinerator, publicly owned treatment works (POTW), and/or non-POTW wastewater treatment (WWT) sites for disposal and these cases are assessed under this OES.
Distribution in Commerce (OES #16)	EPA considers the activities of loading and unloading of chemical product part of distribution in commerce; however, these activities were assessed as part of each COU's OES. Releases and exposures for the remaining aspects of distribution in commerce are not quantitatively assessed in this draft risk evaluation.

3.1.1.3 Daily Release Estimation

EPA collected facility release data for *trans*-1,2-dichloroethylene from Toxic Release Inventory (TRI) (years 2019–2023) and Discharge Monitoring Report (DMR) (years 2019–2023). TRI provides facility-specific data on releases to air, water, and land; DMR includes data on water releases. Data are available in each of these sources that can be utilized to map the facility to an OES. In brief, mapping consists of using facility-reported industry sectors (typically reported as either North American Industry Classification System [NAICS] or Standard Industrial Classification [SIC] codes), and chemical activity, processing, and use information to assign the most likely OES to each facility.

When releases are expected for an OES, but TRI and/or DMR data or release data from systematic review are not available, EPA used modeling to estimate releases. Modeling was also performed when there is limited facility release data available and the number of sites for the OES may be much higher than what is captured by the facility release data. EPA modeled releases for the following (sometimes abbreviated) OESs: Repackaging (OES #3), Vapor Degreasing (OES #6), Commercial Aerosol Products (OES #8), Application of Paints and Coatings (OES #9), Adhesives and Sealants (OES #10), Blowing Agent in Spray Foam (OES #11), and Laboratory Chemicals (OES #12). The Agency identified model input parameters and equations from relevant literature sources, generic scenarios (GSs), or emission scenario documents (ESDs).

For each modeled OES, a Monte Carlo simulation with 100,000 iterations was conducted to capture variability in input parameters and estimate total for *trans*-1,2-dichloroethylene releases by environmental media across all sources in each iteration. EPA selected the 50th and 95th percentile values to represent the central tendency and high-end releases, respectively. The Agency then compiled the environmental releases by air, water, and land for each OES. Annual and daily release estimates are presented as 50th and 95th percentiles. Where available, EPA used GSs or ESDs to estimate number of release days, which the Agency used to convert between annual release estimates and daily release estimates. EPA uses facility data reported to CDR, TRI, and DMR as a first approach to estimate the number of sites for an OES. If these data were not available, EPA used Monte Carlo modeling approaches to estimate releases, which required estimates of production volume for a given OES and facility throughput. For each OES, EPA developed a conclusion on the weight of scientific evidence supporting the environmental release estimates based on the strengths, limitations, and uncertainties associated with the release estimates. The Agency considered factors that increase or decrease the

strength of the evidence supporting the release estimate—including quality of the data/information, applicability of the release data to the COU (including considerations of temporal relevance, locational relevance), and the representativeness of the estimate across the whole industry.

The *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) describes EPA's approach and methodology for estimating daily releases and provides detailed facility-level results for each OES. EPA developed facility-level release estimates by OES from TRI (2019–2023) and DMR (2019–2023) (water) to support general population and environmental exposure assessments.

3.2 Summary of Environmental Releases

Estimates of releases for *trans*-1,2-dichloroethylene in this section are derived from industrial and commercial sources.

3.2.1 Industrial and Commercial

EPA combined its estimates for annual releases, release days, number of facilities, and hours of release per day to estimate a range of daily releases for each OES. These estimates are based on TRI and DMR data from reporting years 2019 to 2023. Table 3-4 presents a summary of these ranges across facilities. See *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) for additional detail.

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Table 3-4. Summary of Environmental Releases by Occupational Exposure Scenario for *trans*-1,2-Dichloroethylene

OES	Type of Discharge, ^a Air Emission, ^b or Transfer for Disposal ^c	Estimated Annual Release (kg/site-yr) ^d		Estimated Daily Release (kg/site-day) ^e		Number of Release Days	Number of Data Points ^f	Number of Facilities ^g	Source(s)
		Central Tendency ^g	High-End	Central Tendency	High-End				
Manufacturing as a Primary Product	Surface water	12	15	3.5E-02	4.2E-02	350	5	1	2019–2023 TRI
	Surface water	150	710	0.43	2.0		4	1	2019–2023 DMR
	Fugitive air	2,300	6,500	6.6	19		5	1	2019–2023 TRI
	Stack air	220	490	0.62	1.4		5	1	2019–2023 TRI
	Land	0.11	1.5	3.2E-04	4.2E-03		5	1	2019–2023 TRI
Manufacturing as a Byproduct	Transfer to non-POTW	36	37	0.10	0.10	350	5	1	2019–2023 TRI
	Fugitive air	8.6	210	2.5E-02	0.61		45	9	2019–2023 TRI
	Stack air	0.5	79	1.4E-03	0.23		45	9	2019–2023 TRI
	Land	2,500	4,700	7.1	13		2	1	2019–2023 TRI
Repackaging	Fugitive or stack air ⁱ	15	24	0.35	0.63	24–119	–	–	Environmental release modeling
	Uncertain media (total) ⁱ	275	320	6.4	10				
	If hazardous landfill ^k	275	320	6.4	10				
	If incineration ^l	2.7E-02	3.2E-02	6.4E-04	1.0E-03				
Processing as a Reactant	Transfer to non-POTW	36	37	0.10	0.10	350	5	1	2019–2023 TRI
	Fugitive air	8.6	210	2.5E-02	0.61		45	9	2019–2023 TRI
	Stack air	0.5	79	1.4E-03	0.23		45	9	2019–2023 TRI
	Land	2,500	4,700	7.1	13		2	1	2019–2023 TRI
Incorporation into Formulation, Mixture, or Reaction Product	Transfer to POTW	0.45	0.45	1.8E-03	1.8E-03	250	2	1	2019–2023 TRI
	Fugitive air	61	650	0.24	2.6		26	6	2019–2023 TRI
	Stack air	2.3	1,300	9.1E-03	5.2		26	6	2019–2023 TRI
	Land	200	350	0.81	1.4		3	1	2019–2023 TRI
Vapor Degreasing	Fugitive or stack air ⁱ	1,100	9,500	3.6	32	296	–	–	Environmental release modeling
	Uncertain media (total) ⁱ	430	600	1.4	2.0				
	If wastewater treatment ^j	120	160	0.39	0.55				
	If hazardous landfill ^k	430	600	1.4	2.0				
	If incineration ^l	4.3E-02	6.0E-02	1.4E-04	2.0E-04				
	Incineration ^l	1.6E-02	0.59	5.3E-05	2.0E-03				
	Water ^j	18	31	6.0E-02	0.10				

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OES	Type of Discharge, ^a Air Emission, ^b or Transfer for Disposal ^c	Estimated Annual Release (kg/site-yr) ^d		Estimated Daily Release (kg/site-day) ^e		Number of Release Days	Number of Data Points ^f	Number of Facilities ^g	Source(s)
		Central Tendency ^g	High-End	Central Tendency	High-End				
Misc. Non-Aerosol Uses	Fugitive air	7,100	1.3E04	28	51	250	5	1	2019–2023 TRI
Aerosol Uses	Fugitive air ⁱ	660	1,400	2.6	5.5	250	–	–	Environmental release modeling
Application of Paints and Coatings	Fugitive or stack air ⁱ	1,800	1.7E05	10	1,200	50–250	–	–	Environmental release modeling
	Uncertain media (total) ⁱ	63	6,600	0.36	42				
	If hazardous landfill ^k	63	6,600	0.36	42				
	If incineration ^l	6.3E–03	0.66	3.6E–05	4.2E–03				
Adhesives and Sealants	Fugitive or stack air ⁱ	1,800	1.7E05	10	1,200	50–250	–	–	Environmental release modeling
	Uncertain media (total) ⁱ	63	6,600	0.36	42				
	If hazardous landfill ^k	63	6,600	0.36	42				
	If incineration ^l	6.3E–03	0.66	3.6E–05	4.2E–03				
Blowing Agent in Spray Foam	Fugitive or stack air ⁱ	1.9	3.1	0.65	1.0	3	–	–	Environmental release modeling
	Uncertain media (total) ⁱ	0.91	1.4	0.30	0.46				
	If wastewater treatment ^j	0.25	0.37	8.2E–02	0.12				
	If hazardous landfill ^k	0.91	1.4	0.30	0.46				
	If incineration ^j	9.5E–05	1.4E–04	3.0E–05	4.6E–05				
Use of Laboratory Chemicals	Fugitive or stack air ⁱ	9.5	26	4.1E–02	0.11	235–258	–	–	Environmental release modeling
	Uncertain media (total) ⁱ	125	600	0.54	2.6				
	If hazardous landfill ^k	125	600	0.54	2.6				
	If incineration ^l	1.3E–02	6.0E–02	5.4E–05	2.6E–04				
Refrigerant	Fugitive air	7,100	1.3E04	28	51	250	5	1	2019–2023 TRI
Use in Semiconductor Manufacturing	Transfer to POTW	0.45	0.45	1.8E–03	1.8E–03	250	2	1	2019–2023 TRI
	Fugitive air	2.3	2.3	9.1E–03	9.1E–03		5	1	2019–2023 TRI
	Stack air	4.5	4.5	1.8E–02	1.8E–02		5	1	2019–2023 TRI

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OES	Type of Discharge, ^a Air Emission, ^b or Transfer for Disposal ^c	Estimated Annual Release (kg/site-yr) ^d		Estimated Daily Release (kg/site-day) ^e		Number of Release Days	Number of Data Points ^f	Number of Facilities ^g	Source(s)
		Central Tendency ^g	High-End	Central Tendency	High-End				
Waste Handling, Disposal, and Treatment	Surface water – from POTW	1.6	28	4.5E-03	7.6E-02	365	264	109	2019–2023 DMR
	Surface water – from non-POTW WWT	2.2E-02	1.1	6.1E-05	2.9E-03	365	36	14	2019–2023 DMR
	Surface water – from landfill	3.7E-02	0.14	1.0E-04	3.9E-04	365	18	4	2019–2023 DMR
	Surface water – from remediation or monitoring ^h	3.9E-02	4.3	1.1E-04	1.2E-02	365	656	198	2019–2023 DMR
	Stack air – fuel use	0.45	0.45	1.3E-03	1.3E-03	350	3	1	2019–2023 TRI
	Fugitive air – nonfuel use	0.19	30	5.4E-04	8.7E-02	350	19	6	2019–2023 TRI
	Stack air – nonfuel use	4.5E-02	0.22	1.3E-04	6.1E-04	350	19	6	2019–2023 TRI
	Land – nonfuel use	0.45	1.3	1.3E-03	3.8E-03	350	7	5	2019–2023 TRI

CDR = Chemical Data Reporting; COU = condition of use; DMR = Discharge Monitoring Report; ESD = emission scenario document; GS = generic scenario; NPDES = National Pollutant Discharge Elimination System; OES = occupational exposure scenario; POTW = publicly owned treatment works; TRI = Toxics Release Inventory; WWT = wastewater treatment

^a Direct discharge to surface water; indirect discharge to non-POTW WWT; indirect discharge to POTW

^b Emissions via fugitive air, stack air, or treatment via incineration

^c Transfer to surface impoundment, land application, or landfills

^d For modeled results, the presented central tendency and high-end are the 50th and 95th percentile values of the modeled distribution. For programmatic data (DMR and TRI), the presented central tendency is calculated from the median reported release amounts and high-end from the reported maximum release amounts. The specific central tendency and high-end values presented depends on the number of sites with programmatic data. For databases with 6 or more reporting facilities, EPA estimated central tendency and high-end releases using the 50th and 95th percentile values, respectively. For 3–5 facilities, EPA estimated the central tendency and high-end releases using the 50th percentile and maximum values, respectively. For 2 sites, EPA presented the midpoint and the maximum value. Finally, EPA presented sites with only 1 data point as-is from the programmatic database.

^e Where available, EPA used peer reviewed literature (e.g., GSs or ESDs) to provide a basis to estimate the number of release days of *trans*-1,2-dichloroethylene within a COU.

^f Data points represent the total number of reports submitted during the years included in the assessment.

^g Where available, EPA used the 2020 CDR ([U.S. EPA, 2020a](#)), DMR ([U.S. EPA, 2026ap](#)), and TRI databases ([U.S. EPA, 2024c](#)), 2020 U.S. County Business Practices ([U.S. Census Bureau, 2022](#)), and Monte Carlo models to estimate the number of sites that use *trans*-1,2-dichloroethylene for each COU. Some modeled OESs calculated the number of facilities/sites, presented as 50th and 95th percentiles. Other modeled OESs set the number of facilities deterministically, presented as 1 value.

^h EPA categorized DMR reports as “remediation or monitoring,” when EPA was unable to determine why NPDES permits were testing for the presence of *trans*-1,2-dichloroethylene. Sometimes, an internet search of the NPDES permit number indicated that the facility had been decommissioned in the past but that the past owners of the site were still responsible for maintaining groundwater remediation efforts and monitoring the current discharges to surface waters.

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OES	Type of Discharge, ^a Air Emission, ^b or Transfer for Disposal ^c	Estimated Annual Release (kg/site-yr) ^d		Estimated Daily Release (kg/site-day) ^e		Number of Release Days	Number of Data Points ^f	Number of Facilities ^g	Source(s)
		Central Tendency ^g	High-End	Central Tendency	High-End				
ⁱ When EPA modeled releases, EPA modeled losses from the processes that were expected to occur at the facility and not the releases to the environment from the facility. Modeled process losses to fugitive or stack air were assumed to be released to the environment without further treatment. Modeled process losses to uncertain media (total) are assumed to be potentially released to surface water, landfill, and/or incineration depending on EPA’s knowledge of the OES. Then EPA presents a what-if scenario in the table by labeling the following wastewater treatment, hazardous landfill, and/or incineration with an “If” to indicate how much would be released if 100% of the uncertain media (total) amount was released to that media using a treatment efficiency described by the table footnotes ^j , ^k , or ^l . ^j EPA applied a wastewater treatment efficiency of 73%. ^k EPA did not apply a treatment efficiency for waste deposited into landfills. ^l Regulations at 40 CFR part 63, subpart EEE – National Emission Standards for Hazardous Air Pollutants from Hazardous Waste Combustors, require all hazardous waste combustors (incinerators, cement kilns, lightweight aggregate kilns, solid fuel boilers, liquid fuel boilers, and hydrochloric acid production furnaces) to achieve a destruction removal efficiency (DRE) of 99.99% for each principal organic hazardous constituent (POHC) including <i>trans</i> -1,2-dichloroethylene. It is important to note that the incineration DRE should only be applied to OESs involving industrial sites and not commercial sites.									

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Table 3-5 and Table 3-6 provide data for release trends over the reporting years included in this draft risk evaluation.

Table 3-5. *trans*-1,2-Dichloroethylene TRI Release Trends for Reporting Years 2019–2023

Reporting Year	Air (kg/yr)			Water (kg/yr)			Land (kg/yr)
	Fugitive	Stack	Fugitive and Stack	On-Site Discharge	Transfer to POTW	Transfer to WWT (Non-POTW)	
2023	1.7E04	1,800	1.9E04	—	—	21	4,900
2022	1.4E04	1,800	1.6E04	11	—	30	170
2021	1.6E04	2,100	1.8E04	14	0.45	36	210
2020	1.3E04	2,600	1.5E04	15	0.45	36	1.9
2019	1.1E04	1,600	1.3E04	5.9	—	37	370

POTW = publicly owned treatment works; TRI = Toxics Release Inventory; WWT = wastewater treatment plant

Table 3-6. *trans*-1,2-Dichloroethylene Discharge Monitoring Report (DMR) Release Trends for Reporting Years 2019–2023

Reporting Year	Annual Releases to Surface Water (kg/yr)
2023	340
2022	450
2021	1,400
2020	730
2019	950

3.2.2 Weight of Scientific Evidence Conclusions for Environmental Releases from Industrial and Commercial Sources

For each OES, EPA considered the assessment approach, the quality of the data and models, and the uncertainties in the assessment results to determine a level of confidence for the environmental release estimates. Table 3-7 provides EPA's weight of scientific evidence rating for each OES.

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Table 3-7. Summary of Overall Confidence in Environmental Release Estimates by Occupational Exposure Scenario (OES)

OES (#)	Weight of Scientific Evidence Conclusion in Release Estimate	Confidence Rating
Manufacturing as a Primary Product (OES #1)	Evidence Found: For this OES, EPA had release information from air, land, and water from the Toxics Release Inventory (TRI), and water from the Discharge Monitoring Report (DMR). Strengths: Water releases are assessed using reported releases from 2019–2023 DMR and TRI. These databases received a high data quality rating in systematic review. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. Based on reporting thresholds, TRI captures the highest throughput sites. Since releases are related to throughput, this increases confidence that the highest emitters are captured in this assessment. Air releases are assessed using reported releases from 2019–2023 TRI. Limitations/Assumptions/Uncertainties: Factors that decrease the overall confidence for the water estimates include the uncertainty in the accuracy of reported releases and the significant difference between the TRI release to water and DMR release for the same facility. Factors that decrease the overall confidence for the air and land release estimates include the uncertainty in the accuracy of reported releases. Weight of Scientific Evidence Conclusion: EPA identified 1 facility in the United States that manufactures <i>trans</i>-1,2-dichloroethylene as a primary product, and used the release data from this facility, which are rated high in systematic review. Based on this information, EPA has concluded that the weight of scientific evidence for this assessment provides moderate-to-robust confidence in the estimate of releases.	Moderate-to-Robust
Manufacturing as a Byproduct (OES #2)	Evidence Found: For this OES, EPA had release information from air, land, and water from TRI. Strengths: TRI received a high data quality rating in systematic review. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. Based on reporting thresholds, TRI captures the highest throughput sites. Since releases are related to throughput, this increases confidence that the highest emitters are captured in this assessment. TRI contains reports from 9 facilities for this OES. Limitations/Assumptions/Uncertainties: Factors that decrease the overall confidence for the release estimates include the uncertainty in the accuracy of reported releases. EPA made assumptions on the number of operating days to estimate daily releases because EPA did not find such information. Weight of Scientific Evidence Conclusion: As the release data were rated high in systematic review, EPA has concluded that the weight of scientific evidence for this assessment provides moderate-to-robust confidence in the estimate of releases.	Moderate-to-Robust

OES (#)	Weight of Scientific Evidence Conclusion in Release Estimate	Confidence Rating
Repackaging (OES #3)	Evidence Found: For this OES, EPA did not identify any release information from programmatic data. Therefore, releases to the environment are assessed using the Generic Scenario (GS) on Chemical Repackaging, which has a high data quality rating from the systematic review process (U.S. EPA, 2022a). EPA used EPA/OPPT models combined with Monte Carlo modeling to estimate releases to the environment, with media of release assessed using assumptions from the GS and EPA/OPPT models. Strengths: A strength of the Monte Carlo modeling approach is that variation in model input values and a range of potential releases values is more likely than a discrete value to capture actual releases at sites. Limitations/Assumptions/Uncertainties: The Agency believes the primary limitation to be the uncertainty in the representativeness of values toward the true distribution of potential releases. In addition, EPA lacks <i>trans</i>-1,2-dichloroethylene repackaging throughput data; therefore, throughput estimates are based on the Chemical Repackaging GS and Chemical Data Reporting (CDR) reporting thresholds. EPA assumed that the media of release for repackaging waste is to hazardous waste landfill or incineration, per the GS. Weight of Scientific Evidence Conclusion: Based on this information, EPA has concluded that the weight of scientific evidence for this assessment provides slight-to-moderate confidence in the estimate of releases.	Slight-to-Moderate
Processing as a Reactant (OES #4)	Evidence Found: For this OES, EPA had release information from air, land, and water from TRI. Strengths: TRI received a high data quality rating in systematic review. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. Based on reporting thresholds, TRI captures the highest throughput sites. Since releases are related to throughput, this increases confidence that the highest emitters are captured in this assessment. TRI contains reports from 9 facilities for this OES. Limitations/Assumptions/Uncertainties: Factors that decrease the overall confidence for the release estimates include the uncertainty in the accuracy of reported releases. EPA made assumptions on the number of operating days to estimate daily releases because EPA did not find such information. Weight of Scientific Evidence Conclusion: As the release data are rated high in systematic review, EPA has concluded that the weight of scientific evidence for this assessment provides moderate-to-robust confidence in the estimate of releases.	Moderate-to-Robust
Incorporation into Formulation, Mixture, or Reaction Product (OES #5)	Evidence Found: For this OES, EPA had release information from air, land, and water from TRI. Strengths: TRI received a high data quality rating in systematic review. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. Based on reporting thresholds, TRI	Moderate-to-Robust

OES (#)	Weight of Scientific Evidence Conclusion in Release Estimate	Confidence Rating
	captures the highest throughput sites. Since releases are related to throughput, this increases confidence that the highest emitters are captured in this assessment. TRI contains reports from 6 facilities for this OES. Limitations/Assumptions/Uncertainties: Factors that decrease the overall confidence for the release estimates include the uncertainty in the accuracy of reported releases. EPA made assumptions on the number of operating days to estimate daily releases because the Agency found a range of operating days. Weight of Scientific Evidence Conclusion: As the release data are rated high in systematic review, EPA has concluded that the weight of scientific evidence for this assessment provides moderate-to-robust confidence.	
Vapor Degreasing (OES #6)	Evidence Found: For this OES, EPA did not identify any release information from programmatic data. Therefore, releases to the environment are assessed using the emission scenario document (ESD) on the Use of Vapour Degreasers, which has a high data quality rating from the systematic review process (U.S. EPA, 2022a). EPA used EPA/OPPT models combined with Monte Carlo modeling to estimate releases to the environment, with media of release assessed using assumptions from the GS and EPA/OPPT models. Strengths: A strength of the Monte Carlo modeling approach is that variation in model input values and a range of potential releases values is more likely than a discrete value to capture actual releases at sites. Limitations/Assumptions/Uncertainties: The Agency believes the primary limitation to be the uncertainty in the representativeness of values toward the true distribution of potential releases. In addition, EPA lacks <i>trans</i>-1,2-dichloroethylene vapor degreasing throughput data; therefore, throughput estimates are based on the Use of Vapour Degreasers ESD. The high-end throughput estimate exceeds the TRI reporting threshold and a facility operating at this level would need to report its releases to TRI, thus the high-end release estimates are a likely an overestimate. EPA assumed that the media of release of vapor degreasing waste is to air, wastewater treatment, hazardous waste landfill or incineration, per the GS. Weight of Scientific Evidence Conclusion: Based on this information, EPA has concluded that the weight of scientific evidence for this assessment provides slight-to-moderate confidence in the central tendency estimate of releases and that risk estimates derived from high-end environmental releases, which are above the TRI reporting threshold, are expected to be health protective.	Slight-to-Moderate
Miscellaneous Non-Aerosol Industrial and Commercial Uses (Cleaning and Degreasing	Evidence Found: For this OES, EPA had release information from air from TRI. Strengths: Air releases are assessed using reported releases from 2019–2023 TRI. This database received a high data quality rating in systematic review. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. Based on reporting thresholds, TRI captures the highest throughput	Slight-to-Moderate

OES (#)	Weight of Scientific Evidence Conclusion in Release Estimate	Confidence Rating
Agents, Lubricants and Greases, Mold Release) (OES #7)	sites. Since releases are related to throughput, this increases confidence that the highest emitters are captured in this assessment. Limitations/Assumptions/Uncertainties: The greatest limitation that decreases the overall confidence is that it is not known how representative this single facility is of a potentially diverse OES. Weight of Scientific Evidence Conclusion: Based on this information, EPA has concluded that the weight of scientific evidence for this assessment provides slight-to-moderate confidence in the estimate of releases.	
Commercial Aerosol Products (Aerosol Degreasing, Aerosol Lubricants, Mold Release) (OES #8)	Evidence Found: For this OES, EPA did not identify any release information from programmatic data. Therefore, releases to the environment are assessed using the aerosol degreasing model. EPA used EPA/OPPT models combined with Monte Carlo modeling to estimate releases to the environment, with media of release assessed using assumptions from the GS and EPA/OPPT models. Strengths: A strength of the Monte Carlo modeling approach is that variation in model input values and a range of potential releases values is more likely than a discrete value to capture actual releases at sites. Limitations/Assumptions/Uncertainties: The Agency believes the primary limitation to be the uncertainty in the representativeness of values toward the true distribution of potential releases. In addition, EPA lacks <i>trans</i>-1,2-dichloroethylene aerosol degreaser throughput data; therefore, throughput estimates are based on the CARB (2000a) Weight of Scientific Evidence Conclusion: Based on this information, EPA has concluded that the weight of scientific evidence for this assessment provides slight-to-moderate confidence in the estimate of releases.	Moderate
Application of Paints and Coatings (OES #9)	Evidence Found: For this OES, EPA did not identify any release information from programmatic data. Therefore, releases to the environment are assessed using a model based upon the Organisation for Economic Co-operation and Development (OECD) ESD for Use of Adhesives (OECD, 2013), which has a high data quality rating from the systematic review process. EPA used EPA/OPPT models combined with Monte Carlo modeling to estimate releases to the environment, with media of release assessed using assumptions from the GS and EPA/OPPT models. Strengths: A strength of the Monte Carlo modeling approach is that variation in model input values and a range of potential releases values is more likely than a discrete value to capture actual releases at sites. Limitations/Assumptions/Uncertainties: The Agency believes the primary limitation to be the uncertainty in the representativeness of values toward the true distribution of potential releases. In addition, EPA lacks <i>trans</i>-1,2-dichloroethylene adhesive and sealant throughput data; therefore, throughput estimates are based on the ESD. The high-end throughput estimate exceeds the TRI reporting threshold and a facility operating at this level would need	Slight-to-Moderate

OES (#)	Weight of Scientific Evidence Conclusion in Release Estimate	Confidence Rating
	to report its releases to TRI. EPA assumed that the media of release of adhesive and sealant waste is to air, hazardous landfill, and/or incineration per the OECD ESD for Use of Adhesives (OECD, 2013). Weight of Scientific Evidence Conclusion: Based on this information, EPA has concluded that the weight of scientific evidence for this assessment provides slight-to-moderate confidence in the central tendency estimate of releases.	
Application of Adhesives and Sealants (OES #10)	Evidence Found: For this OES, EPA did not identify any release information from programmatic data. Therefore, releases to the environment are assessed using a model based upon the OECD ESD for Use of Adhesives (OECD, 2013), which has a high data quality rating from the systematic review process. EPA used EPA/OPPT models combined with Monte Carlo modeling to estimate releases to the environment, with media of release assessed using assumptions from the GS and EPA/OPPT models. Strengths: A strength of the Monte Carlo modeling approach is that variation in model input values and a range of potential releases values is more likely than a discrete value to capture actual releases at sites. Limitations/Assumptions/Uncertainties: The Agency believes the primary limitation to be the uncertainty in the representativeness of values toward the true distribution of potential releases. In addition, EPA lacks <i>trans</i>-1,2-dichloroethylene adhesive and sealant throughput data; therefore, throughput estimates are based on the ESD. The high-end throughput estimate exceeds the TRI reporting threshold and a facility operating at this level would need to report its releases to TRI. EPA assumed that the media of release of adhesive and sealant waste is to air, hazardous landfill, and/or incineration per the OECD ESD for Use of Adhesives (OECD, 2013). Weight of Scientific Evidence Conclusion: Based on this information, EPA has concluded that the weight of scientific evidence for this assessment provides slight-to-moderate confidence in the central tendency estimate of releases.	Slight-to-Moderate
Blowing Agent in Spray Foam (OES #11)	Evidence Found: For this OES, EPA did not identify any release information from programmatic data. Therefore, releases to the environment are assessed using the Use of Blowing Agent in Spray Foam Model, which has a high data quality rating from the systematic review process (U.S. EPA, 2021a). EPA used EPA/OPPT models combined with Monte Carlo modeling to estimate releases to the environment, with media of release assessed using assumptions from the GS and EPA/OPPT models. Strengths: A strength of the Monte Carlo modeling approach is that variation in model input values and a range of potential releases values is more likely than a discrete value to capture actual releases at sites. Limitations/Assumptions/Uncertainties: The Agency believes the primary limitation to be the uncertainty in the representativeness of values toward the true distribution of potential releases. In addition, EPA lacks <i>trans</i>-1,2-	Slight-to-Moderate

OES (#)	Weight of Scientific Evidence Conclusion in Release Estimate	Confidence Rating
	dichloroethylene blowing agent in spray foam throughput data; therefore, throughput estimates are based on the application of spray polyurethane foam insulation – generic scenario (U.S. EPA, 2021a). EPA assumed that the media of release of blowing agent in spray foam waste is to air, hazardous landfill, and/or incineration per the generic scenario. Weight of Scientific Evidence Conclusion: Based on this information, EPA has concluded that the weight of scientific evidence for this assessment provides slight-to-moderate confidence in the estimate of releases.	
Laboratory Use (OES #12)	Evidence Found: For this OES, EPA did not identify any release information from programmatic data. Therefore, releases to the environment are assessed using the Draft GS on the Use of Laboratory Chemicals, which has a high data quality rating from the systematic review process (U.S. EPA, 2023c). EPA used EPA/OPPT models combined with Monte Carlo modeling to estimate releases to the environment. Strengths: A strength of the Monte Carlo modeling approach is that variation in model input values and a range of potential releases values is more likely than a discrete value to capture actual releases at sites. Limitations/Assumptions/Uncertainties: The Agency believes the primary limitation to be the uncertainty in the representativeness of values toward the true distribution of potential releases. In addition, EPA lacks <i>trans</i>-1,2-dichloroethylene laboratory chemical throughput data; therefore, throughput estimates are based on stock solution throughputs from the Draft GS on the Use of Laboratory Chemicals. EPA assumed that the media of release for disposal of laboratory waste is to hazardous waste landfill or incineration, per the GS. Weight of Scientific Evidence Conclusion: Based on this information, EPA has concluded that the weight of scientific evidence for this assessment provides slight-to-moderate confidence in the estimate of releases.	Slight-to-Moderate
Refrigerant Flush (OES #13)	Evidence Found: For this OES, EPA had analogous air release information from the miscellaneous non-aerosol OES from TRI. Strengths: Air releases are assessed using reported releases from 2019–2023 TRI. This database received a high data quality rating in systematic review. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. Based on reporting thresholds, TRI captures the highest throughput sites. Since releases are related to throughput, this increases confidence that the highest emitters are captured in this assessment. Limitations/Assumptions/Uncertainties: The greatest limitation is that it is not known how representative this single analogous facility is of this OES.	Slight-to-Moderate

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OES (#)	Weight of Scientific Evidence Conclusion in Release Estimate	Confidence Rating
	Weight of Scientific Evidence Conclusion: Based on this information, EPA has concluded that the weight of scientific evidence for this assessment provides slight-to-moderate confidence in the estimate of releases.	
Processing Aid in Semiconductor Manufacturing (OES #14)	Evidence Found: For this OES, EPA had release information from air and transfer to publicly owned treatment works (POTW) from TRI. Strengths: TRI received a high data quality rating in systematic review. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. Based on reporting thresholds, TRI captures the highest throughput sites. Since releases are related to throughput, this increases confidence that the highest emitters is captured in this assessment. TRI contains reports from the one facility for this OES that EPA knows creates the product. Limitations/Assumptions/Uncertainties: Factors that decrease the overall confidence for the release estimates include the uncertainty in the accuracy of reported releases. EPA made assumptions on the number of operating days to estimate daily releases because EPA did not find such information. Weight of Scientific Evidence Conclusion: In conclusion, as the release data are rated high in systematic review, EPA has concluded that the weight of scientific evidence for this assessment provides moderate-to-robust confidence in the estimate of releases.	Moderate
Waste Handling, Disposal, and Treatment (OES #15)	Evidence Found: For this OES, EPA had release information for air and land from TRI and for water from DMR. Strengths: Water releases for sites are assessed using reported releases from 2019–2023 DMR. A strength of using DMR data and the Pollutant Loading Tool is that the tool calculates an annual pollutant load by integrating monitoring period release reports provided to the EPA and extrapolating over the course of the year. Air releases for sites are assessed using reported releases from 2019–2023 TRI. Based on reporting thresholds, TRI captures the highest throughput sites. Since releases are related to throughput, this increases confidence that the highest emitters are captured in this assessment. Limitations/Assumptions/Uncertainties: The DMR approach assumes average quantities, concentrations, and hydrologic flows for a given period are representative of other times of the year. EPA made assumptions on the number of operating days to estimate daily releases. Factors that decrease the confidence for this OES include the uncertainty in the accuracy of reported releases, and the limitations in representativeness to all sites because TRI may not capture all relevant sites. Weight of Scientific Evidence Conclusion: Although there is uncertainty of whether the databases capture all sites releasing to each medium, the release data are rated medium to high in systematic review and provide releases	Moderate-to-Robust

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OES (#)	Weight of Scientific Evidence Conclusion in Release Estimate	Confidence Rating
	directly from a wide number of facilities. Based on this information, EPA has concluded that the weight of scientific evidence for this assessment provides moderate-to-robust estimate of releases.	
Distribution in Commerce (OES #16)	EPA did not quantitatively assess exposures for an OES of Distribution in Commerce. Activities associated with loading and unloading chemical products were assessed as part of each COU's OES. It is possible that <i>trans</i> -1,2-dichloroethylene may go through a third party for temporary storage/warehousing before distribution to users. If repackaging takes place at these facilities involving transfer from larger to smaller containers, EPA assessed this under the OES of repackaging. Transport containers are not expected to be opened during transport between producing and receiving sites. EPA expects all the <i>trans</i> -1,2-dichloroethylene containing products to be transported in a closed system such that there is negligible potential for releases. Therefore, no occupational exposures are reasonably expected to occur and no separate assessment was performed for estimating releases and exposures from distribution in commerce. Speculative exposures that may result from irregular and unpredictable accidental spills during transport are not assessed by EPA in TSCA risk evaluations.	N/A

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3.2.2.1 Overall Strengths, Limitations, Assumptions, and Key Sources of Uncertainty for the Environmental Release Assessment

Strengths

EPA compiled release information using reported releases from the 2019 through 2023 TRI ([U.S. EPA, 2024c](#)) and 2019 through 2023 DMR ([U.S. EPA, 2022b](#)). TRI obtained a high data quality rating from the Agency's systematic review process. TRI-reporting facilities are required to submit their "best available data" to EPA for TRI reporting purposes. Some facilities are required to measure or monitor emission or other waste management quantities due to regulations unrelated to TRI (e.g., permitting requirements) or due to company policies. These existing reasonably available data are often used by facilities for TRI reporting purposes as they represent the best available data; for example, stack releases can be directly measured by stack testing using EPA reference methods providing a directly measured emission rate that can then be used to calculate annual emissions. Because DMR-reporting facilities are required to monitor, measure, and report effluent at regular intervals, they generate many site-specific water release datapoints.

Limitations

Facilities are only required to report to TRI if the facility has 10 or more full-time employees, is included in an applicable NAICS code, and manufactures, processes, or uses the chemical in quantities greater than a certain threshold (25,000 lb for manufacturers and processors and 10,000 lb for users). DMR data are submitted by National Pollutant Discharge Elimination System (NPDES) permit holders to states or directly to EPA according to the monitoring requirements of the facility's permit. States are only required to load major discharger data into DMR and may or may not load minor discharger data. Permits vary in their sampling requirements. Some may require monthly sampling while others may only require sampling every 6 months. Manufacturers and importers of *trans*-1,2-dichloroethylene submit CDR data to EPA if they meet reporting threshold requirements. Sites are generally only required to report production data to CDR if their yearly production volume exceeds 25,000 lb. As a result, the total production volume (an input into release models when TRI and/or DMR data are not found) for a given OES may be underestimated. For sites not captured by CDR, whether—and to what extent—they release *trans*-1,2-dichloroethylene to the environment is unknown. The media of release for these sites are also unknown.

Assumptions and Uncertainties

There is some uncertainty in the DMR data pulled using the EPA Enforcement and Compliance History Online (ECHO) Pollutant Loading Tool Advanced Search option. For facilities that reported having zero pollutant loads to DMR, the EZ Search Load Module uses a combination of setting non-detects equal to zero and as one-half the detection limit to calculate the annual pollutant loadings. This method could cause overestimation or underestimation of annual and daily pollutant loads. A strength of using DMR data and the Pollutant Loading Tool is that the tool calculates an annual pollutant load by integrating monitoring period release reports provided to the EPA and extrapolating over the course of the year. However, this approach assumes average quantities, concentrations, and hydrologic flows for a given period are representative of other times of the year.

When monitoring or direct measurement data are not reasonably available or are known to be nonrepresentative for TRI reporting purposes, the TRI regulations require that facilities determine release and other waste management quantities of TRI-listed chemicals by making reasonable estimates. There is additional uncertainty in daily release estimates for air emissions. Facilities reporting to TRI report annual air emissions. To assess daily air emissions for TRI, EPA used relevant data from relevant ESDs or GSs to estimate the expected number of release days. CDR information on the downstream

processing and use of *trans*-1,2-dichloroethylene at facilities is also limited; therefore, there is some uncertainty as to the production volume attributed to a given OES. For OES with limited CDR data, EPA developed potential production volume ranges given reported CDR data, known reporting thresholds, and the national aggregate production volume of 1 to 5 million lb for *trans*-1,2-dichloroethylene in 2024. To handle an OES without programmatic data, EPA used the potential production volume ranges as uniform distributions in Monte Carlo modeling when assessing releases for each OES. Due to the wide range of potential production volumes attributable to certain OES, the overall releases may be over or underestimated. *trans*-1,2-Dichloroethylene releases at each site may vary from day to day, such that on any given day the actual daily release rate may be higher or lower than the estimated average daily release rate.

EPA has further identified the following additional uncertainties that contribute to the overall uncertainty in the environmental release assessment:

- Use of Census Bureau for Number of Facilities: In some cases, EPA estimated the maximum number of facilities for a given OES using data from the U.S. Census. In such cases, the Agency determined the maximum number of sites for use in Monte Carlo modeling from industry data from the U.S. Census Bureau, County and Business Patterns dataset ([U.S. BLS, 2023](#)).
- Uncertainties Associated with Facility Throughputs: EPA estimated facility throughputs of *trans*-1,2-dichloroethylene containing products using various methods, including using generic industry data presented in the relevant GS or ESD or by calculation based on production volume of *trans*-1,2-dichloroethylene from CDR for the given OES. Due to these uncertainties, the facility throughputs may be overestimated or underestimated.
- Uncertainties Associated with Number of Release Days Estimate: For most OESs, EPA estimated the number of release days using programmatic data where available, or from GSs, ESDs, or SpERC (Specific Environmental Release Category) factsheets when no programmatic data were found. In such cases, EPA used applicable sources to estimate a range of release days over the course of an operating year. Due to uncertainty in *trans*-1,2-dichloroethylene-specific facility operations, release days may be overestimated or underestimated.

3.3 Summary of Concentrations of *trans*-1,2-Dichloroethylene in the Environment

The environmental release assessment summarized in Section 3.2 and presented in Section 4 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)), indicate that *trans*-1,2-dichloroethylene is expected to be released to the environment via air, water, and disposal to landfills. EPA relied on its fate assessment to determine which environmental pathways to consider for its analysis of environmental exposure and general population exposure. Details on the environmental partitioning and media assessment can be found in Section 3 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)). Briefly, based on fate parameters, EPA anticipates *trans*-1,2-dichloroethylene to be predominantly in air. Environmental media concentrations were quantified in ambient air, surface water, and soil (Section 4.1.3). Additional analysis of surface water used as drinking water was conducted to assess risk to the general population (Section 4.1.3.4). Given the physical-chemical properties and fate parameters of *trans*-1,2-dichloroethylene, available biomonitoring data, and difficulties in maintaining *trans*-1,2-dichloroethylene in sediment for a hazard study ([EPA-HQ-OPPT-2018-0465-0072](#)), EPA did not further quantitatively assess exposure to the sediment pathway (see Sections 3.3.2 and 5.1.2 for details).

3.3.1 Ambient Air Pathway

Both modeling and monitoring information were considered when evaluating the ambient air pathway.

The monitoring data are presented in Section 5.2.1 in the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* (U.S. EPA, 2026g). The Air Quality System (AQS) Monitoring Data total sample size (n) across the entire archive dataset presented was 35,403 reported concentrations between 2018 to 2025 across 178 monitoring stations. Out of the 35,403 samples 80.95% reported *trans*-1,2-dichloroethylene concentrations as zero.² The samples are taken at every site listed several times per month. Overall, there were 6,741 reported values across the entire AQS archive dataset evaluated for *trans*-1,2-dichloroethylene. The reported monitoring concentrations ranged from 0 to 34.89 µg/m³. The average mean reported across all sites is 0.03 µg/m³.

Modeled ambient air concentrations for both the TRI Dataset and the EPA Estimated Generic Scenarios only used a screening-level approach. As discussed in Section 5.3.1 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* (U.S. EPA, 2026g), both datasets were modeled in EPA's Integrated Indoor/Outdoor Air Calculator (IIOAC) for stack and fugitive releases. The screening analysis used EPA's IIOAC Model to estimate both mean (50th percentile) and high-end (95th percentile) daily and annual average concentrations of a chemical in the ambient air at two finite distances (100 and 1,000 m) and one area distance (between 100–1,000 m) from the releasing facility.

EPA Estimated Generic Scenarios

For the EPA estimated generic scenarios, EPA used the high-end (95th percentile) for the EPA-estimated daily releases of *trans*-1,2-dichloroethylene for all OESs listed in Section 5.2.1 in the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* (U.S. EPA, 2026g) as direct inputs to the IIOAC Model. These EPA-estimated releases are based on production volumes from facilities that manufacture, process, repack, or dispose of *trans*-1,2-dichloroethylene. Since the release type is unknown, under the methodology used, EPA assumed the entire release was either all fugitive or all stack releases and models the entire release as each type. Although this assumption captures the highest release for both stack and fugitive, it limits the analysis to exposure from an individual release type, which may overestimate ambient concentrations of *trans*-1,2-dichloroethylene.

TRI Facility Releases

EPA selected the highest TRI reported stack and fugitive releases across all facility data between 2019 to 2023, which has an operating scenario representing industrial facilities releasing *trans*-1,2-dichloroethylene to the ambient air operating 24 hours/day, 7 days/week. This is a conservative assumption for this screening-level estimate, in that facilities are constantly releasing *trans*-1,2-dichloroethylene every day and every hour throughout the year. See Section 5.2.1 in the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* (U.S. EPA, 2026g) for more details. The highest modeled concentrations for both stack and fugitive outdoor for the TRI facilities are found to be 32.49 µg/m³, which are within the same magnitude of the maximum measured concentration from AQS monitoring data.

Because *trans*-1,2-dichloroethylene is volatile, it has the potential to volatilize from surface soils based on its low Henry's Law constant and is not expected to be present in land-applied biosolids, EPA does not evaluate deposition from ambient air to water or soil in this screening-level analysis.

² The AQS dataset does not report the method detection limit (MDL), samples below MDL (<MDL), or non-detects (NDs); these values are reported as zeros.

3.3.2 Surface Water and Aquatic Sediment Pathways

Both modeling and monitoring information were considered when evaluating the surface water and sediment pathways. As discussed in Section 6.1.1 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)), 1,094 surface water monitoring samples from 21 states collected between 2015 to 2025 were retrieved from the Water Quality Portal (WQP) with the highest number of samples coming from North Dakota, Utah, California, and Washington. Of the 1,094 *trans*-1,2-dichloroethylene samples, only 83 reported detectable concentrations of *trans*-1,2-dichloroethylene at or above their respective detection limits with concentrations and ranged from 0.037 to 1 µg/L with a median and 95th percentile value of 0.2 µg/L. All but two of the samples with a detectable concentration came from multiple locations over multiple years at the Palermo Wellfield Superfund site in the State of Washington. Two other samples from Texas ranged from 0.037 to 0.043 µg/L. Full details of available surface water monitoring data are available in the supplemental file *Draft Surface Water and Sediment Monitoring Data for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026ai](#)).

Modeled concentrations of surface water followed a tiered approach for both facility-specific releases and GS releases for evaluation of general population and environmental populations as discussed in Section 6.2.1.1 for facility-specific releases and Section 6.2.1.2 for GS releases of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

Surface water concentrations were modeled across a variety of flow metrics (7Q10 = lowest 7-day average flow that occurs (on average) once every 10 years; 30Q5 = lowest 30-day average flow that occurs once every 5 years; and harmonic mean) with different flow metrics used depending on the exposure pathway of interest. Overall, after Tier 2 evaluation of facility-specific releases, modeled surface water concentrations were highest for the Waste Handling, Disposal, and Treatment – POTW OES with a maximum estimated 7Q10 flow concentration of 509 and 29 µg/L for the 21 operating day and maximum operating day release scenarios, respectively, and used for environmental exposure. Waste Handling, Disposal, and Treatment – POTW also had the highest 30Q5 and harmonic mean concentrations at 28 and 19 µg/L, respectively, across all modeled OES for maximum operating day release scenarios used for general population exposure.

Modeled surface water concentrations for generic scenarios releases of *trans*-1,2-dichloroethylene were modeled for a central tendency and high-end scenario for each OES with varying daily release volumes based on Monte Carlo modeling of annual releases and days of release. Surface water concentrations were modeled across a distribution of flows across each evaluated OES (10th, 50th, 75th, and 95th percentile designated as P10, P50, P75, and P90, respectively) for all relevant flow metrics. Overall, modeled 7Q10 flow concentrations ranged from 1.2×10^{-3} to 4.6 µg/L with the highest estimated concentrations modeled for the high-end P10 Blowing Agent in Spray Foam OES used for environmental exposure. The Blowing Agent in Spray Foam OES also had the highest modeled concentrations for the 30Q5 and harmonic mean flow metrics modeled concentrations across all evaluated scenarios ranged from 8.5×10^{-4} to 3.8 µg/L for 30Q5 flow scenarios and 4.8×10^{-4} to 3.9 µg/L for harmonic mean flow scenarios used for general population exposure.

As discussed in Section 6.1.2 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)), sediment monitoring data collected between 2015 to 2025 from the WQP resulted in retrieval of 351 samples from 151 locations across a range of detection limits from 0.96 to 110,000 µg/kg across samples. Greater than 90% of the samples were collected as part of the EPA Great Lakes National Program (n = 318) for a variety of sampling locations throughout that region. For all retrieved samples, values were recorded at or below the reported detection limit indicating that monitored concentrations are uniformly low. Full details of available sediment

monitoring data are available in the supplemental file *Draft Surface Water and Sediment Monitoring Data for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026ai](#)). As discussed in Section 6.3 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)), aquatic sediment concentrations were not quantitatively evaluated as a potential pathway for environmental exposure due to a combination of its physical and chemical properties, indicating exposures are unlikely to occur and monitoring information showing uniformly low concentrations. Due to the volatile and non-absorptive nature of *trans*-1,2-dichloroethylene, relevant exposures in testing undertaken for hazard toxicity could not be determined. Additionally, alternative approaches to fill the data need to estimate sediment concentrations and potential exposures are unavailable.

3.3.3 Land Pathway (Soils, Groundwater, and Biosolids)

There were limited measured concentration data for *trans*-1,2-dichloroethylene in biosolids. A maximum concentration of 10.7 mg/kg was reported by the 1988 National Sludge Survey (NSSS), with a detection frequency of 1% from a sample size of 178 across 176 U.S. POTWs. Detection limits ranged from 3 to 41 µg/kg depending on whether samples were wet or dry ([U.S. EPA, 1996; 1990](#)). No more recent national occurrence data for *trans*-1,2-dichloroethylene in sewage sludge are available. Subsequent EPA sewage sludge surveys did not analyze chlorinated VOCs but focused on other contaminants. Estimates of *trans*-1,2-dichloroethylene concentrations in biosolids were made using the SimpleTreat 4.0 wastewater treatment plant model ([RIVM, 2015](#)) as a conservative screening tool based on maximum reported releases for *trans*-1,2-dichloroethylene in its Discharge Monitoring Report. A concentration of 24.14 mg/kg in combined sludge was predicted for *trans*-1,2-dichloroethylene.

The WQP dataset included 24,143 groundwater samples collected in the United States between 2015 and 2025 with concentrations ranging from 0.01 to 6,700 µg/L. The detection limits for the samples ranged from 1.49×10^{-4} to 149 µg/L. A closer look at the data shows that while about 16% of the samples report measured concentrations of *trans*-1,2-dichloroethylene in groundwater, concentrations were generally low, with only a small fraction occurring at the upper end of the observed range. This means that the samples are dominated by non-detects and low concentrations of *trans*-1,2-dichloroethylene. Further examination of some of the higher concentrations show that they are from remediation programs at contaminated facilities with a documented history of chlorinated-solvent releases (primarily tetrachloroethylene and trichloroethylene) from legacy dry-cleaning and related commercial/industrial uses. In anaerobic groundwater, those parent solvents dechlorinate to 1,2-dichloroethylene isomers, including *trans*-1,2-dichloroethylene.

There were 46,797 groundwater samples reported in the State of Washington's Environmental Information Management System (EIMS) between 2015 and 2025 with a detection rate of less than 5% and *trans*-1,2-dichloroethylene concentrations ranging from 1.25×10^{-2} to 1×10^4 µg/L and MDLs ranging from 5×10^{-5} to 1.6×10^4 µg/L. However, when that data are filtered to remove samples associated with contamination clean up and underground tank monitoring programs, the remaining concentrations range from 0.1 to 42 µg/L are more likely to be representative of ambient groundwater concentrations ([WA DOE, 2026](#)).

To address some of the uncertainties around the source of *trans*-1,2-dichloroethylene in groundwater (*i.e.*, current uses vs. legacy uses), EPA ran the DRAS Model under varying waste loading rates based on reported TRI releases of *trans*-1,2-dichloroethylene to land. Screening-level estimates for landfill impacted groundwater were predicted to be less than 0.01 mg/L.

The WQP database contained only 33 soil samples collected between 2015 and 2025 with concentrations reported at the detection limits and detection limits ranged from 4.5×10^{-4} to 1.3×10^{-3}

mg/kg. It is unclear whether these are true detections or non-detect concentrations reported at the limit of detection (LOD). To assess the site-specific impacts of releases, EPA modeled soil concentrations from biosolids application. The estimated concentration of *trans*-1,2-dichloroethylene in agricultural soil receiving an annual biosolids application was 0.071 mg/kg.

3.3.4 Weight of Scientific Evidence Conclusions for Environmental Concentrations

Ambient Air Monitored and Modeled Concentrations

The Agency modeled ambient air concentrations in IIOAC to conduct a screening level analysis from the highest stack release and the highest fugitive release from two different TRI facility-reported releases. Concentrations of *trans*-1,2-dichloroethylene due to EPA estimated releases from generic facilities/sites were estimated using IIOAC. The TRI are reported by facilities and provide EPA with data on the level of *trans*-1,2-dichloroethylene being released into ambient air.

Because TRI releases are reported on a facility level, there is some uncertainty associated with the modeled distances from each release point and the associated exposure concentrations to which the general population living in proximity to releasing facilities might be exposed. The TRI-reported data used for IIOAC do not include source-specific stack parameters that can affect plume characterization and associated dispersion of the plume. Therefore, EPA used pre-defined stack parameters within the IIOAC. Those stack parameters include a stack height of 10 m above the ground with a 2-meter inside diameter, an exit gas temperature of 300 K, and an exit gas velocity of 5 m/s (see Table 6 of the IIOAC User Guide). These predefined stack parameters were selected because they represent a slow-moving, low-to-the-ground plume with limited dispersion that results in a more conservative estimate of exposure concentrations at the distances evaluated. As such, these parameters might result in some overestimation of emissions for certain modeled facilities. Additionally, the assumption of a 10 m × 10 m area source for fugitive releases might impact the exposures estimates very near a releasing facility (*i.e.*, 10 m from a fugitive release). This assumption places the 10-meter exposure points just off the release point that might result in either an over- or underestimation, depending on other factors like meteorological data release heights and plume characteristics.

EPA also used meteorology data for Lake Charles, Louisiana, for OESs that had EPA-estimated releases for generic facilities/sites where facility-specific data were not available. Lake Charles was selected because the area represents meteorological datasets that tend to provide central tendency and high-end concentration estimates relative to the other stations within IIOAC based on a sensitivity analysis of the average concentration and deposition predictions conducted in support of IIOAC development (see the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) for more details).

EPA has robust confidence in the use of IIOAC to model ambient air concentrations because it has been peer reviewed and is appropriate for the purposes of this risk evaluation. EPA also has robust confidence in the use of facility-reported release data from TRI as model inputs. Overall, the Agency has robust confidence in the ambient air concentrations modeled using IIOAC when TRI-reported releases were used as model inputs.

In contrast, the Agency has moderate confidence in the concentrations modeled using EPA-estimated releases from generic facilities/sites. The lower confidence for EPA-estimated releases is due to the uncertainty associated with the estimated releases and the lack of site-specific data available for generic facilities/sites.

Surface Water Measured and Modeled Information

EPA quantitatively modeled estimated concentrations of *trans*-1,2-dichloroethylene in surface water from known facility releases as reported to DMR and TRI as well as developed generic release scenarios through the use of the E-FAST modeling tool. With the use of updated hydrologic flow information there is increased confidence in the accuracy of the estimated surface water concentrations, and for facility-specific modeling, better linkages between the facility releases and their reported receiving water body. Additionally, the use of tiering by identifying initial preliminary risks to both environmental and human populations provided greater confidence and improved characterization of both facility releases and representation of surface water concentrations. Comparing between modeled surface water concentrations using the maximum operating days scenario for the highest facility-reported releases per OES and the modeled generic scenarios show that modeled concentrations are broadly similar (*e.g.*, within the same order of magnitude), offering increased confidence of estimated surface water concentrations.

Although there is limited available detectable measured data of *trans*-1,2-dichloroethylene in surface waters, these monitored values provide a point of reference and comparison with the modeled releases estimates. Although it is difficult to directly compare monitored values to potential modeled releases because measured concentrations oftentimes are not temporally or geographically close to known releases of *trans*-1,2-dichloroethylene, available measured concentrations are low and similar in magnitude to most modeled facility-specific and generic scenario estimates. The high-end modeled concentrations are based on industrial releases data released over a limited number of days. These high-end modeling concentrations exceeded the highest monitoring values by 1 to 2 orders of magnitude, offering support that evaluated scenarios effectively capture the range of potential concentrations and scenarios needed to assess environmental and general population exposure. Additionally, in instances where these concentrations indicated preliminary risk, the tiering approaches and targeted refinement of releases increased confidence in resulting environmental and general population exposures.

Land Pathway (Soils, Groundwater, and Biosolids) Measured and Modeled Concentrations

The physical and chemical properties of *trans*-1,2-dichloroethylene suggest that it is unlikely to persist in soil. There were limited monitored soil concentration data of *trans*-1,2-dichloroethylene identified from the WQP, which were all from a single superfund site and had low measured concentrations reported at the detection limits, making it difficult to ascertain if these were true detections or non-detect concentrations reported at the LOD. The identified data were also not associated with sites releasing *trans*-1,2-dichloroethylene to land as reported in TRI and DMR. To assess the site-specific impacts of releases, soil concentrations were conservatively estimated via land application of biosolids from POTWs. The application of biosolids is estimated to result in concentrations of 0.071 mg/kg of *trans*-1,2-dichloroethylene in soil (see Sections 7.1.2 and 7.4.2 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#))).

Monitoring data from the WQP show that *trans*-1,2-dichloroethylene is detected at low concentrations in groundwater at numerous locations across the United States. While disposal of *trans*-1,2-dichloroethylene to landfills could contribute to groundwater via landfill leachate under certain conditions, as indicated by the Hazardous Waste Delisting Risk Assessment Software (DRAS) modeling (see Section 7.3.1 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#))), *trans*-1,2-dichloroethylene may also be present as a transformation product formed under anaerobic conditions from higher-chlorinated solvents—particularly 1,1,2-trichloroethane and 1,1,2,2-tetrachloroethane—commonly associated with legacy disposal practices. Given the limited geographic scope of contemporary *trans*-1,2-dichloroethylene land

1367 releases and the prevalence of legacy chlorinated-solvent sites, observed detections likely reflect a
1368 combination of direct disposal and *in situ* formation from legacy sources of other chlorinated solvents.

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4 HUMAN HEALTH RISK ASSESSMENT

trans-1,2-Dichloroethylene – Human Health Risk Assessment: Key Points

EPA evaluated all reasonably available information to support human health risk characterization of *trans*-1,2-dichloroethylene for workers, ONUs, and consumers, as well as the general population exposed to *trans*-1,2-dichloroethylene released to the environment. The exposures are described in Section 4.1, human health hazards are in Section 4.2, and human health risk characterization is in Section 4.3.

Exposure Key Points

- EPA assessed exposure to workers through inhalation and dermal exposure.
- EPA assessed exposure to ONUs through inhalation exposure.
- EPA assessed exposure to consumers through dermal and inhalation exposure and bystander exposure via inhalation.
- EPA assessed exposure to the general population through inhalation of ambient air and dermal and oral exposure to surface water while swimming and drinking water.

Hazard Key Points

- EPA concluded that the weight of scientific evidence supports dose-response analysis on two non-cancer hazard outcomes: (1) sensory irritation and acute neurotoxicity, and (2) immunological toxicity.
- Acute ocular irritation (via exposure to *trans*-1,2-dichloroethylene in air) has a human equivalent concentration (HEC) of 7,930 mg/m³ (2,000 ppm) with an uncertainty factor (UF) of 30 based on lacrimation in rats and supported by a case report in humans.
 - This is a peak effect and the HEC was not adjusted for exposure duration.
- The adverse repeat-dose effect supported by the weight of scientific evidence is decreased T-cell mediated humoral immune responses in mice, with an oral human equivalent dose (HED) of 21.4 mg/kg-d from a 90-day drinking water study in mice.
 - This HED was extrapolated across routes and durations; the route-extrapolated HEC is 116 mg/m³ (29.4 ppm).
 - A total UF of 30 was applied for all intermediate scenarios.
 - A total UF of 300 was applied to chronic oral exposure scenarios (increased to account for subchronic-to-chronic uncertainty), with a reduced UF of 100 for the chronic inhalation and dermal point of departures (extrapolated from the oral POD) because extrapolating from the oral HED is likely already conservatively health-protective.
- There is insufficient evidence from cancer bioassays to evaluate carcinogenicity using standard approaches; EPA applied a weight of scientific evidence approach using the ReCAAP Framework
 - The Agency concluded that carcinogenic effects from *trans*-1,2-dichloroethylene are not expected based on primarily negative results for genotoxicity, no evidence of precancerous lesions in subchronic studies, “marginal” carcinogenicity concern from *in silico* modeling, and minimal formation of reactive metabolites.

Risk Assessment Key Points

- Risk estimates below the benchmark were identified for workers and occupational non-users (ONUs) via inhalation and dermal exposures.
- Risk estimates below the benchmark were identified for consumers via inhalation exposure.
- After refining the screening-level modeling using a tiered approach, all risk estimates for the general population were above benchmarks.

4.1 Summary of Human Exposures

EPA evaluated all reasonably available information for occupational, consumer, and general population human exposures, including consideration of increased exposure across PESS considerations.

4.1.1 Occupational Exposures

4.1.1.1 Approach and Methodology

The steps that EPA followed in assessing occupational exposure to *trans*-1,2-dichloroethylene are illustrated in Figure 4-1.

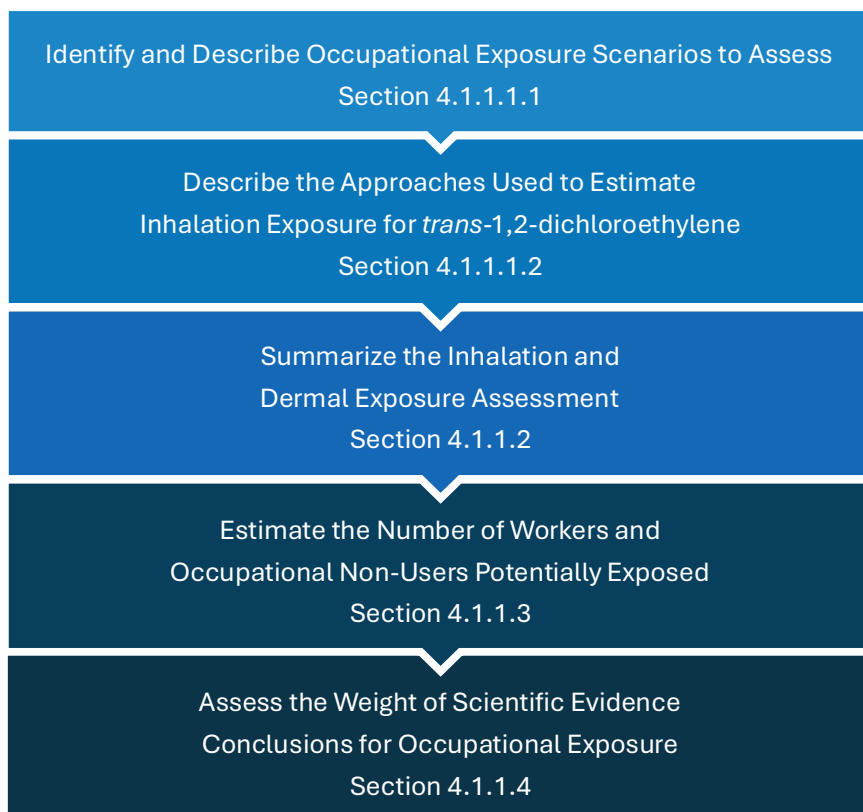


Figure 4-1. Overview of EPA’s Approach to Estimate Occupational Exposure for *trans*-1,2-Dichloroethylene

EPA followed the hierarchy established in Table 4-1 in selecting data and approaches for assessing occupational exposures to *trans*-1,2-dichloroethylene ([CEB, 1991](#)).

Table 4-1. Hierarchy of Data and Approaches for Assessing Occupational Exposures to *trans*-1,2-Dichloroethylene

Type of Approach	Description
1. Monitoring data	a) Personal and directly applicable
	b) Area and directly applicable
	c) Personal and potentially applicable or similar (analogous data)
	d) Area and potentially applicable or similar (analogous data)

Type of Approach	Description
2. Modeling approaches	a) Surrogate monitoring data
	b) Indoor Environmental Concentrations in Buildings with Conditioned and Unconditioned Zones (IECCU)
	c) Consumer Exposure Model (CEM)

4.1.1.1.1 Identify and Describe Occupational Exposure Scenarios to Assess

As discussed in Section 3.1.1, EPA identified OESs from the COUs to group scenarios with similar sources of exposure at industrial and commercial workplaces within the scope of the risk evaluation. The Agency identified similar exposure groups (SEGs) for each OES as presented below in Table 4-2. Additional details on worker activities performed by the exposure groups for each OES can be found in the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

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Table 4-2. Similar Exposure Groups (SEGs) Assessed for *trans*-1,2-Dichloroethylene

OES	SEGs Assessed by OES
Manufacturing as Primary Product	The final study report published by the TDCE Consortium (Exponent, 2023) detailed worker activities per SEG that occurred at the <i>trans</i> -1,2-dichloroethylene manufacturing as a primary product site. The SEGs of Outside Lead Operator/B-Operator – Batch Manufacturing, Operator – Distillation Operation, Shipping/Warehouse Worker – Batch Manufacturing, Laboratory Technician – Batch Manufacturing, and ONUs were identified and monitored for inhalation exposure.
Manufacturing as Byproduct	EPA used the SEGs of Outside Lead Operator/B-Operator – Batch Manufacturing, Operator – Distillation Operation, Laboratory Technician – Batch Manufacturing, and ONUs that were identified and monitored for inhalation exposure to <i>trans</i> -1,2-dichloroethylene from the Manufacturing as Primary Product OES as analogous data.
Repackaging	EPA used the SEGs of Drum Filler and Packaging Operator – Container Packaging that were identified and monitored for inhalation to <i>trans</i> -1,2-dichloroethylene exposure from the Processing into Formulation, Mixture, or Reaction Product OES as analogous data.
Processing as a Reactant	EPA used the SEGs of Outside Lead Operator/B-Operator – Batch Manufacturing, Operator – Distillation Operation, Laboratory Technician – Batch Manufacturing, and ONUs that were identified and monitored for inhalation exposure to <i>trans</i> -1,2-dichloroethylene from the Manufacturing as Primary Product OES as analogous data.
Incorporation into Formulation, Mixture, or Reaction Product	The final study report published by the TDCE Consortium (Exponent, 2023) detailed worker activities per SEG that occurred at the <i>trans</i> -1,2-dichloroethylene incorporation into a formulation sites. The SEGs of Packaging Operator – Container Packaging (3M 1), Process Operator (3M 1), Technician – Aerosol Packaging (Microcare), Technician – Blending (Microcare), Production Technician (BASF), Batch Maker (Huntsman), Drum Filler (Huntsman), Coat And Wash Operations Tech (Versum), Distillation Operation Tech (Versum), Packaging Operator – Bubbler Packaging (Versum), Quality Control (QC) Technician (Versum), Return Goods Authorization (RGA) Operations Tech (Versum), and ONUs were identified and monitored for inhalation exposure.
Vapor Degreasing	The final study report published by the TDCE Consortium (Exponent, 2023) detailed worker activities per SEG that occurred at facilities that used <i>trans</i> -1,2-dichloroethylene for vapor degreasing. The SEGs of Technician/Process Mechanic Operating Degreaser (Boeing 1), Assembler Operating Ultrasonic Machine (3M 2), Waste Handling/Maintenance Worker (3M 2), and ONUs were identified and monitored for inhalation exposure.
Miscellaneous Non-Aerosol Industrial and Commercial Uses (Cleaning and Degreasing Agents, Lubricants and Greases, Mold Release)	The final study report published by the TDCE Consortium (Exponent, 2023) detailed worker activities per SEG that occurred at facilities that used <i>trans</i> -1,2-dichloroethylene as a non-aerosol product. The SEGs of Aircraft Technician Performing Cleaning Task (Boeing 2), Flight Mechanics Performing Flush Cleaning (Boeing 1), Technician – Tube Dipping, Edge Cutting and Buffing (3M 3), Technician – Slitter Knife Cleaning (3M 5), and ONUs were identified and monitored for inhalation exposure.
Commercial Aerosol Products (Aerosol Degreasing, Aerosol Lubricants, Mold Release)	The final study report published by the TDCE Consortium (Exponent, 2023) detailed worker activities per SEG that occurred at facilities that used <i>trans</i> -1,2-dichloroethylene as an aerosol product. The SEGs of Technician (Boeing 1),

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OES	SEGs Assessed by OES
	Mechanic (Boeing 3), and ONUs were identified and monitored for inhalation exposure. Additionally, EPA considered workers using aerosol/degreaser products in an auto repair shop using the Consumer Exposure Model.
Application of Paints and Coatings	EPA assessed the general SEG categories of Spray Application and Unknown Application Method. Worker exposures to <i>trans</i> -1,2-dichloroethylene may occur during the application of paints and coatings during container cleaning and unloading, equipment cleaning, spraying or roll coating, and curing or drying activities. ONUs are potentially exposed via inhalation while present in the application area; however, EPA expects ONUs to have lower inhalation exposures than workers who handle or apply the products.
Adhesives and Sealants	EPA assessed the general SEG categories of Spray Coating, Non-Spray Coating, and Unknown Application Method. Worker exposures may occur during the use of adhesives and sealants during container cleaning and unloading, equipment cleaning, spraying or roll coating, and curing or drying activities. ONUs are potentially exposed to <i>trans</i> -1,2-dichloroethylene via inhalation while present in the work area; however, EPA expects ONUs to have lower inhalation exposures than workers who handle or apply the products.
Blowing Agent in Spray Foam	EPA assessed the general SEG categories of Worker. Worker exposures to <i>trans</i> -1,2-dichloroethylene may occur during the use of spray foam during container cleaning and unloading, equipment cleaning, spraying, and curing or drying activities. ONUs are potentially exposed via inhalation while present in the application area; however, EPA expects ONUs to have lower inhalation exposures than workers who handle or apply the products. Additionally, EPA considered contractors in residential spaces using commercial spray foam insulation products using the Indoor Environmental Concentrations in Buildings with Conditioned and Unconditioned Zones (IECCU).
Laboratory Use	EPA used the SEG of Laboratory Technician – Batch Manufacturing, and ONUs that were identified and monitored for inhalation exposure from the Manufacturing as Primary Product OES as analogous data.
Refrigerant Flush	EPA used the general SEG category of Worker and used inhalation monitoring data from the Miscellaneous Non-Aerosol Industrial and Commercial Uses OES. ONUs are potentially exposed to <i>trans</i> -1,2-dichloroethylene via inhalation while present in the work area; however, EPA expects ONUs to have lower inhalation exposures than workers who handle or apply the products.
Processing Aid in Semiconductor Manufacturing	As described in Section 4.2.14 of the <i>Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026g), <i>trans</i> -1,2-dichloroethylene is received in hermetically sealed containers and fed into a closed system where it is completely reacted away. EPA believes that workers are not exposed to <i>trans</i> -1,2-dichloroethylene during semiconductor manufacturing and, therefore, considered the exposure pathway to be incomplete and did not assess exposure for this OES.
Waste Handling, Disposal, and Treatment	EPA assessed the general SEG categories of Worker – Landfill, Worker – Incineration, and Worker – POTW and Non-POTW. ONUs are potentially exposed to <i>trans</i> -1,2-dichloroethylene via inhalation while present in the application area; however, EPA expects ONUs to have lower inhalation exposures than workers who handle the waste.
Distribution in Commerce	As described in Section 4.2.16 of the <i>Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026g), loading/unloading of <i>trans</i> -1,2-dichloroethylene (loading/unloading) is evaluated within the relevant use-specific COUs/OESs (e.g., manufacturing, repackaging, processing), not this

OES	SEGs Assessed by OES
	standalone Distribution in Commerce OES. EPA expects that under standard operating procedures, there is negligible potential for releases during transportation of the product in commerce. Therefore, no occupational exposures to <i>trans</i> -1,2-dichloroethylene are reasonably expected to occur for this OES.
COU = condition of use; EPA = Environmental Protection Agency; OES = occupational exposure scenario; ONU = occupational non-user; SEG = similar exposure group; TDCE = <i>trans</i> -1,2-dichloroethylene	

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4.1.1.1.2 Approaches Used to Estimate Inhalation Exposure for *trans*-1,2-Dichloroethylene

1396 EPA followed the exposure assessment hierarchy depicted in Table 4-1 and used the highest rated
1397 approach available for each OES. A summary of the approaches used to estimate inhalation exposure for
1398 each OES for *trans*-1,2-dichloroethylene is presented below in Table 4-3. Additional details on worker
1399 activities performed by the exposure groups for each OES can be found in the *Draft Chemistry, Fate,*
1400 *Release, and Occupational Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

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Table 4-3. Approaches for Estimation of Inhalation Exposures for Each OES

OES	Approach Used to Estimate Inhalation Exposure
Manufacturing as a Primary Product (OES #1)	<i>trans-1,2-Dichloroethylene Personal Breathing Zone (PBZ) Monitoring Data from Test Order:</i> Inhalation exposures were assessed based on inhalation monitoring data provided to EPA via a test order submission from the TDCE Consortium (Exponent, 2023). The monitoring was conducted according to an EPA-approved study plan and exposures were monitored for 4 worker SEGs (as well as ONUs, described below). The test order monitoring study includes 66 full-shift PBZ worker samples at a manufacturing facility where <i>trans</i>-1,2-dichloroethylene is intentionally produced. There were 26 full-shift worker samples that were below the limit of detection (range <0.02 to <0.04 ppm)^a. The number of full-shift samples (and number of non-detects) for each SEG was as follows: 5 Outside Lead Operator/B-Operator – Batch Manufacturing (1 non-detect)^a, 13 Operator – Distillation Operation (7 non-detects)^a, 5 Shipping/Warehouse Worker – Batch Manufacturing (0 non-detects), and 6 Laboratory Technician – Batch Manufacturing (6 non-detects)^a. For the three SEGs with detected samples, EPA estimated the 50th and 95th percentiles and used them to represent the central tendency and high-end exposures, respectively. For the one SEG with no detected samples (Laboratory Technician – Batch Manufacturing), EPA presented one half of the maximum LOD in the dataset. <i>ONUs:</i> The dataset included 37 ONU full-shift PBZ samples from the same study described above; 27 samples were non-detect (LODs between <0.02 ppm and <0.04 ppm)^a. EPA estimated the 50th and 95th percentile values to represent the central tendency and high-end exposures, respectively.
Manufacturing as a Byproduct (OES #2)	<i>trans-1,2-Dichloroethylene PBZ Monitoring Data from Test Order (Manufacturing as a Primary Product) Used as an Analogous Scenario:</i> EPA did not identify inhalation exposure monitoring data related to manufacturing of <i>trans</i>-1,2-dichloroethylene as a byproduct. EPA used worker exposure data at a facility that manufactures <i>trans</i>-1,2-dichloroethylene as a primary product as an analogous scenario for the manufacturing of <i>trans</i>-1,2-dichloroethylene as byproduct. EPA excluded the Shipping/Warehouse Worker SEG from this OES as EPA does not expect shipping and warehouse workers to be exposed to a byproduct. The remaining information is described in the “Manufacturing as a Primary Product” OES above. This OES uses 61 full-shift samples for workers including 20 worker samples that were below the limit of detection (<0.02 to <0.04 ppm)^a from the test order (Exponent, 2023). These data was chosen as an analogous scenario due to similarities in expected tasks performed when manufacturing a chemical as a primary product vs. a byproduct, which is further discussed in Section 4.1.1.4 (Weight of Scientific Evidence Conclusions for Occupational Exposure). EPA estimated the 50th and 95th percentile values to represent the central tendency and high-end exposures, respectively. <i>ONUs:</i> The dataset included 37 ONU full-shift PBZ samples from the same study described above; 27 samples were non-detect (LOD between <0.02 ppm and <0.04 ppm)^a. EPA estimated the 50th and 95th percentile values to represent the central tendency and high-end exposures, respectively.
Repackaging (OES #3)	<i>trans-1,2-Dichloroethylene PBZ Monitoring Data from Test Order (Incorporation into Formulation, Mixtures, and Reaction Products) Used as an Analogous Scenario:</i> EPA did not identify inhalation exposure monitoring data related to the repackaging of <i>trans</i>-1,2-dichloroethylene. EPA used select worker exposure data from facilities that process <i>trans</i>-1,2-dichloroethylene into formulations, mixtures, and reaction products as an analogous scenario for the repackaging of <i>trans</i>-1,2-dichloroethylene. This OES uses 12 full-shift samples from the Drum Filler and Packaging Operator – Container Packaging

OES	Approach Used to Estimate Inhalation Exposure
	SEG for workers including 3 worker samples that were below the limit of detection (<0.02 to <0.04 ppm)^a from the test order (Exponent, 2023). The drum filler fills drums with a product that is between 1 and 5% <i>trans</i>-1,2-dichloroethylene, while the packaging operator is filling containers with a product that is between 50% and 90% <i>trans</i>-1,2-dichloroethylene. The remaining information is described in the “Incorporation into formulations, mixtures, and reaction products” OES below. These data was chosen as an analogous scenario due to similarities in expected tasks performed during repackaging neat chemicals and packaging reformulated products, which is further discussed in Section 4.1.1.4 (Weight of Scientific Evidence Conclusions for Occupational Exposure). EPA also used short-term surrogate monitoring data from workers filling drums with dichloromethane (Unocal Corporation, 1987). EPA estimated the 50th and 95th percentile values to represent the central tendency and high-end exposures, respectively. ONUs: Since no applicable full-shift ONU data was found, EPA used the central tendency from monitored workers inhalation exposures to represent ONU inhalation exposure.
Processing as a Reactant (OES #4)	<i>trans</i>-1,2-Dichloroethylene PBZ Monitoring Data from Test Order (Manufacturing as a Primary Product) Used as an Analogous Scenario: EPA did not identify inhalation exposure monitoring data related to use of <i>trans</i>-1,2-dichloroethylene as a reactant. EPA used worker exposure data at a facility that manufactures <i>trans</i>-1,2-dichloroethylene as a primary product as an analogous scenario for the use of <i>trans</i>-1,2-dichloroethylene as an intermediate. EPA excluded the Shipping/Warehouse Worker SEG from this OES as EPA does not expect shipping and warehouse workers to be exposed to an intermediate. The remaining information is described in the “Manufacturing as a primary product” OES above. This OES uses 61 full-shift samples for workers including 20 worker samples that were below the limit of detection (<0.02 to <0.04 ppm)^a from the test order (Exponent, 2023). These data was chosen as an analogous scenario due to similarities in expected tasks performed during chemical manufacturing and processing, which is further discussed in Section 4.1.1.4 (Weight of Scientific Evidence Conclusions for Occupational Exposure). EPA also used short-term surrogate monitoring data from workers using dichloromethane as a reactant (TNO (CIVO), 1999; Olin, 1979). EPA estimated the 50th and 95th percentile values to represent the central tendency and high-end exposures, respectively. ONUs: The dataset included 37 ONU full-shift PBZ samples from the same study described above; 27 samples were non-detect (LOD between <0.02 ppm and <0.04 ppm)^a. EPA estimated the 50th and 95th percentile values to represent the central tendency and high-end exposures.
Incorporation into Formulations, Mixtures, and Reaction Products (OES #5)	<i>trans</i>-1,2-Dichloroethylene PBZ Monitoring Data from Test Order: Inhalation exposures were assessed based on inhalation monitoring data provided to EPA via a test order submission from the TDCE Consortium (Exponent, 2023). The monitoring was conducted according to an EPA-approved study plan and exposures were monitored for 12 worker SEGs (as well as ONUs, described below). The test order monitoring study includes 130 full-shift PBZ worker samples at 5 facilities where <i>trans</i>-1,2-dichloroethylene is processed into a formulation. There were 26 full-shift worker samples that were below the limit of detection (range <0.02 to <0.04 ppm)^a. The number of full-shift samples (and number of non-detects) for each SEG was as follows: 6 Packaging Operator – Container Packaging (3M) (0 non-detect), 8 Process Operator (3M 1) (0 non-detect), 6 Technician – Aerosol Packaging (Microcare) (0 non-detects), 8 Technician – Blending (Microcare) (0 non-detects), 9 Production Technician (BASF) (0 non-detect), 9 Batch Maker (Huntsman) (0 non-detects), 6 Drum Filler (Huntsman) (3 non-

OES	Approach Used to Estimate Inhalation Exposure
	detects)^a, 3 Coat And Wash Operation Tech (Versum) (3 non-detects)^a, 3 Distillation Operation Tech (Versum) (0 non-detects), 3 Packaging Operator – Bubbler Packaging (Versum) (3 non-detects)^a, 3 QC Technician (Versum) (2 non-detects)^a, and 6 Return Goods Authorization (RGA) Operations Tech (Versum) (1 non-detect)^a. For each SEG with detected samples, EPA estimated the 50th and 95th percentile values to represent the central tendency and high-end exposures, respectively. For the two SEGs with no detected samples, EPA presented one half of the maximum LOD in the dataset. ONUs: The ONU (3M 1, BASF, Microcare, Huntsman) dataset included 44 ONU full-shift PBZ samples with 2 non-detects and the ONU (Versum) dataset included 16 ONU full-shift PBZ samples with 15 non-detects from the same study described above; the limit of detection had a range from <0.02 to <0.04 ppm^a. For the ONU datasets, EPA estimated the 50th and 95th percentile values to represent the central tendency and high-end exposures, respectively.
Vapor Degreasing (OES #6)	<i>trans-1,2-Dichloroethylene PBZ Monitoring Data from Test Order:</i> Inhalation exposures were assessed based on inhalation monitoring data provided to EPA via a test order submission from the TDCE Consortium (Exponent, 2023). The monitoring was conducted according to an EPA-approved study plan and exposures were monitored for 3 worker SEGs (as well as ONUs, described below). The test order monitoring study includes 31 full-shift PBZ worker samples at 2 facilities where <i>trans</i>-1,2-dichloroethylene is used for vapor degreasing. There were no full-shift worker samples that were below the limit of detection. The number of full-shift samples for each SEG was as follows: 9 Technician/Process Mechanic Operating Degreaser (Boeing 1), 8 Assembler Operating Ultrasonic Machine (3M 2), and 3 Waste Handling/Maintenance Worker (3M 2). EPA also used short-term monitoring data from workers using <i>trans</i>-1,2-dichloroethylene in a vapor degreaser (3M, 2010). For each SEG, EPA estimated the 50th and 95th percentile values to represent the central tendency and high-end exposures, respectively. ONUs: The dataset included 11 ONU full-shift PBZ samples from the same study described above; no samples were non-detect. EPA estimated the 50th and 95th percentile values to represent the central tendency and high-end exposures, respectively.
Miscellaneous Non-Aerosol Uses (OES #7)	<i>trans-1,2-Dichloroethylene PBZ Monitoring Data from Test Order:</i> Inhalation exposures were assessed based on inhalation monitoring data provided to EPA via a test order submission from the TDCE Consortium (Exponent, 2023). The monitoring was conducted according to an EPA-approved study plan and exposures were monitored for 4 worker SEGs. The test order monitoring study includes 22 full-shift PBZ worker samples at 3 facilities where <i>trans</i>-1,2-dichloroethylene is used as a non-aerosol cleaner and degreaser. There were no full-shift worker samples that were below the limit of detection. The number of full-shift samples for each SEG was as follows: 2 Aircraft Technicians Performing Cleaning Task (Boeing 2), 14 Technicians – Tube Dipping, Edge Cutting And Buffing (3M 3), and 6 Technicians – Slitter Knife Cleaning (3M 5). The test order also contained 2 Aircraft Technicians Performing Cleaning Task (Boeing 2) and 9 Flush Cleaning – Flight Mechanics Performing Flush Cleaning (Boeing 1). For each SEG, EPA estimated the 50th and 95th percentile values to represent the central tendency and high-end exposures, respectively. ONUs: Since no applicable full-shift ONU data was found, EPA used the central tendency from monitored workers inhalation exposures to represent ONU inhalation exposure.

OES	Approach Used to Estimate Inhalation Exposure
Commercial Aerosol Uses (OES #8)	<i>trans-1,2-Dichloroethylene PBZ Monitoring Data from Test Order:</i> Inhalation exposures were assessed based on inhalation monitoring data provided to EPA via a test order submission from the TDCE Consortium (Exponent, 2023). The monitoring was conducted according to an EPA-approved study plan and exposures were monitored for 2 worker SEGs (as well as ONUs, described below). The test order monitoring study includes 18 full-shift PBZ worker samples at 2 facilities where <i>trans</i>-1,2-dichloroethylene is used as an aerosol cleaner and degreaser. There were no full-shift worker samples that were below the limit of detection. The number of full-shift samples for each SEG was as follows: 8 Technician – Test and Evaluation (Boeing 1) and 8 Mechanic (Boeing 3). For each SEG, EPA estimated the 50th and 95th percentile values to represent the central tendency and high-end exposures, respectively. Additionally, the Consumer Exposure Model was used to model worker inhalation exposures to <i>trans</i>-1,2-dichloroethylene aerosol/degreaser products in an auto repair shop. <i>ONUs:</i> The dataset included 2 ONU full-shift PBZ samples from the same study described above; no samples were non-detect. EPA used the mean and maximum values to represent the central tendency and high-end exposures, respectively.
Application of Paints and Coatings (OES #9)	<i>PBZ Monitoring Data for Dichloromethane from Published Risk Evaluation Used as a Surrogate to Estimate Exposure to trans-1,2-Dichloroethylene:</i> EPA used surrogate data from the dichloromethane risk evaluations during the application of paints and coatings (OSHA, 2019; (DOEHRS-IH), 2018; Finkel, 2017; U.S. EPA, 1985; NIOSH, 1973). The data included 27 samples for workers during spray application and 271 samples for workers during unknown application method; 2 samples were below the limit of detection for spray application. The limit of detection was not known so these two values were excluded from the calculations. Dichloromethane has a vapor pressure of 435 mmHg compared to 331 mmHg for <i>trans</i>-1,2-dichloroethylene. EPA assumed solvents would be used in neat form and, therefore, corrected for vapor pressure differences between dichloromethane and <i>trans</i>-1,2-dichloroethylene. Surrogate data corrections were made for all data points and then EPA estimated the 50th and 95th percentile values to represent the central tendency and high-end exposures, respectively. <i>ONUs:</i> Since no applicable full-shift ONU data was found, EPA used the central tendency from monitored workers inhalation exposures to represent ONU inhalation exposure.
Adhesives and Sealants (OES #10)	<i>PBZ Monitoring Data for Dichloromethane and 1-Bromopropane from Published Risk Evaluation Used as a Surrogate to Estimate Exposure to trans-1,2-Dichloroethylene:</i> EPA used surrogate data from the dichloromethane and 1-bromopropane risk evaluations during the use adhesives and sealants (OSHA, 2019; Finkel, 2017; OSHA, 2013; Hanley et al., 2009; NIOSH, 2003, 2002; Reh et al., 2002; TNO (CIVO), 1999; IPCS, 1996; NIOSH, 1985; U.S. EPA, 1985). The data includes 99 samples for workers during spray coating of adhesives or sealants, 100 samples for workers during non-spray coating of adhesives or sealants, and 468 samples for workers during unknown application method, 5 samples and 18 samples were below the limit of detection for spray coating and non-spray coating, respectively. The limit of detection was not known, and so they were assumed to be zero. Dichloromethane has a vapor pressure of 435 mmHg and 1-bromopropane has a vapor pressure of 146 mmHg compared to a vapor pressure of 331 mmHg for <i>trans</i>-1,2-dichloroethylene. EPA assumed solvents would be used in neat form and, therefore, corrected for vapor pressure differences only for dichloromethane and 1-bromopropane vs. <i>trans</i>-1,2-dichloroethylene. Surrogate data corrections were made for all data points and then EPA estimated the 50th and 95th percentile values to represent the central tendency and high-end exposures, respectively.

OES	Approach Used to Estimate Inhalation Exposure
	ONUs: Since no applicable full-shift ONU data was found, EPA used the central tendency from monitored workers inhalation exposures to represent ONU inhalation exposure.
Blowing Agent in Spray Foam (OES #11)	<i>PBZ Monitoring Data for Dichloromethane from Published Risk Evaluation Used as a Surrogate to Estimate Exposure to trans-1,2-Dichloroethylene:</i> EPA used surrogate data from the dichloromethane risk evaluation during the use of dichloromethane as a blowing agent during the spraying of foam (OSHA, 2019; IARC, 2016; TNO (CIVO), 1999; IPCS, 1996; Vulcan Chemicals, 1991; NIOSH, 1990; Olin Chemicals, 1987; U.S. EPA, 1985; Cone Mills, 1982, 1981). The data includes 84 samples for workers and 1 sample was below the limit of detection. The limit of detection was not provided, so zero was assumed for this sample. Dichloromethane has a vapor pressure of 435 mmHg compared to 331 mmHg for <i>trans</i>-1,2-dichloroethylene. EPA assumed solvents would be used in neat form and, therefore, corrected for vapor pressure differences for dichloromethane compared to <i>trans</i>-1,2-dichloroethylene. Surrogate data corrections were made for all data points and then EPA estimated the 50th and 95th percentile values to represent the central tendency and high-end exposures, respectively. Additionally, IECCU was used to assess the commercial application of spray foam insulation products containing <i>trans</i>-1,2-dichloroethylene by contractors in residential spaces similar to the analysis conducted in the consumer exposure assessment. ONUs: Since no applicable full-shift ONU data was found, EPA used the central tendency from monitored workers inhalation exposures to represent ONU inhalation exposure.
Laboratory Chemicals (OES #12)	<i>trans-1,2-Dichloroethylene PBZ Monitoring Data from Test Order (Manufacturing as a Primary Product) Used as an Analogous Scenario:</i> EPA did not identify inhalation exposure monitoring data related to use of <i>trans</i>-1,2-dichloroethylene in a commercial laboratory. EPA used the Laboratory Worker SEG exposure data at a facility that manufactures <i>trans</i>-1,2-dichloroethylene as a primary product as an analogous scenario for the laboratory chemicals OES. This OES used 6 full-shift samples for workers that were all below the limit of detection (<0.02 to <0.04 ppm)^a from the test order (Exponent, 2023). These data was chosen as an analogous scenario due to similarities in expected tasks performed in a laboratory in a manufacturing facility and a commercial laboratory, which is further discussed in Section 4.1.1.4 (Weight of Scientific Evidence Conclusions for Occupational Exposure). EPA used half of the LOD value to represent the central tendency exposure. ONUs: Since no applicable full-shift ONU data was found, EPA used the central tendency from monitored workers inhalation exposures to represent ONU inhalation exposure.
Refrigerant Flush (OES #13)	<i>trans-1,2-Dichloroethylene PBZ Monitoring Data from Test Order (Miscellaneous Non-Aerosol Uses) Used as an Analogous Scenario:</i> EPA did not identify inhalation exposure monitoring data related to use of <i>trans</i>-1,2-dichloroethylene as a refrigeration system. EPA used the miscellaneous non-aerosol use exposure data as an analogous scenario for the refrigerant flush OES. Inhalation exposures were assessed based on inhalation monitoring data provided to EPA via a test order submission from the TDCE Consortium (Exponent, 2023). The test order monitoring study includes 22 full-shift PBZ worker samples at facilities where <i>trans</i>-1,2-dichloroethylene is used as a non-aerosol cleaner and degreaser. All full-shift worker samples were above the limit of detection. EPA estimated the 50th and 95th percentile values to represent the central tendency and high-end exposures for the OES, respectively.

OES	Approach Used to Estimate Inhalation Exposure
	ONUs: Since no applicable full-shift ONU data was found, EPA used the central tendency from monitored workers inhalation exposures to represent ONU inhalation exposure.
Processing Aid in Semiconductor Manufacturing (OES #14)	As described in Section 4.2.14 of the <i>Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026g), <i>trans</i> -1,2-dichloroethylene is received in hermetically sealed containers and fed into a closed system where it is completely reacted away. EPA believes that workers are not exposed to <i>trans</i> -1,2-dichloroethylene during semiconductor manufacturing and, therefore, considered the exposure pathway to be incomplete and did not assess exposure for this OES.
Waste Handling, Disposal, and Treatment (OES #15)	Area Monitoring Data for 1,2-Dichloroethylene, Surrogate Monitoring Data for Dichloromethane, and Surrogate Monitoring Data for 1,2-Dichloroethane Were Used to Estimate Exposure to trans-1,2-Dichloroethylene for Landfill Workers, Incineration Workers, and POTW and Non-POTW WWT Workers, Respectively: EPA used three <i>trans</i>-1,2-dichloroethylene area monitoring samples to estimate worker exposure at landfills (ATSDR, 1996). EPA used 22 dichloromethane PBZ samples to estimate worker exposures during incineration (DOEHRS-IH, 2018; Finkel, 2017; U.S. EPA, 1985). EPA used three <i>trans</i>-1,2-dichloroethane PBZ samples to estimate worker exposures at POTWs and non-POTW WWTs (Lehtinen and Veijanen, 2011). None of the samples were below the detection level. Dichloromethane has a vapor pressure of 435 mmHg and 1,2-dichloroethane has a vapor pressure of 78.9 mmHg compared to 331 mmHg for <i>trans</i>-1,2-dichloroethylene. Surrogate data corrections were made for all surrogate data points. EPA estimated the 50th and 95th percentile values to represent the central tendency and high-end exposures, respectively, for datasets with more than 5 points. For datasets with three to five points, EPA used the median value to estimate central tendency and the maximum value to estimate high-end exposures. ONUs: Since no applicable full-shift ONU data was found, EPA used the central tendency from monitored workers inhalation exposures to represent ONU inhalation exposure.
Distribution in Commerce (OES #16)	As described in Section 4.2.16 of the <i>Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026g), loading/unloading of <i>trans</i> -1,2-dichloroethylene (loading/unloading) is evaluated within the relevant use-specific COUs/OESs (e.g., manufacturing, repackaging, processing), not this standalone Distribution in Commerce OES. EPA expects that under standard operating procedures, there is negligible potential for releases during transportation of the product in commerce. Therefore, no occupational exposures to <i>trans</i> -1,2-dichloroethylene are reasonably expected to occur for this OES.
COU = condition of use; EPA = Environmental Protection Agency; IECCU = Indoor Environmental Concentrations in Buildings with Conditioned and Unconditioned Zones; LOD = limit of detection; OES = occupational exposure scenario; ONU = occupational non-user; POTW = publicly owned treatment works; RGA = return goods authorization; SEG = similar exposure group; TDCE = <i>trans</i>-1,2-dichloroethylene; WWT = wastewater treatment ^a Values below the limit of detection were replaced with LOD/2, unless otherwise noted.	

4.1.1.1.3 Approaches Used to Estimate Dermal Exposure for *trans*-1,2-Dichloroethylene

EPA did not identify any dermal exposure monitoring data for any OES through systematic review or through other reasonably available sources (*e.g.*, public comments). Therefore, to assess dermal exposure, the Agency used the EPA Dermal Exposure to Volatile Liquids Model (DEVL) to calculate the acute absorbed dose rate (AADR) for each OES. While the acute dermal exposures were calculated to determine intermediate and chronic dermal exposures, acute dermal exposures were not assessed in the risk evaluation due to the lack of evidence of acute dermal toxicity (see *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026w](#)) for more details). Additional information on the DEVL model and all parameters utilized is provided below, and in the *Draft Chemistry, Fate, Release, and Occupational Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)). EPA utilized information on fraction absorption data that was developed from a TSCA section 4 test order ([Labcorp Early Development, 2023](#)), and is further described in the *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene Technical Support Document* ([U.S. EPA, 2026w](#)).

EPA did not assess dermal exposures to ONUs because EPA does not expect ONUs to directly handle *trans*-1,2-dichloroethylene as part of their duties. Therefore, ONUs are not expected to have dermal exposures during the course of their work.

Dermal Exposure to Volatile Liquids (DEVL) Model

The DEVL (see Equation 4-1) modifies the EPA/OPPT Dermal Exposure to Liquids Model (peer-reviewed) by incorporating a “fraction absorbed (f_{abs})” parameter to account for the evaporation of volatile chemicals to estimate the acute absorbed dose rate (AADR):

Equation 4-1.

$$AADR = S \times Q_u \times f_{abs} \times Y_{derm} \times FT / BW$$

Where:

S	=	Surface area of skin in contact with the chemical formulation (cm ²)
Q_u	=	Dermal load (<i>i.e.</i> , the quantity of the chemical formulation on the skin after the dermal contact event, mg/cm ² -event)
f_{abs}	=	Fractional absorption, (<i>i.e.</i> , the portion of chemical formulation absorbed systemically, accounting for evaporation of the chemical from the dermal load, Q_u (unitless, $0 \leq f_{abs} \leq 1$))
Y_{derm}	=	Weight fraction of the chemical of interest in the liquid (unitless, $0 \leq Y_{derm} \leq 1$)
FT	=	Frequency of events (integer number/day)
BW	=	Body weight (kg)

Probabilistic Modeling with Monte Carlo

EPA used a Monte Carlo simulation with 100,000 iterations and the Latin Hypercube sampling method using the Dermal Exposure to Volatile Liquids Model. Specific details of the dermal exposure assessment for each OES can be found in the *Draft Chemistry, Fate, Release, and Occupational Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)). Table 4-4 contains a list of specific parameters and distributions utilized in the Monte Carlo Modeling.

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Table 4-4. Parameters Utilized in the Probabilistic Monte Carlo Monitoring

Input Parameter	Symbol	Uncertainty Analysis Distribution Parameters			Unit	Reference
		Lower Bound	Upper Bound	Distribution Type		
Dermal load	Q_u	0.7	2.1	Uniform	mg/cm ² -event	U.S. EPA (1992)
Surface area	S	0	1,070	Uniform	cm ²	U.S. EPA (2011)
Fractional absorption	f_{abs}	7.0E-03	1.7E-02	Uniform	Unitless	EPA-HQ-OPPT-2018-0465-0069
Frequency of events	FT	1	1	Static	Events/day	N/A
Body weight	BW	80	80	Static	kg	U.S. EPA (2011)
Weight fraction of chemical	Y_{derm}	OES-dependent (see Table 4-5)			Unitless	N/A

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The weight fraction was determined based on EPA's review of currently available products and formulations containing *trans*-1,2-dichloroethylene. The weight fractions used for each OES are summarized in Table 4-5.

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Table 4-5. Summary of OES Weight Fraction Values in the Probabilistic Monte Carlo Modeling

OES ^a	Lower Bound	Upper Bound	Distribution Type	Rationale/Basis
Manufacture	0.9	1.0	Uniform	Based on 2020 and 2024 CDR data.
Manufacture as a Byproduct	1.25E-02	1.25E-02	Static	About 1.25 lb of mixed chlorinated organic liquids are unintentionally produced per 100 pounds of ethylene dichloride manufactured (VI, 2020).
Repackaging	1.0	1.0	Static	Assumed repackaged at 100% concentration
Processing as a Reactant	1.0	1.0	Static	Assumed processed at 100% concentration
Incorporation into Formulation, Mixture, or Reaction Product	1.0E-02	1.0	Uniform	Range of formulated products. Assumed to arrive at formulation sites at 100% concentration, then formulated into lower product concentrations.
Vapor Degreasing	1.0E-02	1.0	Discrete	Discrete distribution based on product data
Miscellaneous Non-Aerosol Industrial and Commercial Uses	1.0E-02	1.0	Discrete	Discrete distribution based on product data
Commercial Aerosol Products	1.0E-02	1.0	Discrete	Discrete distribution based on product data

OES ^a	Lower Bound	Upper Bound	Distribution Type	Rationale/Basis
Application of Paints and Coatings	1.0E-02	0.85	Discrete	Discrete distribution based on product data
Use of Adhesives and Sealants	1.0E-02	0.70	Discrete	Discrete distribution based on product data
Blowing Agent in Spray Foam	1.0E-02	0.05	Discrete	Discrete distribution based on product data
Use as a Laboratory Chemical	0.2	1.0	Discrete	Discrete distribution based on product data
Refrigerant and Refrigerant Flush	0.25	0.90	Discrete	Discrete distribution based on product data
Waste Handling, Disposal, and Treatment	1.0E-02	1.0	Uniform	Based on range of upstream concentrations.
CDR = Chemical Data Reporting; EPA = Environmental Protection Agency; OES = Occupational Exposure Scenario ^a EPA believes that workers are not exposed to <i>trans</i> -1,2-dichloroethylene during semiconductor manufacturing and, therefore, considered the exposure pathway to be incomplete and did not assess exposure for this OES.				

4.1.1.1.4 Exposure Frequency and Working Years

Exposure Frequency

EPA estimated worker exposure frequency as the number of days per year that workers are potentially exposed to *trans*-1,2-dichloroethylene. In some cases, it was reasonable to assume a worker is exposed to the chemical on each working day. In other cases, it was more appropriate to estimate a workers' exposure to the chemical occurs during a subset of the worker's annual working days. In general, the exposure frequency is the same as the number of operating days per year for a given OES. However, if the number of operating days exceeded 250 days per year, EPA assumed that a single worker would not work more than 250 days per year such that the maximum exposure days per year was still 250. EPA assumed up to 250 days/year of exposure for each SEG based on assumptions that each SEG could have tasks that needed to be performed on a daily basis as well as 50 weeks per year and 5 days per week.

The test order submission from the TDCE Consortium ([Exponent, 2023](#)) provided daily and weekly task frequency information for the sites that were monitored. Tasks across SEGs occurred daily or on an "as needed," 2 to 4 times/week, or 3 to 4 times/month basis, with each SEG having at least one daily task. Additional details on task frequencies and durations by SEG are provided in the *Draft Chemistry, Fate, Release, and Occupational Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

Working Years

EPA used worker tenure data from the Bureau of Labor Statistics (BLS) and the U.S. Census Bureau. Based on these sources, EPA selected 31 years as the central tendency estimate and 40 years as the high-end estimate for working years. The Bureau of Labor Statistics ([U.S. BLS, 2014](#)) provides information on employee tenure with current employer obtained from the Current Population Survey (CPS), which is a monthly sample survey of about 60,000 households that provides information on the labor force status of the civilian non-institutional population age 16 years and over. The U.S. Census's ([U.S. Census Bureau, 2019](#)) Survey of Income and Program Participation (SIPP) provides information on lifetime tenure with all employers. SIPP is a household survey that collects data on income, labor force participation, social program participation and eligibility, and general demographic characteristics through a continuous series of national panel surveys of between 14,000 and 52,000 households.

Exposure frequency and working years are parameters used to estimate chronic exposure and risks, which are presented in Section 4.3.2. While working years is a parameter in calculating chronic, non-cancer exposures (e.g., ADC and CAD), the exposure dose over the working years is averaged over the working years. The working years are included in both the numerator and denominator in the calculations, and they cancel out. For additional details on the parameters and equations used to calculate acute, intermediate, and chronic exposures, refer to the *Draft Chemistry, Fate, Release, and Occupational Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

4.1.1.2 Summary of Inhalation and Dermal Exposure Assessment

Table 4-6 presents a summary of full-shift inhalation exposure results based on reasonably available monitoring data and exposure modeling for each OES. This table provides a summary of the 8-hour time weighted average (8-hour TWA) inhalation exposure estimates for workers and ONUs. The *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) provides additional details regarding EPA's approach and methodology for estimating inhalation and dermal exposures.

Using the 8-hour TWA exposure concentrations in Table 4-6, EPA then calculated acute, intermediate, and chronic (non-cancer) exposures. Table 4-7 provides a summary for these inhalation metrics. Table 4-8 presents a summary of the dermal exposure results and the calculated dermal metrics for each OES. The *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) provides more detail on the estimation of the inhalation and dermal exposure metrics.

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Table 4-6. Summary of Occupational Inhalation Exposure Results by Occupational Exposure Scenario (OES)

OES ^{jk}	SEG Description	Exposure Days (day/yr)	Number of Samples	Number of Non-Detects ^a	LOD (ppm)	Short-Term Inhalation Estimates ^b (ppm)		Full-Shift Inhalation Estimates ^c (ppm)		Sources for Inhalation Data ^{de}
						Central Tendency	High-End	Central Tendency	High-End	
Manufacturing as a Primary Product	Outside Lead Operator/B-Operator – Batch Manufacturing	250	5	1	2E–02 to 4E–02	N/A	N/A	0.11	0.57	<i>trans</i> -1,2-Dichloroethylene test order data (Exponent, 2023)
	Operator – Distillation Operation	250	13	7		N/A	N/A	1.3E–02	0.79	
	Shipping/Warehouse Worker – Batch Manufacturing	250	5	0		N/A	N/A	8.3	30	
	Laboratory Technician – Batch Manufacturing	250	6	6		N/A	N/A	1.3E–02		
	ONU	250	37	27		N/A	N/A	1.7E–02	0.15	
Manufacturing as a Byproduct	Outside Lead Operator/B-Operator – Batch Manufacturing	250	5	1	2E–02 to 4E–02	N/A	N/A	0.11	0.57	Analogous data from <i>trans</i> -1,2-dichloroethylene test order data (manufacturing as primary product) (Exponent, 2023)
	Operator – Distillation Operation	250	13	7		N/A	N/A	1.3E–02	0.79	
	Laboratory Technician – Batch Manufacturing	250	6	6		N/A	N/A	1.3E–02		
	ONU	250	37	27		N/A	N/A	1.7E–02	0.15	
Repackaging	Drum Filler	250	6	0	2E–02 to 4E–02	N/A	N/A	1.0	1.5	Analogous data from <i>trans</i> -1,2-dichloroethylene test order data (incorporation into formulation) (Exponent, 2023). Surrogate DCM data (Unocal Corporation, 1987)
	Packaging Operator	250	6	0		N/A	N/A	28	130	
	Drum Filler (DCM)	250	4	0	N/A	9.3	81	N/A	N/A	
	ONU ^e	250	12	0	2E–02 to 4E–02	N/A	N/A	1.4		
Processing as a Reactant	Outside Lead Operator/B-Operator – Batch Manufacturing	250	5	1	2E–02 to 4E–02	N/A	N/A	0.11	0.57	Analogous data from <i>trans</i> -1,2-dichloroethylene test order data (manufacturing as primary product) (Exponent, 2023). Surrogate DCM data (TNO (CIVO), 1999 ; Olin, 1979)
	Operator – Distillation Operation	250	13	7		N/A	N/A	1.3E–02	0.79	
	Laboratory Technician – Batch Manufacturing	250	6	6		N/A	N/A	1.3E–02		

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OES ^{jk}	SEG Description	Exposure Days (day/yr)	Number of Samples	Number of Non-Detects ^a	LOD (ppm)	Short-Term Inhalation Estimates ^b (ppm)		Full-Shift Inhalation Estimates ^c (ppm)		Sources for Inhalation Data ^{de}
						Central Tendency	High-End	Central Tendency	High-End	
Processing as a Reactant	Worker (DCM)	250	2	0	N/A	300	470	N/A	N/A	Analogous data from <i>trans</i> -1,2-dichloroethylene test order data (manufacturing as primary product) (Exponent, 2023). Surrogate DCM data (TNO (CIVO), 1999 ; Olin, 1979)
	ONU	250	37	27	2E-02 to 4E-02	N/A	N/A	1.7E-02	0.15	
Incorporation into Formulation, Mixture, or Reaction Product	Packaging Operator – Container Packaging (3M 1)	250	6	0	2E-02 to 4E-02	N/A	N/A	67	120	<i>trans</i> -1,2-Dichloroethylene test order data (Exponent, 2023)
	Process Operator (3M 1)	250	8	0		N/A	N/A	1.5	3.0	
	Technician – Aerosol Packaging (Microcare)	250	6	0		N/A	N/A	13	58	
	Technician – Blending (Microcare)	250	8	0		N/A	N/A	5.9	45	
	Production Technician (BASF)	250	9	0		N/A	N/A	0.76	5.2	
	Batch Maker (Huntsman)	250	9	0		N/A	N/A	0.38	1.6	
	Drum Filler (Huntsman)	250	6	3		N/A	N/A	1.0	1.5	
	ONU (3M 1, BASF, Microcare, Huntsman)	250	44	2		N/A	N/A	0.32	6.0	
	Coat and Wash Operations Tech (Versum)	250	3	3		N/A	N/A	1.7E-02		
	Distillation Operation Tech (Versum)	250	3	0		N/A	N/A	0.43	0.63	
	Packaging Operator – Bubbler Packaging (Versum)	250	3	3		N/A	N/A	1.7E-02		
	QC Technician (Versum)	250	3	2		N/A	N/A	1.7E-02	9.7E-02	
	RGA Operations Tech (Versum)	250	6	1		N/A	N/A	2.4	6.4	
	ONU (Versum)	250	16	15		N/A	N/A	1.7E-02	3.9E-02	

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OES ^{jk}	SEG Description	Exposure Days (day/yr)	Number of Samples	Number of Non-Detects ^a	LOD (ppm)	Short-Term Inhalation Estimates ^b (ppm)		Full-Shift Inhalation Estimates ^c (ppm)		Sources for Inhalation Data ^{de}
						Central Tendency	High-End	Central Tendency	High-End	
Vapor Degreasing	Technician/Process Mechanic Operating Degreaser (Boeing 1)	250	9	0	2E-02 to 4E-02	N/A	N/A	3.5	7.2	<i>trans</i> -1,2-Dichloroethylene test order data (Exponent, 2023) for full-shift. Technical report (3M, 2010) for short-term.
	Assembler Operating Ultrasonic Machine (3M 2)	250	8	0		N/A	N/A	1.3	2.2	
	Waste Handling/Maintenance Worker (3M 2)	250	3	0		N/A	N/A	11	18	
	Other Data	250	4	0	N/A	17	20	N/A	N/A	
	ONU	250	11	0	2E-02 to 4E-02	N/A	N/A	0.73	1.5	
Misc. Non-Aerosol Use	Aircraft Technician Performing Cleaning Task (Boeing 2)	250	4	0	2E-02 to 4E-02	1.2	2.2	0.90	1.4	<i>trans</i> -1,2-Dichloroethylene test order data (Exponent, 2023)
	Flight Mechanics Performing Flush Cleaning (Boeing 1)	250	9	0		0.96	82	N/A	N/A	
	Technician – Tube Dipping, Edge Cutting and Buffing (3M 3)	250	14	0		N/A	N/A	8.1	28	
	Technician – Slitter Knife Cleaning (3M 5)	250	6	0		N/A	N/A	5.6	17	
	All SEG	250	31	0		N/A	N/A	6.1	22	
	ONU ^e	250	6	0		0.2	1.3	6.1		
Commercial Aerosol Products	Mechanic (Boeing 3)	250	8	0	2E-02 to 4E-02	N/A	N/A	0.19	1.0	<i>trans</i> -1,2-Dichloroethylene test order data (Exponent, 2023). (3M, 2019)
	Technicians (Boeing 1)	250	8	0		N/A	N/A	0.69	6.9	
	Other Data	250	2	0	N/A	5.0	9.2	N/A	N/A	
	All SEG	250	16	0	2E-02 to 4E-02	N/A	N/A	0.42	3.8	
	ONU	250	2	0	2E-02 to 4E-02	N/A	N/A	0.28	0.43	

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OES ^{jk}	SEG Description	Exposure Days (day/yr)	Number of Samples	Number of Non-Detects ^a	LOD (ppm)	Short-Term Inhalation Estimates ^b (ppm)		Full-Shift Inhalation Estimates ^c (ppm)		Sources for Inhalation Data ^{de}
						Central Tendency	High-End	Central Tendency	High-End	
Commercial Aerosol Products	Auto Mechanic (3%) using 85 g in 1.7 min	250	N/A	N/A	N/A	4.8		N/A		Modeled using Consumer Exposure Model
	Auto Mechanic (3%) using 255 g in 5 min	250				18				
	Auto Mechanic (51%) using 85 g in 1.7 min	250				81				
	Auto Mechanic (51%) using 170 g in 3.4 min	250				184				
	Auto Mechanic (90%) using 85 g in 1.7 min	250				144				
	Auto Mechanic (90%) using 255 g in 5 min	250				530				
Application of Paints and Coatings	Spray Application	250	27	2	N/A	3.9	20	15	80	Surrogate data – DCM ^f
	Unknown Application Method	250	271	0		1.2	24	2.7	57	
	ONU ^e	250	298	2		N/A	N/A	3.6		
Adhesives and Sealants	Spray Coating	250	99	5	N/A	37	170	260	570	Surrogate data – DCM and 1-BP ^g
	Non-Spray Coating	250	100	18		120	160	2.3	65	
	Unknown Application Method	250	468	0		N/A	N/A	6.0	150	
	ONU ^e	250	667	23		N/A	N/A	7.8		
Blowing Agent in Spray Foam	Worker	250	84	1	N/A	4.3	14	42	220	Surrogate data – DCM ^h
	ONU ^e	250	84	1		N/A	N/A	42		
	Spray Foam – Gap Filler	250	N/A	N/A	N/A	8.8		N/A		Modeled using Consumer Exposure Model
	Spray Foam – Open Cell	250				252				
Laboratory Use	Laboratory Technician – Batch Manufacturing	250	6	6	2E–02 to 4E–02	N/A	N/A	1.3E–02		<i>trans</i> -1,2-Dichloroethylene test order data (manufacturing as primary product) (Exponent, 2023)
	ONU ^e	250	6	6		N/A	N/A	1.3E–02		

OES ^{j,k}	SEG Description	Exposure Days (day/yr)	Number of Samples	Number of Non-Detects ^a	LOD (ppm)	Short-Term Inhalation Estimates ^b (ppm)		Full-Shift Inhalation Estimates ^c (ppm)		Sources for Inhalation Data ^{d,e}
						Central Tendency	High-End	Central Tendency	High-End	
Refrigerant and Refrigerant Flush	Worker	250	22	0	2E-02 to 4E-02	N/A	N/A	6.1	22	Analogous data from <i>trans</i> -1,2-dichloroethylene test order data (misc. non-aerosol use) (Exponent, 2023)
	ONU ^e	250	22	0		N/A	N/A	6.1		
Waste Handling, Disposal, and Treatment	Worker – Landfill	250	3	0	N/A	N/A	N/A	2.0E-02	0.29	Area monitoring data and surrogate data – DCM and 1,2-DCA ^{i,j}
	Worker – Incineration	250	22	0		N/A	N/A	0.51	18	
	Worker – POTW and Non-POTW	250	3	0		N/A	N/A	0.37	0.99	
	ONU ^e	250	28	0		N/A	N/A	0.47		

1-BP = 1-bromopropane; 1,2-DCA = 1,2-dichloroethane; DCM = dichloromethane; EPA = Environmental Protection Agency; LOD = limit of detection; OES = occupational exposure scenario; ONU = occupational non-user; POTW = publicly owned treatment works; RGA = return goods authorization; SEG = similar exposure group; TWA = time-weighted average; WWT = wastewater treatment

^a Values below the limit of detection were replaced with LOD ÷ 2, unless otherwise noted.

^b Short-term exposure estimates are derived from 15- to 127-minute duration monitoring samples.

^c Full-shift exposure estimates are 8-hour TWAs.

^d Additional information on the sources for the inhalation data can be found in Table 4-3.

^e When EPA was not able to estimate ONU inhalation exposure from monitoring data, ONU exposure was assumed equivalent to the central tendency experienced by workers for the corresponding OES.

^f (OSHA, 2019; (DOEHRS-IH), 2018; Finkel, 2017; U.S. EPA, 1985; NIOSH, 1973)

^g (OSHA, 2019; Finkel, 2017; OSHA, 2013; Hanley et al., 2009; NIOSH, 2003, 2002; Reh et al., 2002; TNO (CIVO), 1999; IPCS, 1996; NIOSH, 1985; U.S. EPA, 1985)

^h (OSHA, 2019; IARC, 2016; TNO (CIVO), 1999; IPCS, 1996; Vulcan Chemicals, 1991; NIOSH, 1990; Olin Chemicals, 1987; U.S. EPA, 1985; Cone Mills, 1982, 1981)

ⁱ ((DOEHRS-IH), 2018; Finkel, 2017; Lehtinen and Veijanen, 2011; ATSDR, 1996; U.S. EPA, 1985)

^j EPA believes that workers are not exposed to *trans*-1,2-dichloroethylene during semiconductor manufacturing and, therefore, considered the exposure pathway to be incomplete and did not assess exposure for this OES.

^k For the purpose of this risk evaluation, distribution in commerce is the transportation of *trans*-1,2-dichloroethylene and *trans*-1,2-dichloroethylene-containing products between sites at which *trans*-1,2-dichloroethylene manufacturing, processing, and use occurs or the transportation of *trans*-1,2-dichloroethylene-containing wastes for recycling or disposal. EPA expects all of the above mentioned materials to be transported in a closed system or otherwise to be transported in a form (e.g., articles containing *trans*-1,2-dichloroethylene) such that there is negligible potential for occupational exposure except during an incident.

1506 **Table 4-7. Summary of Occupational Inhalation Exposure Metrics**

OES ^{b c}	SEG Description	8-Hour TWA Exposures ^a		Acute, Non-Cancer Exposures		Intermediate, Non-Cancer Exposures		Chronic, Non-Cancer Exposures	
		8-Hour TWA (ppm)		AC _{24-hr} TWA (ppm)		ADC _{24-hr} TWA (ppm)		ADC _{24-hr} TWA(ppm)	
		Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End
Manufacturing as a Primary Product	Outside Lead Operator/B-Operator – Batch Manufacturing	0.11	0.57	7.4E–02	0.39	5.4E–02	0.29	5.1E–02	0.27
	Operator – Distillation Operation	1.3E–02	0.79	1.3E–02	0.79	8.5E–03	0.54	6.2E–03	0.40
	Shipping/Warehouse Worker – Batch Manufacturing	8.3	30	5.7	20	4.2	15	3.9	14
	Laboratory Technician – Batch Manufacturing	1.3E–02		8.5E–03	8.8E–03	6.3E–03	6.4E–03	5.8E–03	6.0E–03
	ONU	1.7E–02	0.15	1.2E–02	0.10	8.7E–03	7.4E–02	8.1E–03	7.0E–02
Manufacturing as a Byproduct	Outside Lead Operator/B-Operator – Batch Manufacturing	0.11	0.57	7.4E–2	0.39	5.4E–02	0.29	5.1E–02	0.27
	Operator – Distillation Operation	1.3E–02	0.79	1.3E–02	0.79	8.5E–03	0.54	6.2E–03	0.40
	Laboratory Technician – Batch Manufacturing	1.3E–02		8.5E–03	8.8E–03	6.3E–03	6.4E–03	5.8E–03	6.0E–03
	ONU	1.7E–02	0.15	1.2E–02	0.10	8.7E–03	7.4E–02	8.1E–03	7.0E–02
Repackaging	Drum Filler	1.0	1.5	0.68	1.0	0.50	0.75	0.46	0.70
	Packaging Operator	28	130	46	83	33	61	31	57
	ONU	1.4		0.98	0.98	0.72	0.72	0.45	0.67
Processing as a Reactant	Outside Lead Operator/B-Operator – Batch Manufacturing	0.11	0.57	7.4E–02	0.39	5.4E–02	0.29	5.1E–02	0.27
	Operator – Distillation Operation	1.3E–02	0.79	1.3E–02	0.79	8.5E–03	0.54	6.2E–03	0.40

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OES ^{b c}	SEG Description	8-Hour TWA Exposures ^a		Acute, Non-Cancer Exposures		Intermediate, Non-Cancer Exposures		Chronic, Non-Cancer Exposures	
		8-Hour TWA (ppm)		AC ₂₄ -hr TWA (ppm)		ADC ₂₄ -hr TWA (ppm)		ADC ₂₄ -hr TWA(ppm)	
		Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End
Processing as a Reactant	Laboratory Technician – Batch Manufacturing	1.3E-02		8.5E-03	8.8E-03	6.3E-03	6.4E-03	5.8E-03	6.0E-03
	ONU	1.7E-02	0.15	1.2E-02	0.10	8.7E-03	7.4E-02	8.1E-03	7.0E-02
Incorporation into Formulation, Mixture, or Reaction Product	Packaging Operator – Container Packaging (3M 1)	67	120	46	83	33	61	31	57
	Process Operator (3M 1)	1.5	3.0	1.0	2.0	0.75	1.5	0.71	1.4
	Technician – Aerosol Packaging (Microcare)	13	58	8.7	39	6.4	29	5.9	27
	Technician – Blending (Microcare)	5.9	45	4.0	31	3.0	23	2.8	21
	Production Technician (BASF)	0.76	5.2	0.51	3.5	0.38	2.6	0.35	2.4
	Batch Maker (Huntsman)	0.38	1.6	0.26	1.1	0.19	0.82	0.18	0.77
	Drum Filler (Huntsman)	1.0	1.5	0.68	1.0	0.50	0.75	0.46	0.70
	ONU (3M 1, BASF, Microcare, Huntsman)	0.32	6.0	0.21	4.1	0.16	3.0	0.15	2.8
	Coat and Wash Operations Tech (Versum)	0.17		1.2E-02	1.2E-02	8.7E-03	8.7E-03	8.1E-03	8.1E-03
	Distillation Operation Tech (Versum)	0.43	0.63	0.29	0.43	0.21	0.32	0.20	0.29
	Packaging Operator – Bubbler Packaging (Versum)	1.7E-02		1.2E-02	1.2E-02	8.6E-03	8.6E-03	8.1E-03	8.1E-03
	QC Technician (Versum)	1.7E-02	9.7E-02	1.2E-02	6.6E-02	8.6E-03	4.8E-02	8.1E-03	4.5E-02

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OES ^{b c}	SEG Description	8-Hour TWA Exposures ^a		Acute, Non-Cancer Exposures		Intermediate, Non-Cancer Exposures		Chronic, Non-Cancer Exposures	
		8-Hour TWA (ppm)		AC ₂₄ -hr TWA (ppm)		ADC ₂₄ -hr TWA (ppm)		ADC ₂₄ -hr TWA(ppm)	
		Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End
Incorporation into Formulation, Mixture, or Reaction Product	RGA Operations Tech (Versum)	2.4	6.4	1.6	4.4	1.2	3.2	1.1	3.0
	ONU (Versum)	1.7E-02	3.9E-02	1.2E-02	2.7E-02	8.6E-03	2.0E-02	8.3E-03	1.8E-02
Vapor Degreasing	Technician/Process Mechanic Operating Degreaser (Boeing 1)	3.5	7.2	2.4	4.9	1.8	3.6	1.6	3.3
	Assembler Operating Ultrasonic Machine (3M 2)	1.3	2.2	0.9	1.5	0.66	1.1	0.62	1.0
	Waste Handling/Maintenance Worker (3M 2)	11	18	7.7	13	5.7	9.2	5.3	8.6
	ONU	0.74	1.5	0.50	0.99	0.37	0.72	0.34	0.68
Misc. Non-Aerosol Use	Aircraft Technician Performing Cleaning Task (Boeing 2)	0.90	1.4	0.61	0.97	0.45	0.71	0.42	0.67
	Technician – Tube Dipping, Edge Cutting and Buffing (3M 3)	8.1	28	5.5	19	4.0	14	3.8	13
	Technician – Slitter Knife Cleaning (3M 5)	5.6	17	3.8	12	2.8	8.5	2.6	8.0
	All SEG	6.1	22	4.1	15	3.0	11	2.8	10
	ONU	6.1		4.1	4.1	3.0	3.0	2.8	2.8
Commercial Aerosol Products	Mechanic (Boeing 3)	0.19	1.0	0.13	0.68	9.3E-02	0.50	8.7E-02	0.47
	Technicians (Boeing 1)	0.69	6.9	0.47	4.7	0.35	3.4	0.32	3.2
	All SEG	0.42	3.8	0.28	2.6	0.21	1.9	0.19	1.8
	ONU	0.28	0.43	5.4E-02	8.1E-02	3.5E-02	5.9E-02	3.7E-02	5.5E-02

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OES ^{b c}	SEG Description	8-Hour TWA Exposures ^a		Acute, Non-Cancer Exposures		Intermediate, Non-Cancer Exposures		Chronic, Non-Cancer Exposures	
		8-Hour TWA (ppm)		AC ₂₄ -hr TWA (ppm)		ADC ₂₄ -hr TWA (ppm)		ADC ₂₄ -hr TWA(ppm)	
		Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End
Application of Paints and Coatings	Spray Application	15	80	10	54	7.6	40	7.1	37
	Unknown Application Method	2.7	57	1.8	39	1.3	29	1.3	27
	ONU	3.6		1.8	1.8	1.3	1.3	1.3	1.3
Adhesives and Sealants	Spray Coating	260	570	177	390	130	280	120	270
	Non-Spray Coating	2.3	65	1.6	44	1.1	32	1.1	30
	Unknown Application Method	6.0	150	4.1	100	3.0	75	2.8	70
	ONU	7.8		5.3	5.3	3.9	3.9	3.6	3.6
Blowing Agent in Spray Foam	Worker	42	220	28	150	21	110	19	100
	ONU	42		28	28	21	21	19	19
Laboratory Use	Laboratory Technician – Batch Manufacturing	1.3E-02		8.5E-03	8.8E-03	6.3E-03	6.4E-03	5.8E-03	6.0E-03
	ONU	1.3E-02		8.5E-03	8.5E-03	6.3E-03	6.3E-03	5.8E-03	5.8E-03
Refrigerant and Refrigerant Flush	Worker	6.1	22	4.1	15	3.0	11	2.8	10
	ONU	6.1		4.1	4.1	3.0	3.0	2.8	2.8
Waste Handling, Disposal, and Treatment	Worker – Landfill	2.0E-02	0.29	1.4E-02	0.20	9.9E-03	0.14	9.3E-03	0.14
	Worker – Incineration	0.51	18	0.35	12	0.26	8.8	0.24	8.2
	Worker – POTW and Non-POTW	0.37	0.99	0.25	0.67	0.19	0.49	0.17	0.46
	ONU	0.47		0.32	0.32	0.24	0.24	0.22	0.22

EPA = Environmental Protection Agency; OES = occupational exposure scenario; ONU = occupational non-user; POTW = publicly owned treatment works; RGA = return goods authorization; SEG = similar exposure group; TWA = time-weighted average; WWT = wastewater treatment

^a Full-shift exposure estimates are 8-hour TWAs.

^b EPA believes that workers are not exposed to *trans*-1,2-dichloroethylene during semiconductor manufacturing and, therefore, considered the exposure pathway to be incomplete and did not assess exposure for this OES.

^c For the purpose of this risk evaluation, distribution in commerce is the transportation of *trans*-1,2-dichloroethylene and *trans*-1,2-dichloroethylene-containing products between sites at which *trans*-1,2-dichloroethylene manufacturing, processing, and use occurs or the transportation of *trans*-1,2-dichloroethylene-containing wastes for

OES ^{b c}	SEG Description	8-Hour TWA Exposures ^a		Acute, Non-Cancer Exposures		Intermediate, Non-Cancer Exposures		Chronic, Non-Cancer Exposures	
		8-Hour TWA (ppm)		AC ₂₄ -hr TWA (ppm)		ADC ₂₄ -hr TWA (ppm)		ADC ₂₄ -hr TWA(ppm)	
		Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End
recycling or disposal. EPA expects all of the above mentioned materials to be transported in closed system or otherwise to be transported in a form (<i>e.g.</i> , articles containing <i>trans</i> -1,2-dichloroethylene) such that there is negligible potential for occupational exposure except during an incident.									

Table 4-8. Summary of Occupational Dermal Exposure Metrics

OES ^{a b}	Acute Absorbed Dose Rate		Acute Absorbed Dose		Intermediate Absorbed Dose, Non-Cancer		Chronic Absorbed Dose, Non-Cancer	
	AADR (mg/day)		AAD (mg/kg-day)		IAD (mg/kg-day)		CAD (mg/kg-day)	
	Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End
Manufacturing as a Primary Product	7.4	21	9.2E-02	0.26	6.8E-02	0.19	6.3E-02	0.18
Manufacturing as a Byproduct	9.7E-02	0.27	1.2E-03	3.4E-03	8.9E-04	2.5E-03	8.3E-04	2.5E-03
Repackaging	7.8	22	9.7E-02	0.27	7.1E-02	0.20	5.4E-02	0.16
Processing as a Reactant	7.8	22	9.7E-02	0.27	7.1E-02	0.20	6.6E-02	0.19
Incorporation into Formulation, Mixture, or Reaction Product	3.1	14	3.8E-02	0.17	2.8E-02	0.13	2.6E-02	0.12
Vapor Degreasing	4.7	16	5.8E-02	0.20	4.3E-02	0.15	4.0E-02	0.14
Misc. Non-Aerosol Use	2.7	12	3.3E-02	0.15	2.4E-02	0.11	2.3E-02	0.10
Commercial Aerosol Products	2.7	12	3.4E-02	0.15	2.5E-02	0.11	2.3E-02	0.10
Application of Paints and Coatings	3.3	11	4.1E-02	0.14	3.0E-02	0.10	2.8E-02	9.8E-02
Adhesives and Sealants	0.60	8.8	7.5E-03	0.11	5.5E-03	8.0E-02	5.1E-03	7.5E-02
Blowing Agent in Spray Foam	0.21	0.68	2.6E-03	8.5E-03	1.9E-03	6.2E-03	1.8E-03	5.8E-03
Laboratory Use	1.9	11	2.4E-02	0.14	1.8E-02	0.10	1.3E-02	7.7E-02
Refrigerant and Refrigerant Flush	4.0	13	5.0E-02	0.16	3.7E-02	0.12	3.4E-02	0.11
Waste Handling, Disposal, and Treatment	3.1	14	3.8E-02	0.17	2.8E-02	0.13	2.6E-02	0.12

OES ^{a b}	Acute Absorbed Dose Rate		Acute Absorbed Dose		Intermediate Absorbed Dose, Non-Cancer		Chronic Absorbed Dose, Non-Cancer	
	AADR (mg/day)		AAD (mg/kg-day)		IAD (mg/kg-day)		CAD (mg/kg-day)	
	Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End
^a EPA believes that workers are not exposed to <i>trans</i>-1,2-dichloroethylene during semiconductor manufacturing and, therefore, considered the exposure pathway to be incomplete and did not assess exposure for this occupational exposure scenario (OES). ^b For the purpose of this risk evaluation, distribution in commerce is the transportation of <i>trans</i>-1,2-dichloroethylene and <i>trans</i>-1,2-dichloroethylene-containing products between sites at which <i>trans</i>-1,2-dichloroethylene manufacturing, processing, and use occurs or the transportation of <i>trans</i>-1,2-dichloroethylene-containing wastes for recycling or disposal. EPA expects all of the aforementioned materials to be transported in closed system or otherwise to be transported in a form (<i>e.g.</i>, articles containing <i>trans</i>-1,2-dichloroethylene) such that there is negligible potential for occupational exposure except during an incident.								

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4.1.1.3 Estimate the Number of Workers and Occupational Non-Users Potentially Exposed

Where available, EPA used CDR data to provide a basis to estimate the number of workers and ONUs. EPA supplemented the available CDR data using available market data; NAICS and Standard Industrial Classification (SIC) code data from TRI, and DMR identified for each COU; U.S. Bureau of Labor Statistics (BLS) and U.S. Census data; and GSs and ESDs.

Methodology

Data were available from the 2016, 2020, and 2024 CDR for manufacturing sites; however, the Agency determined this was not sufficient to determine the total number of workers for the manufacturing OES. EPA supplemented the available CDR data using the methodology described in the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* (U.S. EPA, 2026g). Where market penetration data and site-specific NAICS/SIC codes from TRI/DMR were not available, EPA estimated the number of workers using data from GSs and ESDs. For additional details on development of estimates of number of workers refer to the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* (U.S. EPA, 2026g). EPA also determined the number of days per year that workers are potentially exposed to *trans*-1,2-dichloroethylene. In general, the exposure frequency is the same as the number of operating days per year for a given OES. However, if the number of operating days exceeded 250 days per year, EPA assumed that a single worker would not work more than 250 days per year such that the maximum exposure days per year was still 250. See Table 4-6 for the number of worker exposures assumed for each OES.

Results

Table 4-9 provides a summary for the number of workers and ONUs potentially exposed to *trans*-1,2-dichloroethylene per facility. The estimates are provided for a facility within each OES.

Table 4-9. Total Number of Workers and ONUs Potentially Exposed to *trans*-1,2-Dichloroethylene for Each OES

OES ^{b c}	Potential Number of Sites	Potential Number of Workers per Site ^a (Total Workers per OES)	Potential Number of ONUs per Site ^a (Total ONUs per OES)
Manufacturing as a Primary Product	1	33 (33)	16 (16)
Manufacturing as a Byproduct	9	33 (297)	16 (144)
Repackaging	Unknown ^d	1 ^d	1 ^d
Processing as a Reactant	9	27 (243)	15 (135)
Incorporation into Formulation, Mixture, or Reaction Product	7	12 (84)	7 (49)
Vapor Degreasing	1 to 1,021 (median of 40) ^e	76 (3,040 median)	22 (880 median)
Misc. Non-Aerosol Use	5	76 (380)	22 (110)
Commercial Aerosol Products	2	76 (152)	22 (44)
Application of Paints and Coatings	1 to 494,000 (median of 291) ^e	6 (1,746 median)	2 (582 median)
Adhesives and Sealants	1 to 494,000 (median of 291) ^e	6 (1,746 median)	2 (582 median)
Blowing Agent in Spray Foam	Unknown ^d	6 ^d	1 ^d

OES ^{b c}	Potential Number of Sites	Potential Number of Workers per Site ^a (Total Workers per OES)	Potential Number of ONUs per Site ^a (Total ONUs per OES)
Laboratory Use	9 to 18,400 (median of 84) ^e	6 (504)	10 (840)
Refrigerant and Refrigerant Flush	Unknown ^d	6 ^d	1 ^d
Waste Handling, Disposal, and Treatment	343 ^f	10 (3430)	11 (3,773)

CDR = Chemical Data Reporting; DMR = Discharge Monitoring Report; NEI = National Emissions Inventory; OES = occupational exposure scenario; ONU = occupational non-user; PV = production volume; TRI = Toxics Release Inventory

^a Number of workers and ONUs estimates based on U.S. Census Bureau Data, U.S. BLS data and CDR ([U.S. BLS, 2023](#); [U.S. Census Bureau, 2017](#)).

^b EPA believes that workers are not exposed to *trans*-1,2-dichloroethylene during semiconductor manufacturing and, therefore, considered the exposure pathway to be incomplete and did not assess exposure for this OES.

^c For the purpose of this risk evaluation, distribution in commerce is the transportation of *trans*-1,2-dichloroethylene and *trans*-1,2-dichloroethylene-containing products between sites at which *trans*-1,2-dichloroethylene manufacturing, processing, and use occurs or the transportation of *trans*-1,2-dichloroethylene-containing wastes for recycling or disposal. EPA expects all of the above mentioned materials to be transported in closed system or otherwise to be transported in a form (e.g., articles containing *trans*-1,2-dichloroethylene) such that there is negligible potential for occupational exposure except during an incident.

^d EPA did not identify a specific number of facilities from CDR or TRI that exclusively conduct this use of *trans*-1,2-dichloroethylene. Therefore, EPA did not find a total number of workers and ONUs for this OES.

^e No data on number of facilities was found in the programmatic data (CDR, TRI, DMR, NEI), and so the number of sites was modeled using the assumed PV for the use.

^f Number of facilities obtained from adding the reporting facilities from DMR (325 facilities) and TRI (18 facilities). This may overestimate number of sites as some facilities may have reported to both databases.

4.1.1.4 Weight of Scientific Evidence Conclusions for Occupational Exposure

EPA considered the assessment approach, the quality of the data, and uncertainties in assessment results to determine a weight of scientific evidence conclusion for the occupational exposure estimates. In Table 4-10 summarizes EPA's overall confidence in the occupational exposure estimates for each OES. Additionally, Table 4-10 summarizes the weight of scientific evidence rating for the dermal assessment approach, which was utilized across all OES. For more detail on the weight of scientific evidence determinations, see the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-dichloroethylene* ([U.S. EPA, 2026g](#)).

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Table 4-10. Weight of Scientific Evidence Conclusion in Exposure Estimates

OES (or Assessment)	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates ^a
Manufacturing as a Primary Product(OES #1)	Evidence Found: For this OES, EPA used inhalation monitoring data from a facility that manufactures <i>trans</i>-1,2-dichloroethylene as a primary product provided via a test order submission from the TDCE Consortium (Exponent, 2023). Strengths: The primary strengths of the inhalation occupational exposure estimates for this OES include the use of personal breathing zone samples directly applicable to this OES, which are preferable to other assessment approaches such as modeling or the use of OELs, and the high number of samples available for workers and ONUs. EPA used full-shift PBZ air concentration data to assess inhalation exposures, with the data source having a high data quality rating from the systematic review process. The data included 29 worker and 37 ONU full-shift PBZ samples at 1 manufacturing facility. Out of the 66 total samples, 24 were quantified samples (<i>i.e.</i>, samples above the method LOD). A strength is that the LOD is below the draft OEV (Appendix F), which provides confidence that non-detects will not contribute to risk. Another strength is that the monitoring data was collected in accordance with sampling plan that has been reviewed and approved by EPA, and includes all of the agreed upon metadata. Limitations/Assumptions/Uncertainties: Out of the 29 worker samples used for this OES, 14 were below the method limit of detection. Having a high number of non-detects adds uncertainty to the assessment because in these cases estimation methods (such as substituting the non-detect sample with the LOD/2) is used to quantify the unknown values. The SEG with the highest proportion of non-detects was the SEG of Laboratory Technician – Batch Manufacturing, where all 6 samples were non-detects. This increases the uncertainty in the resulting exposure estimate because assumptions were required to quantify all values associated with this SEG. ONUs had the second highest proportion of non-detects (of 37 total samples, 27 were non-detect). Although there were some detected samples, assumptions were required to quantify a majority of samples in this dataset. For ONUs, the non-detects increase the uncertainty in the central tendency value in particular, because while the calculated high-end value falls among the measured values in the dataset, all that is known of the central tendency is that it is below the method’s limit of detection. The remaining three SEGs (Outside Lead Operator/B-Operator – Batch Manufacturing, Operator – Distillation Operation, and Shipping/Warehouse Worker – Batch Manufacturing) have a larger portion of their datasets (around half or more) above the limit of detection, which increases the confidence in these cases. There were data in the test order summary report that indicated that certain tasks (those done by the Outside Lead Operator/B-Operator – Batch Manufacturing, Operator – Distillation Operation, and Laboratory Technician – Batch Manufacturing) are done on a daily basis, while the tasks that are completed by the Shipping/Warehouse Worker – Batch Manufacturing were periodic, without providing more detail. Overall, EPA assumed 250 exposure days/year based on <i>trans</i>-1,2-dichloroethylene exposure each working day for a typical worker schedule. Weight of Scientific Evidence Conclusion: Based on these strengths and limitations, EPA has concluded that the weight of scientific evidence for this assessment provides robust confidence in the estimate of exposures for three worker SEGs (Outside Lead Operator/B-Operator – Batch Manufacturing, Operator – Distillation Operation, and Shipping/Warehouse

OES (or Assessment)	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates ^a
	Worker – Batch Manufacturing), moderate confidence in the worker SEG of Laboratory Technician – Batch Manufacturing, and moderate-to-robust confidence in the ONU SEG due to the number of non-detects in these later two datasets.
Manufacturing as a Byproduct (OES #2)	Evidence Found: EPA did not identify monitoring data for the manufacturing of <i>trans</i>-1,2-dichloroethylene as a byproduct. Based on available data, EPA used analogous data from the manufacturing of <i>trans</i>-1,2-dichloroethylene as a primary product provided via a test order submission from the TDCE Consortium (Exponent, 2023). Strengths: The primary strengths of the inhalation occupational exposure estimates for this OES include the use of personal breathing zone samples, the high number of samples available for workers and ONUs. EPA used full-shift PBZ air concentration data to assess inhalation exposures, with the data source having a high data quality rating from the systematic review process. The data included 29 worker and 37 ONU full-shift PBZ samples at one manufacturing facility. 24 of the 29 worker samples were considered relevant for this OES, and all ONU samples were considered relevant. Out of the 24 total samples, 12 were quantified samples (as in, samples above the method LOD). A strength is that the LOD is below the draft OEV (Appendix F), which provides confidence that non-detects will not contribute to risk. Another strength is that the monitoring data was collected in accordance with sampling plan that has been reviewed and approved by EPA, and includes all the agreed upon metadata. Limitations/Assumptions/Uncertainties: The limitations, assumptions and uncertainties associated with the analogous exposure data extrapolated from the Manufacturing as the Primary Product (OES #1) are outlined under that OES. EPA is uncertain about the similarity of worker exposures when comparing manufacturing as a byproduct vs. manufacturing as a primary product. This is because byproducts may not be produced at a high concentration as primary products are and byproducts are not typically isolated like primary products. There is also uncertainty about similarities in frequency of workers exposure during the two types of manufacturing. Weight of Scientific Evidence Conclusion: Based on the strengths and limitations outlined above, EPA has concluded that the weight of scientific evidence for this assessment provides moderate confidence in the estimate of exposures for two worker SEGs (Outside Lead Operator/B-Operator – Batch Manufacturing and Operator – Distillation Operation), and slight-to-moderate confidence in the worker SEG of Laboratory Technician – Batch Manufacturing and the ONU SEG due to the number of non-detects.
Repackaging (OES #3)	Evidence Found: For this OES, EPA used inhalation monitoring data from facilities that package <i>trans</i>-1,2-dichloroethylene formulations provided via a test order submission from the TDCE Consortium (Exponent, 2023). EPA also used short-term surrogate monitoring data from workers filling drums with dichloromethane (Unocal Corporation, 1987). Strengths: The primary strengths of the inhalation occupational exposure estimates for this OES include the use of personal breathing zone samples directly applicable to this OES, which are preferable to other assessment approaches such as modeling or the use of OELs, and the high number of samples available for workers. EPA used full-shift PBZ air concentration data to assess inhalation exposures, with the data source having a high data quality rating from the systematic

OES (or Assessment)	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates ^a
	review process. Another strength is that the data used from TDCE Consortium were <i>trans</i>-1,2-dichloroethylene-specific from multiple facilities that processes the chemical into formulations, mixtures, or reaction products; the data included 15 worker full-shift PBZ samples at 2 facilities. Out of the 12 total samples, only 3 were below the method detection limit. A strength is that the LOD is below the draft OEV (Appendix F), which provides confidence that non-detects will not contribute to risk. Another strength is that the monitoring data was collected in accordance with sampling plan that has been reviewed and approved by EPA, and includes all of the agreed upon metadata. Limitations/Assumptions/Uncertainties: The primary limitation was that the monitoring data captured packaging activities after a new formulation of <i>trans</i>-1,2-dichloroethylene was created, rather than the repackaging of the chemical without reformulation as is the intent of this OES. It is uncertain how similar packaging activities are to repackaging activities. For example, the underlying monitoring data informing the assessment for the Drum Filler SEG is from working with a formulation that is 1% to 5% <i>trans</i>-1,2-dichloroethylene and the Packaging Operator SEG is from working with a formulation that is 50% to 90% <i>trans</i>-1,2-dichloroethylene, where the Repackaging OES considers handling up to 100% <i>trans</i>-1,2-dichloroethylene. The short-term surrogate monitoring data from workers filling drums with dichloromethane is more than thirty years old and may not be representative of current industrial practices, which limits the usefulness of the data. Another limitation is the use of worker central tendency to estimate the exposure to ONUs, since no data for ONUs were available; this central tendency estimate is based on exposure concentrations for workers across both relevant SEGs. Out of the 12 total worker samples, 3 were below the LOD, and while there is uncertainty as to what these 3 values are, little uncertainty is added to the overall assessment due to these non-detects. Weight of Scientific Evidence Conclusion: Based on these strengths and limitations, EPA has concluded that the weight of scientific evidence for this assessment provides moderate confidence in the estimate of exposures for workers and slight-to-moderate for ONUs.
Processing as a Reactant (OES #4)	Evidence Found: EPA did not identify monitoring data for the processing of <i>trans</i>-1,2-dichloroethylene as a reactant. Based on available data, EPA used analogous data from the manufacturing of <i>trans</i>-1,2-dichloroethylene as a primary product provided via a test order submission from the TDCE Consortium (Exponent, 2023). EPA also used short-term surrogate monitoring data from workers using dichloromethane as a reactant (TNO (CIVO), 1999; Olin, 1979). Strengths: The primary strengths of the inhalation occupational exposure estimates for this OES include the use of personal breathing zone samples, the high number of samples available for workers and ONUs. EPA used full-shift PBZ air concentration data to assess inhalation exposures, with the data source having a high data quality rating from the systematic review process. The data included 29 worker (24 of which were deemed relevant to this OES) and 37 ONU full-shift PBZ samples (all deemed relevant) at one manufacturing facility. A strength is that the LOD is below the draft OEV (Appendix F), which provides confidence that non-detects will not contribute to risk. Another strength is that the monitoring data was collected in accordance with sampling plan that has been reviewed and approved by EPA, and includes all of the agreed upon metadata.

OES (or Assessment)	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates ^a
	The strength of the short-term data is the use of surrogate monitoring data from a similar chemical during a use that is expected to result in similar occupational exposures to <i>trans</i>-1,2-dichloroethylene for this task. The use of surrogate data is preferred over the use of a generic scenario model, which would be used in the absence of data. Limitations/Assumptions/Uncertainties: EPA is uncertain about the similarity of worker exposures when comparing processing as a reactant vs. manufacturing as a primary product. This is because reactants are typically found at lower concentrations in the manufacturing product stream than primary products. Also, out of the 61 total samples used for this OES, 26 were below the method limit of detection. Having a high number of non-detects adds uncertainty to the assessment because in these cases estimation methods (such as substituting the non-detect sample with the LOD/2) is used to quantify the unknown values. The SEG with the highest proportion of non-detects was the SEG of Laboratory Technician – Batch Manufacturing, where all six samples were non-detects. This increases the uncertainty in the resulting exposure estimate because assumptions were required to quantify all values associated with this SEG. The second highest proportion of non-detects was for ONUs, which had 37 total samples, 27 of which were non-detect. Although there were some detected samples, assumptions were required to quantify a majority of samples in this dataset. For ONUs, the non-detects increase the uncertainty in the central tendency value in particular, because while the calculated high-end value falls among the measured values in the dataset, all that is known of the central tendency is that it is below the method's limit of detection. The remaining SEGs (Outside Lead Operator/B-Operator – Batch Manufacturing And Operator – Distillation Operation) had a larger portion of their datasets above the limit of detection (around half or more), which increases the confidence in these cases. The short-term surrogate monitoring data from workers using dichloromethane as a reactant is more than twenty years old and may be representative of current industrial practices, which limits the usefulness of the data. It is also data from a different chemical, which, although dichloromethane is a reasonable surrogate for <i>trans</i>-1,2-dichloroethylene, uncertainty is introduced due to the possibility of different handling practices and behaviors. Weight of Scientific Evidence Conclusion: Based on the strengths and limitations outlined above, for the full-shift assessment, EPA has concluded that the weight of scientific evidence for this assessment provides moderate confidence in the estimate of exposures for two worker SEGs (Outside Lead Operator/B-Operator – Batch Manufacturing and Operator – Distillation Operation). There is slight-to-moderate confidence in the worker SEG of Laboratory Technician – Batch Manufacturing SEG and ONUs due to the number of samples with no detections above the level of detection. For the short-term data, based on the strengths and limitations outlined above, EPA has concluded that the weight of scientific evidence for this assessment is slight-to-moderate.
Incorporation into Formulation, Mixture, or Reaction Product (OES #5)	Evidence Found: For this OES, EPA used inhalation monitoring data from facilities that processes <i>trans</i>-1,2-dichloroethylene into formulations, mixtures, or reaction products provided via a test order submission from the TDCE Consortium (Exponent, 2023).

OES (or Assessment)	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates ^a
	Strengths: The primary strengths of the inhalation occupational exposure estimates for this OES include the use of personal breathing zone samples directly applicable to this OES, which are preferable to other assessment approaches such as modeling or the use of OELs, and the high number of samples available for workers and ONUs. EPA used full-shift PBZ air concentration data to assess inhalation exposures, with the data source having a high data quality rating from the systematic review process. Another strength is that the data used from the TDCE Consortium were <i>trans</i>-1,2-dichloroethylene-specific from multiple facilities that processes the chemical into formulations, mixtures, or reaction products; the data included 70 worker and 60 ONU full-shift PBZ samples at 5 facilities. Out of the 130 total samples, 26 were below the method detection limit (which ranged from <0.02 to <0.04 ppm). A strength is that the LOD is below the draft OEV (Appendix F), which provides confidence that non-detects will not contribute to risk. Another strength is that the monitoring data was collected in accordance with sampling plan that has been reviewed and approved by EPA, and includes all of the agreed upon metadata. Limitations/Assumptions/Uncertainties: There were data in the test order summary report that indicated that certain tasks (Packaging Operator – Container Packaging (3M 1) and Process Operator (3M 1)) are done on a daily basis, while others are done less frequently. Overall, EPA assumed 250 exposure days/year based on <i>trans</i>-1,2-dichloroethylene exposure each working day for a typical worker schedule. Also, out of the 130 total samples, 26 were below the method detection limit. These non-detects most impacted the confidence in the SEGs of Coat and Wash Operation Tech (Versum) (3 samples, 3 non-detects), Packaging Operator – Bubbler Packaging (Versum) (3 samples, 3 non-detects), QC Technician (Versum) (3 samples, 2 non-detects), and ONU (Versum) (16 samples, 15 non-detects). The remaining worker SEGs and the ONU (3M 1, Microcare, BASF, Huntsman) SEG had a larger portion of their datasets (around half or more) above the limit of detection. Weight of Scientific Evidence Conclusion: Based on these strengths and limitations, EPA has concluded that the weight of scientific evidence for this assessment provides robust confidence in the estimate of exposures for all but three worker SEGs and the ONU (Versum). Exposure estimates for ONU (Versum) and the remaining three worker SEGs (Coat and Wash Operation Tech (Versum), Packaging Operator – Bubbler Packaging (Versum), and QC Technician (Versum)) have moderate confidence due to the high number of non-detects.
Vapor Degreasing (OES #6)	Evidence Found: For this OES, EPA used inhalation monitoring data from two facilities that uses <i>trans</i>-1,2-dichloroethylene as a vapor degreasing solvent provided via a test order submission from the TDCE Consortium (Exponent, 2023). Strengths: The primary strengths of the inhalation occupational exposure estimates for this OES include the use of personal breathing zone samples directly applicable to this OES, which are preferable to other assessment approaches such as modeling or the use of OELs, and the high number of samples available for workers and ONUs. EPA used full-shift PBZ air concentration data to assess inhalation exposures, with the data source having a high data quality rating from the systematic review process. The data included 20 worker and 11 ONU full-shift PBZ samples at two facilities. Out of the 31 total

OES (or Assessment)	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates ^a
	samples, none were below the method detection limit. Another strength is that the monitoring data was collected in accordance with sampling plan that has been reviewed and approved by EPA, and includes all of the agreed upon metadata. Limitations/Assumptions/Uncertainties: Although expected to be representative of the industry, this is a single dataset for two facilities and it is not known whether the operations and equipment are representative of other facilities in the OES. This uncertainty is inherent when applying a finite dataset to characterize potential exposures across all facilities, operating conditions, and work practices within the industry. Weight of Scientific Evidence Conclusion: Based on these strengths and limitations, EPA has concluded that the weight of scientific evidence for this assessment provides robust confidence in the estimate of exposures for workers and ONUs.
Miscellaneous Non-Aerosol Industrial and Commercial Uses (Cleaning and Degreasing Agents, Lubricants and Greases, Mold Release) (OES #7)	Evidence Found: For this OES, EPA used inhalation monitoring data from three facilities that use <i>trans</i>-1,2-dichloroethylene as a non-aerosol solvent for cleaning and degreasing provided via a test order submission from the TDCE Consortium (Exponent, 2023). Strengths: The primary strengths of the inhalation occupational exposure estimates for this OES include the use of personal breathing zone samples directly applicable to this OES, which are preferable to other assessment approaches such as modeling or the use of OELs, and the high number of samples available for workers and ONUs. EPA used full-shift PBZ air concentration data to assess inhalation exposures, with the data source having a high data quality rating from the systematic review process. The data included 22 worker full-shift PBZ samples at a facility. Out of the 36 total samples, only 4 were below the method detection limit. EPA also obtained 17 short-term from the same test order submission. Another strength is that the monitoring data was collected in accordance with sampling plan that has been reviewed and approved by EPA, and includes all of the agreed upon metadata. Limitations/Assumptions/Uncertainties: EPA did not find data for lubricants and greases sub-OES or the mold release sub-OES. Although expected to be representative of the industry, this dataset is for three facilities and it is not known whether the operations and equipment are representative of other facilities in the OES. This uncertainty is inherent when applying a finite dataset to characterize potential exposures across all facilities, operating conditions, and work practices within the industry. Out of the 36 total worker samples, 4 were below the LOD, and there is uncertainty as to what these 4 values are. For the Aircraft Technician Performing Cleaning Task SEG, only two samples were provided. Another limitation, specific to the exposure estimate for ONUs, is the use of worker central tendency to estimate the exposure to ONUs, since no data for ONUs were available. Weight of Scientific Evidence Conclusion: Based on these strengths and limitations, EPA has concluded that the weight of scientific evidence for this assessment provides robust confidence in the estimate of exposures for all but 1 SEG of workers, and moderate-to-robust confidence in the estimate of exposures for ONUs (due to using worker CT for the estimate) and the SEG of Aircraft Technician Performing Cleaning Task (due to having only 2 data points).

OES (or Assessment)	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates ^a
	When the SEGs are combined into one estimate to represent the OES of Misc. Non-Aerosol Industrial and Commercial Uses more broadly, EPA has moderate-to-robust confidence in this dataset due to the number and quality of samples but acknowledges that combining SEGs may lead to over- or under-estimations of exposures (higher exposure SEGs may bring the combined exposure value up, while lower exposure SEGs may bring the combined exposure value down).
Commercial Aerosol Products (Aerosol Degreasing, Aerosol Lubricants, Mold Release) (OES #8)	Evidence Found: For this OES, EPA used inhalation monitoring data from two facilities that use <i>trans</i>-1,2-dichloroethylene as an aerosol solvent for cleaning and degreasing provided via a test order submission from the TDCE Consortium (Exponent, 2023). In addition, modeling was used to supplement analysis of the exposure to mechanics in an autobody shop for the lubricants and degreasing COU, which was not captured in the test order data. For short-term exposures, EPA used two short-term PBZ monitoring samples collected during aerosol degreasing using <i>trans</i>-1,2-dichloroethylene (3M, 2019). Strengths: The primary strengths of the inhalation occupational exposure estimates for this OES include the use of personal breathing zone samples directly applicable to this OES, which are preferable to other assessment approaches such as modeling or the use of OELs, and the high number of samples available for workers and ONUs. EPA used full-shift PBZ air concentration data to assess inhalation exposures, with the data source having a high data quality rating from the systematic review process. The data included 16 worker and 2 ONU full-shift PBZ samples at a facility. Out of the 18 total samples, none were below the method detection limit. EPA also obtained 2 short-term from the same test order submission. Another strength is that the monitoring data was collected in accordance with sampling plan that has been reviewed and approved by EPA, and includes all of the agreed upon metadata. CEM was used to model exposures for a commercial auto repair garage space using ASHRAE 62.1 ventilation rates standards. The product compositions used in the modeling analysis were pulled from a range of available SDS. For short-term exposures, the primary strength is the recent PBZ data that is directly applicable to the use. Limitations/Assumptions/Uncertainties: EPA did not find data for the lubricants and greases sub-OES or the mold release sub-OES. This dataset is for two facilities and it is not known whether the operations and equipment are representative of other facilities in the OES. Therefore, modeling was used to estimate exposure for mechanics in autobody shops, which required making assumptions about frequency and duration of use. For the case of ONU exposure, the small number of full-shift samples (two) is a limitation of this dataset. For short-term exposures, the primary limitation of the dataset is the small number of samples (only two points in the dataset), which may not represent the highest exposures that a worker or ONU may encounter. Weight of Scientific Evidence Conclusion: Based on these strengths and limitations, EPA has concluded that the weight of scientific evidence for this assessment provides robust confidence in the estimate of exposures for workers based on the test order data, and moderate-to-robust confidence in the estimate of exposures for ONUs based on the two data points from the test order. EPA has concluded that there is moderate confidence in the modeled inhalation exposures for mechanics in

OES (or Assessment)	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates ^a
	autobody shops. For short-term exposures, EPA has concluded that the weight of scientific evidence for this assessment provides moderate confidence in the estimate of exposures to workers.
Application of Paints and Coatings (OES #9)	Evidence Found: EPA did not identify inhalation exposure monitoring data related to the use of <i>trans</i>-1,2-dichloroethylene during the application of paints and coatings. Based on available data, EPA used surrogate data from dichloromethane during the application of paints and coatings. The dataset collected monitoring data from four studies, including OSHA facility inspections and defense occupational and environmental health readiness system data, contained 27 full-shift worker samples encompassing facilities using dichloromethane during the application of paints and coatings. The studies had a medium to high data quality rating from the systematic review process. Strengths: The primary strength of these surrogate data is the use of personal breathing zone data, some of the data indicate method of application, and they are expected to be applicable to <i>trans</i>-1,2-dichloroethylene activities. The use of surrogate data is preferred over the use of a generic scenario model, which would be used in the absence of data. Limitations/Assumptions/Uncertainties: The primary limitation of this assessment is that it is based on data from a different chemical, which will cause inherent uncertainties due to differences in the chemical properties and possibly handling. For example, <i>trans</i>-1,2-dichloroethylene and dichloromethane have different vapor pressures (331 mmHg for <i>trans</i>-1,2-dichloroethylene vs. 435 mmHg for dichloromethane). Another limitation is that because the majority of the monitoring data was collected more than 20 years ago, there is uncertainty in whether worker practices and controls have changed for these activities at these facilities affecting the potential for exposure. EPA assumed 250 exposure days/year based on exposure each working day for a typical worker schedule. It is uncertain whether this captures actual worker schedules and exposures. Another limitation, specific to the exposure estimate for ONUs, is the use of worker central tendency to estimate the exposure to ONUs, since no data for ONUs were available. Weight of Scientific Evidence Conclusion: Based on these strengths and limitations, EPA has concluded that the weight of scientific evidence for this assessment provides moderate confidence in the estimate of exposures for workers and slight-to-moderate confidence in the estimate of exposures for ONUs. EPA expects that central tendency will be more representative of worker exposure due to the age of the data source.
Adhesives and Sealants (OES #10)	Evidence Found: EPA did not identify inhalation exposure monitoring data related to the use of <i>trans</i>-1,2-dichloroethylene during the use of adhesives and sealants. Based on available data, EPA used surrogate data from dichloromethane and 1-bromopropane during use of adhesives and sealants. The dataset collected monitoring data from ten studies, including NIOSH HHEs and OSHA facility inspections, contained 667 full-shift worker samples encompassing facilities using dichloromethane and 1-bromopropane in adhesive and coating applications. The studies had a medium to high data quality rating from the systematic review process.

OES (or Assessment)	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates ^a
	Strengths: The primary strength of these surrogate data is the use of personal breathing zone data, some of the data indicate method of application, and they are expected to be applicable to <i>trans</i>-1,2-dichloroethylene activities. The use of surrogate data is preferred over the use of a generic scenario model, which would be used in the absence of data. Limitations/Assumptions/Uncertainties: The primary limitation of this assessment is that it is based on data from a different chemical, which will cause inherent uncertainties due to differences in the chemical properties and possibly handling. For example, <i>trans</i>-1,2-dichloroethylene, dichloromethane, and 1-bromopropane have different vapor pressures (331 mmHg for <i>trans</i>-1,2-dichloroethylene vs. 435 mmHg for dichloromethane vs. 146 mmHg for 1-bromopropane). Another limitation is that because the majority of the monitoring data was collected more than thirty years ago, there is uncertainty in whether worker practices and controls have changed for these activities at these facilities affecting the potential for exposure. EPA assumed 250 exposure days/year based on exposure each working day for a typical worker schedule. It is uncertain whether this captures actual worker schedules and exposures. Another limitation, specific to the exposure estimate for ONUs, is the use of worker central tendency to estimate the exposure to ONUs, since no data for ONUs were available. Weight of Scientific Evidence Conclusion: Based on these strengths and limitations, EPA has concluded that the weight of scientific evidence for this assessment provides moderate confidence in the estimate of exposures for workers and slight-to-moderate confidence in the estimate of exposures for ONUs. EPA expects that central tendency will be more representative of worker exposure due to the age of the data source.
Blowing Agent in Spray Foam (OES #11)	Evidence Found: EPA did not identify inhalation exposure monitoring data related to the use of <i>trans</i>-1,2-dichloroethylene as a blowing agent during the spraying of foam and modeling for estimating exposure within a residential setting. Based on available data, EPA used surrogate data from dichloromethane during the spraying of foam. The dataset collected monitoring data from ten studies, including OSHA facility inspections and a NIOSH HHE, contained 84 full-shift worker samples encompassing facilities using dichloromethane during the spraying of foam. The studies had a medium to high data quality rating from the systematic review process. For the modeling analysis of blowing insulation in residential settings, IECCU modeling was used to estimate exposures. Strengths: The primary strength of these surrogate data is the use of personal breathing zone data and they are expected to be applicable to <i>trans</i>-1,2-dichloroethylene activities. The use of surrogate data is preferred over the use of a generic scenario model, which would be used in the absence of data. For the modeling analysis of blowing insulation in residential settings, the product compositions were pulled from a range of available SDS. Limitations/Assumptions/Uncertainties: The primary limitation of this assessment is that it is based on data from a different chemical, which will cause inherent uncertainties due to differences in the chemical properties and possibly handling. For example, <i>trans</i>-1,2-dichloroethylene and dichloromethane have different vapor pressures (331 mmHg for <i>trans</i>-1,2-dichloroethylene vs. 435 mmHg for dichloromethane). Another limitation is that because the majority of the monitoring data

OES (or Assessment)	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates ^a
	was collected more than 30 years ago, there is uncertainty in whether worker practices and controls have changed for these activities at these facilities affecting the potential for exposure. EPA assumed 250 exposure days/year based on exposure each working day for a typical worker schedule. It is uncertain whether this captures actual worker schedules and exposures. Another limitation, specific to the exposure estimate for ONUs, is the use of worker central tendency to estimate the exposure to ONUs, since no data for ONUs were available. For the modeling conducted for blowing insulation in residential settings, assumptions about the frequency and duration of use were similarly estimated. Weight of Scientific Evidence Conclusion: Based on these strengths and limitations, EPA has concluded that the weight of scientific evidence for this assessment using monitoring data provides moderate confidence in the estimate of exposures for workers and a slight-to-moderate confidence in the estimate of exposures for ONUs. EPA expects that central tendency will be more representative of worker exposure due to the age of the data source. For the modeling analysis of blowing insulation in residential settings, EPA has concluded that the weight of scientific evidence for this assessment provides moderate confidence.
Laboratory Use (OES #12)	Evidence Found: For this OES, EPA used inhalation monitoring data from the laboratory at a facility that manufactures <i>trans</i>-1,2-dichloroethylene as a primary product provided via a test order submission from the TDCE Consortium (Exponent, 2023). Strengths: The primary strengths of the inhalation occupational exposure estimates for this OES include the use of personal breathing zone samples directly applicable to this OES, which are preferable to other assessment approaches such as modeling or the use of OELs. EPA used full-shift PBZ air concentration data to assess inhalation exposures, with the data source having a high data quality rating from the systematic review process. The data included six worker full-shift PBZ samples at one manufacturing facility. A strength is that the LOD is below the draft OEV (Appendix F), which provides confidence that non-detects will not contribute to risk. Another strength is that the monitoring data was collected in accordance with sampling plan that has been reviewed and approved by EPA, and includes all of the agreed upon metadata. Limitations/Assumptions/Uncertainties: There is uncertainty about how representative worker activities and exposures at a laboratory within a manufacturing plant are of other laboratories that use <i>trans</i>-1,2-dichloroethylene, which could have a very diverse set of procedures and exposures. Another limitation, specific to the exposure estimate for ONUs, is the use of worker central tendency to estimate the exposure to ONUs, since no data for ONUs were available.

OES (or Assessment)	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates ^a
	Weight of Scientific Evidence Conclusion: Based on these strengths and limitations, EPA has concluded that the weight of scientific evidence for this assessment provides moderate confidence in the estimate of exposures for workers and slight-to-moderate for ONUs.
Refrigerant Flush (OES #13)	Evidence Found: EPA did not identify monitoring data for the use of <i>trans</i>-1,2-dichloroethylene for refrigerant flushing. Based on available data, EPA used analogous data from the use of <i>trans</i>-1,2-dichloroethylene as a miscellaneous non-aerosol product provided via a test order submission from the TDCE Consortium (Exponent, 2023). Strengths: EPA used full-shift PBZ air concentration data to assess inhalation exposures, with the data source having a high data quality rating from the systematic review process. The data included 22 worker full-shift PBZ samples. Out of the 22 total samples, none were below the method detection limit. Another strength is that the monitoring data was collected in accordance with sampling plan that has been reviewed and approved by EPA, and includes all of the agreed upon metadata. Limitations/Assumptions/Uncertainties: EPA is uncertain about the similarity of worker exposures when comparing use of a cleaner/degreaser vs. use during the flushing of refrigerants, including the duration and frequency of such actions. Another limitation, specific to the exposure estimate for ONUs, is the use of worker central tendency to estimate the exposure to ONUs, since no data for ONUs were available. Weight of Scientific Evidence Conclusion: Based on the strengths and limitations outlined above, EPA has concluded that the weight of scientific evidence for this assessment provides moderate confidence in the estimate of exposures for workers and slight-to-moderate confidence for estimates of exposure for ONUs due to the use of central tendency worker estimates for ONU exposure.
Processing Aid in Semiconductor Manufacturing (OES #14)	As described in Section 4.2.14 of the <i>Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026g), <i>trans</i>-1,2-dichloroethylene is received in hermetically sealed containers and fed into a closed system where it is completely reacted away. EPA believes that workers are not exposed to <i>trans</i>-1,2-dichloroethylene during semiconductor manufacturing and, therefore, considered the exposure pathway to be incomplete and did not assess exposure for this OES.
Waste Handling, Disposal, and Treatment (OES #15)	Evidence Found: EPA did not identify monitoring data for the waste handling, disposal, and treatment of <i>trans</i>-1,2-dichloroethylene. Based on available data, EPA used surrogate data from 1,2-dichloroethane and dichloromethane with area monitoring data for an unspecified mixture of isomers of 1,2-dichloroethylene (CASRN 540-59-0) to cover the various sub-disciplines of disposal, including landfill (3 points of area monitoring from 1,2-dichloroethylene), incinerator (22 points of PBZ monitoring from dichloromethane, and POTW and non-POTW (3 points of PBZ monitoring data from 1,2-dichloroethane). Strengths: The primary strength of these surrogate data is the availability of monitoring data relevant to the OES, all of which were detected samples. The use of surrogate data is preferred over the use of a generic scenario model, which would be used in the absence of data.

OES (or Assessment)	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates ^a
	Limitations/Assumptions/Uncertainties: EPA is uncertain if the exposures monitored at the facilities are representative of all facilities in the OES, particularly because the monitoring data was collected for other chemicals which adds uncertainty to the estimate. Another limitation is that because the majority of the monitoring data was collected more than thirty years ago, there is uncertainty in whether worker practices and controls have changed for these activities at these facilities affecting the potential for exposure. Specific to the landfill estimate, the use of area monitoring data is a limitation of the dataset as this may underestimate exposures depending on the location of the area monitor. Specific to the POTW and non-POTW workers, the small number of datapoints is another limitation. A limitation specific to the exposure estimate for ONUs is the use of worker central tendency to estimate the exposure to ONUs, since no data for ONUs were available. Weight of Scientific Evidence Conclusion: Based on the strengths and limitations outlined above, EPA has concluded that the weight of scientific evidence for this assessment provides moderate confidence in the estimate of exposures for Worker –Incinerator and Worker – POTW And Non-POTW SEGs, and slight-to-moderate confidence in the estimate of exposures for the Worker – Landfill SEG and ONUs. EPA expects that central tendency will be more representative of worker exposure due to the age of the data source.
Dermal Exposure	Evidence Found: EPA estimated dermal exposures using modeling methodologies, which are supported by moderate evidence. The Agency used the EPA Dermal Exposure to Volatile Liquids combined with Monte Carlo modeling to calculate the dermal absorbed dose. EPA used test order data on <i>trans</i>-1,2-dichloroethylene for the fraction absorption parameter (EPA-HQ-OPPT-2018-0465-0069) and OES-specific data for the weight percent parameter in the model. Strengths: A strength of the Monte Carlo modeling approach is that variation in model input values and a range of potential exposure values is more likely than a discrete value to capture actual exposure at sites. Limitations/Assumptions/Uncertainties: The primary limitations are the uncertainty in the representativeness of values toward the true distribution of potential dermal exposures and the uncertainty about the amount of chemical that is initially loaded onto the skin. Weight of Scientific Evidence Conclusion: Therefore, the weight of scientific evidence for the modeling methodologies specifically for all OES is moderate. Note that EPA did not assess dermal exposures to ONUs as EPA does not expect ONUs to directly handle <i>trans</i>-1,2-dichloroethylene as part of their duties, and thus ONUs are not expected to have routine dermal exposures during the course of their work. Depending on the COU, ONUs may have incidental dermal exposures due to surface contamination, but EPA did not consider these exposures to be significant and thus they were not assessed.

OES (or Assessment)	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates ^a
EPA = Environmental Protection Agency; HHE = Health Hazard Evaluation; LOD = limit of detection; NIOSH = The National Institute for Occupational Safety and Health; OES = occupational exposure scenario; OEV = occupational exposure value; ONU = occupational non-user; OSHA = Occupational Safety and Health Administration; PBZ = personal breathing zone; POTW = publicly owned treatment works; SEG = similar exposure group; TDCE = <i>trans</i> -1,2-dichloroethylene; WWT = wastewater treatment	
^a The weight of scientific evidence discussion for occupational exposure has been expanded between the public release of the <i>Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026g) and the public release of this draft risk evaluation to provide explicit confidence rating for workers and ONUs. Conforming edits to the above draft TSD will be made during finalization of both documents.	

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4.1.2 Consumer Exposures

EPA evaluated the reasonably available information for the following consumer exposures to *trans*-1,2-dichloroethylene. For more information on the full consumer assessment, see the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)). Two COUs were evaluated:

- Consumer use – Cleaning agent – Cleaner/degreaser (aerosol and non-aerosol); and
- Consumer use – Propellants, non-motive (blowing agent) – Polymer foam.

The major routes of exposure considered were inhalation and dermal exposure. EPA assessed six types of products for the consumer inhalation assessment with varied duration of use, weight fraction and mass of product used as the input parameters driving the high-, medium-, and low-intensity scenarios. There were two products evaluated in the Cleaning agent – Cleaner/degreaser (aerosol and non-aerosol) COU, which included degreasers for mechanical equipment and components and flux remover as well as contact cleaners for electronics. EPA notes that, despite the name of this COU, no non-aerosol products were identified. There were four products evaluated under the COU of Consumer use – Propellants, non-motive (blowing agent) – Polymer foam COU. Two of the propellant products included a gap filler and sealant and an open cell non-structural sealant that were quantitatively assessed. There were two additional products including a closed cell rigid spray foam and roof tile foam adhesive that were assessed qualitatively in the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

The cleaning agent products were quantitatively modeled using CEM for inhalation. The propellants COU products were quantitatively modeled using the Indoor Environmental Concentrations in Buildings with Conditioned and Unconditioned Zones (IECCU) Model for inhalation. The dermal modeling used the delivery-limited fractional absorption approach based on the test order experiments as the most appropriate choice for the consumer COUs. This approach is the same as implemented within CEM. Due to identified use patterns of the products, exposure due to ingestion is not expected; therefore, ingestion was not quantitatively assessed. EPA also focused on the lifestages of youth (11–20 years), and adults (21+ years) for both inhalation and dermal exposures, since these products are not likely to be used by younger age groups.

Table 4-11 presents a summary of the COUs and consumer scenarios assessed. EPA evaluated these lifestages as potential users of the product. All lifestages are considered bystanders in the risk assessment with the exception of the spray foam scenarios in the attic. The Agency assumes that the bystanders will remain in the main part of the house and not move into the attic when the spray foam exposure would be occurring. Although *trans*-1,2-dichloroethylene is potentially present in these consumer products with the potential for emissions from these consumer products during disposal, EPA expects residual *trans*-1,2-dichloroethylene at the time of disposal to be minimal and not result in measurable exposure of concern, as most volatilization from off-gassing occurs within months of consumer use. Further discussion is provided in the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

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Table 4-11. Summary of Consumer COUs, Exposure Scenarios, and Exposure Routes

Consumer COU	Consumer COU Subcategory	Product/Article	Exposure Scenario and Route	Evaluated Exposure Routes				
				Inhalation	Dermal	Ingestion ^a		
						Dust (Air)	Dust (Surface)	Mouthing
Cleaning agent	Cleaner/degreaser (aerosol and non-aerosol)	Degreasers for mechanical equipment and components	Application of product in house (garage) via aerosol spray can; Direct dermal contact during use; Inhalation of emissions during and after use	QT (CEM)	QT	<i>QL</i>	<i>QL</i>	<i>QL</i>
		Flux remover and contact cleaners for electronics	Application of product in house (utility room) via aerosol spray can; Direct dermal contact during use; Inhalation of emissions during and after use	QT (CEM)	QT	<i>QL</i>	<i>QL</i>	<i>QL</i>
Propellants, non-motive (blowing agent)	Polymer foam	Gap filler and sealant (one component cylinder)	Application of product in house (attic) via pressurized foam spray; Direct dermal contact during use; Inhalation of emissions during and after use	QT (IECCU)	QT	<i>QL</i>	<i>QL</i>	<i>QL</i>
		Open cell non-structural sealant (two component cylinder)	Application of product in house (attic) via pressurized foam spray; Direct dermal contact during use; Inhalation of emissions during and after use	QT (IECCU)	QT	<i>QL</i>	<i>QL</i>	<i>QL</i>
		Closed cell rigid foam system (two component cylinder; professional application only)	Inhalation of emissions during and after use for bystanders only. This type of system is only installed by professionals. Therefore, all consumers would be considered bystanders; bystanders assessed by the open cell non-structural sealant scenario above.	<i>QL</i>	<i>QL</i>	<i>QL</i>	<i>QL</i>	<i>QL</i>
		Roof tile adhesive (one component cylinder)	Application of product outdoors via pressurized foam spray; Direct dermal contact during use; Inhalation of emissions during use.	<i>QL</i>	<i>QL</i>	<i>QL</i>	<i>QL</i>	<i>QL</i>
CEM = assessed using the Consumer Exposure Model; COU = condition of use; IECCU = assessed using the model Indoor Environmental Concentrations in Buildings with Conditioned and Unconditioned Zones; QL = qualitative consideration, exposure by route was deemed unlikely because of physical and chemical characteristics of <i>trans</i> -1,2-dichloroethylene and/or expected use patterns; QT = quantitative consideration								
^a The oral (ingestion) route was not modeled because the possibility of mouthing based on product use descriptions is low. Also, the physical chemical properties (<i>i.e.</i> , vapor pressure) indicate that there is no partitioning from the gas phase to the particulate phase.								
Quantitative is bolded QT and qualitative is <i>italicized QL</i> .								

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4.1.2.1 Summary of Consumer COUs and Exposure Scenarios

Consumers are primarily exposed to *trans*-1,2-dichloroethylene through inhalation and dermal exposures during application of the products. For more information on the full list of products for both cleaning agents and propellant's, including SDSs, weight fractions and product densities, see the *Draft Consumer and Commercial Exposure Analysis Risk Calculator for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026h](#)).

Cleaning Agent – Cleaner/Degreaser (Aerosol and Non-Aerosol) COU

Seven aerosol spray degreaser products were identified that can reasonably be purchased by consumers. The products, typically sold in 13- to 20-ounce aerosol cans, are advertised to dissolve grease, oil, and sludge from mechanical equipment and components such as air tools, mechanical brakes, clutches, chains, motor, and parts. Other advertised characteristics include quick evaporation, no residue, no flash, or fire point, and may be used on sensitive plastics. According to the SDSs, ([ITW Pro Brands, 2025b](#); [CRC Industries Inc., 2023a, b, 2022d, e, f](#); [Chemtronics, 2015](#)), the products contain 3 to 90% *trans*-1,2-dichloroethylene (average of 51%) and product densities range from 1.24 to 1.35 g/cm³ (average of 1.28 g/cm³). The weight fractions used in the assessment for high, medium, and low are 0.90, 0.51, and 0.03, respectively.

Fourteen aerosol flux remover/contact cleaners were identified that can reasonably be purchased by consumers. The products, typically sold in 5 to 20-oz aerosol cans, are advertised to remove dirt, moisture, dust, flux, or oxides from the internal components of electronic or precision equipment, such printed circuit boards, barcode instruments, switch boxes, gear relays, and electronic motor controllers. The products are advertised as non-flammable and eliminate the need for brushing and scrubbing, although an attached brush on some products may be used. According to the SDSs, ([ACL Inc, 2025](#); [Chemtronics, 2025](#); [ITW Pro Brands, 2025a, c, d](#); [Techspray, 2025](#); [CRC Industries Inc., 2022a, b, c](#); [Techspray, 2022a, b, c](#); [Chemtronics, 2021](#); [Techspray, 2021](#)) The products contain 1 to 80% *trans*-1,2-dichloroethylene (average of 36%) and product densities range from 0.92 to 1.5 g/cm³ (average of 1.27 g/cm³). The weight fractions used in the assessment for high, medium, and low are 0.8, 0.36, and 0.01 g/cm³, respectively.

Propellants, Non-Motive (Blowing Agent) – Polymer Foam COU

EPA identified consumer use of propellant products containing *trans*-1,2-dichloroethylene as reasonably foreseen based on relatively recent safety data sheets (SDSs) for such products. While specific products may not currently be available for purchase or were recently reformulated to remove *trans*-1,2-dichloroethylene, EPA assessed the products identified from similar SDSs ([DAP Global, 2022b, c](#)), to characterize anticipated exposure to consumers from the product category.

Two Touch N Seal Quick Cure Cylinder foam products for filling gaps were identified as containing *trans*-1,2-dichloroethylene. These include Touch N Seal Quick Cure Cylinder Reduced Expansion PU Foam Sealant ([DAP Global, 2022c](#)), as identified in the (U.S. EPA Indoor Exposure Product Testing, Version 2.0, Protocol 1 and 3 ([EPA-HQ-OPPT-2018-0465-0065](#))), and Touch N Seal Quick Cure Cylinder High Yield PU Foam Sealant (SDS dated 4/12/2022) found on a publicly available website. Both products contain 1 to 5% *trans*-1,2-dichloroethylene. Currently, neither product appears to be available for purchase, though the Touch N Seal Quick Cure Cylinder High Yield PU Foam Sealant has an Amazon.com listing. Similar Touch N Seal products are listed on the DAP website (accessed June 16, 2026), (*i.e.*, DAP Touch N Seal Quick Cure Foam Sealant Low GWP 0.1 ([DAP Global, 2022b](#)), but they do not appear to contain *trans*-1,2-dichloroethylene according to their

SDS. The technical data sheets (TDSs) for these surrogate products, which are available in 10- or 16-pound cylinders, were used to help inform modeling decisions (*i.e.*, product yield).

U.S. EPA Indoor Exposure Product Testing, Version 2.0, Protocol 1 and 3 (([Withheld](#)], 2023), EPA-HQ-OPPT-2018-0465-0065) describes the Quick Cure Product as intended for use in filling gaps and voids in the building envelope to block air, moisture, and insects. It is noted to bond to building materials including wood, metal, concrete, plastic, insulating foam boards, and drywall, giving it a wide range of potential use. The product is labeled for professional use.

One open cell foam insulation product was identified as containing *trans*-1,2-dichloroethylene DAP Touch ‘n Seal Low Density (1.0% weight fraction) Spray Foam. This is a two-component product, with the B-side containing 1 to 5% *trans*-1,2-dichloroethylene([DAP Foam, 2018](#)). The A-side does not contain *trans*-1,2-dichloroethylene. The two components are combined in a 1:1 ratio using a foam insulation sprayer, resulting in a theoretical 0.05 to 2.5% *trans*-1,2-dichloroethylene in the final foam product. Currently, this product is not listed on the DAP website (<https://www.dap.com/products-projects/our-brands/touch-n-seal/>; accessed August 20, 2026) and does not appear to be available for purchase. Similar Touch ‘n Seal products are listed on the DAP website but do not appear to contain *trans*-1,2-dichloroethylene according to their SDS. The TDSs for these products, however, were used as a surrogate to help inform modeling decisions (*i.e.*, application methods and product yield).

The open cell foam insulation product is advertised for use in residential, commercial, industrial, and agricultural applications as part of a “flash and batt” application in which this foam is applied directly to the external wall and then fiber insulation (fiberglass or cellulose) is installed on top of the cured foam. This application is expected to seal the building envelope more effectively than fiber insulation alone.

There are two additional propellant products (closed cell rigid spray foam and roof tile foam adhesive) that were assessed qualitatively. For more information on the analysis, see the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

4.1.2.2 Summary of Inhalation Exposure Assessment

4.1.2.2.1 CEM Model Inhalation Exposure Assessment

CEM Version 4.0 ([U.S. EPA, 2023a](#)) was selected to estimate inhalation exposures to the Cleaning Agent COUs when empirical data (*e.g.*, test order data) were not available.

Higher concentrations of *trans*-1,2-dichloroethylene in air increase inhalation exposure. This can result from product formulations or use patterns that provide greater emissions, as well as environment-specific characteristics such as smaller room volume and lower ventilation rates. In CEM Version 4.0, key parameters influencing emission rates include weight fraction of *trans*-1,2-dichloroethylene in the product, duration of product use, mass of product used, and frequency of product use. Any increase in these parameters results in higher chemical exposure from product use. To capture a range of potential exposure levels, these inputs were varied to create high, medium, and low intensity use scenarios. Other parameters such as chemical properties, building volume, air exchange rate, and user and bystander activity patterns (*i.e.*, movements around the home) were held constant across all intensities. Detailed descriptions on the derivation of these inputs are provided below in Table 4-12.

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Table 4-12. Summary of Key Parameters for Products Modeled in CEM 3.2

Product	Exposure Scenario Level	WF ^a (%)	Duration of Use ^b (mins)	Product Mass Used ^c (g)	Acute Freq. of Use ^c (day ⁻¹)	Int. Freq. of Use ^{d,e} (day ⁻¹)	Use Environment ^d ; Volume (m ³) ^c	Air Exchange Rate, Zone 1 and Zone 2 ^c (hour ⁻¹)	Interzone Ventilation Rate (m ³ /h) ^c
Degreasers for mechanical equipment and components	Low	3	1	50	1	2	Garage; 90	0.45	108.978
	Medium	51	2	100		5			
	High	90	4	200		10			
Flux remover and contact cleaners for electronics	Low	1	1	50	1	2	Utility Room; 20	0.45	107.01
	Medium	36	2	100		5			
	High	80	4	200		10			

^a See Section 10.2 in the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) for weight fraction (WF) sources and discussion.

^b See text in Section 1.4.2 *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) for discussion on calculation of duration of use. Based on manufacturer product use description to support decision making.

^c Consumer Exposure Model (CEM) default.

^d Based on manufacturer product use description to support decision making.

^e Intermediate frequency of use is not a parameter directly inputted into CEM. Acute results from CEM are scaled outside of CEM to account for intermediate frequency of use.

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4.1.2.2.2 IECCU Model Inhalation Exposure Assessment

IECCU was used to model inhalation exposure to the propellant COU because there is no scenario or emission model that represents the polyurethane spray foam in CEM. IECCU is a previously peer-reviewed deterministic model that uses mass balance calculations and can consider both sources and sinks within the indoor environment to estimate concentrations in the indoor environment (EPA, 2019a). IECCU has over 60 different models available and thus can be used to evaluate a variety of release and exposure scenarios. IECCU is a higher tier inhalation model than CEM and has flexible equations, which are more applicable to VOCs. Because EPA had test order data characterizing emission from spray foam products, IECCU was chosen to allow the emission equations to be fully tailored to the test order data.

EPA identified two products containing *trans*-1,2-dichloroethylene that were evaluated in this exposure assessment. One product is a smaller can for filling gaps (Convenience Products, 2017), and the other product is a larger canister type propellant that is used for larger spaces like an attic (DAP Global, 2022c). IECCU requires that all inputs be user-defined, such as environmental parameters (e.g., building and room volumes, air flow, and ventilation rates) which are adjustable over time. IECCU can be configured with one, two, or three zones within a building.

IECCU reports air concentrations in each zone for the entire modeling period. These values are then used to calculate an exposure concentration in air (C_{air}) for product users and bystanders (based on the average concentration in each zone over the exposure duration of interest and the amount of time spent in each zone). For the propellant scenario, it was assumed that the bystander would not enter the attic and would remain in the other parts of the house.

The dual-first order decay empirical emission model within IECCU contains two distinct time constants, a “fast” decay rate k_1 and a “slow” decay rate k_2 . This equation was chosen because it can best capture the actual concentration profile seen in the test order data from the *Consumer Exposure Chamber Testing for trans-1,2-Dichloroethylene* (EPA-HQ-OPPT-2018-0465-0071) as shown in the analysis in Appendix I.3.3 in the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* (U.S. EPA, 2026g). The model is implemented using emission parameters derived from test order chamber study data and product-specific inputs. The simulation duration selected for the empirical emission rate model was 50 hours and the number of data points selected was 5,000, resulting in a time series concentration profile of 36 second intervals.

Table 4-13. Summary of Key Parameters for Products Modeled in IECCU

Product	WF ^a (%)	Duration of Use ^b (mins)	Product Mass Used ^c (g)	Acute Freq. of Use ^c (day ⁻¹)	Int. Freq. of Use ^d (day ⁻¹)	Use Environment ^d ; Volume (m ³)	Air Exchange Rate, Zone 1 and Zone 2 ^c (hour ⁻¹)	Interzone Ventilation Rate (m ³ /h) ^c
Gap Filler Propellant	5	40	4,535	1	2, 3 and 4	Attic; 150	0.26	300
Open Cell Propellants	5	40	18,110	1	2, 3, and 4	Attic; 150	0.26	300

Product	WF ^a (%)	Duration of Use ^b (mins)	Product Mass Used ^c (g)	Acute Freq. of Use ^c (day ⁻¹)	Int. Freq. of Use ^d (day ⁻¹)	Use Environment ^d ; Volume (m ³)	Air Exchange Rate, Zone 1 and Zone 2 ^c (hour ⁻¹)	Interzone Ventilation Rate (m ³ /h) ^c
IECCU = Indoor Environmental Concentrations in Buildings with Conditioned and Unconditioned Zones; WF = weight fraction ^a See Section 10.2 in the <i>Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026g) for WF sources and discussion. ^b See text in Section 1.4 <i>Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026g) for discussion on calculation of duration of use. Based on manufacturer product use description to support decision making. ^c IECCU default. ^d Based on manufacturer product use description to support decision making.								

4.1.2.3 Summary of Dermal Exposure Assessment

To establish appropriate dermal input parameters, EPA used test order data that performed experiments under different conditions: (1) infinite dose experiments to determine the permeability coefficient appropriate for a flux-limited modeling approach and (2) finite dose experiments to determine the fraction absorbed appropriate for delivery-limited modeling U.S. EPA Indoor Exposure Product Testing, Version 2.0, Protocol 1 and 3 ([U.S. EPA, 2025](#)). The physical and chemical properties of *trans*-1,2-dichloroethylene (high molecular weight, large size, low solubility in water, and high volatility) allow mass to evaporate from the skin and impede its ability to cross the dermal barrier, suggesting a flux-limited approach may be appropriate. Since the product descriptions do not include instructions requiring deliberate contact, such as hand mixing prior to application, EPA expects that the amount available for absorption may be limited compared with the full quantity of the exposure. In the test order, the infinite dose experiments were occluded and evaporation was prevented, suggesting any steady state flux estimated from the experiments may overestimate the flux for those scenarios developed in this assessment.

Therefore, EPA used delivery-limited fractional absorption approach based on the test order experiments as the most appropriate choice for the consumer COUs.

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Product	Exposure Level	WF ^a %	Intermediate Frequency (days) ^b	Product Density ^a (g/cm ³)	Film Thickness (cm) ^c	Chemical Mass on Skin (mg/cm ²) ^d	Dermal Absorption Fraction ^e	Contact Area ^{e,f}
Degreasers for mechanical equipment and components	Low	3	2	1.28	6.55E-03	8.4E-02	6E-03	Inside of 1 hand (palms, fingers)
	Medium	51	5			3.0	6E-03	Inside of 1 hand (palms, fingers)
	High	90	10			6.7	1.2E-02	Both hands (entire surface area)
Flux remover and contact cleaners for electronics	Low	1	2	1.27	6.55E-03	0.25	6E-03	Inside of 1 hand (palms, fingers)
	Medium	36	5			4.2	6E-03	Inside of 1 hand (palms, fingers)
	High	80	10			7.5	1.2E-02	Both hands (entire surface area)
Gap filler and sealant (1 component)	Low	1	2	1.21	1.59E-02	0.19	6E-03	Inside of 1 hand (palms, fingers)
	Medium	2.5	3			0.58	6E-03	Inside of 1 hand (palms, fingers)
	High	5	4			0.96	1.2E-02	Both hands (entire surface area)
Open cell non-structural sealant (1 component)	Low	5E-02	2	0.44	1.59E-02	3.5E-02	6E-03	Inside of 1 hand (palms, fingers)
	Medium	1.25	3			0.10	6E-03	Inside of one hand (palms, fingers)
	High	2.5	4			0.17	1.2E-02	Both hands (entire surface area)

^a See Section 10.2 in the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) for weight fraction (WF) and product density sources and discussion.

^b Based on manufacturer product use descriptions to support decision making.

^c Input obtained from Consumer Exposure Model (CEM) Guide and Table 7-24 in the *Exposure Factors Handbook* ([U.S. EPA, 2011](#)).

^d Calculated parameter using Equation 12 in the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

^e Dermal absorption fraction determined from Test Order Data.

^f Contact Area is implemented as a Surface Area to Body Weight ratio (cm²/kg). Refer to the CEM guide for values associated with the contact area described.

4.1.2.4 Summary of Inhalation and Dermal Concentrations

4.1.2.4.1 Inhalation Concentrations for Acute and Intermediate Exposure Scenarios

Table 4-15 and Table 4-16 provides a summary of acute and intermediate inhalation exposure concentrations. For a complete overview of all exposure concentrations and all scenarios, see the *Draft Consumer and Commercial Exposure Analysis and Risk Calculator for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026h](#)).

Table 4-15. Summary of Acute Inhalation Concentrations

Product	Exposure Scenario Level	Weight Fraction (%)	Duration of Use (minutes)	Mass of Product Used (g)	Exposure Concentration (mg/m ³) [15 min TWA]
Degreasers for mechanical equipment and components	Low	3	1	50	19
	Medium	51	2	100	7.9E02
	High	90	4	200	3.0E03
Flux remover and contact cleaners for electronics	Low	1	1	50	15
	Medium	36	2	100	1.17E03
	High	80	4	200	5.25E03
Spray Foam – Gap Filler ^a	High	5	120	Perimeter of 4 walls	35
Spray Foam – Open Cell ^a	High	2.5	120	Perimeter of 4 walls	1.0E03

^a For more information on the staggered times for the Spray Foam exposure scenarios, see Section 4.1.2.2.2.

Table 4-16. Summary of Intermediate Inhalation Concentrations

Product	Exposure Scenario Level	Weight Fraction (%)	Duration of Use (Days per Month)	Mass of Product Used (g)	Exposure Concentration (mg/m ³) (24-h TWA – Adjusted for Monthly Use Frequency)
Degreasers for mechanical equipment and components	Low	3	1	50	0.10
	Medium	51	2	100	3.4
	High	90	4	200	25
Flux remover and contact cleaners for electronics	Low	1	1	50	1.8E-02
	Medium	36	2	100	3.4
	High	80	4	200	31
Propellant Spray Foam – Gap Filler ^a	High	5	4	N/A	0.21

Product	Exposure Scenario Level	Weight Fraction (%)	Duration of Use (Days per Month)	Mass of Product Used (g)	Exposure Concentration (mg/m ³) (24-h TWA – Adjusted for Monthly Use Frequency)
Propellant Spray Foam – Open Cell ^a	High	2.5	2	N/A	3.0
	Medium	2.5	3	N/A	4.5
	Low	2.5	4	N/A	5.9
TWA = time-weighted average					
^a For more information on the staggered times for the spray foam exposure scenarios, see Section 4.1.2.2.2.					

4.1.2.4.2 Intermediate Dermal Doses

Table 4-17 summarizes the high exposure inputs and intermediate dose concentrations used for the dermal assessment for *trans*-1,2-dichloroethylene. There was no acute HED for dermal exposure, therefore only intermediate was considered for dermal exposure. The table below highlights the high exposure exposures for all COUs. No further analysis of the consumer dermal assessment is presented within the draft risk evaluation. For more information on dermal exposures and associated risk for low, medium, and high scenarios, see the *Draft Consumer and Commercial Exposure Analysis for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026h](#)).

Table 4-17. Summary of High Exposure Dermal Calculations for Intermediate Consumer Scenarios

Product	Exposure Scenario Level	Weight Fraction (%)	Duration of Use (Days)	Contact Area	Intermediate Dose (mg/kg/day)
Degreasers for mechanical equipment and components	High	80	10	Both Hands (Entire Surface Area)	3.8E-01
Flux remover and contact cleaners for electronics	High	90	10	Both Hands (Entire Surface Area)	3.4E-01
Spray Foam – Gap Filler	High	5	4	Both Hands (Entire Surface Area)	2.0E-02
Spray Foam – Open Cell	High	2.5	4	Both Hands (Entire Surface Area)	3.5E-03

4.1.2.5 Weight of Scientific Evidence Conclusions for Consumer Exposure

Inhalation

EPA has robust confidence in the consumer inhalation exposures estimates from the use of *trans*-1,2-dichloroethylene-containing products due to availability of product-specific data. Exposure estimates are provided for a range of exposures corresponding to low-, medium-, and high-intensity use for each product and are based on the manufacturers or retailer's product-specific data regarding amount (mass) or product used as well as the weight fraction and density of each product. Duration of use is based on cited data and on other exposure factors from the *Exposure Factors Handbook* ([U.S. EPA, 2011](#)).

Dermal

EPA has robust confidence that the consumer dermal exposure estimates from the high exposure scenario for *trans*-1,2-dichloroethylene-containing products are protective of a range of possible dermal exposures. The highest weight fraction (Table 4-17) identified for each product and highest dermal fractional absorption (1.2%) value identified from test order data was used in the high exposure dermal

scenarios, which resulted in risk estimates above the benchmarks. However, a range of exposure scenarios were also calculated based on consumer product technical data, which are presented in the see the *Draft Consumer and Commercial Exposure Analysis for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026h](#)). The dermal exposure was modeled with the low, medium, and high weight fractions, which is the parameter that influences the dermal dose. EPA also relied on dermal absorption data from a test order, and the resulting empirical data on fraction absorbed has a strong impact on the calculation of dermal dose. Both 0.6 and 1.2% values for the fraction absorbed were obtained from the test order to account for variability in the test order data. The 0.6% dermal absorption value is based on measurements from shorter dermal exposure durations more representative of consumer scenarios, but the 1.2% dermal absorption was also modeled to capture all possible scenarios, including high exposure scenarios. The range of weight fractions and dermal fraction absorption parameters present a reasonable range for the dermal exposure scenarios. However, because risk estimates are above the benchmarks for high exposure scenarios, presentation of dermal risk in the risk evaluation is limited to high exposure. For more information on all doses for low, medium, and high scenarios, including the 0.6% dermal absorption values, see the *Draft Consumer and Commercial Exposure Analysis for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026h](#)).

4.1.3 General Population Exposures

General population exposures can occur when *trans*-1,2-dichloroethylene is released into the environment and the impacted media (e.g., air, water, soil) becomes a pathway for exposure. Figure 4-2 illustrates potential exposure pathways for the general population including the media which the chemical is found and the route of exposure. To evaluate these exposures, EPA considers both modeling and monitoring information when evaluating general population exposures and associated risk estimates in this *Draft Risk Evaluation for trans-1,2-Dichloroethylene*. Details on the approaches and methodologies used for general population exposures are presented in the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

This *Draft Risk Evaluation for trans-1,2-Dichloroethylene* evaluates general population exposures and associated risks for the following pathways. Where appropriate, included in the evaluation of these pathways is the consideration of PESS and fenceline communities as discussed in Section 1.2.2.1. Evaluated pathways are visually presented in Figure 4-2.

- Ambient Air Pathway (Section 4.1.3.1): Inhalation route
- Ambient Surface Water Pathway (Section 4.1.3.2) Dermal route while swimming
- Ambient Surface Water Pathway (Section 4.1.3.3): Oral route while swimming
- Drinking Water Pathway (Section 4.1.3.4): Oral route
 - Surface Water
 - Facility-Specific Releases (Section 4.1.3.4.1)
 - Generic Scenario Releases (Section 4.1.3.4.2)
 - Groundwater (Section 4.1.3.4.3).

General population exposure pathways through soil and fish ingestion were not quantitatively assessed for *trans*-1,2-dichloroethylene given its physical and chemical properties and low potential to bioaccumulate in organisms based on measured BCF values as described in Section 2.2.

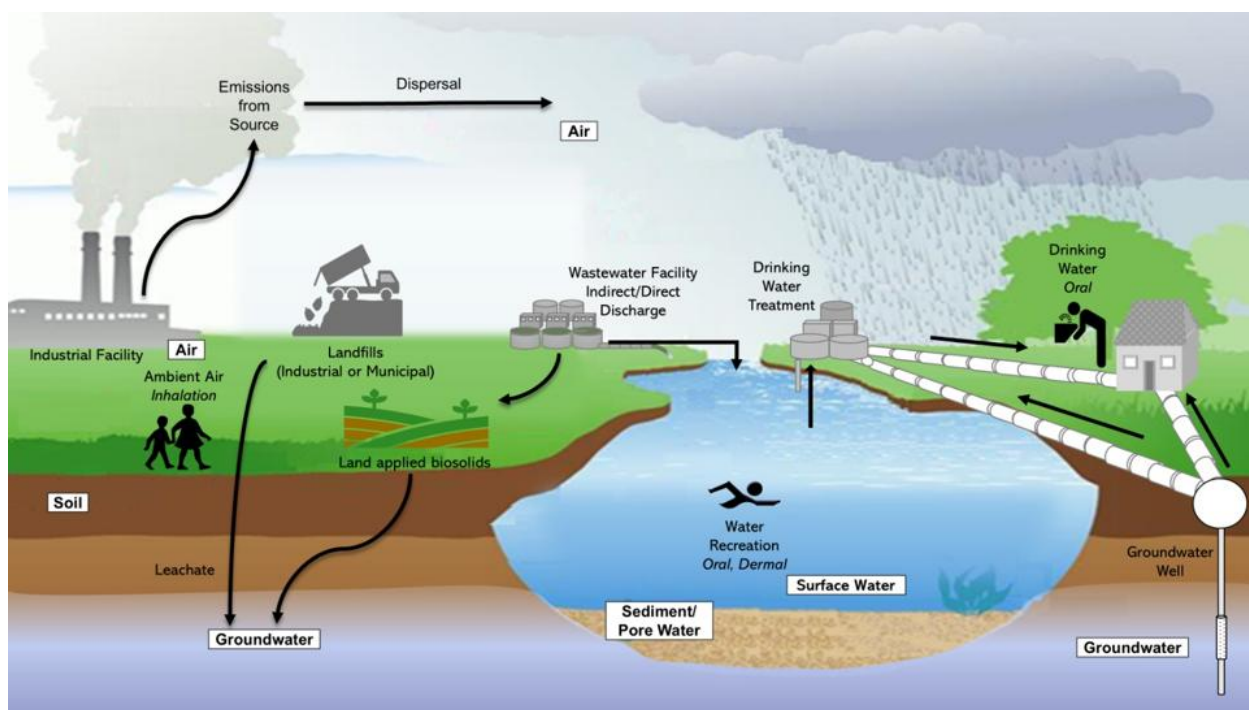


Figure 4-2. Evaluated Human General Population Exposure Pathways to *trans*-1,2-Dichloroethylene

4.1.3.1 Summary of Inhalation Exposure Assessment

EPA expects ambient air to be the primary exposure pathway for *trans*-1,2-dichloroethylene in the outdoor environment. In summary, *trans*-1,2-dichloroethylene is released from industrial facilities as uncontrolled fugitive releases such as process equipment leaks, process vents, building windows, building doors, and roof vents. It is also released from industrial facilities as stack releases, which may be either uncontrolled (e.g., direct releases out a stack) or controlled with a pollution control device (e.g., baghouse, scrubber, thermal oxidizer). Once released to ambient air, *trans*-1,2-dichloroethylene can move off-site into the surrounding areas where human populations may be exposed through inhalation. This inhalation exposure assessment focuses on exposures to the general population living near industrial facilities that release *trans*-1,2-dichloroethylene to ambient air. EPA did not model deposition for *trans*-1,2-dichloroethylene because, as described in Section 2.2, it is not expected to associate strongly with airborne particulates or subsequently undergo deposition.

Results of Exposure Concentrations via Ambient Air Based on Modeling from IIOAC

The Agency used the Integrated Indoor-Outdoor Air Calculator (IIOAC) to model ambient air concentrations based on facility releases from the TRI 2019 to 2023 database to assess general population exposure to air from facility releases of *trans*-1,2-dichloroethylene. For this assessment, IIOAC was used as a screening level or Tier 1 analysis to identify facilities/COUs that may raise exposure concerns and inform whether a higher-tier analysis and/or refined modeling is warranted to further characterize exposures of the general population to *trans*-1,2-dichloroethylene.

Across all facilities, reporting years and modeled distances (100, 100–1,000, and at 1,000 m), the 95th percentile ambient air modeled concentrations ranged from 7.2×10^{-3} to $1,460 \mu\text{g}/\text{m}^3$. The 95th percentile modeled concentrations in the EPA's [Integrated Indoor-Outdoor Air Calculator](#) (IIOAC; accessed August 29, 2026) represent high-end air concentration and deposition values. They are derived from distribution runs using the American Meteorological Society (AMS)/EPA Regulatory Model

(AERMOD) Dispersion Model across predefined meteorological and land-use scenarios to assess chemical exposures at set receptor distances.

Table 4-18 summarizes the highest daily and annual average modeled concentrations from the screening level analysis for TRI facilities. The daily-averaged concentrations are based on 365 days of exposure, and the annual average will be the average of the same values and result in the same modeled concentration. This occurs when the TRI facilities are modeled for 365 days per year. Table 4-19 summarizes the highest daily and annual average modeled concentrations for the generic scenarios (GSs). The highest modeled concentrations from this screening analysis and associated findings occurred at 100 m from the modeled release point. The highest modeled concentrations were associated with the OES: Use of Adhesives. For full IIOAC modeling results, see the supplemental file: *Draft Integrated Indoor Outdoor Air Calculator (IIOAC) TRI 2019-2023 Exposure and Risk Analysis for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026y](#))

Table 4-18. Comparison: Modeled TRI Facility Daily and Annual Average Concentrations

Release Type	Highest Modeled Outdoor Air Concentrations (100m) ($\mu\text{g}/\text{m}^3$)	
	Daily Average	Annual Average
Fugitive	32.2	32.2
Stack	0.286	0.286
Total Concentrations	32.5	32.5

Table 4-19. Comparison: Modeled Generic Scenario Stack and Fugitive Daily and Annual Average Concentrations at 100 m from Release Point

Release Type	Highest Modeled Outdoor Air Concentrations (100m) ($\mu\text{g}/\text{m}^3$)			
	Stack Daily Average	Stack Annual Average	Fugitive Daily Average	Fugitive Annual Average
Vapor Degreasing	2.63	2.13	56.5	45.8
Use of Adhesives	108.0	74.2	2,130	1,460
Use as a Blowing Agent in Spray Foam	9.2E-02	6.56E-02	1.84	1.31
Laboratory Chemicals	1.02E-02	7.22E-03	0.204	0.144
Aerosol Degreasing	0.504	0.346	9.91	6.79
Import – Repackaging	8E-02	2.61E-02	1.21	0.394

The IIOAC modeling methodology and results are presented in Section 10.4.1 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)). When calculating exposures to ambient air using results from IIOAC, EPA assumed that a person is exposed to ambient air at the modeled distance for 24 hours per day. For lifetime exposures, the Agency assumed a lifetime exposure duration of 78 years. These assumptions represent a high-end exposure scenario that do not account for the potential mobility (e.g., people going to work, spending time indoors, moving residences over a lifetime, leaving home for any reason) of people living near *trans*-1,2-dichloroethylene-releasing facilities. Therefore, the modeled daily and annual-average ambient air

concentration results from IIOAC are used to calculate acute and chronic non-cancer screening-level risk estimates.

EPA used the IIOAC results to derive screening-level acute and chronic non-cancer risk estimates in Section 4.3.4.1. The screening-level risk estimates are used to inform whether a higher-tier/more refined exposure analysis is warranted to confirm any screening-level exposure (and associated risk) concerns identified.

Releases Used as Modeling Inputs for IIOAC

EPA considered TRI release data from 2019 to 2023. EPA used facility-reported emissions as inputs to IIOAC. TRI reporters may report either with a Form R or a Form A. To use Form A, reporters must release less than 500 lb/year, and facilities do not need to report release quantities or uses/sub-uses on Form A. Due to uncertainties in the actual amount released by Form A reporting facilities, EPA included only TRI reporting Form R submissions in this analysis.

EPA also considered EPA estimated emissions for generic scenarios as inputs to IIOAC. For more information on the approach and methodology for estimating emissions, see Section 3.1.

The IIOAC modeling methodology and results are presented in Section 10.4.1 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

4.1.3.1.1 Weight of Scientific Evidence for Inhalation Exposure to General Population

The weight of scientific evidence for inhalation exposure estimates is determined by several different evidence streams, including evidence supporting the exposure scenarios (Section 4.1.3.1), release data used as model input data (Section 3.2.1), and agreement between modeled and monitoring ambient air concentrations. The Agency has higher confidence in exposure estimates that are based on facility-reported releases than those based on EPA-estimated releases of *trans*-1,2-dichloroethylene from generic facilities/sites.

EPA has robust confidence in the applicability of IIOAC for the purposes of this draft risk evaluation. This confidence is based on EPA's use of methodologies and models that previously underwent peer review and public comment. See the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) for more details. Overall confidence in inhalation exposure estimates resulting from modeled ambient air concentrations are dependent on the COU and type of data inputs used. See Table 4-40 for more information on confidence levels by COU. The Agency has moderate confidence for all EPA-estimated generic scenarios and robust confidence for TRI facility releases that were used as input for IIOAC. The Agency has robust confidence in the overall characterization of ambient air exposure in this general population exposure assessment and that the general population exposure scenarios represent high-end estimates of exposure.

4.1.3.2 Summary of Dermal Exposure While Swimming Assessment

The general population may have dermal exposures while swimming in surface waters (streams and lakes) that are affected by *trans*-1,2-dichloroethylene releases. Surface water concentrations were modeled for both facility-specific releases and generic scenario releases to assess potential general population dermal exposures while swimming. These modeled surface water concentrations are used for calculation of intermediate doses to assess exposure and risk. As described in Section 2.6 of *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026w](#)) and Section 4.2 of this draft risk evaluation, an acute oral/dermal hazard value was not derived

and instead the intermediate oral/dermal hazard value (21.4 mg/kg-day with UF = 30; Table 4-20) was utilized to evaluate general population dermal exposures while swimming. This approach represents a high-end screen for identifying potential risks from dermal exposure to *trans*-1,2-dichloroethylene while swimming in surface water.

For this screening-level exercise of facility-specific releases, the facility in each OES resulting in the highest estimated surface water concentration for that OES was used to represent a high-end estimate of surface water concentrations across the entire OES, as any facilities with lower surface water concentrations would result in lower general population exposures. Surface water concentrations were estimated most often using the receiving water body 30Q5 flow for each facility. For generic scenario releases, the high-end release scenario combined with a 10th percentile (P10) 30Q5 flow was used for each OES. In both cases, modeled surface water concentrations are representative of high-end concentrations expected to occur in receiving water bodies at or near the point of discharge. Following estimation of surface water concentrations for each OES, intermediate doses (IDR) were calculated for adults (21+ years); youth (11–15 years); and children (6–10 years) within the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

Intermediate doses associated with facility-specific releases ranged from 7.1×10^{-7} to 1.8×10^{-4} mg/kg-day across age groups with the highest doses modeled for Waste Handling, Disposal, and Treatment – POTW OES from a 30Q5 flow surface water concentration of 28 µg/L. Across the two modeled generic scenario OESs (Blowing Agent in Spray Foam; and Vapor Degreasing), intermediate doses ranged from 8.0×10^{-9} to 5.5×10^{-6} mg/kg-day with highest doses modeled for the Blowing Agent in Spray Foam OES from a 30Q5 flow surface water concentration of 3.8 µg/L. Discussion and characterization of potential risk associated with these exposures is in Section 4.3.4.2.

Full description of the approach for modeling these exposures and presentation of estimated dermal doses is in the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)), with additional information on inputs in *Draft General Population Surface Water Exposure Estimates for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026v](#)).

Weight of Scientific Evidence for Dermal Exposure While Swimming

Overall, EPA has robust confidence that the modeled surface water concentrations presented for both the facility-specific releases and generic scenarios represent higher-end estimated concentrations, and that these concentrations are reasonably applied for estimation of potential dermal exposure. EPA's Swimmer Exposure Assessment Model provided detailed information on the skin surface areas for dermal exposure and potential swimming exposure times for the evaluated age groups given as high-end default durations for the evaluated age groups ([U.S. EPA, 2015a](#)). Furthermore, estimated concentrations are representative of those expected near the point of discharge to receiving water bodies and a more high-end estimate of expected exposures overall as concentrations would be expected to dilute and/or degrade with time and movement downstream. The use of a tiered approach where exposures were refined when necessary offers additional confidence and robustness in estimated exposures. Therefore, EPA has robust confidence that presented estimates of exposure are representative of higher-end exposure estimates for dermal exposure while swimming per OES and are appropriate to derive final risk estimates and characterize risk as discussed in Section 4.3.4.2.

4.1.3.3 Summary of Oral Exposure While Swimming Assessment

The general population may ingest surface water while swimming in water bodies that are affected by *trans*-1,2-dichloroethylene. Surface water concentrations were modeled for both facility-specific releases and generic scenario releases to assess potential general population oral exposures while

swimming. These modeled surface water concentrations are used for calculation of intermediate doses to assess exposure and risk. As described in Section 2.6 of *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026w](#)) and Section 4.2, an acute oral/dermal hazard value was not derived and the intermediate oral/dermal hazard value (21.4 mg/kg-day with UF = 30; Table 4-20) was utilized to evaluate general population oral exposures while swimming. This approach represents a high-end screen for identifying potential risks from oral exposure to *trans*-1,2-dichloroethylene while swimming in surface water.

As a higher-end estimation of exposure resulting from facility-specific releases, the facility in each OES with the highest estimated surface water concentration for that OES was used as a higher-end estimate of potential concentrations across the entire OES as any facilities with lower surface water concentrations would result in lower general population exposures. Surface water concentrations were estimated using the receiving water body 30Q5 flow for each facility. For generic scenario releases, the high-end release scenario combined with a P10 30Q5 flow percentile was used for each OES. In both cases, modeled surface water concentrations are representative of higher-end concentrations expected to occur in receiving water bodies at or near the point of discharge. Following estimation of surface water concentrations for each OES, intermediate doses (IDR) were calculated for adults (21+ years); youths (11–15 years); and children (6–10 years) within the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

Intermediate doses associated with facility-specific releases ranged from 6.9×10^{-7} to 1.5×10^{-4} mg/kg-day across age groups with the highest doses modeled for Waste Handling, Disposal, and Treatment – POTW OES from a 30Q5 flow surface water concentration of 28 µg/L. Across the two modeled generic scenario OESs, intermediate doses ranged from 3.6×10^{-8} to 2.0×10^{-5} mg/kg-day across age groups with highest doses modeled for the Blowing Agent in Spray Foam OES from a 30Q5 flow surface water concentration of 3.8 µg/L. Discussion and characterization of potential risk associated with these exposures is in Section 4.3.4.3.

Full description of the approach for modeling these exposures and presentation of estimated intermediate oral ingestion doses is in the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)). Additional information on inputs is available in *Draft General Population Surface Water Exposure Estimates for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026v](#)).

Weight of Scientific Evidence for Oral Exposure While Swimming

Overall, EPA has robust confidence that the modeled surface water concentrations presented for both the facility-specific releases and generic scenarios represent high-end estimated concentrations, and that these concentrations are reasonably applied for estimation of potential oral exposure. EPA's Swimmer Exposure Assessment Model provided detailed information on potential swimming exposure times for the evaluated age groups given as high-end default durations for evaluated age groups ([U.S. EPA, 2015a](#)). Additionally, age group-specific ingestion rates are selected from EPA's *Exposure Factors Handbook* as upper percentile values while swimming ([U.S. EPA, 2019b](#)). Further, estimated surface water concentrations are representative of those expected near the point of discharge to receiving water bodies and a more conservative estimate of expected exposures overall as concentrations would be expected to dilute and/or degrade with time and movement downstream. The use of a tiered approach where exposures were refined, when necessary, offered additional confidence and robustness in estimated exposures. Therefore, EPA has robust confidence that presented estimates of exposure are representative of higher end exposure estimates for intermediate duration dermal exposure per OES and are appropriate to derive final risk estimates characterize risk discussed in Section 4.3.4.3.

4.1.3.4 Summary of Drinking Water Exposures Assessment

Potential drinking water exposures were calculated using a tiered approach for a variety of lifestyles—adults (21+ years); youths (16–20 years); youths (11–15 years); children (6–10 years); toddlers (1–5 years); and bottle-fed infants (birth–1 year)—for both facility-specific and generic scenario releases. Exposures are presented for the bottle-fed infant, toddler and adult lifestyles within the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) and full presentation of all evaluated age groups is available in the *Draft General Population Surface Water Exposure Estimates for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026v](#)). By including bottle-fed infant and toddler exposure estimates, the Agency considered PESS because these susceptible subpopulations would be expected to be most sensitive to these exposures.

EPA used a tiered approach towards assessment of all surface water pathways including drinking water. This approach is intended to identify potential preliminary risk at each tier and assist in evaluating potential refinements or higher tier evaluations that better characterize potential drinking water exposures and risk. For evaluation of drinking water exposures to the general population, chronic non-cancer exposure and associated doses are calculated from modeled surface water concentrations. Acute exposures and doses were not evaluated because EPA did not identify a health endpoint associated with oral exposure to derive an acute oral hazard value, as described in Section 2.6 of *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026w](#)) and Section 4.2. For evaluation of chronic non-cancer drinking water exposures, the harmonic mean surface water concentrations were used for calculating potential average daily doses (ADD) and the ADD was used to calculate potential risks and to inform whether additional tiers of analysis were warranted.

For landfill leachate impacted groundwater, EPA used modeled groundwater concentrations to estimate chronic, non-cancer doses for the general population. The ADDs were used to characterize drinking water risk and determine whether higher tier analyses were warranted.

4.1.3.4.1 Surface Water Facility-Specific Exposures

Table 6-4 in Section 6.2.1.1 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) shows estimated harmonic mean surface water concentrations from facility-specific releases following Tier 2 evaluation. These concentrations were used to estimate drinking water doses as shown in Table 6-14 in Section 6.4.3 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) for bottle-fed infants (<1 year), toddlers (1–5 years), and adults (21+ years). Following Tier 2 evaluation, average daily doses ranged from 1.2×10^{-6} to 5.6×10^{-4} mg/kg-day across age groups, with the highest doses modeled for the Waste Handling, Disposal, and Treatment OES with a harmonic mean flow concentration of 20 µg/L. Discussion and characterization of potential risk associated with these exposures is in Section 4.3.4.4.1.

4.1.3.4.2 Surface Water Generic Scenario Exposures

Table 6-9 in Section 6.2.1.2 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) shows estimated 30Q5 and harmonic mean surface water concentrations from generic scenario releases following Tier 1 evaluation for two identified OES: Blowing Agent in Spray Foam OES and Vapor Degreasing OES. These surface water concentrations were used to estimate drinking water doses as shown in Table 6-15 in Section 6.4.3 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) for bottle-fed infants (<1 year), toddlers (1–5 years) and adults (21+ years). Average daily doses ranged from 1.1×10^{-7} to 7.7×10^{-5} mg/kg-day across age groups with the highest doses modeled for Blowing Agent in Spray Foam OES from a harmonic mean flow concentration of 3.9 µg/L. Discussion and characterization of potential risk associated with these exposures is in Section 4.3.4.4.2.

4.1.3.4.3 Groundwater Exposures

Based on the concentrations of *trans*-1,2-dichloroethylene estimated from the Hazardous Waste Delisting Risk Assessment Software (DRAS Model), EPA conducted a screening-level assessment of general population exposure based on a release scenario an order of magnitude above the highest TRI-reported releases and a landfill leachate concentration an order of magnitude above what was reported in the literature. Chronic drinking water doses were calculated for adults (21+ years) and infants (birth to <1 month), as infants have the highest body-weight-normalized water intake (health-protective upper bound) and adults represent long-term population exposure. At the highest assessed loading rate and landfill leachate concentration, estimated average daily doses across age groups were 1.11×10^{-4} to 2.83×10^{-4} , based on a groundwater concentration of 0.01 mg/L. Discussion and characterization of risk associated with these exposures is in Section 4.3.4.4.3.

4.1.3.4.4 Weight of Scientific Evidence for Drinking Water Exposure

Overall, there is robust confidence that the modeled surface water concentrations presented for both the facility-specific releases and generic scenario releases represent higher-end concentrations, and that these concentrations are reasonably applied for identification of drinking water exposure across the evaluated age groups. The use of a tiering structure to evaluate and, where possible, refine these estimates, offered increasing confidence and robustness in predicted surface water drinking water exposures. These refinements provided additional support and confidence in actual potential exposures encountered by the general population from facility-specific releases. While it is difficult to directly compare monitored values to potential modeled releases due to measured concentrations oftentimes not being temporally or geographically close to known releases of *trans*-1,2-dichloroethylene, because it is a regulated drinking water contaminant, there is ample monitoring data of *trans*-1,2-dichloroethylene in drinking water across multiple reporting cycles. This broadly confirms modeled results. Available data showed that *trans*-1,2-dichloroethylene is infrequently detected in drinking water and when measured, most measured concentrations are low and similar in magnitude to the modeled facility and generic scenario estimates. Therefore, EPA has robust confidence that presented estimates of exposure are representative of drinking water exposure per OES and are appropriate to derive final risk estimates discussed in Section 4.3.4.4.

Uncertainties and limitations are inherent in the modeling of groundwater concentrations from disposing chemical substances into poorly managed Resource Conservation and Recovery Act (RCRA) Subtitle D landfills as well as those that are not regulated as closely. These uncertainties include, but are not limited to, (1) determining the total and leachable concentrations of waste constituents, (2) estimating the release of pollutants from the waste management units to the environment, and (3) estimating and transport of pollutants in a range of variable environments by process that often are not completely understood or are too complex to quantify accurately. To address some of these uncertainties and add strength to the assessment, EPA ran the DRAS Model under multiple scenarios—varying waste loading rates and assumed leachate concentrations. These considerations add value to estimate exposure that falls at an unknown percentile of the full distribution of exposures. The DRAS Model is based on a survey of drinking water wells located downgradient from a waste management unit ([U.S. EPA, 1988b](#)). Due to the age of the survey, it is unclear how the survey represents current conditions and proximity of drinking water wells to disposal units. Similarly, it is not clear if the surveyed waste management units are representative of current waste management practices. EPA has however made conservative assumptions (loading rates and landfill leachate concentrations far above reported values) in modeling groundwater concentrations and therefore has moderate confidence in the modeled groundwater estimates for *trans*-1,2-dichloroethylene and deems the resulting exposure estimates suitable for characterizing risk.

4.1.3.5 Weight of Scientific Evidence Conclusions for General Population Exposure

EPA has robust confidence in the overall characterization of exposure in this general population exposure assessment and that the general population exposure scenarios represent a higher-end estimates of exposure. This confidence is based on EPA's use of methodologies and models that previously underwent peer review and public comment. See the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) for more details.

4.2 Summary of Human Health Hazard

Hazards were assessed through systematic review of reasonably available evidence, which includes human epidemiology, animal toxicology, and mechanistic data (including *in vitro* studies). Although inhalation exposure is the predominant route of exposure for *trans*-1,2-dichloroethylene (Section 4.1), EPA quantitatively evaluated hazards via all exposure routes. Previous reviews by U.S. and international governmental agencies and authoritative bodies were also consulted. The Agency for Toxic Substances and Disease Registry's (ATSDR) 2025 *Toxicological Profile for 1,2-Dichloroethene* ([ATSDR, 2025](#)) was used to identify the primary hazards and previously identified key studies. Other EPA reviews including the 2020 EPA Provisional Peer-Reviewed Toxicity Values (PPRTV) assessment ([U.S. EPA, 2020c](#)), 2010 EPA Integrated Risk Information System (IRIS) assessment ([U.S. EPA, 2010b](#)), 2008 Acute Exposure Guideline Levels (AEGL) document ([U.S. EPA, 2022c](#)), and 2018 CalEPA/OEHHA Public Health Goals ([CalEPA, 2018](#)) were also consulted for their hazard databases. These sources were supplemented by a literature search for all reasonably available information through September 2019. An updated literature search was also performed in April 2025 and refined with specific keywords to prioritize data on cancer and immunological data. EPA also reviewed the 2025 ATSDR assessment ([ATSDR, 2025](#)) for any post-2019 studies; however, newer studies were not identified in that assessment.

The updated and refined literature pool was screened using an updated population, exposure, comparator, and outcome (PECO) statement for *in vivo* information specific to those hazard domains. Cancer was selected for a targeted literature screening to support EPA's cancer analysis due to the absence of any published carcinogenicity studies; immunotoxicity was selected because it is the most critical repeated-dose outcome supporting hazard value derivation. Following PECO screening, relevant newer studies were not identified as part of this updated search. The updated literature pool was not screened for other hazards because the recent 2025 ATSDR Toxicological Profile ([2025](#)) did not contain any studies published post-2019 or any other information that would impact the weight of scientific evidence for other hazard domains. Independent systematic review was performed for all studies and outcomes.

trans-1,2-Dichloroethylene is readily absorbed through the lungs and gastrointestinal tract. Evidence from a test order suggest that *trans*-1,2-dichloroethylene has measurable but limited dermal absorption ($\approx 1\%$ absorption based on 8 hours of exposure) when accounting for volatility of the substance from unoccluded skin ([TDCE Consortium, 2023](#)). Metabolism is unlikely to be a major contributor to the toxicity of *trans*-1,2-dichloroethylene because it undergoes "suicide inhibition" that decreases oxidative metabolism through inactivation of cytochrome P450 (CYP450) enzymes. Because of this unique metabolism, toxicologically similar structural analogs other than the *cis*-isomer were not identified.

In reviewing the reasonably available information, EPA concluded that the weight of scientific evidence supports dose-response analysis on two non-cancer hazard outcomes: (1) sensory irritation and acute neurotoxicity, and (2) immunological toxicity. The best representative non-cancer endpoints and PODs representing those hazard outcomes were derived for inhalation, oral, and dermal routes corresponding

to either acute, intermediate, or chronic exposure. The database did not include any studies of longer than 90-day exposure duration.

EPA derived an acute human equivalent concentration (HEC) of 7,930 mg/m³ (2,000 ppm) for ocular irritation based on lacrimation in rats ([Hurtt et al., 1993](#)) with an uncertainty factor (UF) of 30, supported by a single occupational exposure study. In that study, exposed persons self-reported symptoms within minutes of exposure to *trans*-1,2-dichloroethylene in air ([Lehmann and Schmidt-Kehl, 1936](#)). These studies also reported signs of solvent neurotoxicity in humans and rodents at similar concentrations. Collectively these effects could result in a lack of ability to escape or may otherwise present a dangerous environment for exposed individuals. The effects reported in ([Lehmann and Schmidt-Kehl, 1936](#)) are the basis of the first threshold of Acute Exposure Guideline Levels (AEGL-1) of 280 ppm for *trans*-1,2-dichloroethylene. This threshold represents exposure limits for the general public and is applicable to emergency exposure periods ranging from 10 minutes to 8 hours for high priority, acutely toxic chemicals ([U.S. EPA, 2022c](#)). Because ocular irritation is based on exposure levels at peak (*i.e.*, maximal 15-minute period) air concentrations, the HEC was not duration-adjusted to continuous exposure. An acute POD for oral and dermal exposures was not derived because ocular irritation was the only endpoint relevant to acute exposure.

For repeated oral exposures via drinking water, decreased T-cell dependent humoral immune response indicated by reduced antibody-forming cells (AFCs) in mice ([Shopp et al., 1985](#)) was benchmark dose modeled and a human equivalent dose (HED) adjusted to daily exposure of 21.4 mg/kg-day was derived. As a measure of functional immunity, AFC assays are considered one of the best predictors of immunotoxicity in mice ([Ladics, 2007](#)) and demonstrated concordance with immunotoxicity among immune measures ([Luster et al., 1992](#)). This was considered the most reliable POD for intermediate and chronic exposures via all exposure routes despite inconsistency in other less reliable measures of immune function. Because functional immunity was not measured in other studies, the oral HED from ([Shopp et al., 1985](#)) was also applied to dermal exposures and route-to-route extrapolation to inhalation resulted in an HEC of 116 mg/m³. The POD was derived from a 90-day experiment and increased immunotoxicity was observed at 90 days compared to a 14-day experiment in the same ([Shopp et al., 1985](#)) study at comparable doses. Because there were no other studies identified investigating chronic *trans*-1,2-dichloroethylene exposure, the observed increased toxicity at longer exposure duration supports an additional uncertainty factor for extrapolation from the intermediate POD to the chronic duration (UFs). A 10-fold UFs was applied for chronic oral scenarios, with a reduced 3-fold UFs value applied to chronic dermal and inhalation scenarios because (1) only the oral database contains data indicating increased sensitivity over time, while (2) extrapolation to other routes is more uncertain. As a result, the total uncertainty factor for intermediate scenarios via all routes is 30, while the total uncertainty factors for chronic dermal/inhalation and chronic oral scenarios are 100 and 300, respectively.

There is insufficient evidence from cancer bioassays to evaluate the carcinogenicity of *trans*-1,2-dichloroethylene using standard approaches as described in EPA *Guidelines for Carcinogen Risk Assessment* ([U.S. EPA, 2005](#)). Therefore, a weight of scientific evidence approach was employed to evaluate the extent to which the lack of inhalation carcinogenicity studies imparts significant uncertainty on the human health risk assessments for *trans*-1,2-dichloroethylene using the Rethinking Chronic Toxicity and Carcinogenicity Assessment for Agrochemicals Project (ReCAAP) Framework ([OECD, 2024](#); [Hilton et al., 2022](#)). Based on the weight of scientific evidence, EPA has preliminarily concluded that quantitative cancer risk assessment of *trans*-1,2-dichloroethylene is not warranted and carcinogenic effects from *trans*-1,2-dichloroethylene are not expected because (1) carcinogenic effects from *trans*-1,2-dichloroethylene are not expected based on primarily negative results for genotoxicity, (2) no

evidence of precancerous lesions in subchronic studies, (3) only “marginal” carcinogenicity concern from *in silico* modeling, and (4) minimal formation of reactive metabolites. While there is some remaining uncertainty based on the absence of any direct cancer data or chronic toxicity data, the overall weight of scientific evidence is sufficient for making this preliminary conclusion that *trans*-1,2-dichloroethylene is not carcinogenic, and any additional cancer bioassays would be unlikely to provide evidence leading to a different conclusion.

EPA evaluated the confidence for non-cancer human health hazard conclusions based on the following factors: evidence integration conclusions, selection of the most critical endpoint and study, relevance to exposure scenarios, dose-response considerations, and incorporation of PESS. More details on how EPA evaluated these factors are provided in Section 2.3.3 of the *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026w](#)). For cancer, weight of scientific conclusions for the ReCAAP analysis are summarized in Section 2.4.6 of the same TSD.

As noted in the *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene*, EPA did not identify an acute oral study that was suitable for dose-response analysis. Study findings were either described only qualitatively or apical health effects were not observed due to acute oral exposures in the limited studies identified by systematic review ([U.S. EPA, 2026w](#)). Confidence was reduced for relevance to exposure scenarios when extrapolation of the immunotoxicity POD across routes or durations was required. Dose-response considerations also indicated reduced confidence specifically for the dermal route, due to uncertainty in dermal absorption estimates from ([TDCE Consortium, 2023](#)) that required additional statistical adjustments ([U.S. EPA, 2026k](#)).

For more details see the *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026w](#)).

4.2.1 Human Health Hazard Values

Table 4-20 presents the human health hazard endpoints, hazard values, and uncertainty factors derived in the *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026w](#)) used for risk estimation.

Table 4-20. Summary of Human Health Hazard Points of Departure for *trans*-1,2-Dichloroethylene

Target Organ System	Study Duration (Route)	Effect	HED	HEC	Uncertainty Factors	Reference (OQD)	Confidence ^a
Acute inhalation exposure scenario							
Ocular/Neurological	6 hours/day from GD 7–16 (Whole body exposure)	Ocular irritation/CNS depression	N/A	7,930 mg/m ³ (2,000 ppm)	UF _A = 3; UF _H = 3; UF _L = 3; Total UF = 30	Hurtt et al. (1993) (High)	Moderate-to-Robust
Intermediate oral/dermal/inhalation exposure scenario							
Immune	90 days (Oral via drinking water)	Decreased humoral immune response (AFCs)	BMDL _{1SD} = 21.4 mg/kg-d	116 mg/m ³ (29.4 ppm)	UF _A = 3; UF _H = 10; Total UF = 30	Shopp et al. (1985) (High)	Moderate-to-Robust (Oral/Inhalation); Moderate (Dermal)
Oral chronic exposure scenario							
Immune	90 days	Decreased humoral	BMDL _{1SD} = 21.4 mg/kg-d	116 mg/m ³ (29.4 ppm)	UF _A = 3; UF _H = 10; UF _s = 10;	Shopp et al. (1985)	Moderate

Target Organ System	Study Duration (Route)	Effect	HED	HEC	Uncertainty Factors	Reference (OQD)	Confidence ^a
	(Oral via drinking water)	immune response (AFCs)			<i>Total UF = 300</i>	(High)	
Inhalation/dermal chronic exposure scenario							
Immune	90 days (Oral via drinking water)	Decreased humoral immune response (AFCs)	BMDL _{1SD} = 21.4 mg/kg-d	116 mg/m ³ (29.4 ppm)	UF _A = 3; UF _H = 10; UF _S = 3; <i>Total UF = 100</i>	Shopp et al. (1985) (High)	Moderate (Inhalation); Slight-to-Moderate (Dermal)
AFCs = antibody-forming cells; BMDL _{1SD} = benchmark dose lower 95% confidence limit 1 standard deviation; CNS = central nervous system; GD = gestational day; HEC = human equivalent concentration; HED = human equivalent dose; OQD = overall study quality determination for the individual study that was used; POD = point of departure; UF = uncertainty factor; UF _A = interspecies uncertainty factor; UF _H = intraspecies uncertainty factor; UF _L = LOAEL-to-NOAEL uncertainty factor; UF _S = subchronic-to-chronic uncertainty factor							
^a POD confidence selection based on an evaluation of the identified POD and the confidence in the alignment of this POD to the assigned route/duration and any uncertainties associated with the POD being used for risk estimates (e.g., route-to-route extrapolation, duration adjustment).							

4.3 Human Health Risk Characterization

4.3.1 Risk Assessment Approach

Table 4-21. Use Scenarios, Populations of Interest, and Toxicological Endpoints Used for Acute and Chronic Exposures

Population of Interest and Exposure Scenario	Workers and Occupational Non-Users (ONUs) - EPA estimated risks to workers and ONUs ≥16 years old via inhalation exposure following acute, intermediate, and chronic exposures - EPA estimated risk to workers ≥16 years old via dermal exposure for intermediate and chronic exposures.
	General Population Exposed to Environmental Releases - EPA estimated risks to the general population following acute or chronic inhalation, oral drinking water, or oral/dermal exposure while swimming of any lifestage living near facilities releasing <i>trans</i> -1,2-dichloroethylene into the environment. - All ages considered for inhalation and drinking water exposure - Age 6+ considered for oral/dermal exposure from swimming
	Consumers and Bystanders - EPA estimated risks to consumers aged 11+ and bystanders of all ages ^a exposed for acute or intermediate ^b exposures via inhalation. - EPA estimated acute or intermediate risks to consumers ages 11+ years via dermal routes to products containing <i>trans</i> -1,2-dichloroethylene.
Dermal Exposure Scenarios • All data from (TDCE Consortium, 2023)	Occupational Scenarios - Fractional absorption of 0.7–1.7% from data on a 10% solution in isopropyl myristate (IPM) was incorporated into Monte Carlo modeling with a triangular distribution (peak at 1.2%); range accounts for variance in the dataset.
	Consumer Scenarios - Fractional absorption values of 0.6% and 1.2% were applied for all consumer COUs; values were derived from the average across all formulations at 4 and 24 hours respectively.
	General Population Scenarios - A permeability coefficient (K _p) of 9.16×10 ⁻³ cm/hour was derived from a 10% solution in receptor fluid, to be used for dermal exposure from swimming in a body of water such as a lake.

Health Effects, Hazard Values, and Uncertainty Factors	<i>Non-Cancer PODs for Acute, Intermediate, and Chronic Risk Estimates</i>
	<i>Acute</i> - Inhalation HEC = 7,920 mg/m ³ (2,000 ppm) for ocular irritation (with associated CNS depression) • Benchmark MOE = 30 (3 × UF_A × 3 × UF_H × 3 × UF_L) • HEC not duration adjusted from original study; POD represents a peak effect – compared to 15-minute TWA exposures when appropriate
	<i>Intermediate</i> - Oral/Dermal HED = 21.4 mg/kg-day for decreased humoral immune response - Inhalation HEC = 116 mg/m ³ (29.4 ppm) for decreased humoral immune response • Benchmark MOE = 30 (3 × UF_A × 10 × UF_H) • Adjusted for continuous/daily exposure (24 hours/day, 7 days/week)
	<i>Chronic</i> - Oral/Dermal HED = 21.4 mg/kg-day for decreased humoral immune response - Inhalation HEC = 116 mg/m ³ (29.4 ppm) for decreased humoral immune response • Benchmark MOE (oral) = 300 (3 × UF_A × 10 × UF_H × 10 × UF_S) • Benchmark MOE (inhalation/dermal) = 100 (3 × UF_A × 10 × UF_H × 3 × UF_S) • Adjusted for continuous/daily exposure (24 hour/day, 7 days/week)
CNS = central nervous system; COU = condition of use; EPA = Environmental Protection Agency; HEC = human equivalent concentration; HED = human equivalent dose; MOE = margin of exposure; POD = point of departure; TWA = time-weighted average; UF = uncertainty factor; UF _A = interspecies uncertainty factor; UF _H = intraspecies uncertainty factor; UF _L = LOAEL-to-NOAEL uncertainty factor; UF _S = subchronic-to-chronic uncertainty factor ^a Inhalation risk estimates are based on air concentrations and are independent of lifestage. ^b Chronic consumer exposures were not assessed because consumer product use frequency is not expected to approach 10% of a lifetime.	

4.3.1.1 Estimation of Non-Cancer Risks

EPA used an MOE approach to identify potential non-cancer risks. The MOE is the ratio of the non-cancer hazard value (or point of departure (POD)) divided by a human exposure dose. The chronic MOEs for non-cancer inhalation risks were calculated using the equation below:

Equation 4-2. Margin of Exposure Calculation

$$MOE = \frac{\text{Non-cancer Hazard Value (POD)}}{\text{Human Exposure}}$$

Where:

<i>MOE</i>	=	Margin of exposure for acute, short-term, or chronic risk comparison (unitless)
<i>Non-cancer Hazard Value (POD)</i>	=	Human equivalent concentration (HEC, µg/m ³)
<i>Human Exposure</i>	=	Exposure estimate (µg/m ³), adjusted specific to the population and exposure scenario to match the hazard value

The above equation is generalized. However, when comparing a single hazard value with exposures for varied populations and exposure scenarios, risk calculations require adjustment of the exposure estimate to match assumptions inherent in the hazard value. This is especially true for inhalation risks, which must match both exposure duration and exposure factors such as breathing rate. MOE risk estimates are interpreted in relation to benchmark MOEs. Benchmark MOEs are typically the total uncertainty factor for each non-cancer POD. The MOE estimate is interpreted as a starting point for evaluating a human health risk of concern if the MOE estimate is less than the benchmark MOE (*i.e.*, the total uncertainty

factor). On the other hand, if the MOE estimate is equal to or exceeds the benchmark MOE, the exposure pathway is not analyzed further. Typically, the larger the MOE, the more unlikely it is that a non-cancer adverse effect occurs relative to the benchmark. When determining whether a chemical substance presents unreasonable risk to human health or the environment, calculated risk estimates are not bright-line indicators of unreasonable risk, and EPA uses discretion based on all of the reasonably available information to consider other risk-related factors in addition to risks identified in the risk characterization.

4.3.2 Risk Estimates for Workers

This section summarizes risk estimates for workers and ONUs from inhalation, dermal and aggregate exposures to *trans*-1,2-dichloroethylene that result from each COU and OES. It also provides relevant information on personal protective equipment (PPE) reported under the *trans*-1,2-dichloroethylene test order and other sources such as OECD ESDs and EPA GSs, National Institute for Occupational Safety and Health (NIOSH) Health Hazard Evaluations (HHEs), and published literature. Table 4-24 and Table 4-25 contain the risk estimates. Risks were calculated based on the *trans*-1,2-dichloroethylene derived PODs described in Section 4.2. For additional details on the risk estimates, refer to the *Draft Risk Calculator for Occupational Exposure for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026ae](#)).

4.3.2.1 Information on Personal Protective Equipment

EPA gathered information on PPE applicable to the OESs assessed in this risk evaluation that was available in sources such as test orders, EPA-developed GSs and OECD ESDs, NIOSH HHEs, and SDSs. Table 4-22 provides a summary and analysis of reasonably available information on PPE by OES. Additional information on respiratory protection and APFs is provided below.

Table 4-22. Summary of Information on PPE Used by OES

OES	PPE Information
Manufacturing as a Primary Product	Data was available in the test order summary report on respiratory protection used at the monitored facilities. Distillation and batch operators generally worked outdoors with no respiratory protection, except for the use of a half-face respirator during a 15-minute task of isolating equipment, handling drums of catalyst, and adding stabilizer. Shipping/warehouse workers work outdoors with local exhaust ventilation (LEV) during loading activities. Some of these workers also wore half face respirators with organic vapor cartridges, but some did not. Laboratory technicians conducted benchtop activities inside fume hoods with no additional respiratory protection.
Manufacturing as a Byproduct	In absence of industry- or facility-specific information, EPA considers the information on PPE described for the Manufacturing as a Primary Product OES to be relevant to facilities that manufacture <i>trans</i> -1,2-dichloroethylene as a byproduct. However, there is uncertainty as to how representative this might be across facilities.
Repackaging	The Chemical Repackaging GS indicates that information on typical PPE used at repackaging sites is limited. For example, a chemical wholesaler list commonly used PPE such as safety glasses, face shields, aprons, and gloves, while engineering controls at another site include vacuum system and centrifugal degassing (U.S. EPA, 2022a).
Processing as a Reactant	In absence of industry- or facility-specific information, EPA considers the information on PPE described for the Manufacturing as a Primary Product OES to be relevant to facilities that process <i>trans</i> -1,2-dichloroethylene as a reactant. However, there is uncertainty as to how representative this might be across facilities.
Incorporation into Formulation,	Data was available in the test order summary report on respiratory protection used at the monitored facilities. Two of the 9 batch makers (Huntsman) indicated that full-face negative pressure respirators were worn. Two of the 3 distillation operation technicians

OES	PPE Information
Mixture, or Reaction Product	(Versum) indicated that a full-face air purifying respirator with multi-gas cartridges was worn, while the third indicated that it was worn if needed. Three of the 6 RGA technicians (Versum) wore a full-face air purifying respirator with multi-gas cartridges. The process operators (3M 1) had a nozzle equipped with LEV. The packaging operators – container packaging (3M 1) had a nozzle equipped with LEV on the third day but not the first 2 days. Two of the 6 drum fillers (Huntsman) worked inside a slot hood. The aerosol packaging technicians (Microcare) worked inside a fume hood. The blending technicians (Microcare) worked in an area equipped with LEV. The QC technicians (Versum), packaging operator – bubbler packaging (Versum), coat and wash operation techs (Versum), and RGA technicians (Versum) worked under a fume hood, while some of the distillation operation technicians (Versum) made use of a fume hood.
Vapor Degreasing	The <i>trans</i> -1,2-dichloroethylene test order study report from the TDCE Consortium indicated that neither the workers using the vapor degreasers nor the workers maintaining the vapor degreasers used respiratory protection or LEV.
Miscellaneous Non-Aerosol Industrial and Commercial Uses	The <i>trans</i> -1,2-dichloroethylene test order study report from the TDCE Consortium indicated that the workers using the non-aerosol cleaners or degreasers did not use respiratory protection or local exhaust ventilation.
Commercial Aerosol Uses	The <i>trans</i> -1,2-dichloroethylene test order study report from the TDCE Consortium indicated that the workers using the aerosol cleaners or degreasers did not use respiratory protection. However, the test and evaluation technicians sprayed their aerosol in an industrial spray booth while the mechanics had no LEV.
Application of Paints and Coatings	No specific information on exposure controls or PPE was found for application of paints and coatings containing <i>trans</i>-1,2-dichloroethylene. According to the GS Automobile OEM spray painting and ESD for Automobile Refinishing, OEM painting is typically conducted by robots and overspray collected in waterwash booths of downdraft or crossdraft design. In automobile refinishing, almost all spray coating operations are expected to involve a worker spraying the vehicle, typically in a ventilated spray booth with dry filters to collect overspray (GS for Automobile Spray Coating). Typical worker PPE at automotive refinishers includes half- or full-face respirators, latex or nitrile gloves, and safety glasses or goggles (U.S. EPA, 2014b; Science Applications International Corporation, 1996) The ESD on Radiation Curable Coatings, Inks, and Adhesives states that typical PPE used in the workplace include fabric or non-woven long-sleeved shirts and pants, coveralls, and neoprene or rubber gloves. A rubber apron or rubber suit and rubber boots may also be worn in cases where there is potential for splashing on or penetration through clothing. Respiratory protection is used when necessary, especially when escape of spray particles into the work environment is unavoidable (OECD, 2011).
Adhesives and Sealants	No specific information on exposure controls or PPE was found for application of adhesives containing <i>trans</i> -1,2-dichloroethylene. Typical PPE for the application and use of adhesive formulations focuses on minimizing exposure due to spray application or VOC emissions. Chemical pre-manufacture Notice (PMN) submissions submitted to EPA by adhesive chemical manufacturers show that all manufacturers recommend the use of gloves and safety glasses with a side shield or goggles. Approximately half of the submissions also recommended the use of some kind of ventilation and respirators if necessary (OECD, 2015).
Blowing Agent in Spray Foam	No specific information on exposure controls or PPE was found for the use of <i>trans</i> -1,2-dichloroethylene blowing agents.

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OES	PPE Information
	According to the Industry Profile for the Flexible Polyurethane Foam Industry and the Industry Profile for the Rigid Polyurethane Foam Industry, many polyurethane manufacturers incorporate engineering controls such as enclosures or LEV due to exposure limits for diisocyanates and methylene chloride. Supplemental PPE includes eye protection, respiratory protection, and gloves and suits (U.S. EPA, 2004a, b) For spray polyurethane foam insulation, typical engineering controls include work zone containment and ventilation. The Alliance for the Polyurethanes Industry (API) offers guidelines for selecting appropriate protective equipment when handling diisocyanates or polyols, which include eye protection, respiratory protection, and proper selection of chemical resistant gloves and suits (U.S. EPA, 2021a).
Laboratory Use	In absence of industry- or facility-specific information, EPA considers the information on PPE described for laboratory work within manufacturing facilities OES to be relevant to commercial laboratory facilities. However, there is uncertainty as to how representative this might be across laboratory facilities.
Refrigerant Flush	No specific information on exposure controls and PPE for refrigerant flush was found. The <i>trans</i> -1,2-dichloroethylene test study report for the TDCE Consortium provided some information for flight mechanics performing flush cleaning at one facility. The flight mechanics did not wear respiratory protection nor did they have LEV.
Processing Aid in Semiconductor Manufacturing ^a	Occupational exposure was not anticipated for this OES, and thus PPE was not assessed.
Waste Handling, Disposal, and Treatment	EPA did not find information that indicates the extent that engineering controls and worker PPE are used at landfill, incineration, and WWT facilities.
Distribution in Commerce ^b	Occupational exposure was not anticipated for this OES, and thus PPE was not assessed.
ESD = emission scenario document; GS = generic scenario; OES = occupational exposure scenario; ONU = occupational non-user; PMN = pre-manufacture notice; PPE = personal protective equipment; RGA = return goods authorization; TDCE = <i>trans</i>-1,2-dichloroethylene; WWT = wastewater treatment ^a As described in Section 4.3.2.2.14, EPA believes that workers are not exposed to <i>trans</i>-1,2-dichloroethylene during semiconductor manufacturing and therefore considered the exposure pathway to be incomplete and did not assess exposure for this OES. ^b As described in Section 4.3.2.2.16, no occupational exposures are reasonably expected to occur, and no separate assessment was performed for estimating releases and exposures from Distribution in Commerce.	

Discussion of Respirator Assigned Protection Factors (APFs)

OSHA's Respiratory Protection Standard (29 CFR 1910.134) requires employers in certain industries to address workplace hazards by implementing engineering control measures and, if these are not feasible, provide respirators that are applicable and suitable for the purpose intended. Respirator selection provisions are provided in CFR 1910.134(d) and require that appropriate respirators are selected based on the respiratory hazard(s) to which the worker will be exposed and workplace and user factors that affect respirator performance and reliability. Assigned APFs are provided in Table 1 under 1910.134(d)(3)(i)(A) (see also Table 4-23 below) and refer to the level of respiratory protection that a respirator or class of respirators is expected to provide to employees when the employer implements a continuing, effective respiratory protection program according to the requirements of OSHA's Respiratory Protection Standard.

Table 4-23. Assigned Protection Factors (APFs) for Respirators in OSHA Standard 29 CFR 1910.134

Type of Respirator	Quarter Mask	Half Mask	Full Facepiece	Helmet/Hood	Loose-Fitting Facepiece
1. Air-Purifying Respirator	5	10	50	—	—
2. Power Air-Purifying Respirator (PAPR)	—	50	1,000	25/1,000 ^a	25
3. Supplied-Air Respirator (SAR) or Airline Respirator					
• Demand mode	—	10	50	—	—
• Continuous flow mode	—	50	1,000	25/1,000 ^a	25
• Pressure-demand or other positive-pressure mode	—	50	1,000	—	—
4. Self-Contained Breathing Apparatus (SCBA)					
• Demand mode	—	10	50	50	—
• Pressure-demand or other positive-pressure mode (e.g., open/closed circuit)	—	—	10,000	10,000	—

Source: 29 CFR 1910.134(d)(3)(i)(A)

^a The employer must have evidence provided by the respirator manufacturer that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000. This level of performance can best be demonstrated by performing a workplace protection factor (WPF) or simulated workplace protection factor (SWPF) study or equivalent testing. Absent such testing, all other PAPRs and SARs with helmets/hoods are to be treated as loose-fitting facepiece respirators and receive an APF of 25.

Consideration of Information on Dermal PPE Protection and Use

Hand protection provisions are provided in CFR 1910.138, but OSHA has not established quantitative protection factors for gloves. OSHA's hand protection standard (29 CFR 1910.138) requires that employers select and require employees to use appropriate hand protection when expected to be exposed to hazards such as those from skin absorption of harmful substances; severe cuts or lacerations; severe abrasions; punctures; chemical burns; thermal burns; and harmful temperature extremes. Dermal protection selection provisions are provided in CFR 1910.138(b) and require that appropriate hand protection is selected based on the performance characteristics of the hand protection relative to the task(s) to be performed, conditions present, duration of use, and the hazards to which employees will be exposed. OSHA provides various guidance documents on the selection of protective gloves (<https://www.osha.gov/otm/section-2-health-hazards/chapter-2>; <https://www.osha.gov/sites/default/files/publications/OSHA3151.pdf>; both accessed August 20, 2026). Both guidance documents note that glove permeability and breakthrough rates are affected by a number of factors, including temperature, glove thinning due to performance of tasks with increased pressure or friction, glove degradation, wear time, and reuse of gloves.

4.3.2.2 Occupational Risk Estimates and Effect of Personal Protective Equipment

This section provides a summary of non-cancer risk estimates for inhalation and dermal exposure to *trans*-1,2-dichloroethylene. Cancer risks were not estimated for *trans*-1,2-dichloroethylene because EPA has preliminarily concluded that carcinogenic effects are not expected (Section 4.3.1). The *Draft Chemistry, Fate, Release, and Occupational Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](https://www.epa.gov/chemical-safety/draft-chemistry-fate-release-and-occupational-exposure-assessment-for-trans-12-dichloroethylene)) provides more detail on the estimation of the inhalation and dermal exposure metrics. For non-cancer effects, the *trans*-1,2-dichloroethylene specific HEC (inhalation) or HED (dermal) values (see also Section 4.3.1) were divided by the value of the inhalation or dermal exposure metric for the effect to determine the MOE. This was then compared to the benchmark value to assess risks. Table

4-24 provides MOEs without PPE associated with dermal exposures. Table 4-25 provides MOEs without PPE associated with occupational inhalation exposures as well as the APF needed to increase all MOEs above the risk benchmark.

Table 4-25 also provides a potential minimum APF required for all MOEs to be above the benchmark depending on the expected workplace activity. In addition to the use of respirators that achieve a minimum APF, these benchmarks may be met by implementation of other exposure controls (e.g., engineering controls) that may be equally or more effective in reducing worker exposure. Sections 4.3.2.2.1 through 4.3.2.2.16 provide a discussion of the risk characterization per OES. Acute inhalation risks were generally assessed for full-shift 8-hour TWA exposures; however, in cases where 15-minute tasks specific data was available, risk estimates were also provided for that short-term acute exposure duration (Table 4-25). Acute dermal risks were not assessed because it was determined that there are no acute dermal hazards (Section 4.2). Intermediate (30 days) and chronic (central tendency: 31 years and high-end: 40 years) dermal and inhalation risk estimates are presented in Table 4-24 and Table 4-25, respectively.

Table 4-24. Non-Cancer Occupational Dermal Risk Estimates for Workers

COU Life Cycle Stage – Category – Subcategory	Occupational Exposure Scenario (OES)	Exposure Level	Intermediate (Benchmark MOE = 30)	Chronic (Benchmark MOE = 100)
Manufacture – Domestic manufacture	Manufacturing as a Primary Product	CT	318	341
		High-End	114	122
	Manufacturing as a Byproduct	CT	2.4E04	2.6E04
		High-End	8.6E03	9.3E03
Manufacture – Import	Repackaging	CT	302	401
		High-End	108	138
Processing – Repackaging	Repackaging	CT	302	401
		High-End	108	138
Processing – Processing as a reactant – Intermediate	Processing as a Reactant	CT	302	324
		High-End	108	116
Processing – Recycling	Processing as a Reactant	CT	302	324
		High-End	108	116
Processing – Incorporation into a formulation, mixture, or reaction product – Solvents (which become part of product formulation or mixture)	Incorporation into Formulation, Mixture, or Reaction Product	CT	764	818
		High-End	169	181
Processing – Incorporation into a formulation, mixture, or reaction product – Solvent purification (for semiconductor manufacturing)	Incorporation into Formulation, Mixture, or Reaction Product	CT	764	818
		High-End	169	181
Processing – Incorporation into articles	Blowing Agent in Spray Foam	CT	1.1E04	1.2E04
		High-End	3.5E03	3.7E03
Industrial/Commercial use – Propellants, non-motive (blowing agent) – Polyurethane foam	Blowing Agent in Spray Foam	CT	1.1E04	1.2E04
		High-End	3.5E03	3.7E03
Industrial/Commercial use – Adhesion/cohesion promoter – Solvent-based adhesives, sealants, and adhesive accelerants	Application of Adhesives and Sealants	CT	3.9E03	4.2E03
		High-End	267	286

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COU Life Cycle Stage – Category – Subcategory	Occupational Exposure Scenario (OES)	Exposure Level	Intermediate (Benchmark MOE = 30)	Chronic (Benchmark MOE = 100)
Industrial/Commercial use – Paints and coatings – Urethane coatings	Application of Paints and Coatings	CT	720	771
		High-End	206	220
Industrial/Commercial use – Cleaning agent – Aerosol spray cleaner/degreaser	Commercial Aerosol Product	CT	861	922
		High-End	198	212
Industrial/Commercial use – Anti-adhesive/cohesive – Mold release	Commercial Aerosol Product	CT	861	922
		High-End	198	212
	Misc. Non-Aerosol Use	CT	878	941
		High-End	201	215
Industrial/Commercial use – Lubricants and greases	Commercial Aerosol Product	CT	861	922
		High-End	198	212
Industrial/Commercial use – Other uses – Specialized detection indicator paints	Commercial Aerosol Product	CT	861	922
		High-End	198	212
	Misc. Non-Aerosol Use	CT	878	941
		High-End	201	215
Industrial/Commercial use – Cleaning agent – Non-aerosol cleaner/degreaser	Misc. Non-Aerosol Use	CT	878	941
		High-End	201	215
Industrial/Commercial use – Cleaning agent – Vapor degreasing	Vapor Degreasing	CT	504	539
		High-End	145	156
Industrial/Commercial use – Surface modifier – Smoothing fluid in additive manufacturing	Vapor Degreasing (All SEGs)	CT	504	539
		High-End	145	156
Industrial/Commercial use – Refrigerants	Refrigerant Flush	CT	878	941
		High-End	201	215
Industrial/Commercial use – Other uses – Laboratory chemical	Laboratory Use	CT	1.2E03	1.6E03
		High-End	215	280
Disposal	Waste Handling, Disposal, and Treatment	CT	765	819
		High-End	169	181
CT = central tendency; MOE = margin of exposure; SEG = similar exposure group				

2344

2345

Table 4-25. Non-Cancer Occupational Inhalation Risk Estimates for Workers and ONUs

COU Life Cycle Stage – Category – Subcategory	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exposure Level	Acute ^a (Benchmark MOE = 30)	Intermediate (Benchmarks MOE = 30)	Chronic (Benchmarks MOE = 100)	PPE to Raise All MOEs Above Benchmark
Manufacture – Domestic manufacture	Manufacturing as a Primary Product (OES #1)	Outside Lead Operator/B-Operator – Batch Manufacturing	CT	1.8E04	545	584	N/A
			High-End	3.5E03	103	110	N/A
		Operator – Distillation Operation	CT	1.6E05	4.7E03	5.1E03	N/A
			High-End	2.5E03	75	80	APF 10
		Shipping/Warehouse Worker – Batch Manufacturing	CT	240	7.1	7.6	APF 50
			High-End	67	2.0	2.1	APF 50
		Laboratory Technician – Batch Manufacturing	CT	1.6E05	4.7E03	5.0E03	N/A
			High-End	1.6E05	4.6E03	4.9E03	N/A
	Manufacturing as a Byproduct (OES #2)	ONU	CT	1.1E05	3.4E03	3.6E03	N/A
			High-End	1.3E04	396	424	N/A
		Outside Lead Operator/B-Operator – Batch Manufacturing	CT	1.8E04	545	584	N/A
			High-End	3.5E03	103	110	N/A
		Operator – Distillation Operation	CT	1.6E05	4.7E03	5.1E03	N/A
			High-End	2.5E03	75	80	APF 10
		Laboratory Technician – Batch Manufacturing	CT	1.6E05	4.7E03	5.0E03	N/A
			High-End	1.6E05	4.6E3	4.9E03	N/A
Manufacture – Import	Repackaging (OES #3)	Drum Filler	CT	2.0E03	59	95	APF 10
			High-End	1.3E03	40	42	APF 10
		Packaging Operator	CT	72	2.1	3.4	APF 50
			High-End	16	0.47	0.50	APF 1,000
		DCM Drum Filler	CT	215 ^b	–	–	N/A
			High-End	25 ^b	–	–	APF 10
		ONU ^c	N/A	1.4E03	41	66	APF 10
Processing – Repackaging	Repackaging (OES #3)	Drum Filler	CT	2.0E03	59	95	APF 10
			High-End	1.3E03	40	42	APF 10
		Packaging Operator	CT	72	2.1	3.4	APF 50

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COU Life Cycle Stage – Category – Subcategory	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exposure Level	Acute ^a (Benchmark MOE = 30)	Intermediate (Benchmarks MOE = 30)	Chronic (Benchmarks MOE = 100)	PPE to Raise All MOEs Above Benchmark
Processing – Repackaging	Repackaging (OES #3)		High-End	16	0.47	0.50	APF 1,000
		DCM Drum Filler	CT	215 ^b	–	–	N/A
			High-End	25 ^b	–	–	APF 10
		ONU ^c	N/A	1.4E03	41	66	APF 10
Processing – Processing as a reactant – Intermediate	Processing as a Reactant (OES #4)	Outside Lead Operator/B-Operator – Batch Manufacturing	CT	1.8E04	545	584	N/A
			High-End	3.5E03	103	110	N/A
		Operator – Distillation Operation	CT	1.6E05	4.7E03	5.1E03	N/A
			High-End	2.5E03	75	80	APF 10
		Laboratory Technician – Batch Manufacturing	CT	1.6E05	4.7E3	5.0E03	N/A
			High-End	1.6E05	4.6E3	4.9E3	N/A
		DCM – Reactant	CT	6.8	–	–	APF 10
			High-End	4.3	–	–	APF 10
		ONU	CT	1.1E05	3.4E03	3.6E03	N/A
			High-End	1.3E04	396	424	N/A
Processing – Recycling	Processing as a Reactant (OES #4)	Outside Lead Operator/B-Operator – Batch Manufacturing	CT	1.8E04	545	584	N/A
			High-End	3.5E03	103	110	N/A
		Operator – Distillation Operation	CT	1.6E05	4.7E03	5.1E03	N/A
			High-End	2.5E03	75	80	APF 10
		Laboratory Technician – Batch Manufacturing	CT	1.6E05	4.7E03	5.0E03	N/A
			High-End	1.6E05	4.6E03	4.9E03	N/A
		DCM – Reactant	CT	6.8 ^b	–	–	APF 10
			High-End	4.3 ^b	–	–	APF 10
		ONU	CT	1.1E05	3.4E03	3.6E03	N/A
			High-End	1.3E04	396	424	N/A

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COU Life Cycle Stage – Category – Subcategory	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exposure Level	Acute ^a (Benchmark MOE = 30)	Intermediate (Benchmarks MOE = 30)	Chronic (Benchmarks MOE = 100)	PPE to Raise All MOEs Above Benchmark
Processing – Incorporation into a formulation, mixture, or reaction product – Solvents (which become part of product formulation or mixture)	Incorporation into Formulation, Mixture, or Reaction Product (OES #5)	Packaging Operator – Container Packaging (3M 1)	CT	30	0.88	0.94	APF 1,000
			High-End	16	0.49	0.52	APF 1,000
		Process Operator (3M 1)	CT	1.3E03	39	42	APF 10
			High-End	664	20	21	APF 10
		Technician – Aerosol Packaging (Microcare)	CT	157	4.6	5.0	APF 50
			High-End	35	1.0	1.1	APF 1,000
		Technician – Blending (Microcare)	CT	337	10	11	APF 10
			High-End	44	1.3	1.4	APF 1,000
		Production Technician (BASF)	CT	2.6E03	78	84	APF 10
			High-End	385	11	12	APF 10
		Batch maker (Huntsman)	CT	5.3E03	156	167	N/A
			High-End	1.2E03	36	39	APF 10
		Drum filler (Huntsman)	CT	2.0E03	59	64	APF 10
			High-End	1.3E03	40	42	APF 10
Processing – Incorporation into a formulation, mixture, or reaction product – Solvent purification (for semiconductor manufacturing)	Incorporation into Formulation, Mixture, or Reaction Product (OES #5)	Coat and Wash Operations Tech (Versum)	CT	1.1E05	3.4E03	3.6E03	N/A
			High-End	1.1E05	3.4E03	3.6E03	N/A
		Processing into Distillation Operation Tech (Versum)	CT	4.7E03	138	148	N/A
			High-End	3.2E03	93	100	N/A
		Packaging Operator – Bubbler Packaging (Versum)	CT	1.2E05	3.4E03	3.7E03	N/A
			High-End	1.2E05	3.4E03	3.7E03	N/A
		QC Technician (Versum)	CT	1.2E05	3.4E03	3.7E03	N/A
			High-End	2.1E04	609	652	N/A
		RGA Operations Tech (Versum)	CT	839	25	27	APF 10
			High-End	311	9.2	9.8	APF 50
		ONU (Versum)	CT	1.2E05	3.4E03	3.7E03	N/A
			High-End	5.1E04	1.5E03	1.6E03	N/A

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COU Life Cycle Stage – Category – Subcategory	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exposure Level	Acute ^a (Benchmark MOE = 30)	Intermediate (Benchmarks MOE = 30)	Chronic (Benchmarks MOE = 100)	PPE to Raise All MOEs Above Benchmark
Processing – Incorporation into articles	Blowing Agent in Spray Foam (OES #11)	Industrial/Commercial	CT	48 / 463 ^b	1.4	1.5	APF 1,000
			High-End	9.2 / 142 ^b	0.27	0.29	APF 1,000
		ONU (Industrial/Commercial) ^c	CT	48	1.4	1.5	APF 1,000
Industrial/ Commercial use – Propellants, non-motive (blowing agent) – Polyurethane foam	Blowing Agent in Spray Foam (OES #11)	Industrial/Commercial	CT	48 / 463 ^b	1.4	1.5	APF 1,000
			High-End	9.2 / 142 ^b	0.27	0.29	APF 1,000
		Residential Insulation – Gap Filler ^d	Representative	227 ^b	–	13	APF 10
		Residential Insulation – Open Cell ^d	Representative	8 ^b	–	0.31	APF 1,000
		ONU (Industrial/Commercial) ^c	N/A	48	1.4	1.5	APF 1,000
Industrial/ Commercial use – Adhesion/cohesion promoter – Solvent-based adhesives, sealants, and adhesive accelerants	Application of Adhesives and Sealants (OES #10)	Spray Coating	CT	7.7 / 54 ^b	0.23	0.24	APF 1,000
			High-End	3.5 / 12 ^b	0.10	0.11	APF 1,000
		Non-Spray Coating	CT	872 / 17 ^b	26	28	APF 10
			High-End	31 / 13 ^b	0.91	0.98	APF 1,000
		Unknown Application Method	CT	336	9.9	11	APF 10
			High-End	13	0.39	0.42	APF 1,000
		ONU	CT	256	7.6	8.1	APF 50
Industrial/ Commercial use – Paints and coatings – Urethane coatings	Application of Paints and Coatings (OES #9)	Spray Application	CT	131 / 515 ^b	3.9	4.1	APF 50
			High-End	25 / 101 ^b	0.74	0.79	APF 1,000
		Unknown Application Method	CT	741 / 1.7E3 ^b	22	23	APF 10
			High-End	35 / 84 ^b	1.0	1.1	APF 1,000
		ONU	CT	561	17	18	APF 10
Industrial/ Commercial use – Cleaning agent – Aerosol spray cleaner/degreaser	Commercial Aerosol Products (OES #8)	Mechanic (Boeing 3)	CT	1.1E04	316	338	N/A
			High-End	2.0E03	59	63	APF 10
		Technician (Boeing 1)	CT	2.9E03	85	91	APF 10
			High-End	290	8.6	9.2	APF 50
		Other Data	CT	398 ^b	–	–	N/A
			High-End	217 ^b	–	–	N/A
		ONU	CT	2.5E04	747	800	N/A
			High-End	1.7E04	499	534	N/A

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COU Life Cycle Stage – Category – Subcategory	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exposure Level	Acute ^a (Benchmark MOE = 30)	Intermediate (Benchmarks MOE = 30)	Chronic (Benchmarks MOE = 100)	PPE to Raise All MOEs Above Benchmark
Industrial/ Commercial use – Anti-adhesive/ cohesive – Mold release	Commercial Aerosol Products (OES #8)	Mechanic (Boeing 3)	CT	1.1E04	316	338	N/A
			High-End	2.0E03	59	63	APF 10
		Technician (Boeing 1)	CT	2.9E03	85	91	APF 10
			High-End	290	8.6	9.2	APF 50
		Other Data	CT	398 ^b	–	–	N/A
			High-End	217 ^b	–	–	N/A
		ONU	CT	2.5E04	747	800	N/A
			High-End	1.7E04	499	534	N/A
	Misc. Non-Aerosol Use (OES #7)	Worker	CT	330	9.7	10	APF 10
			High-End	90	2.7	2.9	APF 50
		ONU ^c	CT	330	9.7	10	APF 10
Industrial/ Commercial use – Lubricants and greases	Commercial Aerosol Products (OES #8)	Mechanic (Boeing 3)	CT	1.1E04	316	338	N/A
			High-End	2.0E03	59	63	APF 10
		Technician (Boeing 1)	CT	2.9E03	85	91	APF 10
			High-End	290	8.6	9.2	APF 50
		Other Data	CT	398 ^b	–	–	N/A
			High-End	217 ^b	–	–	N/A
		Mechanics (Auto) ^e	Low	24 ^b	–	34	APF 10
			Medium	11 ^b	–	1	APF 1,000
			High	4 ^b	–	0.30	APF 1,000
		ONU	CT	2.5E04	747	800	N/A
			High-End	1.7E04	499	534	N/A
Industrial/ Commercial use – Other uses – Specialized detection indicator paints	Commercial Aerosol Products (OES #8)	Mechanic (Boeing 3)	CT	1.1E04	316	338	N/A
			High-End	2.0E03	59	63	APF 10
		Technician (Boeing 1)	CT	2.9E03	85	91	APF 10
			High-End	290	8.6	9.2	APF 50
		Other Data	CT	398 ^b	–	–	N/A
			High-End	217 ^b	–	–	N/A
		ONU	CT	2.5E04	747	800	N/A
			High-End	1.7E04	499	534	N/A

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COU Life Cycle Stage – Category – Subcategory	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exposure Level	Acute ^a (Benchmark MOE = 30)	Intermediate (Benchmarks MOE = 30)	Chronic (Benchmarks MOE = 100)	PPE to Raise All MOEs Above Benchmark
	Misc. Non-Aerosol Use (OES #7)	Worker	CT	330	9.7	10	APF 10
			High-End	90	2.7	2.9	APF 50
		ONU ^c	N/A	330	9.7	10	APF 10
Industrial/ Commercial use – Cleaning agent – Non-aerosol cleaner/degreaser	Misc. Non-Aerosol Use (OES #7)	Aircraft Technician Performing Cleaning Task (Boeing 2)	CT	2.2E03 / 1.6E03 ^b	66	71	APF 10
			High-End	1.4E03 / 914 ^b	41	44	APF 10
		Flight Mechanics Performing Flush Cleaning (Boeing 1)	CT	2.1E03 ^b	–	–	N/A
			High-End	24 ^b	–	–	APF 10
		Technician – Tube Dipping, Edge Cutting and Buffing (3M 3)	CT	248	7.3	7.8	APF 50
			High-End	71	2.1	2.2	APF 50
		Technician – Slitter Knife Cleaning (3M 5)	CT	360	11	11	APF 10
			High-End	120	3.5	3.7	APF 50
		ONU ^c	N/A	330 / 1.0E04 ^b	9.7	10	APF 10
Industrial/ Commercial use – Cleaning agent – Vapor degreasing	Vapor Degreasing (OES #6)	Technician/Process Mechanic Operating Degreaser (Boeing 1)	CT	566	17	18	APF 10
			High-End	279	8.3	8.8	APF 50
		Assembler Operating Ultrasonic Machine (3M 2)	CT	1.5E03	45	48	APF 10
			High-End	908	27	29	APF 10
		Waste Handling/Maintenance Worker (3M 2)	CT	176	5.2	5.6	APF 50
			High-End	109	3.2	3.4	APF 50
		Other Data	CT	118 ^b	–	–	N/A
			High-End	102 ^b	–	–	N/A
Industrial / Commercial use – Surface modifier – Smoothing fluid in additive manufacturing	Vapor Degreasing (OES #6)	Technician/Process Mechanic Operating Degreaser (Boeing 1)	CT	566	17	18	APF 10
			High-End	279	8.3	8.8	APF 50
		Assembler Operating Ultrasonic Machine (3M 2)	CT	1.5E03	45	48	APF 10
			High-End	908	27	29	APF 10
		Waste Handling/Maintenance Worker (3M 2)	CT	176	5.2	5.6	APF 50
			High-End	109	3.2	3.4	APF 50
		Other Data	CT	118 ^b	–	–	N/A
			High-End	102 ^b	–	–	N/A

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COU Life Cycle Stage – Category – Subcategory	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exposure Level	Acute ^a (Benchmark MOE = 30)	Intermediate (Benchmarks MOE = 30)	Chronic (Benchmarks MOE = 100)	PPE to Raise All MOEs Above Benchmark
			High-End	102 ^b	–	–	N/A
		ONU	CT	2.7E03	80	86	APF 10
			High-End	1.4E03	41	44	APF 10
Industrial/ Commercial use – Refrigerants	Refrigerant Flush (OES #13)	Worker	CT	330	9.7	10	APF 10
			High-End	90	2.7	2.9	APF 50
		ONU ^c	N/A	330	9.7	10	APF 10
Industrial/ Commercial use – Other uses – Laboratory chemical	Laboratory Use (OES #12)	Laboratory Technician – Batch Manufacturing	CT	1.6E05	4.7E03	7.6E03	N/A
			High-End	1.6E05	4.6E03	4.9E03	N/A
		ONU ^c	N/A	1.6E05	4.7E03	7.6E03	N/A
Disposal	Waste Handling, Disposal, and Treatment (OES #15)	Landfills	CT	1.0E05	3.0E03	3.2E03	N/A
			High-End	6.9E03	204	218	N/A
		Incinerators	CT	3.9E03	115	123	N/A
			High-End	113	3.3	3.6	APF 50
		POTW and Non-POTW WWT	CT	5.4E03	159	170	N/A
			High-End	2.0E03	60	64	APF 10
		ONU ^c	N/A	4.2E03	125	134	N/A
APF = assigned protection factor; CEM = Consumer Exposure Model; CT = central tendency; DCM = dichloromethane; ONU = occupational non-user; POTW = publicly owned treatment works; PPE = personal protective equipment; RGA = return goods authorization; WWT = wastewater treatment Bolded/shaded risk estimates are below the margin of exposure (MOE). ^a Full-shift exposure estimates are 8-hour time-weighted averages (TWAs), unless indicated with a footnote as a short-term exposure estimate. If both 8-hour TWAs and short term exposures were determined, MOEs are presented at 8-hour TWA / short-term with a footnote on short term. ^b Short-term exposure estimates are derived from 15–127 minute duration monitoring samples. ^c ONU exposure is based upon the central tendency of worker exposure, when ONU-specific monitoring data are not available. ^d A single representative exposure scenario was run with CEM for this SEG. ^e Exposure scenarios represent a range of weight fractions, exposure durations, and product mass as follows: Low (3%, 1.7 min, 85 g), Medium (51%, 3.4 min, 170 g), and High (90%, 5 min, 255 g).							

4.3.2.2.1 Manufacturing as a Primary Product (OES #1)

The OES of Manufacturing as a Primary Product is mapped the COU of Manufacture – Domestic manufacture. As described in Table 4-3, EPA assessed inhalation exposure concentrations for this OES based on test order data that are personal worker monitoring data. These data were collected by monitoring *trans*-1,2-dichloroethylene manufacturing workers during the manufacture of *trans*-1,2-dichloroethylene at Westlake's Eagle US 2 in Westlake, Louisiana, site between January 2023 and March 2023 and were collected by the TDCE Consortium in response to the inhalation monitoring test order. No dermal risks were identified for this OES (Table 4-24).

As shown in Table 4-25, for this OES, most SEGs did not show inhalation risk estimates below the benchmark MOEs for workers or ONUs. However, inhalation exposures resulted in risk estimates below the benchmark for central tendency inhalation intermediate (MOE = 7.1), and chronic (MOE = 7.6) exposures for the Shipping/Warehouse Worker – Batch Manufacturing and for high-end inhalation intermediate (MOE = 2.0), and chronic (MOE = 2.1) exposures for workers in this same SEG. The Operator – Distillation Operation SEG also had inhalation exposures that resulted in risk estimates below the benchmark for high-end inhalation chronic (MOE = 80) exposures. As described in Section 4.3.2.1, Distillation and Batch operators were noted to use half-face respirator during some 15-minute tasks. Use of respirators was mixed for shipping/warehouse workers, and laboratory technicians did not use PPE.

Although EPA has robust confidence in the exposure estimates for three of the four worker SEGs in this OES, as described in Table 4-10, for the Shipping/Warehouse Worker – Batch Manufacturing SEG, the test order did note that this was a periodic/batch operation. Due to a lack of specific information, EPA assumed this task occurred 250 days/year which may lead to an overestimate of risks. The Agency has moderate confidence in the Laboratory Technician SEG and moderate-to-robust confidence in the ONU due to the number of non-detects sampled.

4.3.2.2.2 Manufacturing as a Byproduct (OES #2)

The OES of Manufacturing as a Byproduct is mapped the COU of Manufacture – Domestic manufacture. As described in Table 4-3, EPA assessed inhalation exposure concentrations based on analogous test order data that were personal worker monitoring data collected during *trans*-1,2-dichloroethylene manufacturing as a primary product. As described in Section 4.3.2.1, the PPE usage was assumed to be the same as described for Manufacturing as Primary Product OES.

No dermal risks were identified for this OES (Table 4-24). As shown in Table 4-25, for this COU, most SEGs did not show inhalation risk estimates below the benchmark MOEs for workers or ONUs. However, inhalation exposures resulted in risk estimates below the benchmark for high-end inhalation chronic (MOE = 80) for workers in the Operator – Distillation Operation SEG.

As described in Table 4-10, EPA has moderate confidence in the exposure estimates for the Outside Lead Operator/B-Operator – Batch Manufacturing and Operator – Distillation Operation worker SEGs. EPA has slight-to-moderate confidence in the exposure estimates for the Laboratory Technician SEG and ONUs due to the number of non-detects. As described in Section 4.2.2.1 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)), EPA has data to support *trans*-1,2-dichloroethylene concentrations of 1 to 30% when produced as a byproduct. Therefore, the high-end values may be overestimates of risk.

4.3.2.2.3 Repackaging (OES #3)

The OES of Repackaging is mapped to two COUs: (1) Manufacture – Import; and (2) Processing – Repackaging. As described in Table 4-3, EPA assessed full-shift inhalation exposure concentrations based on analogous test order data that were personal worker monitoring data collected during *trans*-1,2-dichloroethylene incorporation into formulation. As described in Section 4.3.2.1, the limited information on PPE usage for repackaging sites indicates some usage of safety glasses, face shields, aprons, and gloves.

No dermal risks were identified for this OES (Table 4-24). As shown in Table 4-25, worker and ONU inhalation exposures resulted in risk estimates for the Packaging Operator SEG below the benchmark for high-end inhalation 8-hour TWA acute exposure (MOE = 16), central tendency (MOE = 2.1) and high-end (MOE = 0.47) intermediate exposures, and central tendency (MOE = 3.4) and high-end (MOE = 0.50) chronic while the MOE for central tendency 8-hour TWA acute exposure was above the benchmark. The Drum Filler (*trans*-1,2-dichloroethylene repackaging) SEG had chronic inhalation exposures that were below the benchmark for central tendency (MOE = 95) and high-end (MOE = 42) workers. ONUs had chronic inhalation exposures that were below the benchmark for central tendency (MOE = 66), while the MOEs for workers and ONUs for 8-hour TWA acute and intermediate for central tendency were above the benchmark. The short-term data for the Drum Filler (dichloromethane repackaging) SEG resulted in a risk estimate below the benchmark for high-end (MOE = 25) worker acute exposures, while the central tendency acute exposure was above the benchmark. The short-term data was collected for the repackaging of dichloromethane and EPA used the vapor pressures to correct the difference in exposures due to the difference in volatilities. The weight of scientific evidence is discussed in Table 4-10.

In conclusion, EPA has moderate confidence that the assessed exposure concentrations for workers and slight-to-moderate for ONUs. The central tendency estimate for ONUs is based on exposure concentrations calculated as the median of the data for workers across both relevant SEGs. The assessed high-end values are not overestimates of actual exposure for the OES as EPA expects that the incorporation into formulation exposures to be the result of filling containers with a less concentrated form (1–5% for the Drum Filler and 50–90% for the Packaging Operator) than what typically happens during the repackaging of neat *trans*-1,2-dichloroethylene.

4.3.2.2.4 Processing as a Reactant (OES #4)

The OES of Processing as a Reactant is mapped to two COUs: (1) Processing – Processing as a reactant – Intermediate; and (2) Processing – Recycling. As described in Table 4-3, EPA assessed full-shift inhalation exposure concentrations based on analogous test order data that were personal worker monitoring data collected during *trans*-1,2-dichloroethylene manufacturing as a primary product and assessed short-term inhalation exposure concentrations based on surrogate personal worker monitoring data collected during the use of dichloromethane during its use as a reactive intermediate. As described in Section 4.3.2.1, the PPE usage was assumed to be similar to that described for Manufacturing as Primary Product OES.

No dermal risks were identified for this OES (Table 4-24). There were no risk estimates for workers and ONUs below the benchmark MOEs of 30 for intermediate inhalation exposure (Table 4-25). Inhalation exposures resulted in risk estimates below the benchmark for high-end inhalation chronic exposure (MOE = 80) for the Operator – Distillation Operation SEG, whereas the MOEs for all other Manufacturing SEGs including ONUs were above the benchmark for high-end exposures. Inhalation exposures resulted in risk estimates for workers below the benchmark at central tendency (MOE = 6.8) and high-end (MOE = 4.3) for 8-hour TWA acute exposure. When comparing acute risks from short-

term surrogate data to full-shift analogous data, EPA has more confidence in the full-shift data as the short-term data are significantly older and lacks some metadata. The weight of scientific evidence is discussed in Table 4-10. EPA has moderate confidence in the estimate of exposures for two worker SEGs (Outside Lead Operator/B-Operator – Batch Manufacturing and Operator – Distillation Operation) and slight-to-moderate confidence in the exposure estimates for the worker SEG of Laboratory Technician – Batch Manufacturing and ONUs due to the number of non-detects. The assessed full-shift exposure concentrations for workers and ONUs, including the assessed high-end value, are potentially overestimates of the OES because EPA does not expect a reactive intermediate to be present in the product at concentrations similar to the primary product.

4.3.2.2.5 Incorporation into Formulation, Mixture, or Reaction Product (OES #5)

The OES of Processing into a Formulation, Mixture, or Reaction Product is mapped to two COUs: (1) Processing – Incorporation into a formulation, mixture, or reaction product – Solvent purification (for semiconductor manufacturing); and (2) Processing – Incorporation into a formulation, mixture, or reaction product – Solvents (which become part of a product formulation or mixture).

As described in Table 4-3, EPA assessed inhalation exposure concentrations based on personal working monitoring data from a test order. These data were collected by monitoring *trans*-1,2-dichloroethylene incorporation into formulation workers during the formulation of *trans*-1,2-dichloroethylene at five sites between January 2023 and June 2023 and were collected by the TDCE Consortium in response to the inhalation monitoring test order. As described in Section 4.3.2.1, only 3 of 12 SEGs in this OES indicated PPE was sometimes used: (1) Batch Makers (Huntsman), 2) Distillation Operation Technicians (Versum), and (3) Return Goods Authorization (RGA) Operations Technicians (Versum).

There were no dermal risk estimates for workers below the benchmark MOEs (Table 4-24) for this OES.

As described in Table 4-25, inhalation exposures resulted in risk estimates below the benchmark for at least one risk estimate for each worker SEGs and ONUs relevant to the COU of Processing – Incorporation into a formulation, mixture, or reaction product – Solvents (which become part of a product formulation or mixture). The Packaging Operator – Container Packaging (3M 1) SEG had risk estimates below the benchmark for central tendency (MOE = 30) and high-end (MOE = 16) 8-hour TWA acute inhalation exposure; central tendency (MOE = 0.88) and high-end (MOE = 0.49) intermediate inhalation exposures; and central tendency (MOE = 0.94) and high-end (MOE = 0.52) chronic inhalation exposures. The Process Operator (3M 1) SEG had risk estimates below the benchmark for high-end (MOE = 20) intermediate inhalation exposures; and central tendency (MOE = 42) and high-end (MOE = 21) chronic inhalation exposures. The Technician – Aerosol Packaging (Microcare) SEG had risk estimates below the benchmark for central tendency (MOE = 4.6) and high-end (MOE = 1.0) intermediate inhalation exposures; and for central tendency (MOE = 5.0) and high-end (MOE = 1.1) chronic inhalation exposures. The Technician – Blending (Microcare) SEG had risk estimates below the benchmark for central tendency (MOE = 10.0) and high-end (MOE = 1.3) intermediate inhalation exposures; and for central tendency (MOE = 11) and high-end (MOE = 1.4) chronic inhalation exposures. The Production Technician (BASF) SEG had risk estimates below the benchmark for high-end (MOE = 11) intermediate inhalation exposures; and for central tendency (MOE = 84) and high-end (MOE = 12) chronic inhalation exposures. The Drum Filler (Huntsman) SEG had risk estimates below the benchmark for central tendency (MOE = 64) and high-end (MOE = 42) chronic inhalation exposures. The Batch Maker (Huntsman) SEG had chronic inhalation exposures that were below the benchmark for high-end (MOE = 39). The ONU (3M 1, Microcare, BASF, and Huntsman) SEG had high-end inhalation exposures below the benchmark for intermediate (MOE = 9.9) and chronic (MOE = 11) exposures.

As described in Table 4-25, the Processing – Incorporation into a formulation, mixture, or reaction product – Solvent purification (for semiconductor manufacturing) COU had one relevant worker SEG that had inhalation exposure that resulted in risk estimates below the benchmark. The Return Goods Authorization (RGA) Operation Tech (Versum) SEG had intermediate inhalation exposures that were below the benchmark for central tendency (MOE = 25) and high-end (MOE = 9.2); and chronic inhalation exposures that were below the benchmark for central tendency (MOE = 27) and high-end (MOE = 9.8). The remaining four worker SEGs and the ONU (Versum) relevant to this COU had all MOEs for both central tendency and high-end for 8-hour TWA acute, intermediate, and chronic were above the benchmark.

The weight of scientific evidence is discussed in Table 4-10. In conclusion, EPA has robust confidence that 10 of the 14 assessed worker and ONU exposure concentrations, including the assessed high-end value, are representative of actual exposure because the monitoring data comes from the test order and is specific for the actual OES. The four exceptions were the three worker SEGs and the ONU (Versum), which had a large portion of their dataset below the detection limit and were given a moderate confidence rating.

4.3.2.2.6 Vapor Degreasing (OES #6)

The OES of Vapor Degreasing is mapped to two COUs: (1) Industrial/Commercial uses – Cleaning agent – Vapor degreasing; and (2) Industrial/Commercial uses – Surface modifier – Smoothing fluid in additive manufacturing. As described in Table 4-3, EPA assessed full-shift inhalation exposure concentrations based on test order data that are personal worker monitoring data. These data were collected by monitoring *trans*-1,2-dichloroethylene vapor degreasing workers during the use of *trans*-1,2-dichloroethylene at two sites between January 2023 and June 2023 and were collected by the TDCE Consortium in response to the inhalation monitoring test order. The short-term inhalation exposure concentrations were based upon PBZ monitoring data that was collected prior to 2011 ([3M, 2010](#)) of workers using *trans*-1,2-dichloroethylene for vapor degreasing. As described in Section 4.3.2.1, the test order data indicates that PPE was not used by workers in this OES.

No dermal risks were identified for this OES (Table 4-24). There were no risk estimates for workers or ONUs below the benchmark MOEs for 8-hour TWA acute inhalation exposure (Table 4-25). As described in Table 4-25, inhalation exposures resulted in risk estimates for the Technician/Process Mechanic Operating Degreaser SEG below the benchmark for central tendency (MOE = 17) and high-end (MOE = 8.3) intermediate exposures; and central tendency (MOE = 18) and high-end (MOE = 8.8) chronic exposures. The Assembler Operating Ultrasonic Machine SEG had intermediate inhalation risk estimates below the benchmark for high-end (MOE = 27); and chronic inhalation risk estimates below the benchmark for central tendency (MOE = 48) and high-end (MOE = 29). The Waste Handling/Maintenance Worker SEG had intermediate inhalation risk estimates below the benchmark for central tendency (MOE = 5.2) and high-end (MOE = 3.2); and chronic inhalation risk estimate below the benchmark for central tendency (MOE = 5.6) and high-end (MOE = 3.4). ONUs had chronic inhalation risk estimates below the benchmark for central tendency (MOE = 86) and high-end (MOE = 44), while acute and intermediate inhalation exposures for central tendency and high-end exposures were above the benchmark. All SEGs assessed for this OES are relevant to both of the COUs.

The weight of scientific evidence for occupational exposure is discussed in Table 4-10. In conclusion, EPA has robust confidence that the assessed exposure concentrations for these SEGs, including the assessed high-end value, are representative of actual exposures of workers and ONUs because the monitoring data comes from the test order and is specific for the actual OES.

4.3.2.2.7 Miscellaneous Non-Aerosol Industrial and Commercial Uses (Cleaning and Degreasing Agents, Lubricants and Greases, Mold Release) (OES #7)

The OES of Miscellaneous Non-Aerosol Industrial and Commercial Uses (Cleaning and Degreasing Agents, Lubricants and Greases, Mold Release) is mapped to three COUs: (1) Industrial/Commercial uses – Cleaning agent – Non-aerosol cleaner/degreaser; (2) Industrial/Commercial uses – Anti-adhesive/cohesive – Mold release; and (3) Industrial/Commercial uses – Other uses – Specialized detection indicator paints. As described in Table 4-3, EPA assessed short-term and full-shift inhalation exposure concentrations based on test order data that are personal worker monitoring data. These data were collected by monitoring workers during the use of *trans*-1,2-dichloroethylene at three sites between January 2023 and June 2023 and were collected by the TDCE Consortium in response to the inhalation monitoring test order. EPA did not identify any full-shift ONU PBZ sample and thus used the central tendency from workers to represent ONU exposures. All of the SEGs for this OES are relevant to the Industrial/Commercial use – Cleaning agent – Non-aerosol cleaner/degreaser COU. A single representative exposure from the combined SEGs above was used to evaluate the COUs of Industrial/Commercial use – Other uses – Specialized detection indicator paints and Industrial/Commercial use – Anti-adhesive/ cohesive – Mold release. As described in Section 4.3.2.1, the test order data indicates that PPE was not used by workers in this OES.

There were no risk estimates for workers below the benchmark for dermal exposures (Table 4-24). As described in Table 4-25, inhalation exposures resulted in risk estimates below the benchmark for the Technician (Tube Dipping, Edge Cutting, And Buffing) SEG for central tendency (MOE = 7.3) and high-end (MOE = 2.0) intermediate exposures; and central tendency (MOE = 7.8) and high-end (MOE = 2.1) chronic exposures. The Technician (Slitter Knife Cleaning) SEG had intermediate inhalation exposures with risk estimates below the benchmark for central tendency (MOE = 9.7) and high-end (MOE = 2.9; and chronic inhalation exposures below the benchmark for central tendency (MOE = 10) and high-end (MOE = 3.1). The Aircraft Technician (Performing Cleaning Task) SEG had chronic inhalation exposures with risk estimates below the benchmark for central tendency (MOE = 71) and high-end (MOE = 44). The Flight Mechanics (Performing Flush Cleaning) SEG had 8-hour TWA acute inhalation exposures below the benchmark for high-end (MOE = 24). ONUs had central tendency inhalation exposures with risk estimates below the benchmark for intermediate (MOE = 9.7) and chronic (MOE = 10) exposures, while acute inhalation exposures were above the benchmark.

The weight of scientific evidence for the occupational exposure assessment is discussed in Table 4-10. EPA has robust confidence that the assessed exposure concentrations for workers in the Flight Mechanics Performing Flush Cleaning, Technician (Tube Dipping, Edge Cutting, And Buffing), and Technician (Slitter Knife Cleaning) SEGs, including the assessed high-end value, are representative of actual exposure because the monitoring data from the test order is specific for the actual OES. EPA has moderate-to-robust confidence in the exposure estimates for the Aircraft Technician Performing Cleaning Task SEG, which was limited by a small sample size, and for the ONUs, which were estimated using the worker central tendency. When the SEGs are combined into one estimate to represent the OES of Miscellaneous Non-Aerosol Industrial and Commercial Uses more broadly, EPA has moderate-to-robust confidence in this dataset due to the number and quality of samples, but acknowledges that combining SEGs may lead to over- or under-estimations of exposures (higher exposure SEGs may bring the combined exposure value up, while lower exposure SEGs may bring the combined exposure value down).

4.3.2.2.8 Commercial Aerosol Products (Aerosol Degreasing, Aerosol Lubricants, Mold Release) (OES #8)

The OES of Commercial Aerosol Products (Aerosol Degreasing, Aerosol Lubricants, Mold Release) is mapped to four COUs: (1) Industrial/Commercial uses – Cleaning agent – Aerosol spray cleaner/degreaser; (2) Industrial/Commercial uses – Anti-adhesive/cohesive – Mold release; (3) Industrial/Commercial uses – Lubricants and greases; and (4) Industrial/Commercial uses – Other uses – Specialized detection indicator paints. As described in Table 4-3, EPA assessed full-shift inhalation exposure concentrations based on personal worker monitoring data from a test order to determine exposures for the Mechanic (Boeing 3) SEG, Technician (Boeing 1) SEGs and ONUs. These data were collected by monitoring workers during the use of *trans*-1,2-dichloroethylene at two sites between January 2023 and June 2023 and were collected by the TDCE Consortium in response to the inhalation monitoring test order. The short-term (15–127 minutes) exposure data presented as the Other Data SEG in Table 4-25 were collected by 3M Company during aerosol degreasing using *trans*-1,2-dichloroethylene. These three SEGs and ONU are relevant to all four COUs described above. As described in Section 4.3.2.1, the test order data indicates that PPE was not used by worker in this OES.

Additionally, the Consumer Exposure Model was used to model worker inhalation exposures to *trans*-1,2-dichloroethylene aerosol/degreaser products in an auto repair shop for the Mechanics (Auto) SEG, which is only relevant to the COU of Industrial/Commercial use – Lubricants and greases. Modeled inhalation exposures for Mechanics (Auto) resulted in risk estimates below benchmark for low-intensity use for acute (MOE = 24) and chronic (MOE = 34) inhalation exposures; medium-intensity use for acute (MOE = 11) and chronic (MOE = 1) inhalation exposures; and high-intensity use for acute (MOE = 4) and chronic (MOE = 0.30) inhalation exposures.

There were no dermal risk estimates for workers below the benchmark MOEs (Table 4-24). As described in Table 4-25, inhalation exposures resulted in risk estimates for the Mechanic (Boeing 3) SEG below the benchmark for high-end (MOE = 62) chronic duration exposure. The Technician SEG had intermediate inhalation exposures with risk estimates below the benchmark for high-end (MOE = 8.6), chronic inhalation exposures with risk estimates below the benchmark for central tendency (MOE = 91) and high-end (MOE = 9.2). ONUs had no acute, intermediate, or chronic inhalation exposure estimates with risk estimates below the benchmark for central tendency or high-end.

The weight of scientific evidence for the occupational exposure assessment is discussed in Table 4-10. EPA has robust confidence that the assessed exposure concentrations for workers, including the assessed high-end value, are representative of actual exposure because the monitoring data comes from the test order and is specific for the actual OES for the Mechanic (Boeing 3), Technician (Boeing 1), and Other Data SEGs. EPA has moderate confidence in the exposure concentrations for the Mechanics (Auto) SEG modeled with CEM. The Agency has moderate-to-robust confidence in the ONU exposure estimates based on the limited sample size from the test order.

4.3.2.2.9 Application of Paint and Coatings (OES #9)

The OES of Application of Paint and Coatings is mapped the COU Industrial/Commercial use – Paints and coatings – Urethane coatings. As described in Table 4-3, EPA assessed full-shift inhalation exposure concentrations based on surrogate personal worker monitoring data collected during the use of dichloromethane during the application of paints and coatings, which is expected to be similar to exposures for *trans*-1,2-dichloroethylene. Because no ONU-specific data was available, ONU exposures were estimated with worker central tendency. As described in Section 4.3.2.1, no *trans*-1,2-dichloroethylene-specific PPE data was identified, however, some respiratory protection may be used for certain tasks.

There were no dermal risk estimates for workers below the benchmark MOEs (Table 4-24). As described in Table 4-25, inhalation exposures resulted in risk estimates below the benchmark for Spray Application for high-end (MOE = 25) 8-hour TWA acute exposure, central tendency (MOE = 3.9) and high-end (MOE = 0.79) intermediate exposure, and central tendency (MOE = 4.1) and high-end (MOE = 0.79) chronic exposure. Inhalation exposures resulted in risk estimates below the benchmark for the Unknown Application Method SEG for central tendency (MOE = 22) and high-end (MOE = 1.0) intermediate exposure; and central tendency (MOE = 23) and high-end (MOE = 1.1) chronic exposure. ONUs had central tendency inhalation exposures below the benchmark for intermediate (MOE = 17) and chronic (MOE = 18), while the acute inhalation exposure was above the benchmark.

The weight of scientific evidence for occupational exposure for this OES is discussed in Table 4-10. Since the majority of the monitoring data was collected more than 20 years ago, there is uncertainty in whether worker practices and controls may have changed for these activities at these facilities, which could affect the potential for exposure. Therefore, EPA has identified the assessed central tendency exposure concentrations as most representative of the actual worker exposure for the OES. EPA has moderate confidence in worker exposures and slight-to-moderate confidence in the exposure estimates for ONUs for this OES.

4.3.2.2.10 Application of Adhesives and Sealants (OES #10)

The OES of Application of Adhesives and Sealants is mapped the COU Industrial/Commercial uses – Adhesion/cohesion promoter – Solvent-based adhesives, sealants, and adhesive accelerants. As described in Table 4-3, EPA assessed full-shift inhalation exposure concentrations based on surrogate personal worker monitoring data collected during the use of dichloromethane and 1-bromopropane as adhesives and sealants. Because the vapor pressure is important factor to consider when choosing surrogate chemicals, EPA has increased confidence in the applicability of this surrogate data as the vapor pressure of *trans*-1,2-dichloroethylene (331 mmHg) is in between the vapor pressure of both surrogate chemicals (435 mmHg for dichloromethane and 146 mmHg for 1-bromopropane). The central tendency of worker exposure was used to estimate ONU exposure. As described in Section 4.3.2.1, no *trans*-1,2-dichloroethylene-specific PPE data was identified; however, some sources report the use of safety glasses with a side shield or goggles or a respirator if necessary.

There were no dermal risk estimates for workers below the benchmark MOEs (Table 4-24). As described in Table 4-25, inhalation exposures resulted in risk estimates below the benchmark for Spray Coating for central tendency (MOE = 7.7) and high-end (MOE = 3.5) 8-hour TWA acute exposure, central tendency (MOE = 0.23), and high-end (MOE = 0.10) intermediate exposure; and central tendency (MOE = 0.24) and high-end (MOE = 0.11) chronic exposure. Risk estimates for inhalation exposures were below benchmark for Non-Spray Coating for central tendency (MOE = 17) and high-end (MOE = 13) 8-hour TWA acute exposure; central tendency (MOE = 26) and high-end (MOE = 0.91) intermediate exposure; and central tendency (MOE = 28) and high-end (MOE = 0.98) chronic exposure. For the Unknown Application Method SEG, inhalation risk estimates were below the benchmark for high-end (MOE = 13) 8-hour TWA acute exposure; central tendency (MOE = 9.9) and high-end (MOE = 0.39) intermediate exposure; and central tendency (MOE = 11) and high-end (MOE = 0.42) chronic exposure. ONUs had inhalation exposures below the benchmark for intermediate (MOE = 7.6) and chronic (MOE = 8.1), while the acute inhalation risk estimates were above the benchmark. The weight of scientific evidence for occupational exposure is discussed in Table 4-10. Since the majority of the monitoring data was collected more than 30 years ago, there is uncertainty in whether worker practices and controls may have changed for these activities at these facilities, which could affect the potential for exposure. Thus, EPA has identified the assessed central tendency exposure concentrations as representative of the actual worker exposure for the OES. EPA has moderate

confidence in the worker exposure estimates and slight-to-moderate confidence in the exposure estimates for ONUs for this OES.

4.3.2.2.11 Blowing Agent in Spray Foam (OES #11)

The OES of Blowing Agent in Spray Foam is mapped to two COUs: (1) Industrial/Commercial uses – Propellants, non-motive (blowing agent) – Polymer foam; and 2) Processing – Incorporation into articles. As described in Table 4-3, EPA assessed full-shift inhalation exposure concentrations based on surrogate personal worker monitoring data collected during the use of dichloromethane during the application of spray foam. The Industrial/Commercial Worker and ONU SEGs exposures estimated with these data are relevant to both COUs. The SEGs of Residential Insulation – Gap Filler and Residential Insulation – Open Cell, which are only relevant to the COU of Industrial/Commercial uses – Propellants, non-motive (Blowing agent) – Polymer foam, IECCU was used to assess the commercial application of spray foam insulation products containing *trans*-1,2-dichloroethylene by contractors in residential spaces in alignment with similar analysis conducted in the consumer exposure assessment. As described in Section 4.3.2.1, no *trans*-1,2-dichloroethylene-specific PPE data was identified for this OES; however, industry reports from other chemicals indicate some respiratory protection may be used.

There were no dermal risk estimates for workers below the benchmark MOEs (Table 4-24). As described in Table 4-25, inhalation exposures resulted in risk estimates below the benchmark for workers applying Spray Foam for high-end (MOE = 9.2) 8-hour TWA acute exposure; central tendency (MOE = 1.4) and high-end (MOE = 0.27) intermediate exposure; and central tendency (MOE = 1.5) and high-end (MOE = 0.29) chronic exposure. ONUs had central tendency inhalation exposures resulting in risk estimates below the benchmark for intermediate (MOE = 1.4) and chronic (MOE = 1.5), while the acute inhalation risk estimates were above the benchmark. Modeled inhalation exposures for Residential Insulation – Gap Filler resulted in a risk estimate below benchmark for chronic inhalation exposure (MOE = 13), while the acute inhalation exposure was above the benchmark. Modeled inhalation exposures for Residential Insulation – Open Cell resulted in risk estimates below benchmark for acute inhalation exposure (MOE = 8) and chronic inhalation exposure (MOE = 0.31).

The weight of scientific evidence is discussed in Table 4-10. EPA has increased uncertainty with these risk estimates as the use of surrogate data is generally a less preferred approach when *trans*-1,2-dichloroethylene data are available and representative of the uses. Additionally, because the majority of the monitoring data was collected more than 30 years ago, there is uncertainty in whether worker practices and controls may have changed for these activities at these facilities, which could affect the potential for exposure. For these reasons, central tendency risk estimates are more appropriate for determining unreasonable risk under these two COUs. EPA has identified the assessed central tendency exposure concentrations for workers as most representative of actual exposure for the OES. The Agency has confidence that its assessment for this OES is not an overestimate, as EPA expects a minimal amount of *trans*-1,2-dichloroethylene to be incorporated into the article leaving the worker to be exposed to a similar amount of chemical in both COUs. EPA has moderate confidence in all worker exposure concentrations for this OES and slight-to-moderate confidence in the exposure estimates for ONUs.

4.3.2.2.12 Laboratory Use (OES #12)

The OES of Laboratory Use is mapped the COU Industrial/Commercial uses – Other uses – Laboratory chemical. As described in Table 4-3, EPA assessed inhalation exposure concentrations based on analogous test order data consisting of personal worker monitoring data collected under a test order for *trans*-1,2-dichloroethylene from the Manufacturing as a Primary Product SEG of Laboratory Technician – Batch Manufacturing. ONU exposure was estimated from central tendency of worker exposure for this

OES. As described in Section 4.3.2.1, the PPE usage is not expected for this OES per the reporting on laboratory workers in the test order data for Manufacturing as a Primary Product.

All risk estimates for workers and ONUs were above the benchmark MOEs for all central tendency and high-end inhalation and dermal exposures (Table 4-24 and Table 4-25).

The weight of scientific evidence for occupational exposure for this OES is discussed in Table 4-10. EPA has moderate confidence that the assessed worker exposure concentrations and slight-to-moderate ONU exposure concentrations, including the assessed high-end values, are representative of the OES and not overestimates of actual potential exposure because the monitoring data comes from the test order and is the result of conditions that are reasonably similar to this OES.

4.3.2.2.13 Refrigerant Flush (OES #13)

The OES of Refrigerant Flus is mapped the COU Industrial/Commercial use – Refrigerants. As described in Table 4-3, EPA assessed inhalation exposure concentrations based on analogous test order data consisting of personal worker monitoring data collected during the use of *trans*-1,2-dichloroethylene as a non-aerosol cleaning and degreasing product. ONU exposure was estimated from central tendency of worker exposure for this OES. As described in Section 4.3.2.1, PPE usage is not expected for this OES per the reporting on Flight Mechanics lack of PPE usage in the test order data for Manufacturing as a Primary Product.

There were no dermal risk estimates for workers below the benchmark MOEs (Table 4-24). As described in Table 4-25, inhalation exposures resulted in risk estimates for the Refrigerant Flush worker below the benchmark for central tendency (MOE = 16) and high-end (MOE = 1.1) intermediate exposures; and central tendency (MOE = 17) and high-end (MOE = 1.2) chronic exposures. ONUs had central tendency inhalation risk estimates below the benchmark for intermediate (MOE = 9.7) and chronic (MOE = 10) exposures, while acute inhalation risk estimates were above the benchmark.

The weight of scientific evidence for occupational exposure for this OES is discussed in Table 4-10. EPA has moderate confidence that the assessed worker exposure concentrations and slight-to-moderate confidence for ONU exposure concentrations, including the assessed high-end value, are not overestimates of actual exposure, because the EPA expects that the monitoring data comes from uses of smaller quantities of *trans*-1,2-dichloroethylene than is expected of the Refrigerant Flush OES.

4.3.2.2.14 Processing Aid in Semiconductor Manufacturing (OES #14)

The OES of Processing Aid in Semiconductor Manufacturing is mapped the COU Industrial/Commercial use – Processing aids – Semiconductor and photovoltaic agents for etching and cleaning processes in electronic articles. As described in Section 4.2.14 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)), *trans*-1,2-dichloroethylene is received in hermetically sealed containers and fed into a closed system where it is completely reacted away. EPA believes that workers are not exposed to *trans*-1,2-dichloroethylene during semiconductor manufacturing and, therefore, considered the exposure pathway to be incomplete and did not assess exposure for this OES.

4.3.2.2.15 Waste Handling, Disposal, and Treatment (OES #15)

The OES of Waste Handling, Disposal, and Treatment is mapped to the COU Disposal. As described in Table 4-3, EPA assessed inhalation exposure concentrations for incineration workers with surrogate data from the incineration of dichloromethane. Inhalation exposure concentrations for landfill workers used *trans*-1,2-dichloroethylene area monitoring data. Inhalation exposure concentrations for POTW and non-

POTW WWT workers used surrogate 1,2-dichloroethane data from a wastewater treatment facility. ONU exposure was estimated using the central tendency of worker exposure. As described in Section 4.3.2.1, no PPE usage was identified.

There were no dermal risk estimates for workers below the benchmark MOEs (Table 4-24). There were also no risk estimates for workers or ONUs below the benchmark MOE for 8-hour TWA acute inhalation exposures (Table 4-25). Inhalation exposures resulted in risk estimates for workers for the Incineration SEG below the benchmark for high-end inhalation intermediate exposure (MOE = 3.3) and high-end chronic inhalation exposure (MOE = 3.6). The worker POTW and Non-POTW WWT SEG had chronic inhalation exposures that were below the benchmark for high-end (MOE = 64). The risk estimates for the worker Landfill SEG and ONUs were above the benchmark for high-end inhalation exposures. All central tendency inhalation risk estimates for this OES were above the benchmark for workers and ONUs.

The weight of scientific evidence for occupational exposure is discussed in Table 4-10. In conclusion, as the majority of the monitoring data was collected more than thirty years ago, there is uncertainty whether worker practices and controls may have changed for these activities at these facilities, which could affect the potential for exposure. EPA has identified the assessed central tendency exposure concentrations as representative of the actual exposure for the OES. The Agency has moderate confidence in the Incinerator and POTW and Non-POTW SEGs for workers. EPA has slight-to-moderate confidence in the exposure estimates for the worker Landfill SEG and ONU exposure estimates.

4.3.2.2.16 Distribution in Commerce (OES #16)

The OES of Distribution in Commerce is mapped to the COU Distribution in commerce. For purposes of assessment in this draft risk evaluation, Distribution in Commerce consists of the transportation associated with the moving of *trans*-1,2-dichloroethylene or *trans*-1,2-dichloroethylene containing products and/or articles between manufacturing, processing, and use sites, or the transportation of *trans*-1,2-dichloroethylene containing wastes to recycling sites or for final disposal. EPA expects all the *trans*-1,2-dichloroethylene or *trans*-1,2-dichloroethylene-containing products and/or articles to be transported in closed system or otherwise to be transported in a form (*e.g.*, articles containing *trans*-1,2-dichloroethylene) such that there is negligible potential for releases except during an incident. Therefore, no occupational exposures are reasonably expected to occur, and no separate assessment was performed for estimating releases and exposures from Distribution in Commerce.

4.3.3 Risk Estimates for Consumers

Table 4-26 summarizes the inhalation MOEs used to characterize non-cancer risks for acute and intermediate inhalation exposure to *trans*-1,2-dichloroethylene and presents these for all lifestages for the COU identified. EPA did not assess chronic exposure to consumer products because the exposure frequency would not approach 10% of a lifetime. Table 4-27 summarizes the dermal MOEs used to characterize non-cancer risk for intermediate dermal exposure for all lifestages for high exposures for the COU identified. Only the high exposure scenarios were presented in the table because all MOEs were above the benchmark. EPA assessed six types of products for the consumer inhalation assessment with varied duration of use, weight fraction and mass of product used as the input parameters driving the high-, medium-, and low intensity scenarios. There were two products evaluated under the Consumer use – Cleaning agent – Cleaner/degreaser (aerosol and non-aerosol) COU, including degreasers for mechanical equipment and components and flux remover and contact cleaners for electronics. There were four products evaluated under the Consumer use – Propellants, non-motive (blowing agent) – Polymer foam COU. Two of the propellant products included a gap filler and sealant and an open cell

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non-structural sealant that were quantitatively assessed. There were two additional products including a closed cell rigid spray foam and roof tile foam adhesive that were assessed qualitatively in the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

The MOEs that were below the benchmark were identified in bold in Table 4-26 for the medium- and high-exposure inhalation scenarios. The medium-intensity scenarios represent medium weight fractions, mass of product used, frequency of event or duration of use. The high-intensity scenario represents high-exposure estimates for each of the parameters based on available information discussed in Section 4.1.2.1. MOEs for medium and high exposure levels are presented in Table 4-26 to showcase the range of risks for each product. Because the low exposure scenarios did not have any MOEs below the benchmark, they were not displayed. Please see the *Draft Consumer and Commercial Exposure Analysis and Risk Calculator for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026h](#)), for all low, medium, and high exposure scenarios modeled. The risk estimates for the Spray Foam – Gap Filler Product scenario were above the benchmark MOE of 30 for both acute and intermediate low, medium, and high scenarios. The risk estimates for all acute product scenarios were above benchmark MOEs for the bystander.

Acute Inhalation Risk Summary

The calculated MOEs below the benchmark for products at the medium- and high-exposure acute scenarios for the user included the degreasers, flux removers, and the open cell spray foam products. Additional low exposure scenarios were also modeled, varying the weight fractions, frequency of use and mass used to calculate a range of MOEs that were above the benchmark. Risk was influenced by all factors including the mass of product used, duration of use, and weight fraction.

Aerosol/degreaser products were modeled in a home garage. These products are used to remove grease and grime from a variety of automobile parts. As shown below in Figure 4-3, the acute inhalation exposures for the aerosol/degreaser product with a weight fraction of 3% are all above the benchmark MOE of 30. The scenarios include a low weight fraction, with high duration of 4 minutes and a high mass used of 200 g, and there is also a low weight fraction scenario with a low duration of 1 minute and a low mass of 50g used for context. In addition, there are two medium scenarios present with weight fractions of 51%, medium and low durations with 2 minutes and 1 minutes shown, and a medium (100 g) and low (50 g) mass used. Both scenarios are below the benchmark of 30. There are also three exposure scenarios with a high weight fraction of 90% with several variations of low, medium, and high durations and mass used. All were below the benchmark of 30.

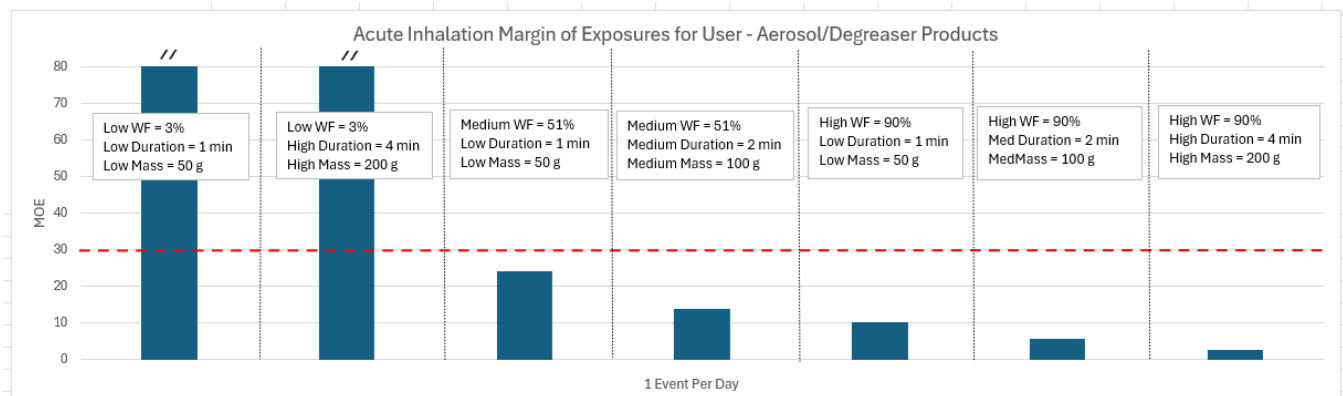


Figure 4-3. Acute Inhalation MOEs for Users of Aerosol/Degreasers

Note://indicates that the bar extends beyond the graph.

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Flux removers are chemical solvents used to remove soldering flux residue off circuit boards or glass pieces. There were several exposure scenarios modeled below, including a range of weight fractions from 1 to 80%, duration of use from 1 to 4 minutes, and mass used of product from 50 to 200 g of product. Figure 4-4 illustrates the acute inhalation exposures to consumers using flux removers. For the acute flux remover scenario, there were 2 scenarios modeled at the low weight fraction of 1% with low and high durations of 4 minutes and 1 minute, with high mass of 200 g and low mass of 50 g. All scenarios for the low weight fraction are above the benchmark MOE of 30. There were two scenarios modeled for the medium weight fraction of 36%, along with medium and low durations of 2 minutes and 1 minute, and medium mass of 100 g and low mass of 50 g. Both scenarios are below the benchmark MOE. There were three scenarios modeled for the highest weight fraction of 80% along with a variety of low, medium, and high durations and mass. All were below the benchmark MOE.

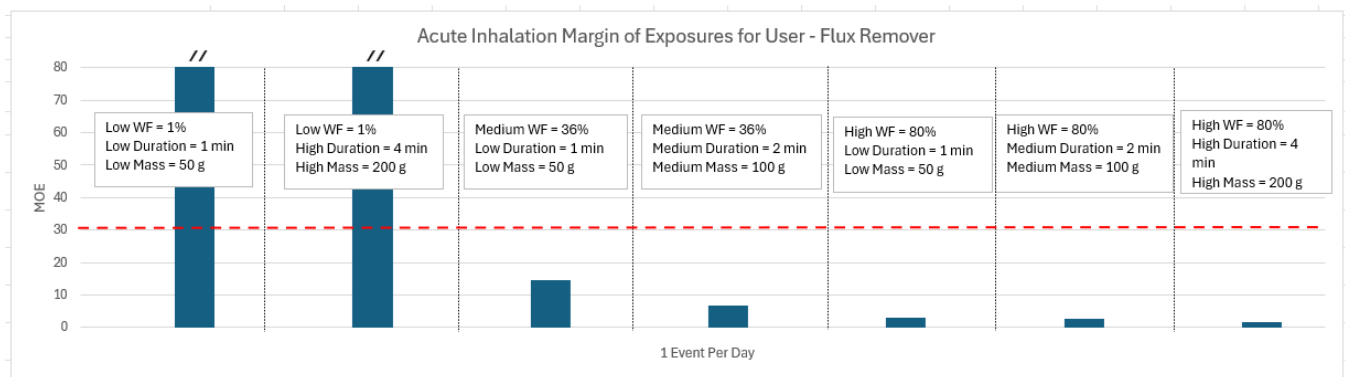


Figure 4-4. Acute Inhalation MOEs for Users of Flux Removers

Note:// indicates that the bar extends beyond the graph.

The open cell spray foam was modeled using a 15-minute TWA for 1 event per day with 2 hours of exposure assumed while installing the spray foam in an attic on all four walls. This scenario is assumed to be a low frequency event for the homeowner. Spray foam typically lasts up to 80 years and only needs to be repaired in the event of flooding.³ In addition, PPE is recommended for installation of this product, which is described on the technical data sheet and the Spray Polyurethane Foam Association website.⁴ The open cell two-component kit recommends the homeowner to wear a respirator to protect the lungs. The acute exposure for the open cell spray foam was below the benchmark MOE of 30.

Intermediate Inhalation Risk Summary

For the intermediate inhalation exposure scenarios, the degreaser, flux remover, and open cell spray foam products showed risks below the benchmark at all high- and medium-exposure scenarios. There were a variety of input parameters varied for high-, medium-, and low-intensity scenarios to illustrate a range of MOEs. Some MOEs were below the benchmark for the intermediate scenarios for bystanders but only at the highest intensity scenario for degreasers and flux removers.

Figure 4-5, Figure 4-6, and Figure 4-7 includes an overview of the varied exposure scenarios that EPA modeled within IECCU and illustrate when the different exposure scenarios fall below the MOE of 30. Figure 4-5 focuses on the aerosol spray/degreaser products; Figure 4-6 focuses on the flux remover products. Table 4-26 also displays values for medium- and high-exposure scenarios intermediate inhalation MOEs. The table displays values for medium- and high-exposures scenarios because the low

³ <https://www.bobvila.com/articles/spray-foam-insulation-cost/> (accessed August 19, 2026)

⁴ https://www.spraypolyurethane.org/wp-content/uploads/2017/08/SPF_PPE-Guidelines-for-SPF-Application-2015.pdf (accessed August 19, 2026)

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exposure scenarios do not have MOEs below the benchmark. Please see the *Draft Consumer and Commercial Exposure Analysis and Risk Calculator for trans-1,2-Dichloroethylene* (U.S. EPA, 2026h), for all low, medium and high exposure scenarios modeled.

In Figure 4-5, the intermediate inhalation exposures for aerosol/degreasers include three scenarios for a low-exposure scenario with weight fractions of 3% for 2, 5, and 10 events per month with a duration of 1 minute using 50 g of mass. Ten events per month was to illustrate hobbyists working on their automobile every weekend. These low exposure scenarios resulted in risk above the benchmark MOE of 30. Three medium exposure scenarios were shown for the weight fractions of 51% for 2, 5, and 10 events per month with a duration of 2 minutes and using a mass of 100 g. Risk was below the benchmark for the scenario with 10 events per month, but for the 2 and 5 events per month, the risks were above the benchmark MOE of 30. Lastly, the high scenario used the high weight fraction of 90%, using a variety of events per month, varied durations, and varied masses. The weight fraction and the events per month seemed to drive the risks below the benchmark. Ten events per month using this product with 90% weight fraction showed risks below the benchmark. Five events per month were below the benchmark for the higher and medium durations and for the low durations for two and five events per month were above the benchmark.

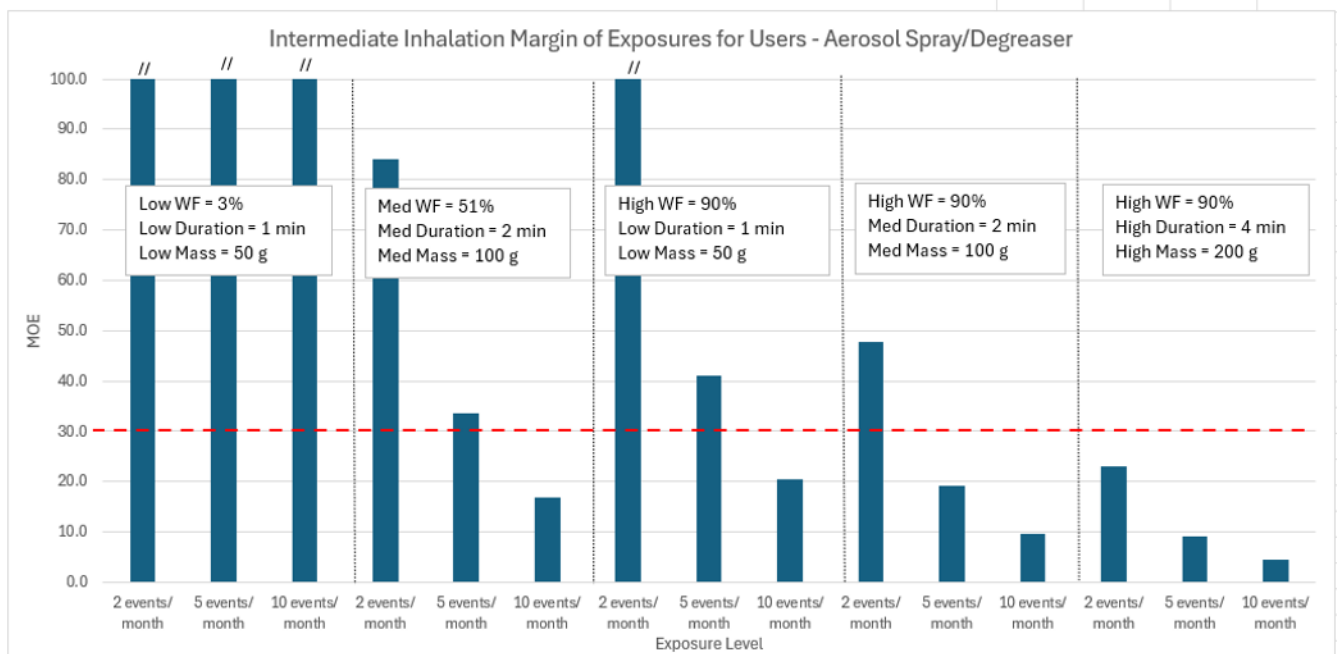


Figure 4-5. Intermediate Inhalation MOE for Users of Aerosol Spray/Degreaser Products

Note:// indicates that the bar extends beyond the graph.

In Figure 4-6, intermediate inhalation risks are displayed across low, medium, and high scenarios. For the low exposure scenario with a weight fraction of 1%, 2, 5, and 10 events per month, all scenarios were above the benchmark MOE of 30. Low, medium, and high scenarios were modeled for the weight fraction of 36% for 2, 5, and 10 events per month with medium 2-minute durations and medium 100 g of mass used. The high exposure scenario modeled with 10 events per month showed risk below the benchmark. Several high exposure scenarios using 80% weight fraction were modeled for 2, 5, and 10 events per month with low, medium, and high durations and mass. Most scenarios showed risk below the benchmark except the scenarios with two events per month.

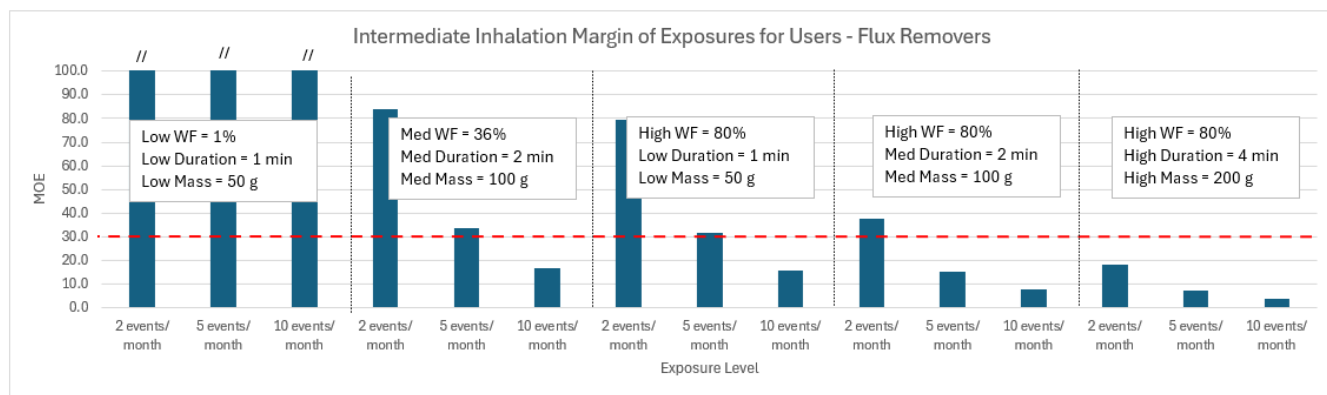


Figure 4-6. Intermediate Inhalation MOEs for Users of Flux Remover Products

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Figure 4-7 provides the MOEs for intermediate inhalation exposure for users of open cell spray foam. EPA modeled 2, 3, and 4 events per month using a 24-hour TWA. An event was assumed to be for 2 hours of time spent in the attic. It was assumed that it would take a user 10 minutes to spray each wall in the attic, and then the remaining hour and 20 minutes would be spent moving the equipment out of the attic and completing any remaining clean up. As noted in the acute inhalation open cell spray foam, it is unlikely that a consumer would need to do this work often, but EPA assumes that 2 events per month may be likely if the user did the work one other day that month for a neighbor or family member. Three to four events per month seem unlikely but was included in the draft risk evaluation to display a range of scenarios.

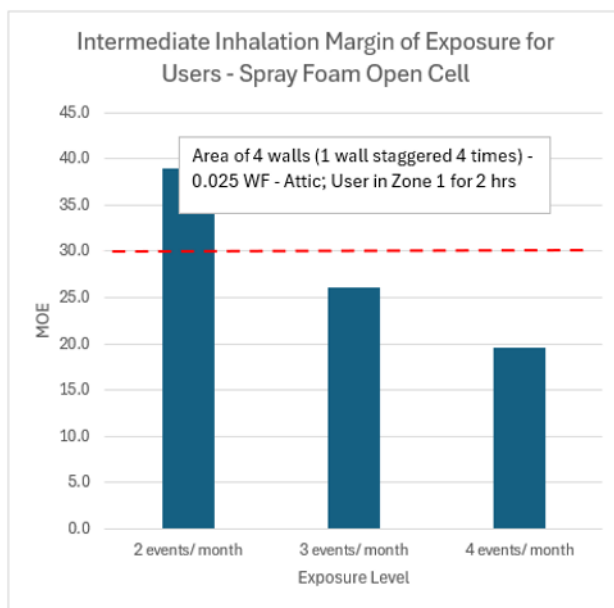


Figure 4-7. Intermediate Inhalation MOEs for Users of Spray Foam Open Cell Products

Note:// indicates that the bar extends beyond the graph.

EPA has robust confidence that the exposure concentrations for both acute and intermediate exposures represent a wide range of scenarios given the variability presented for each parameter. For more information, see the *Draft Consumer and Commercial Exposure Analysis and Risk Calculator for trans-1,2-Dichloroethylene* (U.S. EPA, 2026h) and the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* (U.S. EPA, 2026w).

Intermediate Dermal Risk Summary

EPA modeled intermediate dermal risk for consumer scenarios where repeated uses over a month are expected. Acute risks were not estimated because there was no HED identified for acute dermal exposure to *trans*-1,2-dichloroethylene. The dermal exposure was modeled with the low, medium, and high weight fractions, which is the parameter that influences the dermal fractional absorption equation used to calculate dermal doses in this assessment. This approach used both 0.6% and 1.2% values for the fraction absorbed obtained from the test order to account for variability in the test order data. The 0.6% dermal absorption value is most appropriate for consumer exposures because it is based on measurements from shorter dermal exposure durations (4-hour) more representative of consumer scenarios. The dermal risk values shown in Table 4-27 represent a high exposure scenario using the 1.2% dermal absorption values (from the terminal 24-hour timepoint). These parameters present a reasonable range for this scenario; all the intermediate MOEs for dermal exposures are above the benchmark. The low, medium, and high scenarios using both 0.6% and 1.2% dermal absorption are presented in the supplemental file, *Draft Consumer and Commercial Exposure Analysis and Risk Calculator for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026h](#)).

Table 4-26. Consumer Risk Summary Table for Both Acute and Intermediate Non-Cancer Scenarios for Inhalation Exposures

Consumer COU	Subcategory/ Consumer Condition of Use Scenario	Population	Exposure Route and Duration	Age Group	Acute Non-Cancer (Benchmark MOE = 30)		Intermediate Non-Cancer (Benchmark MOE = 30)	
					Medium	High	Medium	High
Cleaning Agent	Aerosol spray cleaner/degreaser	User	Inhalation	N/A	264	3	34	5
		Bystander	Inhalation	N/A	871	44	135	19
	Flux remover	User	Inhalation	N/A	293	2	34	4
		Bystander	Inhalation	N/A	968	40	179	20
Propellants	Spray foam – Gap filler	User	Inhalation	N/A	N/A ^b	227	749	562
		Bystander	Inhalation	N/A	N/A	7,485	7,429	5,571
	Spray foam – Open cell ^a	User	Inhalation	N/A	N/A	8	26	20
		Bystander	Inhalation	N/A	N/A	260	258	193

MOE = margin of exposure
Bolded/shaded cells indicate MOEs below the benchmark.
^a The spray foam – open cell scenario is considered a well-defined scenario EPA assumed that a consumer would take 10 minutes to apply the spray foam to each wall in an attic totaling 40 minutes of active use and then allowed for an additional 1 hour and 20 minutes for clean-up of spray foam and removal of equipment. As such, there was not a lower or moderate scenario modeled. N/A = air concentrations are equivalent across age groups.
^b A range of low to medium exposure scenarios are available in *Draft Consumer and Commercial Exposure Analysis and Risk Calculator for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026h](#)).

Table 4-27. Consumer Risk Summary Table for Intermediate Non-Cancer Scenarios for Dermal Exposures to Consumers (Users)

Normal Exposures to Consumers (Users)			
Consumer Use COU	Subcategory/ Consumer COU Scenario	Age Group	Intermediate Non-Cancer (Benchmark MOE = 30) High Scenario ^a
Cleaning agent – Cleaner/degreaser (aerosol and non- aerosol)	Aerosol spray cleaner/ degreaser	21+	64
		16–20	69
		11–15	63
	Flux remover	21+	58
		16–20	62
		11–15	56
Propellants, non- motive (blowing agent) – Polymer foam	Spray foam – Gap filler	21+	1,122
		16–20	1,199
		11–15	1,097
	Spray foam – Open cell	21+	6,173
		16–20	6,597
		11–15	6,033
COU = condition of use; MOE = margin of exposure ^a A range of exposure scenarios are available in <i>Draft Consumer and Commercial Exposure Analysis and Risk Calculator for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026h).			

4.3.4 Risk Estimates for General Population

4.3.4.1 Risk Estimates for Inhalation

EPA chose a non-cancer endpoint for general population acute exposure with an HEC value of 7,930,000 µg/m³. A benchmark of 30 was used for acute screening-level risk estimates. EPA chose a non-cancer endpoint for general population chronic exposure with an HEC value of 116,000 µg/m³. A benchmark of 100 was used for chronic screening-level risk estimates. Hazard values used to calculate screening-level risk estimates are described in the *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026w](#)). MOEs were calculated at each distance (100, 100–1,000, and 1,000 m) using the 50th and 95th percentile IIOAC-modeled ambient air concentrations as conservative exposure estimates for each individual facility and for every reporting year for both stack and fugitive releases. This is further detailed in the *Draft Integrated Indoor Outdoor Air Calculator (IIOAC) TRI 2019-2023 Exposure and Risk Analysis for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026y](#)).

TRI Facility Risk Estimates

Table 4-28 provides the non-cancer risk estimates for the highest TRI stack and fugitive facilities that were modeled in IIOAC. The outdoor concentrations were used to generate the non-cancer risk estimates below. See Table 4-18 for additional information on the modeled TRI concentrations from IIOAC. The risk estimates for the TRI facilities are above the benchmark MOEs as noted in the table below.

Table 4-28. Risk Estimates for Inhalation Exposure for the General Population from TRI Releases

Acute HEC ($\mu\text{g}/\text{m}^3$)	Chronic HEC ($\mu\text{g}/\text{m}^3$)	Non-Cancer Risk Estimates	
		Acute (MOE = 30)	Chronic (MOE = 100)
7,930,000	116,000	244,103	3,570
HEC = human equivalent concentration; MOE = margin of exposure; TRI = Toxics Release Inventory			

EPA-Estimated Generic Scenario Risk Estimates

All non-cancer screening-level risk estimates were above the non-cancer benchmark MOEs for both acute and chronic for both stack and fugitive releases. See Section 4.1.3.1 for all concentrations for generic scenarios. There was one scenario that was below the benchmark for fugitive releases. The GS Use of Adhesives at 100 m for chronic exposure for fugitive releases, but this scenario was deemed slight confidence due to several factors, including:

- The data from the GSs are based on total production volume for all chemicals used in the facilities and does not distinguish *trans*-1,2-dichloroethylene from all other chemicals.
- The GSs do not consider engineering controls for these facilities.
- The releases cannot be attributed to either stack or fugitive.
- The inputs into the IIOAC Model were 95% of releases vs. using the mean.
- None of the TRI facility releases were above the benchmark using the IIOAC Model,
- The TRI releases include both *cis*- and *trans*-1,2-dichloroethylene, which is itself a high exposure scenario.
- The generic scenario includes high release estimates, which are orders of magnitude higher than TRI facility.
- IIOAC assumes the most conservative geographic location.

Therefore, it is not necessary to refine the conservative assumptions of the screening-level assessment. Exposure concentrations, acute and chronic non-cancer screening-level risk estimates based on IIOAC modeled results are presented in the supplemental file: *Draft Integrated Indoor Outdoor Air Calculator (IIOAC) TRI 2019-2023 Exposure and Risk Analysis for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026y](#)).

Below Table 4-29 and Table 4-30 present ambient air acute and chronic MOEs from EPA-estimated generic scenario stack and fugitive releases based on IIOAC-modeled concentrations.

Table 4-29. Ambient Air Acute and Chronic Margins of Exposure from EPA Estimated Generic Scenario Stack Releases Based on IIOAC-Modeled Concentrations

Occupational Exposure Scenario (OES)	Non-Cancer Risk Estimates for Stack Releases											
	Acute MOE = Acute HEC/Daily HEC = 7,930,000 µg/m ³ (Benchmark = 30)						Chronic MOE = Chronic HEC/Annual HEC = 117,000 µg/m ³ (Benchmark = 100)					
	Mean (50th percentile)			High-End (95th Percentile)			Mean (50th percentile)			High-End (95th Percentile)		
	100 m	100–1,000 m	1,000 m	100 m	100–1,000 m	1,000 m	100 m	100–1,000 m	1,000 m	100 m	100–1,000 m	1,000 m
Vapor Degreasing	4.34E06	1.33E07	2.46E07	3.01E06	1.16E07	2.21E07	7.90E04	2.42E05	4.48E05	5.48E04	2.11E05	4.02E05
Adhesives and Sealants	1.17E05	3.60E05	6.67E05	7.32E04	2.91E05	5.77E05	2.51E03	7.76E03	1.44E04	1.58E03	6.26E03	1.24E04
Blowing Agent in Spray Foam	1.34E08	4.13E08	7.65E08	8.62E07	3.40E08	6.68E08	2.78E06	8.56E06	1.59E07	1.78E06	7.03E06	1.38E07
Laboratory Chemicals	1.21E09	3.74E09	6.93E09	7.76E08	3.06E09	6.04E09	2.53E07	7.81E07	1.45E08	1.62E07	6.39E07	1.26E08
Aerosol Degreasing	2.50E07	7.73E07	1.43E08	1.57E07	6.24E07	1.24E08	5.39E05	1.67E06	3.08E06	3.39E05	1.34E06	2.67E06
Repackaging	2.17E08	6.75E08	1.25E09	9.92E07	4.18E08	9.18E08	9.80E06	3.06E07	5.68E07	4.49E06	1.89E07	4.15E07
HEC = human equivalent concentration; IIOAC = Integrated Indoor-Outdoor Air Calculator; MOE = margin of exposure												

Table 4-30. Ambient Air Acute and Chronic Margin of Exposures from EPA Estimated Generic Scenario Fugitive Releases Based on IIOAC-Modeled Concentrations

Occupational Exposure Scenario (OES)	Non-Cancer Risk Estimates for Fugitive Releases											
	Acute MOE = Acute HEC/Daily HEC = 7,930,000 µg/m ³ (Benchmark = 30)						Chronic MOE = Chronic HEC/Annual HEC = 117,000 µg/m ³ (Benchmark = 100)					
	Mean (50th percentile)			High-End (95th Percentile)			Mean (50th percentile)			High-End (95th Percentile)		
	100 m	100– 1,000 m	1,000 m	100 m	100– 1,000 m	1,000 m	100 m	100– 1,000 m	1,000 m	100 m	100– 1,000 m	1,000 m
Vapor Degreasing	1.58E05	1.40E06	3.67E06	1.40E05	1.21E06	3.05E06	2.87E03	2.54E04	6.68E04	2.55E03	2.21E04	5.55E04
Adhesives and Sealants ^a	4.28E03	3.78E04	9.95E04	3.73E03	3.26E04	8.17E04	92.3	8.15E02	2.14E03	80.3	7.02E02	1.76E03
Blowing Agent in Spray Foam	4.91E06	4.34E07	1.14E08	4.30E06	3.74E07	9.38E07	1.02E05	8.99E05	2.36E06	8.91E04	7.75E05	1.94E06
Laboratory Chemicals	4.45E07	3.93E08	1.03E09	3.89E07	3.39E08	8.48E08	9.28E05	8.19E06	2.16E07	8.12E05	7.08E06	1.77E07
Aerosol Degreasing	9.19E05	8.12E06	2.14E07	8.00E05	6.99E06	1.75E07	1.98E04	1.75E05	4.60E05	1.72E04	1.51E05	3.78E05
Repackaging	8.06E06	7.11E07	1.87E08	6.56E06	5.79E07	1.50E08	3.65E05	3.22E06	8.46E06	2.97E05	2.62E06	6.77E06
HEC = human equivalent concentration; IIOAC = Integrated Indoor-Outdoor Air Calculator; MOE = margin of exposure Bolded/shaded risk estimates are below the MOE. ^a For the Use of Adhesives Generic Scenario, there was risk below the benchmark at 100 m for chronic for both the mean (50th percentile) and the high-end (95th percentile), but as mentioned in Section 4.3.4.1, there is low confidence in this scenario. In addition, the 100 m distance could also be considered within the facility boundaries.												

4.3.4.2 Risk Estimates for Dermal Exposure While Swimming

EPA assessed possible risk from dermal exposures while swimming from both facility-specific releases identified in TRI/DMR and generic scenario releases from COUs/OESs. For identification of potential risks, EPA did not derive an acute oral/dermal hazard value and the intermediate oral/dermal hazard value of 21.4 mg/kg-day with UF of 30 (see Section 4.2; Table 4-20; Section 2.6 of *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* (U.S. EPA, 2026w)) was utilized to evaluate general population dermal exposures. This approach represents a high-end screen for identifying potential risks from dermal exposure to *trans*-1,2-dichloroethylene in surface water.

Dermal exposures for facility-specific releases and generic scenario releases are fully described in Section 4.1.3.2 above and Section 6.4.1 of *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* (U.S. EPA, 2026g) with presented intermediate doses for adults (21+ years), youths (11–15 years), and children (6–10 years). For facility-specific releases, each OES is represented by the facility within that OES with the highest estimated surface water concentration and generic scenarios are represented by the high-end release scenario and low flow scenario for each OES. These estimated surface water concentrations are combined with high-end, default short-term exposure durations as well as age group-specific body weights and surface area exposed for each evaluated age group to arrive at potential doses. Correspondingly, these estimated exposures and risks are anticipated to be higher-end estimates of potential risk across OESs.

Facility-specific release modeling resulted in intermediate doses ranging from 7.1×10^{-7} to 1.8×10^{-4} mg/kg-day across age groups, with the highest doses modeled for Waste Handling, Disposal, and Treatment – POTW OES from a 30Q5 flow surface water concentration of 28 µg/L (Section 4.1.3.2; Section 6.4.1 of *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* (U.S. EPA, 2026g)). Associated MOEs related to these doses ranged from 1.2×10^5 to 3.0×10^7 , which are much greater than the benchmark MOE of 30 (Table 4-31).

Generic scenario release modeling resulted in intermediate doses ranging from 8.0×10^{-9} to 5.5×10^{-6} mg/kg-day, with highest doses modeled for the Blowing Agent in Spray Foam OES from a 30Q5 surface water concentration of 3.8 µg/L (see Section 4.1.3.2; Section 6.4.1 of *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* (U.S. EPA, 2026g)). Resulting MOEs related to these doses ranged from 3.9×10^6 to 2.7×10^9 , which are much higher than the benchmark MOE of 30 (Table 4-32). Given that these high-end scenarios of possible dermal exposures from both facility-specific and generic scenario releases resulted in no identified risk and all other scenarios for other facilities or generic scenario releases would result in lower expected doses, EPA has robust confidence that dermal exposure from *trans*-1,2-dichloroethylene while swimming poses no identified risk across its range of COU/OESs.

Table 4-31. Facility-Specific Dermal Intermediate Risk While Swimming for Adult, Youth, and Child Lifestages by Occupational Exposure Scenario (OES)

OES ^a	Modeled Surface Water Concentrations		Intermediate MOE ^b (Benchmark = 30)		
	30Q5 Conc. (µg/L)	HM Conc. (µg/L)	Adult (21+ years)	Youth (11–15 years)	Child (6–10 years)
Manufacturing as a Primary Product	2.6	2.6	1.2E06	1.6E06	2.7E06
Manufacturing as a Byproduct	0.23	0.11	1.4E07	1.8E07	3.0E07

OES ^a	Modeled Surface Water Concentrations		Intermediate MOE ^b (Benchmark = 30)		
	30Q5 Conc. (µg/L)	HM Conc. (µg/L)	Adult (21+ years)	Youth (11–15 years)	Child (6–10 years)
Incorporation into Formulation, Mixture or Reaction Product	1.7	1.3	1.9E06	2.4E06	4.0E06
Waste Handling, Disposal, and Treatment (Landfill)	3.7	4.9	8.7E05	1.1E06	1.9E06
Waste Handling, Disposal, and Treatment (non-POTW WWT)	1.6	1.6	2.1E06	2.7E06	4.4E06
Waste Handling, Disposal, and Treatment (POTW)	28	19	1.2E05	1.5E05	2.5E05
Waste Handling, Disposal, and Treatment (Remediation or Monitoring)	20	20	1.6E05	2.1E05	3.4E05
30Q5 = 30 consecutive days of lowest flow over a 5-year period; HM = harmonic mean; MOE = margin of exposure; POTW = publicly-owned treatment works; WWT = wastewater treatment ^a Each OES is represented by the facility within that OES with the highest estimated 30Q5 flow surface water concentration for that OES as described in Section 6.2.1.1 in <i>Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026g). ^b MOEs calculated based on presented doses in Section 4.1.3.2 and Section 6.4.1 of <i>Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026g).					

Table 4-32. Generic Scenario Dermal Intermediate Risk While Swimming for Adult, Youth, and Child Lifestages by Occupational Exposure Scenario (OES)

OES ^a	Flow Percentile	Modeled Surface Water Concentrations		Intermediate MOE ^b (Benchmark = 30)		
		30Q5 Conc. (µg/L)	HM Conc. (µg/L)	Adult (21+ years)	Youth (11–15 years)	Child (6–10 years)
Blowing Agent in Spray Foam	P10	3.8	3.9	3.9E06	5.1E06	8.4E06
Vapor Degreasing (combined)	P10	1.2E–02	1.2E–02	1.2E09	1.6E09	2.7E09
30Q5 = 30 consecutive days of lowest flow over a 5-year period; HM = harmonic mean; MOE = margin of exposure; BM = benchmark ^a Each OES represented in table by the high-end release scenario for that OES as described in Section 6.2.1.2 of <i>Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026g). ^b MOEs calculated based on presented doses in Section 4.1.3.2 and Section 6.4.1 of <i>Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026g).						

4.3.4.3 Risk Estimates for Oral Exposure While Swimming

EPA assessed possible risk from oral exposures while swimming from both facility-specific releases identified in TRI/DMR and generic scenario releases from COU/OESs. For identification of potential risks, the Agency did not derive an acute oral/dermal hazard value and the intermediate oral/dermal hazard value of 21.4 mg/kg-day with a UF of 30 (see Section 4.2; Table 4-20; Section 2.6 of *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA,](#)

[2026w](#)) was utilized to evaluate general population oral exposures while swimming. This approach represents a high exposure screening analysis for identifying potential risks from oral exposure to *trans*-1,2-dichloroethylene while swimming in surface water.

Oral ingestion exposures for facility-specific releases and generic scenario releases are fully described in Section 4.1.3.3 above and Section 6.4.2 of *Draft Chemistry, Fate, Release, and Exposure Assessment for Trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)), with presented intermediate doses for adults (21+ years); youths (11–15 years); and children (6–10 years). For facility-specific releases, each OES is represented by the facility within that OES with the highest estimated 30Q5 surface water concentration and generic scenarios are represented by the high-end release scenario and low flow scenario for each OES. These estimated surface water concentrations are combined with upper percentile ingestion rates for each evaluated age group to arrive at potential doses. Correspondingly, these estimated exposures and risks are anticipated to be higher-end estimates of potential risk across OESs.

Facility-specific release modeling resulted in intermediate doses ranging from 6.9×10^{-7} to 1.5×10^{-4} mg/kg-day across age groups with the highest doses modeled for Waste Handling, Disposal, and Treatment – POTW OES from a 30Q5 flow surface water concentration of 28 µg/L (see Section 4.1.3.3; Section 6.4.2 of *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#))). Associated MOEs related to these doses ranged from 1.5×10^5 to 3.1×10^7 , which are greater than the benchmark MOE of 30 (Table 4-33).

Generic scenario release modeling resulted in intermediate doses ranging from 3.6×10^{-8} to 2.0×10^{-5} mg/kg-day across age groups with highest doses modeled for the Blowing Agent in Spray Foam OES from a 30Q5 flow surface water concentration of 3.8 µg/L (see Section 4.1.3.3; Section 6.4.2 of *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#))). Resulting MOEs related to these doses ranged from 1.0×10^6 to 6.0×10^9 , which are much higher than the benchmark MOE of 30 (Table 4-34). Given that these high-end scenarios of potential oral ingestion exposures from both facility-specific and generic scenario releases resulted in no identified risk and all other scenarios for other facility-specific or generic scenarios releases would result in lower expected doses, EPA has robust confidence that oral ingestion from *trans*-1,2-dichloroethylene while swimming poses no identified risk across its range of COUs/OESs.

Table 4-33. Facility-Specific Oral Intermediate Risk While Swimming for Adult, Youth, and Child Lifestages by OES

OES ^a	Modeled Surface Water Concentrations		Intermediate MOE ^b (Benchmark = 30)		
	30Q5 Conc. (µg/L)	HM Conc. (µg/L)	Adult (21+ years)	Youth (11–15 years)	Child (6–10 years)
Manufacturing as a Primary Product	2.6	2.6	2.4E06	1.6E06	2.7E06
Manufacturing as a Byproduct	0.23	0.11	2.7E07	1.8E07	3.1E07
Incorporation into Formulation, Mixture, or Reaction Product	1.7	1.3	3.6E06	2.3E06	4.1E06
Waste Handling, Disposal, and Treatment (Landfill)	3.7	4.9	1.7E06	1.1E06	1.9E06
Waste Handling, Disposal, and Treatment (Non-POTW WWT)	1.6	1.6	4.0E06	2.6E06	4.6E06
Waste Handling, Disposal, and Treatment (POTW)	28	19	2.3E05	1.5E05	2.6E05

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OES ^a	Modeled Surface Water Concentrations		Intermediate MOE ^b (Benchmark = 30)		
	30Q5 Conc. (µg/L)	HM Conc. (µg/L)	Adult (21+ years)	Youth (11–15 years)	Child (6–10 years)
Waste Handling, Disposal, and Treatment (Remediation or Monitoring)	20	20	3.1E05	2.0E05	3.5E05

30Q5 = 30 consecutive days of lowest flow over a 5-year period; HM = harmonic mean; MOE = margin of exposure

^a Each OES is represented by the facility within that OES with the highest estimated 30Q5 surface water concentration for that OES as described in Section 6.2.1.1 in *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

^b MOEs calculated based on presented doses in Section 4.1.3.3 and Section 6.4.2 of *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

Table 4-34. Generic Scenario Oral Intermediate Risk While Swimming for Adult, Youth and Child Lifestages by Occupational Exposure Scenario (OES)

OES ^a	Flow Percentile	Modeled Surface Water Concentrations		Intermediate MOE ^b (Benchmark = 30)		
		30Q5 Conc. (µg/L)	HM Conc. (µg/L)	Adult (21+ years)	Youth (11–15 years)	Child (6–10 years)
Blowing Agent in Spray Foam	P10	3.8	3.9	1.7E06	1.1E06	1.9E06
Vapor Degreasing (combined)	P10	1.2E–02	1.2E–02	5.2E08	3.4E08	6.0E08

30Q5 = 30 consecutive days of lowest flow over a 5-year period; HM = harmonic mean; MOE = margin of exposure

^a Each OES represented in table by the high-end release scenario for that OES as described in Section 6.2.1.2 of *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

^b MOEs calculated based on presented doses in Section 4.1.3.3 and Section 6.4.2 of *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

4.3.4.4 Risk Estimates for Drinking Water

EPA assessed possible risk from drinking water consumption for surface water and groundwater. Chronic non-cancer drinking water risks for surface water were assessed for both facility-specific releases identified in TRI/DMR and modeled generic scenario releases from TSCA COU/OESs. Acute risks from drinking water were not assessed since EPA did not identify a health endpoint associated with oral exposure to derive an acute oral hazard value (Section 4.2; Section 2.6 of *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026w](#))). A derived chronic oral hazard value of 21.4 mg/kg-day with UF of 300 (Section 2.6 of *Draft Human Health and Environmental Hazard Assessment for Trans-1,2-Dichloroethylene* ([U.S. EPA, 2026w](#))) was used to evaluate preliminary risk to the general population from chronic drinking water exposure in surface water.

Surface water drinking water exposures were evaluated for all age groups for chronic non-cancer exposure, but presented for bottle-fed infants (<1 year), toddlers (1–5 years), and adults (21+ years) in Section 6.4.3 of *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)), with full results presented in *Draft General Population Surface Water Exposure Estimates for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026v](#)). In including infant and toddler exposure and risk estimates, the Agency is considering PESS and protecting these susceptible

subpopulations. 30Q5 flow surface water concentrations are used for calculation of acute doses while harmonic mean flow concentrations are used for calculation of chronic non-cancer doses. These estimated surface water concentrations are combined with upper percentile drinking water ingestion rates for each evaluated age group to arrive at potential doses.

Estimated groundwater concentrations and drinking water exposures from landfill leachate-impacted groundwater were evaluated and presented for chronic non-cancer exposure in Section 7.3.2 of *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) with full results presented in the *Draft Predicted Groundwater Concentrations, Exposure and Risks from Releases to Landfills for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026af](#)). The estimated groundwater concentrations are combined with upper percentile drinking water ingestion rates for each evaluated age group to arrive at exposure doses.

4.3.4.4.1 Surface Water from Facility-Specific Releases

Table 6-4 in Section 6.2.1.1 of *Draft Chemistry, Fate, Release, and Exposure Assessment for Trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) shows estimated harmonic mean flow surface water concentrations from facility-specific releases following Tier 2 surface water concentration modeling. These concentrations were used to estimate drinking water doses as shown in Table 6-14 in Section 6.4.3 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for Trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) and are described in Section 4.1.3.4.1 above.

Average daily doses associated with the evaluation of chronic non-cancer risk ranged from 1.2×10^{-6} to 5.6×10^{-4} across age groups, with the highest doses modeled for the Waste Handling, Treatment and Disposal (Remediation and Monitoring) OES with a harmonic mean flow concentration of 20 µg/L. Associated MOEs related to these doses ranged from 3.8×10^4 to 1.8×10^7 , which are greater than the benchmark MOE of 300 indicating no identified risk for the chronic non-cancer drinking water pathway (Table 4-35). Because each OES is represented by the facility with the highest modeled surface water concentration from that OES, all other facilities within an OES would be expected to have lower doses and risks. Therefore, EPA has robust confidence that there is no identified chronic non-cancer drinking water risk due to *trans*-1,2-dichloroethylene facility-specific releases across its range of COU/OESs.

4.3.4.4.2 Surface Water from Generic Scenario Releases

Table 6-9 in Section 6.2.1.2 of *Draft Chemistry, Fate, Release, and Exposure Assessment for Trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) shows modeled harmonic mean flow surface water concentrations from generic scenario releases from the Blowing Agent in Spray Foam and Vapor Degreasing OESs. These concentrations were used to estimate drinking water doses as shown in Table 6-15 in Section 6.4.3 of *Draft Chemistry, Fate, Release, and Exposure Assessment for Trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) and are described in Section 4.1.3.4.2 above.

Average daily doses associated with the evaluation of chronic non-cancer risk for generic scenario releases ranged from 1.1×10^{-7} to 7.7×10^{-5} mg/kg-day across presented age groups, with the highest doses modeled for the Blowing Agent in Spray Foam OES from a harmonic mean flow surface water concentration of 3.9 µg/L (see Section 4.1.3.4.2; Table 6-13 in *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#))). Associated MOEs related to these doses ranged from 2.8×10^5 to 2.0×10^8 , which are greater than the benchmark MOE of 300 and indicate no identified risk for the chronic non-cancer drinking water pathway (Table 4-36). Evaluated scenarios incorporated higher-end inputs for operating days and amount of *trans*-1,2-dichloroethylene releases along with lower flow conditions. These scenarios are expected to be higher-end estimates of potential risk and all other scenarios using central tendency release conditions or higher flow conditions

would result in lower modeled doses and risk. Because the presented scenarios resulted in no identified risk, EPA has robust confidence that drinking water exposure from *trans*-1,2-dichloroethylene poses no identified chronic non-cancer risk across its range of COU/OESs.

Table 4-35. Facility-Specific Drinking Water Risk for Adult, Infant, and Toddler Lifestages by Occupational Exposure Scenario (OES) Based on Tier 2 Modeled Surface Water Concentrations

OES ^a	Surface Water Concentrations		Adult (21+ years)	Infant (Birth to < 1 year)	Toddler (1–5 years)
	30Q5 Conc. (µg/L)	HM Conc. (µg/L)	Chronic Non-Cancer MOE (BM = 300)		
Manufacturing as a Primary Product	2.6	2.6	7.9E05	3.1E05	7.2E05
Manufacturing as a Byproduct	0.23	0.11	1.8E07	7.0E06	1.6E07
Incorporation into Formulation, Mixture or Reaction Product	1.7	1.3	2.1E06	8.3E05	1.9E06
Waste Handling, Disposal, and Treatment (Landfill)	3.7	4.9	4.0E05	1.6E05	3.6E05
Waste Handling, Disposal, and Treatment (Non-POTW WWT)	1.6	1.6	1.3E06	4.9E05	1.1E06
Waste Handling, Disposal, and Treatment (POTW)	28	19	1.0E05	3.9E04	9.2E04
Waste Handling, Disposal, and Treatment (Remediation or Monitoring)	20	20	9.7E04	3.8E04	8.9E04
30Q5 = 30 consecutive days of lowest flow over a 5-year period; BM = benchmark; HM = harmonic mean; MOE = margin of exposure; POTW = publicly-owned treatment works; WWT = wastewater treatment					
^a Each OES is represented by the facility within that OES with the highest estimated surface water concentration for that OES as described in Section 6.2.1.1 of <i>Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026g) and Section 4.1.3.4.1.					

Table 4-36. Generic Scenario Drinking Water Risk for Adult, Infant, and Toddler Lifestages by OES

OES ^a	Flow Percentile	Modeled Surface Water Concentrations		Adult (21+ Years)	Infant (Birth to <1 Year)	Toddler (1 to 5 Years)
		30Q5 Conc. (µg/L)	HM Conc. (µg/L)	Chronic Non-Cancer MOE (BM = 300)		
Blowing Agent in Spray Foam	P10	3.8	3.9	7.1E05	2.8E05	6.4E05
Vapor Degreasing (combined)	P10	1.2E–02	1.2E–02	2.0E08	7.9E07	1.9E08
30Q5 = 30 consecutive days of lowest flow over a 5-year period; BM = benchmark; HM = harmonic mean flow; MOE = margin of exposure						
^a Each OES represented in table by the high-end release scenario for that OES as described in Section 6.2.1.2 of <i>Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026g) and Section 4.1.3.4.2.						

4.3.4.4.3 Groundwater

Evaluation of drinking water exposures from landfill leachate impacted groundwater followed a tiered approach where if preliminary indications of risk were identified at initial tiers of analysis, then higher tiers or refined analyses were evaluated when possible.

Table 7-1 in Section 7.3.1 of *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* (U.S. EPA, 2026g) shows estimated groundwater concentrations of groundwater impacted by landfill leachate. These concentrations were used to estimate drinking water doses as shown in Tables 7-2 and 7-3 in Section 7.3.2 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* (U.S. EPA, 2026g).

Estimated average daily doses across age groups were 1.11×10^{-4} to 2.83×10^{-4} and based on a groundwater concentration of 0.01 mg/L. Associated MOEs related to these doses ranged from 7.57×10^4 to 1.6×10^{12} , which are greater than the benchmark MOE of 300 and indicate no identified risk for the chronic non-cancer drinking water pathway (see Table 4-37 and Table 4-38). Given the uncertainties in the groundwater estimates and the conservative assumptions (*i.e.*, loading rates and landfill leachate concentrations far above reported values), EPA has moderate confidence that landfill leachate-impacted groundwater with *trans*-1,2-dichloroethylene does not present a chronic, non-cancer drinking water risk.

Table 4-37. Risk Estimates for Adults Exposed to Landfill Leachate Impacted Groundwater

Leachate Concentration (mg/L)	Adult Non-Cancer Chronic Margin of Exposure (MOE) (Benchmark MOE = 300)				
	Loading Rate (kg/yr)				
	1	10	100	1,000	10,000
0.1	1.60E12	1.68E11	1.76E10	1.84E09	1.93E08
1	1.60E11	1.68E10	1.76E09	1.84E08	1.93E07
10	1.60E10	1.68E09	1.76E08	1.84E07	1.93E06
100	1.60E09	1.68E08	1.76E07	1.84E06	1.93E05

Table 4-38. Risk Estimate for Infants Exposed to Landfill Leachate Impacted Groundwater

Leachate Concentration (mg/L)	Infant Non-Cancer Chronic Margin of Exposure (MOE) (Benchmark MOE = 300)				
	Loading Rate (kg/yr)				
	1	10	100	1,000	10,000
0.1	6.27E11	6.57E10	6.89E09	7.22E08	7.57E07
1	6.27E10	6.57E09	6.89E08	7.22E07	7.57E06
10	6.27E09	6.57E08	6.89E07	7.22E06	7.57E05
100	6.27E08	6.57E07	6.89E06	7.22E05	7.57E04

4.3.5 Risk Characterization for Potentially Exposed or Susceptible Subpopulations

Considerations related to PESS can influence the selection of relevant exposure pathways, sensitivity of derived hazard values, inclusion of particular human populations, and discussion of uncertainties throughout the assessment. Evaluation of the qualitative and quantitative evidence for PESS begins as part of the systematic review process where any available relevant published studies and other data are

identified. If adequate and complete, this evidence informs the derivation of exposure estimates and human health hazard endpoints/values that are protective of PESS.

For this *trans*-1,2-dichloroethylene draft risk evaluation, EPA considered information that could support increased exposure or biological susceptibility compared to the general population. The Agency was able to incorporate considerations for multiple PESS factors into risk estimates, as presented in Table 4-39. These include lifestage, pre-existing disease, occupational and consumer exposures, geography, sociodemographic status, and aggregate exposures. EPA considered these through the use of exposure factors, uncertainty factors (UFs), or PESS group-specific data. In some cases, information on PESS factors supported the weight of scientific evidence for a particular hazard or exposure value. For others, EPA was either unable to identify relevant chemical-specific data or could not adequately quantify their contribution. These are addressed in detail in the in the *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* (Section 9.2 in ([U.S. EPA, 2026w](#))) and throughout the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

3216 **Table 4-39. Summary of PESS Factors Incorporated into Risk Estimates**

PESS Factor	Potential Increased Exposures Incorporated into Exposure Assessment	Sources of Uncertainty for Exposure Assessment	Potential Sources of Biological Susceptibility Incorporated into Hazard Assessment	Sources of Uncertainty for Hazard Assessment
Lifestage	General population and consumer exposure estimates incorporated lifestage-specific exposure factors (e.g., body weight, surface area, ingestion rate).	Inhalation assessment does not account for differences between lifestages.	Decreased mean female fetal body weights were observed in rodents following gestational inhalation exposure. A dose-related increase in early resorptions was observed in pregnant rodent dams exposed via inhalation.	The weight of scientific evidence based on a limited database is insufficient to support a reproductive or developmental toxicity endpoint.
Pre-existing disease	Not relevant to exposure assessment		Suicide inhibition of cytochrome (CYP) enzymes could impact sensitivity to processing of drugs and other xenobiotics, dependent on exposure levels and timing of co-exposure.	There is no reasonably available information to inform how this would modify standard human variability from the default 10× UF _H .
Occupational and consumer exposures	Evaluated risks to consumers and bystanders.	Bystanders are assumed to be in a different room of the residence.	Not relevant to hazard assessment	
Geography/dite-specific	EPA used the most health protective geographical location for generic scenario air modeling.		Not relevant to hazard assessment	
Sociodemographic status	No relevant information identified		The most sensitive sex from rodent assays was used for non-cancer dose-response modeling.	The most sensitive sex differed by organ system and specific endpoint, with some inconsistencies across studies.
Aggregate exposures	EPA aggregated the highest stack and highest fugitive air releases from the highest releasing facilities.	EPA did not aggregate exposures across COUs or exposure routes.	Not relevant to hazard assessment	
COU = condition of use; PESS = potentially exposed or susceptible subpopulations; UF _H = intraspecies uncertainty factor				

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4.3.6 Risk Characterization for Aggregate and Sentinel Exposures

Section 6(b)(4)(F)(ii) of TSCA requires EPA, as a part of the risk evaluation, to describe whether aggregate or sentinel exposures under the conditions of use were considered and the basis for their consideration. The Agency defines sentinel exposure as “the exposure from a chemical substance that represents the plausible upper bound of exposure relative to all other exposures within a broad category of similar or related exposures” (40 CFR 702.33).

EPA primarily used sentinel (*i.e.*, high-end/worst-case) exposures for risk characterization of each exposure scenario in lieu of aggregation. Using tiered risk assessments beginning with worst-case sentinel exposures allowed for efficient risk characterization that accounted for high-end exposures without performing unnecessary additional analyses when risk concerns were not indicated. For ambient air exposures, the tier 1 analysis using the worst-case facility releases incorporated both sentinel and aggregate exposures, as both stack and fugitive releases from the highest releasing facility via each respective emission type were considered together. For other scenarios, high-end exposures and risks were evaluated in addition to central tendency or lower-intensity scenarios. EPA characterized high-end exposures in evaluating exposure using both monitoring data and modeling approaches. Where statistical data are available, the Agency typically used the 95th percentile value of the available dataset to characterize high-end exposure for a given COU or otherwise used high-end assumptions when performing tiered assessments, such as was performed for consumer risk characterization. Because risks were not identified for the general population using these conservative sentinel exposure approaches and relevant populations are unlikely to experience high-end exposures from multiple COUs or facilities, aggregation was not needed for the general population analysis.

Occupational and consumer inhalation and dermal exposures were not aggregated across uses because while the intermediate/chronic POD is a systemic effect that can occur via exposure from any route, EPA notes that (1) extrapolation from the oral study ([Shopp et al., 1985](#)) involves uncertainties, and (2) application of the POD to the dermal route is considered the most uncertain due to uncertainty in dermal absorption estimates from ([TDCE Consortium, 2023](#)). Aggregating across inhalation and dermal routes would inappropriately compound these uncertainties. Acute risks were estimated based on ocular irritation from *trans*-1,2-dichloroethylene in air, which would not be applicable to any other routes.

4.3.7 Overall Confidence and Remaining Uncertainties in Human Health Risk Characterization

4.3.7.1 Human Health Hazard Considerations

EPA concluded that the weight of scientific evidence supports dose-response analysis on two non-cancer hazard outcomes: (1) sensory irritation and acute neurotoxicity, and (2) immunological toxicity. While the *trans*-1,2-dichloroethylene database strongly indicates that these are toxicological targets, there is greater uncertainty in the quantification of this effect and the selection of representative POD values. See Section 4.2 and ([U.S. EPA, 2026w](#)) for more details.

An acute air concentration POD was applied for sensory irritation based on lacrimation in ([Hurt et al., 1993](#)). This POD should also be protective of solvent neurotoxicity seen at higher concentrations/doses in animal studies, and both effects were reported at hazard thresholds in a human case study ([Lehmann and Schmidt-Kehl, 1936](#)); however, there is remaining uncertainty in the dose-response analysis as a LOAEL (requiring an additional $3 \times \text{UF}_L$) was considered more appropriate than the benchmark dose (BMD) modeling result or use of the ([Lehmann and Schmidt-Kehl, 1936](#)) values. Ocular irritation is specific to exposure to *trans*-1,2-dichloroethylene in air, so dermal and oral exposure routes are not

relevant. Ocular irritation is a peak effect and was not adjusted for exposure duration; thus, the most appropriate risk estimates are for 15-minute TWA exposures that cover maximal exposures and are not diluted over a full day/workshift. EPA therefore has highest confidence in acute inhalation consumer and occupational risk estimates for short-term exposures covering a 15-minute period of exposure; however, it is unknown whether the available data represents a true peak exposure. In contrast, risks may be underestimated for occupational COUs where 15-minute exposure estimates were not available and only full-shift TWA could be used, or when the available monitoring data did not include high-intensity tasks.

Due to the lack of acute oral endpoints, acute or incidental oral and dermal exposures from swimming and drinking water exposures utilized the intermediate POD and UF. This is health-protective because it assumes that exposures were repeated—despite being characterized as acute. The intermediate oral POD for immunosuppression was extrapolated to other routes and chronic durations due to an absence of chronic studies, which increases uncertainty in the risk estimates for these scenarios. Even with these conservatisms, oral risks for these scenarios were not identified relative to benchmarks for either acute (using the intermediate POD) or chronic exposures (with a UFs of 10 applied), so EPA has high confidence in these risk conclusions.

4.3.7.2 Overall Confidence and Remaining Uncertainties in Occupational Risk Characterization

Detailed discussion of the inhalation and dermal exposure estimates for each OES is provided in Section 4.3.2.2. Confidence in the inhalation data used to inform the evaluation of *trans*-1,2-dichloroethylene ranged from slight-to-moderate through robust based on the underlying data. In general, there was robust confidence when utilizing full-shift, PBZ monitoring data from test order submissions across many of these OESs, where it was applied as directly applicable or analogous exposure monitoring data. In general, there was moderate confidence in OESs with limited inhalation monitoring data (*e.g.*, area data, small sample size), where surrogate data were utilized to estimate exposure, or where modeling was used to estimate exposure. Additionally, there was lower confidence for OES with high levels of non-detect data—especially when all samples were below the limit of detection. In some cases, there was slight-to-moderate confidence in ONU exposure estimates when uncertainties in the worker exposure central tendency estimates further decreased confidence for ONUs. The parameter of exposure duration (days) impacts the estimates of the doses for chronic non-cancer. For most OESs, EPA assumed up to 250 days of exposure per year with 8-hour shifts each working day. Additionally, inhalation exposure values were based on single-day, full-shift measurements, and these values were extrapolated to represent average daily concentrations over the specific duration for intermediate and chronic estimates.

For acute exposures, acute risks may be underestimated when only full-shift data are available, as the acute hazard endpoint of ocular irritation is a peak effect that can be experienced from any short-term exposure regardless of exposure duration. An 8-hour TWA will smooth out any peaks in exposure, so for those OESs it cannot be determined whether higher risks would have resulted from high-intensity tasks performed as part of that shift.

The parameter of working years impacts the estimates of the doses for cancer effects. EPA utilized central tendency value of 31 years and high-end value of 40 years based on analysis of the BLS data. Estimates of working years provided by BLS capture the expected lifetime career exposure of a worker but are not industry-specific. Inhalation monitoring results are obtained from the use of samplers attached to the workers to measure exposure concentrations near the workers' breathing zone. Because the placement of the samplers would be outside of any respiratory protection used, the inhalation exposures do not take into account the exposure reduction from the use of respirators. The monitoring

results do reflect the use of exposure controls such as administrative and engineering controls as these control measures would impact the exposure concentrations measured near the worker's breathing zone. EPA has considered PPE based on available information for each OES but did not assume PPE usage for any of the risk estimates presented in Section 4.3.2. However, the necessary PPE needed to raise the risk estimate over the benchmark is presented in Table 4-25. Overall, EPA has higher confidence where high risk exposures did not indicate risk relative to the benchmark because many of these scenarios are likely to be overly conservative—especially for chronic exposures. Additionally, EPA has lower confidence in risk estimates where ONU data were not available as the Agency assumed that the central tendency exposures for workers were appropriate for characterization of ONUs.

The test order summary report describes dermal and respiratory PPE used in the facilities that were monitored. EPA's practice is to consider if the PPE used at the facility as described in the test order summary report provides protection consistent with the Agency's assessment of the PPE protection factor needed for acceptable MOEs. Based on the available information in the test order report, workers do not wear respiratory protection as standard PPE for full or near full-shift durations, which is typical of industrial hygiene program plans; however, respirators are used during specific short-term tasks, including tasks with high-exposure potential. As previously described, varying levels of respirator protection are associated with tasks described in the test order and use of PPE varied across workers and facilities (as described in Table 4-22). Given the variation in tasks and reported respirator use associated with specific tasks, it is difficult to identify a consistent level of respiratory protection across a job group. However, EPA has performed a detailed review of respirator use by SEG and identified that across several SEGs, workers typically or always wear respirators during high-exposure tasks. However, it should be noted that the proper use of respiratory protection during high-exposure tasks will reduce the overall full-shift exposure. If these high-exposure tasks contribute a large percentage of potential exposure over the full-shift, then the proper use of PPE will significantly reduce full-shift exposures.

Given the detailed amount of information on respiratory protection usage provided in the test order final study report ([Exponent, 2023](#)) and associated documentation, EPA has included additional discussion of respiratory PPE worn by workers for select OES and SEGs in Section 4.3.2.1 and throughout the occupational inhalation exposure risk characterization. During the Agency's review and approval of the test order sampling plan, the inclusion of information on respiratory protection programs and engineering controls was a key consideration.

4.3.7.3 Overall Confidence and Remaining Uncertainties in Consumer Risk Characterization

Key sources of uncertainty for evaluating exposure to *trans*-1,2-dichloroethylene in consumer products and strategies to address those uncertainties are described in detail in Section 10 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)). Generally, the designation of robust confidence suggests that the supporting evidence weighed against the uncertainties is more than adequate to characterize exposure assessments. See Table 4-40 for more information on weight of scientific evidence for consumer COUs.

Product Formulation and Composition

Variability in the formulation of consumer products, including changes in ingredients, concentrations, and chemical forms, can introduce uncertainty in exposure assessments. In this assessment, the Agency has robust confidence in the weight fraction amounts modeled, because they were obtained from SDSs. EPA used the high weight fractions 0.025 to 0.05% for the propellant analysis to capture use of products with the highest *trans*-1,2-dichloroethylene content. For both degreaser products, EPA varied the weight fractions across high, medium, and low scenarios to capture the range of *trans*-1,2 dichloroethylene.

Product Use Patterns

Consumer use patterns such as frequency of use, duration of use, the size of the application area, and skin contact area are expected to differ across different users and scenarios. For the Cleaning agent; Aerosol spray/degreaser; and Flux Remover COU, the CEM default values for the mass used for low-, medium-, and high-use cases were used. Confidence in the surface area to be cleaned, and thus the mass of product used, is moderate, because product-specific values could not be determined. The duration of use was varied based on marketing materials that gave a typical application rate of mass per second; the durations were varied according to that application rate and the mass applied in each scenario. For the frequency of use, EPA varied the frequency across low, medium, and high scenarios to represent use 1 weekend per month, 5 days per month, and every weekend day (10 days per month) based on the *Exposure Factors Handbook* ([U.S. EPA, 2011](#)) and typical hobbyist activities. There are several types of degreasers on the market that can be used on many different parts of a vehicle. The *Exposure Factors Handbook* ([U.S. EPA, 2011](#)) includes several product types, including engine degreaser, transmission degreaser, and brake quieter cleaners, carburetor degreasers, and solvent-type cleaning fluids or degreasers that could be used on any general product in a vehicle that requires degreasing. The mean number of uses per year ranges from 3.00 uses/year for brake quieter cleaners to 16.46 uses/year for solvent-type cleaning fluids or degreasers. The max use/year ranges from 26 uses/year for transmission cleaners to 365 uses/year for solvent-type cleaning fluids. EPA assumes that many of these uses might be used sporadically throughout the year on different types of products that may need degreasing and based on product descriptions and the *Exposure Factors Handbook* ([U.S. EPA, 2011](#)) that hobbyists may be working on one or two cars over every weekend in the year.

For the Propellants, non-motive (blowing agent); Polymer foam building insulation COU, emission rates for *trans*-1,2-dichloroethylene was estimated based on a test order that estimated emission from a spray propellant foam product in a chamber with known air exchange rate and volume. After accounting for mass lost during the experiment, the profile of emission was well-captured by a dual exponential decay function. To adjust the emissions for specific use scenarios, both the area of application and the mass per use were needed. The areas were taken assuming certain fractions of the wall are covered, where the wall size was determined from the IECCU default attic room volume. The associated areas were determined by taking product yields and mass per product container and calculating the mass for the particular coverage area. The product yields and mass per product container were obtained from product manufacturer information.

Overall confidence in product use patterns is robust due to modeling variations in patterns of consumer use, frequency, duration of use, and application methods.

Inhalation and Dermal Modeling Tools

Confidence in the modeling tools considers whether the model has been peer reviewed and whether they are being applied in a manner appropriate to its design and objective. The models used (CEM Version 4.0 and IECCU) have been peer reviewed, are publicly available, and have been applied in their intended manner to estimate exposures associated with uses of household products. Default inputs, such as building and room volumes, interzonal ventilation rates, and air exchange rates, were also used when appropriate. For dermal modeling, the dermal absorption fraction was taken from test order data in unoccluded settings and other inputs are set to their CEM defaults. Overall confidence in the proper use of CEM and IECCU for consumer exposure modeling is robust.

3399 Table 4-40. Weight of Scientific Evidence per Consumer COU

Consumer COU Category and Subcategory	Weight of Scientific Evidence	Overall Confidence
Cleaning agent – Cleaner/degreaser (aerosol and non-aerosol)	High, medium, and low scenarios were assessed for 7 aerosol spray/degreaser products and 14 flux remover products using the same methods for each. Inhalation exposure was modeled using CEM. The confidence in the weight fraction for CEM modeling is robust because they were informed by the SDS. Confidence in the surface area to be cleaned, and thus the mass of product used, is moderate, since product-specific values could not be determined. Instead, CEM defaults were used. Confidence in the associated event durations are considered robust, because they are based on the mass used along with manufacturer-provided product spray volumes in mass per second. Although the <i>Exposure Factors Handbook</i> (U.S. EPA, 2011) gives overall guidance on duration of use and there is robust confidence in that, there are still uncertainties applying the <i>Exposure Factors Handbook</i> information to these individual products giving this input a moderate confidence level. Overall, the confidence in the inhalation estimate range (across low, medium, and high scenarios) is robust. For dermal exposure, EPA implemented the mass-limited model equations in CEM with dermal absorption fractions derived from test order data. EPA modeled high, medium, and low scenarios with varying parameters using 1.2% dermal absorption, and also modeled high, medium, and low scenarios with varying parameters using 0.6% dermal absorption. EPA used the <i>Exposure Factors Handbook</i> (U.S. EPA, 2011) to identify duration of application. All intermediate MOEs for dermal exposures were higher than the benchmark. Overall, confidence in the dermal estimate range (across low, medium, and high scenarios) is robust.	Inhalation – Robust Dermal – Robust
Propellants, non-motive (blowing agent) – Polymer foam	High, medium, and low scenarios were assessed for 2 gap-filler propellant polyurethane foam insulation products and 1 open-cell polyurethane foam insulation product. The exponential form for the emission equation was determined based on test order data. The mass and area of application per event were determined based on the total area of an attic wall based on IECCU defaults, the fraction of the wall covered by each product, and the yield per container, mass per container, and weight fractions based on manufacturer specifications. The overall confidence in the inhalation estimate range (across low, medium, and high scenarios) is robust. For dermal exposure, EPA implemented the mass-limited model equations in CEM with absorption fractions derived from test order data. EPA modeled high, medium, and low scenarios with varying parameters using 1.2% dermal absorption, and also modeled high, medium, and low scenarios with varying parameters using 0.6% dermal absorption. EPA used the manufacturer technical datasheet to identify duration of application. All intermediate MOEs for dermal exposures were higher than the benchmark. Overall, confidence in the dermal estimate range (across low, medium, and high scenarios) is robust.	Inhalation – Robust Dermal – Robust
CEM = Consumer Exposure Model; COU = condition of use; IECCU = Indoor Environmental Concentrations in Buildings with Conditioned and Unconditioned Zones; MOE = margin of exposure; SDS = safety data sheet		

4.3.7.4 Overall Confidence and Remaining Uncertainties in General Population Risk Characterization

Air Pathway

This section provides an overview of the factors used to estimate the non-cancer risks to the general population, with each major factor being described in its own subsection. See Table 4-41 for more information on the confidence in each line of evidence and overall confidence for each OES.

EPA considered TRI release data from the years 2019 to 2023 for this analysis. The highest stack and highest fugitive releases were modeled in IIOAC along with all EPA estimated releases from six OESs. TRI release data are reported annually by over 20,000 facilities across the United States. The TRI Program conducts annual data quality checks. These checks focus on facilities that reported the largest increases or decreases of releases or other waste management quantities from the previous reporting year; reported the largest releases of persistent bioaccumulative toxic chemicals (PBTs); reported the largest releases to air or water; and have the highest risk-screening scores and the largest changes in scores from the previous year. Due to the quality of the TRI data that is used as inputs for IIOAC, EPA has robust confidence in the TRI data. The robust confidence is based on high levels of confidence in underlying release information used to estimate exposures, the completeness of the datasets modeled, and the modeling methods used. The Agency has slight confidence in risk estimates that relied on EPA-estimated releases from generic facilities/sites. Although the Agency has robust confidence in the methodology used to calculate ambient air concentrations, the uncertainties in release estimates and lack of site-specific data resulted in high confidence that potential risks are being overestimated.

The Agency used IIOAC for OESs that had EPA estimated releases from generic facilities/sites because the Agency has assumed release locations and for TRI facilities with the highest stack and fugitive releases. The IIOAC Model has limitations regarding which inputs can be modified and which cannot. Since it is based on pre-run scenarios within AERMOD, default input parameters (*e.g.*, stack characteristics and 2011–2015 meteorological data) are predefined. Certain parameters like building dimensions, release elevation, and land use cannot be considered by the IIOAC Model. Overall, EPA has moderate confidence that the conservative assumptions used in the IIOAC Model for the ambient air exposure scenario modeled represent a high-end estimate. EPA also has moderate confidence in the IIOAC modeling approach. The moderate confidence in IIOAC was based on the use of conservative inputs and the reliance on assumed model input parameters.

For the analysis using IIOAC, EPA assumed a 78-year lifespan and constant exposure over an entire lifetime. The 78-year lifespan is the average life expectancy of the general population ([U.S. EPA, 2011](#)). An exposure duration of 78 years when calculating lifetime exposures was assumed to be protective of PESS group and communities that are located near *trans*-1,2-dichloroethylene-releasing facilities. Note that the assumption of 78 years of exposure does not necessarily indicate that people are stagnant; rather, it is meant to characterize anyone that resides, works, or remains, within approximately the same distance from a facility for their entire life. It is also consistent with previous recommendations from the SACC ([U.S. EPA, 2023b](#)). The default scenario in HEM5.0 assumes an exposure duration of 70 years and a lifetime of 70 years. For both the HEM5.0 and IIOAC analyses, the averaging time and exposure time are the same, which means the risks calculated using both models can be directly compared. Overall, the assumption of constant exposure over a lifetime of either 70 or 78 years is a conservative assumption that will result in high-end risk estimates.

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Table 4-41. Confidence in Each Line of Evidence and Overall Confidence for Each OES

OES or Assessment	Data Source	Overall Confidence
Highest TRI Stack and Fugitive Releases	TRI	For this OES, EPA used facility-reported releases from TRI to estimate risks using IIOAC. The use of the TRI database provides robust confidence that EPA captured high-end releases across the years assessed in this evaluation. No non-cancer risks below the benchmark were found for any modeled distances. Based on the overall weight of evidence, the Agency has robust confidence in the risk estimates and that the estimated risks are protective of actual exposures to the general population living near <i>trans</i>-1,2-dichloroethylene-releasing facilities.
Vapor Degreasing	EPA estimated releases from generic facilities/sites	For this OES, there were no facility-reported releases and EPA relied on estimated releases from generic facilities/sites to estimate general population inhalation risks. The Agency used IIOAC and assumed physical characteristics (<i>e.g.</i>, stack height, stack diameter, exit temperature, etc.) and site characteristics (<i>e.g.</i>, meteorology station) for inputs to the model. No non-cancer risks below the benchmark were found for any modeled distances. The Agency has robust confidence in the accuracy of the risk estimates due to high-end inputs to IIOAC. There were some uncertainties associated with the release estimates because the lack of population data for generic facilities/sites. But the agency has robust confidence that these estimates represent high-end exposure and risk scenarios.
Adhesives and Sealants	EPA estimated releases from generic facilities/sites	For this OES, there were no facility-reported releases and EPA relied on estimated releases from generic facilities/sites to estimate general population inhalation risks. The Agency used IIOAC and assumed physical characteristics (<i>e.g.</i>, stack height, stack diameter, exit temperature, etc.) and site characteristics (<i>e.g.</i>, meteorology station) for inputs to the model. No non-cancer risks below the benchmark were found for any modeled distances. Based on the overall weight of evidence, the Agency has robust confidence in the risk estimates and that the estimated risks are protective of actual exposures to the general population living near releasing facilities.
Blowing Agent in Spray Foam	EPA estimated releases from generic facilities/sites	For this OES, there were no facility-reported releases and EPA relied on estimated releases from generic facilities/sites to estimate general population inhalation risks. The Agency used IIOAC and assumed physical characteristics (<i>e.g.</i>, stack height, stack diameter, exit temperature, etc.) and site characteristics (<i>e.g.</i>, meteorology station) for inputs to the model. No non-cancer risks below the benchmark were found for any modeled distances. Based on the overall weight of evidence, the Agency has robust confidence in the risk estimates and that the estimated risks are protective of actual exposures to the general population living near releasing facilities.
Laboratory Chemicals	EPA estimated releases from generic facilities/sites	For this OES, there were no facility-reported releases and EPA relied on estimated releases from generic facilities/sites to estimate general population inhalation risks. The Agency used IIOAC and assumed physical characteristics (<i>e.g.</i>, stack height, stack diameter, exit temperature, etc.) and site characteristics (<i>e.g.</i>, meteorology station) for inputs to the model. No non-cancer risks below the benchmark were found for any modeled distances.

OES or Assessment	Data Source	Overall Confidence
		Based on the overall weight of evidence, the Agency has robust confidence in the risk estimates and that the estimated risks are protective of actual exposures to the general population living near releasing facilities.
Commercial Aerosol Products (Aerosol Degreasing)	EPA estimated releases from generic facilities/sites	For this OES, there were no facility-reported releases and EPA relied on estimated releases from generic facilities/sites to estimate general population inhalation risks. The Agency used IIOAC and assumed physical characteristics (<i>e.g.</i>, stack height, stack diameter, exit temperature, etc.) and site characteristics (<i>e.g.</i>, meteorology station) for inputs to the model. No non-cancer risks below the benchmark were found for any modeled distances. Based on the overall weight of evidence, the Agency has robust confidence in the risk estimates and that the estimated risks are protective of actual exposures to the general population living near releasing facilities.
IIOAC = Integrated Indoor-Outdoor Air Calculator; OES = occupational exposure scenario; TRI = Toxics Release Inventory		

Surface Water and Sediment Pathway

For the surface water pathway, EPA provides an OES-specific risk characterization based on available facility-specific release information as reported to TRI/DMR as well as generic scenario releases. Modeled concentrations and characterization of general population exposure represent a higher-end estimate of exposures to oral/dermal exposure while swimming and drinking water. As explained in Section 4.1.3, EPA has robust confidence in the overall characterization of exposure to the general population based on the use of methodologies and models that have undergone peer review and public comment. Additionally, the use of measured concentrations in both surface water and drinking water bolster the exposure characterization. As described in Section 4.3, there is also robust confidence in the risk estimates and characterization of these estimates based on available hazard data and evaluation scenarios. Across all evaluated pathways, because each OES is represented by the facility or generic scenario with the highest modeled surface water concentrations, all other facilities or generic scenarios within an OES would be expected to have lower doses and risks. Therefore, because these higher-end scenarios resulted in no identified risk across the evaluated pathways, there is robust confidence that there are no identified risks for any of the evaluated surface water or sediment pathways for *trans*-1,2-dichloroethylene.

Groundwater Pathway

Overall confidence in risk estimates for drinking water exposure to *trans*-1,2-dichloroethylene in landfill leachate-impacted groundwater is moderate. This reflects moderate confidence in the exposure estimates generated using the DRAS Model. DRAS based exposure estimates were used to estimate risks because of the uncertainty associated with identifying the source of *trans*-1,2-dichloroethylene in groundwater (*i.e.*, current vs. legacy uses). Remaining uncertainty in the exposure estimates arises from the underlying basis of the DRAS Model, which relies in part on an older survey of drinking water wells located down-gradient from waste management units ([U.S. EPA, 1988b](#)). It is unclear how well this survey reflects current conditions, the proximity of wells to waste disposal units, or whether the surveyed units are representative of current waste management practices.

3473 5 ENVIRONMENTAL RISK ASSESSMENT

trans-1,2-Dichloroethylene – Environmental Risk Assessment: Key Points

EPA evaluated the reasonably available information to support environmental risk assessment of *trans*-1,2-dichloroethylene. The key points of the environmental risk assessment are summarized below.

Environmental Exposure

- *trans*-1,2-Dichloroethylene is expected to be released to air, water, and land. Based on the fate and transport and environmental media analyses ([U.S. EPA, 2026g](#)) the main environmental exposure pathways for *trans*-1,2-dichloroethylene are surface water, air, and biosolid application to soils.

Environmental Hazard

- Aquatic Species
 - The acute aquatic concentration of concern (COC) of 3,005 µg/L was derived from the lower 95th percentile of the hazard concentration protective of 95% of the population (HC05) based on a species sensitivity distribution (SSD), including supplemental predicted data from Web-ICE. *Trans*-1,2-dichloroethylene data, along with the analogs *cis*-1,2-dichloroethylene and trichloroethylene exposure data, were used in the SSD.
 - The chronic aquatic COC of 788 µg/L was derived from the chronic value (ChV) for the 32-day exposure of juvenal *Pimephales promelas* fish exposed to the analog trichloroethylene and represents the effective concentration on 20% of the exposed fish (EC20) (growth endpoint).
 - The algal COC of 51,467 µg/L was derived from the lower 95th percentile of the HC05 based on an SSD that used growth EC50 data from 72-hour exposures to the analog trichloroethylene.
- Terrestrial Species
 - The mammalian inhalation chronic toxicity threshold of 6,000 ppm was derived from the lowest bounded no-observed-adverse-effect level (NOAEL) for reproduction in rats.
 - The soil-dwelling terrestrial invertebrate soil hazard threshold of 100 mg/kg-soil was derived from taking the lowest-observed-effect concentration (LOEC) of 1,000 mg/kg soil from a 48-hour *Eisenia fetida* exposure to trichloroethylene and dividing it by an assessment factor (AF) of 10.

Environmental Risk Characterization

- Aquatic Species
 - EPA did not identify risk quotients (RQs) exceeding 1 for aquatic animals exposed to *trans*-1,2-dichloroethylene for either acute (RQ = 0.17) or chronic (RQ = 0.65) durations.
 - The RQ for aquatic plants and algae was less than 1 for all COUs/OESs.
- Terrestrial Species
 - The RQ values for terrestrial plants (3.5×10^{-5}) and mammalian (6.1×10^{-5}) from exposure to the highest modeled air concentration at 100 m from the release point were well below the benchmark.
 - The RQ value (7.1×10^{-4}) for soil-dwelling invertebrates in soils with an annual application of biosolids was well below the benchmark.

3474
3475 EPA assessed environmental risks of *trans*-1,2-dichloroethylene exposure to aquatic and terrestrial
3476 species. Section 5.1 describes environmental exposures through surface water, soil, and air.
3477 Environmental hazards for aquatic and terrestrial species are described in Section 5.2 and the
3478 environmental risk characterization is described in Section 5.3.

5.1 Summary of Environmental Exposures

EPA assessed environmental concentrations of *trans*-1,2-dichloroethylene in air, water, and land for use in environmental exposure. The environmental exposures are described in the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)). A summary of how EPA assessed environmental exposures of *trans*-1,2-dichloroethylene in surface water is described in Section 5.3.2, ambient air in Section 5.3.2, and soils in Section 5.3.3. The highest environmental exposure concentrations by exposure media are summarized below in Table 5-1.

Table 5-1. *trans*-1,2-Dichloroethylene Highest Exposure Concentrations Used in Environmental Risk Characterization

OES or Assessment ^a	Release Media	Route of Exposure	<i>trans</i> -1,2-Dichloroethylene Concentration	Data Source
Highest upper bound (95th percentile) facility-specific fugitive release OES (Adhesives and Sealants)	Air	Inhalation	1,460 µg/m ³	(U.S. EPA, 2026g)
Highest modeled 7Q10 surface water concentration (Waste Handling, Disposal, and Treatment)	Water	Surface water	509 µg/L	(U.S. EPA, 2026g)
Highest modeled concentration from biosolid application to soils	Biosolids	Soil	7.1E-02 mg/kg	(U.S. EPA, 2026g)
7Q10 = lowest 7-day average flow that occurs (on average) once every 10 years				
^a See Table 1-1 for crosswalk between Occupational Exposures Scenarios (OES) and Conditions of Use (COU).				

5.1.1 Surface Water

EPA evaluated environmental exposures for aquatic vertebrates, invertebrates, and plants to *trans*-1,2-dichloroethylene via surface water. Exposures are described in Section 6 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-dichloroethylene* ([U.S. EPA, 2026g](#)). EPA conducted modeling with Exposure and Fate Assessment Screening Tool Version 2014 (E-FAST) ([U.S. EPA, 2014a](#)) to estimate concentrations of *trans*-1,2-dichloroethylene in surface water. EPA used a tiered approach for both facility-specific releases reported to the TRI and DMR databases between 2019 – 2023, as well as estimated generic scenario releases based on relevant OESs. Surface water exposure concentrations are further summarized in Section 5.3.2 and described in detail in the *Draft Chemistry, Fate, Release, and exposure Assessment for trans-1,2-dichloroethylene* ([U.S. EPA, 2026g](#)).

5.1.2 Sediments

As described in Sections 6.2.2 and 6.3 of the *Draft Chemistry, Fate, Release, and exposure Assessment for trans-1,2-dichloroethylene* ([U.S. EPA, 2026g](#)), environmental hazard toxicity tests were ordered. Subsequent feasibility studies for these sediment toxicity tests demonstrated that exposures could not be determined for *trans*-1,2-dichloroethylene in sediments based on an inability to maintain exposure concentrations in test sediments. Additionally, alternative approaches to complete data needs to estimate sediment concentrations and potential exposures were unavailable. Therefore, based on these limitations, EPA is not further evaluating risks to sediment-dwelling invertebrates associated with exposures of *trans*-1,2-dichloroethylene in sediments. Given the physical-chemical properties and fate and transport of *trans*-1,2-dichloroethylene, the inability to maintain exposure concentrations in sediments is supportable and provides evidence that exposure via sediment is unlikely in the environment. A full description of these initial studies and rationale for not evaluating potential exposures within sediment is provided in *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene*

(U.S. EPA, 2026w). In summary, the Agency determined that due to the volatile and non-adsorptive nature of *trans*-1,2-dichloroethylene, tests would not yield relevant exposures. This conclusion was supported by the preliminary feasibility study that showed the chemical to be unstable in the water and sediment matrices. Results from both exposure methods tested in the feasibility study failed to consistently retain an acceptable amount of the nominal *trans*-1,2-dichloroethylene concentrations. The overlying water exposure maintained higher concentrations in both water and sediment than the spiked sediment exposure; however, the results from both exposure methods were significantly below standard guidelines. Analytically measured concentrations after the duration of the overlying water exposure test determined a mean of 15% nominal concentration in pore water and 1% nominal concentration in sediment.

5.1.3 Ambient Air

EPA considered exposures to *trans*-1,2-dichloroethylene via the ambient air pathway for terrestrial plants by direct contact exposure and for terrestrial mammalian wildlife by inhalation. As outlined in Section 5.3.1 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* (U.S. EPA, 2026g), the Agency estimated concentrations of *trans*-1,2-dichloroethylene in ambient air from stack releases and fugitive emissions using the EPA's Integrated Indoor-Outdoor Air Calculator (IIOAC) (EPA, 2019b) for each COU/OES. Ambient air environmental exposure concentrations are summarized in Section 5.3.3.

5.1.4 Soils

EPA considered exposure to *trans*-1,2-dichloroethylene via soil for terrestrial plants and soil-dwelling invertebrates. As detailed in Sections 7.1.2 and 7.4 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* (U.S. EPA, 2026g), EPA used Equation 60 of the European Commission Technical Guidance Document part 3 (TGD) (ECB, 2003) to estimate soil concentration after application of biosolids. The application of biosolids is estimated to result in concentrations of 0.071 mg/kg of *trans*-1,2-dichloroethylene in soil.

5.1.5 Weight of Scientific Evidence Conclusions for Environmental Exposures

EPA has robust confidence that the measured and modeled concentrations used in this assessment are protective of actual exposure scenarios. Exposures to aquatic biota followed a tiered structure whereby if preliminary risk was identified at a lower tier information, those scenarios were evaluated for potential refinement of environmental exposure concentrations. The refinement process resulted in revised estimations of potential environmental exposure. EPA's robust confidence comes from the use of multiple data sources from measured values, modeled values from facility-specific TRI and DMR release data, and modeled generic scenario values—all of which results in the exposure estimates being representative of most COU-related risk estimates. Exposure confidence is detailed in *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* (U.S. EPA, 2026g).

5.2 Summary of Environmental Hazards

EPA evaluated the reasonably available information for environmental hazard endpoints associated with *trans*-1,2-dichloroethylene exposure to ecological receptors in aquatic and terrestrial ecosystems. The Agency reviewed references for *trans*-1,2-dichloroethylene environmental hazard; however, these references were deemed insufficient and were supplemented with additional references for two analogs: the isomer *cis*-1,2-dichloroethylene and trichloroethylene. Additional details on the analog selection process can be found in Appendix E of the *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* (U.S. EPA, 2026w). EPA has high confidence in the selection of these analogs for assessment of environmental hazards for *trans*-1,2-dichloroethylene, which is based on the selections process analyzing similarities in structure, physical-chemical properties, and ecological

toxicity. The references selected for use in determining the environmental hazard of *trans*-1,2-dichloroethylene all received a quality of medium or high by the EPA during the systematic review process.

5.2.1 Environmental Hazard Thresholds

Environmental hazard thresholds that were considered for the risk evaluation are summarized in Table 5-2. For more details on how these thresholds were selected see *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026w](#)); for more details on exposure pathways see *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

Environmental hazard thresholds for aquatic organisms were derived from hazard data for *trans*-1,2-dichloroethylene or its analogs *cis*-1,2-dichloroethylene and trichloroethylene. These analogs were selected after an analysis and selection process that evaluated structural, physical-chemical, environmental fate and transport, and toxicological similarities. For more details on these environmental hazard thresholds and the analog selection process see *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026w](#)).

Table 5-2. Environmental Hazard Thresholds for *trans*-1,2-Dichloroethylene

Receptor Group	Exposure Duration/ Effect	Target or Analog Chemical	Hazard Threshold (Confidence in COC or HV)	Assessment Medium	Citation (Quality Rating)
Aquatic vertebrates and invertebrates	Acute/ Mortality	<i>trans</i> -1,2-Dichloroethylene and trichloroethylene	Lower 95th confidence interval of HC05 from SSD 3,005 µg/L (HC05 = 4,438 µg/L) (Robust)	Water column	Based on analyses across multiple studies (U.S. EPA, 2026w)
Aquatic vertebrates and invertebrates	Chronic 32-days/ Growth	Trichloroethylene	788 (µg/L) (Moderate)	Water column	(Broderius et al., 2005) (High)
Aquatic plants (algae)	Acute 48- to 96-hour/ Growth	Trichloroethylene	Lower 95th confidence interval of HC05 from SSD 51,467 (µg/L) HC05 = 93,364 (µg/L) (Moderate-to-Robust)	Water column	Based on analyses across multiple studies (U.S. EPA, 2026w)
Terrestrial plants	Acute/2-hour plant pollen	N/A	10,350 (ppm in air) 41,873,000 µg/m ³ (Moderate-to-Robust)	Ambient air	(Schubert et al., 1995) (Medium)
Terrestrial plants	14-day/ LOEC growth reduction	Trichloroethylene	79 (mg/L in soil solution) (Moderate-to-Robust)	Soil pore water	(Dietz and Schnoor, 2001) (Medium)
Soil-dwelling invertebrates	Acute 48-hour/ Avoidance	Trichloroethylene	100 (mg/kg soil) (Moderate-to-Robust)	Soil	(Wang et al., 2021) (High)

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Receptor Group	Exposure Duration/ Effect	Target or Analog Chemical	Hazard Threshold (Confidence in COC or HV)	Assessment Medium	Citation (Quality Rating)
Terrestrial mammals	Chronic/ Reproduction, growth, survival	N/A	6,000 (ppm in air) 23,789,000 µg/m ³ (Moderate)	Ambient air	Based on analyses across multiple studies (U.S. EPA, 2026w)
COC = concentration of concern; HC05 = hazard concentration for 5% of species; HV = hazard value; LOEC = lowest-observed-effect concentration; SSD = species sensitivity distribution					

5.2.2 Weight of Scientific Evidence Conclusions for Environmental Hazards

The weight of scientific evidence fundamentally means that the evidence is weighed (*i.e.*, ranked) and weighted (*i.e.*, a piece or set of evidence or uncertainty may have more importance or influence in the result than another). Based on the weight of scientific evidence and uncertainties, a confidence statement was developed that qualitatively ranks (*i.e.*, robust, moderate, slight, or indeterminate) the confidence in the hazard threshold. Confidences in the *trans*-1,2-dichloroethylene environmental hazard thresholds can be found in Table 5-2. The evidence considerations and criteria detailed within ([U.S. EPA, 2021b](#)) guide the application of strength-of-evidence judgments for environmental hazard effect within a given evidence stream and were adapted from Table 7-10 of the *Draft Systematic Review Protocol Supporting TSCA Risk Evaluations for Chemical Substances* ([U.S. EPA, 2021b](#)). More information on the strength-of-evidence considerations and confidence ratings for the environmental hazard thresholds can be found in the *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026w](#)).

EPA used the strength-of-evidence and uncertainties from ([U.S. EPA, 2021b](#)) for the hazard assessment to qualitatively rank the overall confidence using evidence for environmental hazard. Confidence levels of robust, moderate, slight, or indeterminate are assigned for each evidence property that corresponds to the evidence considerations ([U.S. EPA, 2021b](#)). The analyses of weight of scientific evidence and confidence is described in detail in the *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026w](#)). EPA has at least moderate and up to robust confidence in all of the hazard values for *trans*-1,2-dichloroethylene (Table 5-2).

Hazard Thresholds for Aquatic Invertebrates, Vertebrates, and Plants (Algae)

EPA has robust confidence in the acute COC for aquatic invertebrates and vertebrates and the COC for aquatic plants (algae) as they are based on a probabilistic SSD approach that uses hazard data across a wide range of aquatic invertebrate and vertebrate species and algal species in the respective analyses. The chronic aquatic hazard threshold of 788 µg/L was read-across from trichloroethylene ([U.S. EPA, 2020d](#)). Although EPA is confident in the selection of trichloroethylene as an analog, EPA has moderate confidence in the quality of the chronic aquatic database for the analog. These studies examined numerous apical endpoints including mortality, reproduction, and development/growth with consistent effects observed among the studies that maintained a reasonable dose-response design using measured concentrations. However, the chronic hazard database is more limited compared to the acute database with seven studies for four species. Therefore, EPA has less confidence in the chronic COC compared to the acute aquatic invertebrate and vertebrate and the aquatic plant (algae) COCs, which have moderate confidence in consistency, strength and precision, dose-response, and relevance in the chronic invertebrate hazard assessment.

Hazard Thresholds for Terrestrial (Soil-Dwelling) Invertebrates

The weight of evidence suggests that *trans*-1,2-dichloroethylene poses hazard to terrestrial invertebrate species at 100 mg/kg soil and 5.88 mg/L soil solution. Across 10 studies the adverse effects were consistent in reporting decreases in abundance, diversity, and mortality. The adverse effects observed are ecologically relevant in that they are related to the short- and long-term viability of terrestrial soil invertebrate populations and the communities of animals that are dependent on these receptors. Therefore, the Agency assigned moderate-to-robust confidence to the terrestrial soil-dwelling invertebrate hazard threshold.

Hazard Thresholds for Terrestrial Plants

The *trans*-1,2-dichloroethylene hazard thresholds for terrestrial plant species was found to be 79 mg/L in soil solution and 10,350 ppm in air. Across eight studies the adverse effects were consistent in reporting decreases in growth (biomass), transpiration (survival), and germination (reproduction). The adverse effects observed are ecologically relevant in that the reduction in growth, survival, and reproduction are related to the short- and long-term viability of terrestrial soil invertebrate populations and the communities of animals that are dependent on these receptors. Even though the hazard database for plants overall is limited to only a few test species, the studies available are well designed and the Agency assigned robust confidence to the terrestrial plant hazard thresholds.

Toxicity Reference Value (TRV) for Inhalation for Mammalian Wildlife

The *trans*-1,2-dichloroethylene mammalian wildlife inhalation toxicity reference value was derived based on an established process was 6,000 ppm. The Agency has robust confidence that this threshold is protective of behavior, reproduction, and survival, but has lower confidence based on the limitations of the hazard database to one species only (the rat) and has identified moderate-to-robust confidence in this TRV.

5.3 Environmental Risk Characterization

5.3.1 Risk Assessment Approach

Environmental risk was characterized by calculating risk quotients (RQs) ([U.S. EPA, 1998](#); [Barnthouse et al., 1982](#)). The RQ is defined in Equation 5-1:

Equation 5-1. Calculating Risk Quotient

$$RQ = \frac{\text{Predicted Environmental Concentration}}{\text{Hazard Threshold}}$$

Environmental exposure concentrations (*i.e.*, surface water, air, and soil) were based on measured and modeled concentrations of *trans*-1,2-dichloroethylene. The COCs (hazard thresholds) used to calculate the RQs are described in Section 5.2.1. The benchmark value for RQs in environmental risk characterization was 1. If the RQ was above 1, the exposure was greater than the COC or hazard threshold concentration, providing evidence of potential adverse effects on populations of animals or plants. If the RQ was below 1, the exposure was less than the hazard concentration. An RQ equal to 1 indicated that the exposures were the same as the concentration that caused effects. The environmental risk characterization of *trans*-1,2-dichloroethylene is provided in Section 5.3.2 for aquatic species and Section 5.3.3 for terrestrial species.

5.3.2 Risk Estimates for Aquatic Species

EPA established COUs under the lifecycle stages of manufacturing, processing, industrial use, commercial use, and disposal (Section 1.1, Table 1-1). Risk for aquatic species was evaluated by the Agency for each OES based on either facility-specific reported releases or generic scenario releases. Facility-specific reported releases are estimated per OES as described in Section 5.1.1. Table 5-3 provides a list of the facilities with the highest reported releases per OES including the modeled 7Q10 surface water concentrations that were used to estimate exposure for aquatic organisms. These surface water exposure estimates were derived as described in the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-dichloroethylene* ([U.S. EPA, 2026g](#)).

After Tier 1 exposure estimates identified scenarios where preliminary risk to environmental populations was observed it was determined that further refinement was required. Based on facility-specific surface water concentration estimates in Tier 1, three facilities across two OESs identified preliminary risk for environmental pathways. These facilities were reviewed for availability of effluent monitoring information of *trans*-1,2-dichloroethylene as reported within the ECHO database or alternate receiving water body information based on reported TRI Form Rs. These reported effluent concentrations were used as more representative maximum estimates of potential concentrations entering surface water bodies. Re-evaluating risk using these refined surface water concentration estimates in Tier 2 did not identify preliminary risk and no further refinement was necessary for the evaluation of environmental population exposures. Tier 2 values are provided in Table 5-3. More information on the tiered approach can be found in Section 6 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

RQ values were calculated for surface water exposure to aquatic organisms from seven OES releases using TRI- and DMR-reported data and two OESs using generic scenario modeling of *trans*-1,2-dichloroethylene Table 5-3. Risk to aquatic organisms was characterized by comparing COCs ([U.S. EPA, 2026w](#)) for aquatic organisms to the highest modeled surface water concentrations for each OES ([U.S. EPA, 2026g](#)). All RQ values are less than the benchmark of 1.

Table 5-3. Environmental Risk Quotients from Facilities with Highest Modeled 7Q10 Water Concentrations per Occupational Exposure Scenario (OES) for TRI and DMR Releases 2019 – 2023 and from OES Generic Scenario Modeling

OES (NPDES) ^a	Annual Release (kg/yr)	Operating Days	Daily Release Estimate (kg/d)	7Q10 Flow (MLD)	7Q10 Conc. (µg/L)	Risk Quotient ^e		
						Acute Aquatic COC	Chronic Aquatic	Aquatic Plants (Algae)
Facility-specific reported releases								
Manufacturing as a Primary Product (LA0000761) ^b	791	21	38	876	43	1.43E-02	5.46E-02	8.35E-04
		350	2.3		2.6	8.65E-04	3.30E-03	5.05E-05
Manufacturing as a Byproduct (N/A) ^c	9.9	21	0.47	79	6	2.00E-03	7.61E-03	1.17E-04
		350	2.8E-02		0.36	1.20E-04	4.57E-04	6.99E-06
Incorporation into Formulation, Mixture, or Reaction Product (N/A) ^c	227	21	11	351	31	1.03E-02	3.93E-02	6.02E-04
		250	0.91		2.6	8.65E-04	3.30E-03	5.05E-05
Waste Handling, Disposal, and Treatment – Landfill (PA0043818) ^d	0.14	21	6.9E-03	5.3E-02	130	4.33E-02	1.65E-01	2.53E-03
		365	4.0E-04		7.5	2.50E-03	9.52E-03	1.46E-04

OES (NPDES) ^a	Annual Release (kg/yr)	Operating Days	Daily Release Estimate (kg/d)	7Q10 Flow (MLD)	7Q10 Conc. (µg/L)	Risk Quotient ^e		
						Acute Aquatic COC	Chronic Aquatic	Aquatic Plants (Algae)
Waste Handling, Disposal, and Treatment – Non-POTW WWT (CA7000004) ^b	7.30E-02	21	3.5E-03	0.13	27	8.99E-03	3.43E-02	5.25E-04
		365	2.0E-04		1.6	5.32E-04	2.03E-03	3.11E-05
Waste Handling, Disposal, and Treatment – POTW (TX0023418) ^{b d}	121	21	5.8	11	509	1.69E-01	6.46E-01	9.89E-03
		365	0.33		29	9.65E-03	3.68E-02	5.63E-04
Waste Handling, Disposal, and Treatment – Remediation or Monitoring (MO0111686) ^d	3.7	21	0.18	0.56	317	1.05E-01	4.02E-01	6.16E-03
		365	1.0E-02		18	5.99E-03	2.28E-02	3.50E-04
Generic scenario releases								
Blowing Agent in Spray Foam (Central Tendency)	0.25	260	0.082	970	8.5E-02	2.82E-05	1.1E-04	2.2E-06
Blowing Agent in Spray Foam (High-End)	0.37	260	0.12	970	0.12	4.1E-05	1.6E-04	3.2E-06
Vapor Degreasing (combined) (Central Tendency)	133	296	0.45	5.6E04	8.0E-03	2.7E-06	1.0E-05	2.1E-07
Vapor Degreasing (combined) (High-End)	194	296	0.65	5.6E04	1.2E-02	3.9E-06	1.5E-05	3.0E-07
7Q10 = the modeled 7Q10 flow (lowest 7-day average flow that occurs [on average] once every 10 years), in MLD (million liters per day); COC = concentration of concern; DMR = Discharge Monitoring Report; NPDES = National Pollutant Discharge Elimination System; POTW = publicly-owned treatment works; TRI = Toxics Release Inventory; WWT = wastewater treatment The highest surface water concentration used for risk characterization is bolded/shaded . ^a See Table 1-1 for crosswalk between Occupational Exposures Scenarios (OES) and Conditions of Use (COU) ^b Concentrations based on plant flow for representative facility extracted from Enforcement and Compliance History Online Dataset (ECHO) ^c Concentrations based on flows from surrogate water body identified in NHDPlus EROM dataset ^d Concentrations based on flows from NHDPlus EROM dataset ^e Risk quotients based on acute aquatic COC = 3,005 µg/L, chronic aquatic COC = 788 µg/L, and algal COC = 51,467 µg/L respectively as shown in <i>Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026w)								

5.3.3 Risk Estimates for Terrestrial Species

Risk estimates for terrestrial species were determined by comparing the hazard thresholds for terrestrial organisms determined in the *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026w](#)) to the exposure concentrations determined in the *Draft Chemistry, Fate, Release, and exposure Assessment for trans-1,2-dichloroethylene* ([U.S. EPA, 2026g](#)).

Ambient Air Risk Estimates

RQs for terrestrial plants and mammals for exposures to ambient are calculated for each OES for stack releases in Table 5-4 and fugitive releases in Table 5-5. All RQ values are less than the benchmark of 1.

Table 5-4. Environmental Risk Estimates for Ambient Air Based on IIOAC-Modeled Annual Concentrations from Emission Scenarios Stack Releases

OES	Maximum 50th Percentile Modeled Concentration ($\mu\text{g}/\text{m}^3$)	Maximum 95th Percentile Modeled Concentration ($\mu\text{g}/\text{m}^3$)	Release Media	Risk Quotient	
	Distance 100 m	Distance 100 m		Terrestrial Plants COC	Mammalian Inhalation TRV
Vapor Degreasing	1.48	2.13	Air	RQ < 1	RQ < 1
Adhesives and Sealants	46.6	74.2	Air	RQ < 1	RQ < 1
Blowing Agent in Spray Foam	4.21E-02	6.56E-02	Air	RQ < 1	RQ < 1
Laboratory Chemicals	4.62E-03	7.22E-03	Air	RQ < 1	RQ < 1
Aerosol Degreasing	0.217	0.346	Air	RQ < 1	RQ < 1
Repackaging	1.19E-02	2.61E-02	Air	RQ < 1	RQ < 1
COC = concentration of concern; IIOAC = Integrated Indoor-Outdoor Air Calculator; OES = occupational exposure scenario; RQ = risk quotient; TRV = toxicity reference value RQs based on terrestrial plant COC = 41,873,000 $\mu\text{g}/\text{m}^3$ converted from 10,350 ppm, mammalian inhalation TRV = 23,789,000 $\mu\text{g}/\text{m}^3$ converted from 6,000 ppm, respectively as shown in <i>Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026w).					

Table 5-5 IIOAC-Modeled Annual Concentrations from Emission Scenarios Fugitive Releases

OES	Maximum 50th Percentile Modeled Concentration ($\mu\text{g}/\text{m}^3$)	Maximum 95th Percentile Modeled Concentration ($\mu\text{g}/\text{m}^3$)	Release Media	Risk Quotient	
	Distance 100 m	Distance 100 m		Terrestrial Plant COC	Mammalian Inhalation TRV
Vapor Degreasing	40.7	45.8	Air	RQ < 1	RQ < 1
Adhesives and Sealants	1,270	1,460	Air	RQ < 1	RQ < 1
Blowing Agent in Spray Foam	1.15	1.31	Air	RQ < 1	RQ < 1
Laboratory Chemicals	0.126	0.144	Air	RQ < 1	RQ < 1
Commercial Aerosol Products (Aerosol Degreasing)	5.91	6.79	Air	RQ < 1	RQ < 1
Repackaging	0.321	0.394	Air	RQ < 1	RQ < 1
COC = concentration of concern; IIOAC = Integrated Indoor-Outdoor Air Calculator; OES = occupational exposure scenario; RQ = risk quotient; TRV = toxicity reference value Risk quotients based on terrestrial plant COC = 41,873,000 $\mu\text{g}/\text{m}^3$, mammalian inhalation COC = 23,789,000 $\mu\text{g}/\text{m}^3$, respectively as shown in <i>Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene</i> (U.S. EPA, 2026w)					

Soil Risk Estimates – Soil-Dwelling Invertebrates

The soil dwelling terrestrial invertebrate hazard threshold of 100 mg/kg-soil (Table 5-2) was compared to the concentration estimate for soil with annual biosolids application of 0.071 mg/kg. The resulting RQ of 7.1×10^{-4} falls below the benchmark of 1. More details on how the soil concentration estimate was calculated can be found in Section 7 of *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

Soil Risk Estimates – Terrestrial Plants

The terrestrial plant hazard value of 79,000 µg/L soil pore water was compared to the soil pore water concentration estimated for soil with annual biosolids application of 68.3 µg/L. The resulting RQ is below the benchmark of 1. More details on how the soil concentration estimate was calculated can be found in Section 7 of *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

Trophic Transfer Risk Estimates

EPA did not characterize risks for mammals by dietary exposures through bioaccumulation because trophic transfer was not identified as a relevant pathway for quantitative analyses due to the physical-chemical properties of *trans*-1,2-dichloroethylene and the lack of risk found in other chlorinated solvent assessments for trophic transfer ([U.S. EPA, 2026g](#)).

5.3.4 Summary of Environmental Risk Characterization

EPA evaluated environmental risks for aquatic species as described in Section 5.3.2 and for terrestrial species in Section 5.3.3. Table 5-6 provides a summary of the environmental risk characterization results for *trans*-1,2-dichloroethylene including the exposure pathway, the duration and organism hazard, risk results, and confidence.

Table 5-6. Relevant Exposure Pathways and Corresponding Risk Assessment for *trans*-1,2-Dichloroethylene Environmental Risk Characterization

Exposure Pathway	Exposure Confidence	Hazard Confidence	Risk Characterization	Confidence in Risk Characterization
Surface water	Robust: modeling and monitoring information inform estimates	Robust: Acute exposure (24- to 96-hours) resulting in aquatic vertebrate and invertebrate species mortality	RQ < 1 after Tier 2 refinement of modeled surface water 7Q10 exposure concentrations ^a	Robust
		Moderate: Chronic (32-day) exposure to aquatic vertebrate (<i>Pimephales promelas</i>) resulting in reduced growth in 20% of exposed population.	RQ < 1 after Tier 2 refinement of modeled surface water 7Q10 exposure concentrations ^a	Moderate-to-Robust
		Moderate-to-robust: 72-hour exposure to aquatic plants (algae) resulting in reduced growth in 50% of the exposed population. ^b	RQ < 1 for all COUs/OESs	Robust
Biosolids to soil	Moderate: modeling, physical chemical properties and release data inform estimates	Moderate-to-robust: 48-hour exposure to the earthworm (<i>Eisenia fetida</i>) resulting in avoidant behavior.	RQ < 1 in screening scenario with high-end measured and modeled soil concentrations	Robust

Exposure Pathway	Exposure Confidence	Hazard Confidence	Risk Characterization	Confidence in Risk Characterization
Ambient air	Robust: modeling and monitoring information inform estimates	Moderate: Chronic/ Reproduction, Growth, Survival	RQ < 1 for all COUs/OESs for both stack and fugitive emissions at 100 m from source.	Robust
		Moderate-to-robust: Acute 2-hour exposure to tobacco (<i>Nicotiana tabacum</i>) pollen germination.	RQ < 1 for all COUs/OESs for both stack and fugitive emissions at 100 m from source.	Robust
COU = condition of use; OES = occupational exposure scenario; RQ = risk quotient ^a RQ < 1 after Tier 2 refinement of modeled surface water concentrations ^b Algal exposures and hazards are not classified as acute or chronic				

5.3.5 Overall Confidence and Uncertainties in Environmental Risk Characterization

Environmental Exposure Confidence

EPA has robust confidence that the measured and modeled concentrations represent an upper estimate of exposure that is protective of actual exposure scenarios. The hazard thresholds derived from multiple medium to high-quality studies are supported by the weight of scientific evidence and fall below the highest modeled exposure concentrations during initial screening for air and soil exposure. Exposures to aquatic biota followed a tiered structure where preliminary risk was identified at a lower tier using more conservative inputs and higher-end release information, so those scenarios were refined to better estimate environmental exposure to surface water. The RQ values derived using the refined Tier 2 assessment did not exceed the benchmark of 1 across the range of evaluated OESs. EPA's robust confidence comes from the use of multiple data sources from measured values, modeled values from facility-specific TRI and DMR release data, and modeled generic scenario values—all of which results in the low exposure estimates being representative of most COU-related risk estimates. Exposure confidence is detailed in *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)).

Aquatic Species Overall Confidence

Comparisons of surface water exposure concentrations to respective COCs for acute and chronic toxicity to aquatic invertebrates and vertebrates do not indicate risks for any group of aquatic species because all RQ values are less than 1. EPA has robust confidence in the protective nature of this risk assessment for acute exposure to aquatic invertebrates, vertebrates and aquatic plants (algae). EPA also has robust confidence in COCs for acute hazards as they are based on probabilistic methods (SSDs) using data (empirical or predictive) for many species. The Agency also has robust confidence in the methods and models used to predict surface water exposure concentrations. EPA has moderate confidence in the chronic aquatic animal COC because there were limited studies available for the analog trichloroethylene and they covered a limited number of species. The Agency has moderate-to-robust confidence in the protective nature of this draft risk assessment for chronic exposure to aquatic vertebrates and invertebrates.

Benthic-Dwelling Species Overall Confidence

As described in Sections 6.2.2 and Section 6.3 of the *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)), environmental hazard toxicity tests for sediments were ordered. Subsequent feasibility studies for these sediment toxicity tests demonstrated

that exposures could not be determined for *trans*-1,2-dichloroethylene in sediments based on an inability to maintain exposure concentrations in test sediments. Additionally, alternative approaches to fill the data need to estimate sediment concentrations and potential exposures were unavailable. Therefore, based on these limitations, EPA did not characterize risks to sediment-dwelling invertebrates associated with exposures of *trans*-1,2-dichloroethylene in sediments. The Agency has robust confidence based on analyses of the study and physical-chemical properties of *trans*-1,2-dichloroethylene in soils (a high vapor pressure) that sediments are not likely to be a viable source of exposure risks for benthic-dwelling species.

Terrestrial Species Overall Confidence – Mammals by Inhalation

The highest modeled concentrations of *trans*-1,2-dichloroethylene in air indicate that RQ values did not exceed the benchmark of 1 for inhalation exposure to terrestrial mammals. EPA has robust confidence in the exposure modeling inputs and estimates for ambient air exposure. Although the Agency has moderate confidence in the inhalation hazard threshold due to a lack of diversity in test species, the use of the highest exposure modeling inputs and resulting RQ of 6.1×10^{-6} indicates robust confidence that this scenario provides a protective risk characterization conclusion.

Terrestrial Species Overall Confidence – Soil-Dwelling Invertebrates and Terrestrial Plants

EPA has robust confidence in low-risk characterizations for *trans*-1,2-dichloroethylene exposures to terrestrial invertebrates from soils due to biosolids and terrestrial plants from ambient air and soil. RQs for terrestrial plants for exposures to ambient air calculated for each OES for stack releases and fugitive releases are all less than the benchmark of 1. The soil-dwelling terrestrial invertebrate RQ for annual biosolids application to soil is equal to 7.1×10^{-4} and falls below the benchmark of 1. An RQ for terrestrial plants for biosolids application to soils and exposure to *trans*-1,2-dichloroethylene in soil pore water was also less than the benchmark of 1. Additional confidence comes from the conservative and protective COCs for terrestrial species.

Terrestrial Species Overall Confidence – Mammals by Oral Ingestion

EPA did not characterize risks for mammals by dietary exposures through bioaccumulation because trophic transfer was not identified as a relevant pathway for quantitative analyses due to the physical-chemical properties of *trans*-1,2-dichloroethylene and the lack of risk found in other chlorinated solvent assessments for trophic transfer ([U.S. EPA, 2026g](#)).

Terrestrial Species Overall Confidence – Avian Species

A quantitative risk characterization was not possible for avian species due to a lack of inhalation or oral hazard data. EPA recognizes that this data gap introduces uncertainty into the terrestrial risk characterization, though the direction of that uncertainty is unknown.

6 UNREASONABLE RISK DETERMINATION

TSCA section 6(b)(4) requires EPA to conduct a risk evaluation to determine whether a chemical substance presents an unreasonable risk of injury to health or the environment, without consideration of costs or other non-risk factors, including an unreasonable risk to a PESS identified by the Agency as relevant to this draft risk evaluation, under the COUs.

EPA has preliminarily determined that *trans*-1,2-dichloroethylene presents unreasonable risk of injury to human health. Nineteen COUs significantly contribute to unreasonable risk based on inhalation exposures to workers. Among those COUs, 13 also significantly contribute to unreasonable risk based on inhalation exposures to ONUs. In addition, EPA has preliminarily determined that *trans*-1,2-dichloroethylene presents unreasonable risk of injury to human health driven by significant contributions to unreasonable risk to consumers from inhalation from one (1) COU. EPA did not identify significant contributions to unreasonable risk to human health due to *trans*-1,2-dichloroethylene exposures via dermal exposure to workers or the general population (which includes fenceline communities). The Agency preliminarily did not identify unreasonable risk of injury to the environment.

The preliminary unreasonable risk determination is based on the information provided in previous sections and subsequent appendices of this draft risk evaluation, the draft TSDs, and supplemental files (see Appendix C)—in accordance with TSCA section 6(b). The preliminary unreasonable risk determination and the underlying evaluations are consistent with the best available science (TSCA section 26(h)) and based on the weight of scientific evidence (TSCA section 26(i)).

Note that uses of *trans*-1,2-dichloroethylene that are not subject to TSCA (e.g., cosmetics, medical devices) and resulting in human or environmental exposure to *trans*-1,2-dichloroethylene were not evaluated.

EPA has preliminarily determined that the unreasonable risk presented by *trans*-1,2-dichloroethylene is due to significant contributions to acute (15-minute and 8-hour), intermediate, and chronic non-cancer effects (Section 6.1) in the following populations via the following 20 COUs listed by exposure(s):

- Manufacture – Domestic manufacture [intermediate and chronic non-cancer inhalation for workers]
- Manufacture – Import [acute, intermediate, and chronic non-cancer inhalation for workers; chronic non-cancer inhalation for ONUs]
- Processing – Processing as a reactant – Intermediate [acute inhalation for workers]
- Processing – Incorporation into a formulation, mixture, or reaction product – Solvent (which become part of a product formulation or mixture) [acute, intermediate, and chronic non-cancer inhalation for workers; intermediate inhalation for ONUs]
- Processing – Incorporation into a formulation, mixture, or reaction product – Solvent purification (for semiconductor manufacturing) [intermediate and chronic non-cancer inhalation for workers]
- Processing – Incorporation into articles [intermediate and chronic non-cancer inhalation for both workers and ONUs]
- Processing – Repackaging [acute, intermediate, and chronic non-cancer inhalation for workers; chronic non-cancer inhalation for ONUs]
- Processing – Recycling (acute inhalation for workers)
- Industrial/Commercial use – Cleaning agent – Vapor degreasing [intermediate and chronic non-cancer inhalation for workers; chronic non-cancer inhalation for ONUs]

- Industrial/Commercial use – Cleaning agent – Aerosol spray cleaner/degreaser [intermediate and chronic non-cancer inhalation for workers]
- Industrial/Commercial use – Cleaning agent – Non-aerosol spray cleaner/degreaser [acute, intermediate, and chronic non-cancer inhalation for workers; intermediate and chronic non-cancer inhalation for ONUs]
- Industrial/Commercial use – Anti-adhesive/cohesive – Mold release [intermediate and chronic non-cancer inhalation for both workers and ONUs]
- Industrial/Commercial use – Paints and coatings – Urethane coatings [intermediate and chronic non-cancer inhalation for both workers and ONUs]
- Industrial/Commercial use – Lubricants and greases [acute, intermediate, and chronic non-cancer inhalation for workers]
- Industrial/Commercial use – Adhesion/cohesion – Solvent-based adhesives, sealants, and adhesive accelerants [acute, intermediate, and chronic non-cancer inhalation for workers; intermediate and chronic non-cancer inhalation for ONUs];
- Industrial/commercial use – Surface modifier – Smoothing fluid in additive manufacturing [intermediate and chronic non-cancer inhalation for workers; chronic non-cancer inhalation for ONUs];
- Industrial/Commercial use – Refrigerants [intermediate and chronic non-cancer for both workers and ONUs]
- Industrial/Commercial use – Other uses – Specialized detection indicator materials [intermediate and chronic non-cancer for both workers and ONUs]
- Industrial/Commercial use – Propellants, non-motive (blowing agent) – Polymer foam [acute, intermediate, and chronic non-cancer inhalation for workers; intermediate and chronic non-cancer inhalation for ONUs]
- Consumer use – Cleaning agent – Cleaner/degreaser (aerosol and non-aerosol) [acute and intermediate inhalation for consumers].

EPA has preliminarily determined that the following five (5) COUs do not significantly contribute to unreasonable risk of *trans*-1,2-dichloroethylene:

- Distribution in commerce;
- Industrial/Commercial use – Processing aids – Semiconductor and photovoltaic agents for etching and cleaning processes in electronic articles;
- Industrial/Commercial use – Other uses – Laboratory chemical;
- Disposal; and,
- Consumer use – Propellants, non-motive (blowing agent) – Polymer foam.

The unreasonable risk determination is based on the best available science and supported by the weight of the scientific evidence, and in making a finding of “presents unreasonable risk,” EPA considers risk-related factors beyond exceedance of standard risk benchmarks. Risk-related factors include the type and severity of health effects under consideration, the reversibility of the health effects being evaluated, exposure-related considerations (*e.g.*, duration, magnitude, frequency of exposure), or population exposed—particularly PESS such as fenceline communities—and the confidence in the information used to inform the hazard and exposure values. For COUs evaluated quantitatively, as described in the risk characterizations (see Sections 4 and 5), EPA based the preliminary determination of unreasonable risk of injury to human health or the environment on the risk estimate that best represents the COU. The Agency describes the confidence in human health and environmental assessments as robust, moderate-to-robust, moderate, slight-to-moderate, or slight.⁵

⁵ Descriptions of the various levels of confidence used in this draft risk evaluation are provided in Sections 4 and 5.

This draft risk evaluation for *trans*-1,2-dichloroethylene discusses important assumptions and key sources of uncertainty in the risk characterization; these are described in more detail in the respective weight of scientific evidence conclusions sections for fate and transport (Section 2.2), environmental release (Section 3.2), human exposures (Section 4.1), human health hazards (Section 4.2), human health risk characterization (Section 5.2), environmental exposures (Section 5.1), environmental hazards (Section 5.2), and environmental risk characterization (Section 5.3). Appendix F describes EPA's draft intermediate and chronic occupational exposure value (OEV) derivation; it also includes a summary of air sampling analytical methods identified for *trans*-1,2-dichloroethylene.

6.1 Unreasonable Risk to Human Health

Calculated risk estimates (MOEs⁶) can provide a risk profile of *trans*-1,2-dichloroethylene by presenting a range of estimates for different health effects for different COUs. When characterizing the risk to human health from occupational exposures during risk evaluation under TSCA, EPA conducted baseline assessments of risk and makes made its determination of unreasonable risk in a manner that takes into consideration reasonably available information (*e.g.*, information submitted by manufacturers and processors of *trans*-1,2-dichloroethylene) regarding whether the use of respiratory protection or other PPE is standard practice at all sites. This allowed EPA to make unreasonable risk determinations based on the available information regarding workers where the Agency has confidence that the information is representative. In this draft risk evaluation, the risk estimates calculated do not reflect PPE use; however, information on PPE that could be used to reduce the exposure is provided throughout this document.

To characterize risk from non-cancer endpoints, the estimated MOEs are compared to their respective benchmark MOE. The benchmark MOE accounts for the total uncertainty in a POD. The benchmark MOE is the product of several individual uncertainty factors relevant to a given POD with individual uncertainty factors (UFs; usually 1, 3, or 10), which are ultimately multiplied together to provide the benchmark MOE. An MOE that is less than the benchmark MOE indicates risk and is a starting point for informing a determination of unreasonable risk of injury to health, based on non-cancer effects. These calculated risk estimates alone are not "bright-line" indicators of unreasonable risk; EPA uses discretion to consider other risk-related factors in addition to risks identified in the risk characterization (Section 4.3).

In consideration of chronic cancer endpoints, a weight of scientific evidence approach was employed to evaluate the extent to which the lack of inhalation carcinogenicity studies imparts significant uncertainty on the human health risk assessments for *trans*-1,2-dichloroethylene using the ReCAAP framework (OECD, 2024; Hilton et al., 2022). Based on the weight of scientific evidence, EPA has preliminarily concluded that quantitative cancer risk assessment of *trans*-1,2-dichloroethylene is not warranted because (1) carcinogenic effects from *trans*-1,2-dichloroethylene are not expected based on primarily negative results for genotoxicity, (2) no evidence of precancerous lesions in subchronic studies, (3) only "marginal" carcinogenicity concern from *in silico* modeling, and (4) minimal formation of reactive metabolites. Although there are still some uncertainties, chronic cancer risk was not further considered for this preliminary unreasonable risk determination.

It is important to emphasize that these calculated risk estimates alone may not reflect certain mitigation measures such as engineering controls, respiratory protection, or other PPE for facilities that have such controls in place. In this draft risk evaluation, monitoring data submitted pursuant to a test order allowed

⁶ EPA derives non-cancer MOEs by dividing the non-cancer POD (HEC [mg/m³] or HED [mg/kg-day]) by the exposure estimate (mg/m³ or mg/kg-day). Section 4.3.1 has additional information on the risk assessment approach for human health.

EPA to make its unreasonable risk determination taking into consideration specific information regarding workers wearing PPE. In addition, the risk estimates are based on exposure scenarios with monitoring data that reflect existing requirements, such as those established by OSHA (*i.e.*, permissible exposure limits [PELs]) or industry or sector best practices. EPA considered risk-related factors beyond exceedance of benchmarks—including the Agency’s confidence in the data; an evaluation of the strengths, limitations, uncertainties; and confidences associated with the information used to inform the risk estimate and risk characterization. Descriptions of risk estimates that are based on highly refined hazard and exposure information would be considered differently than risk estimates based on conservative assumptions on both hazard and exposure. The process of determining unreasonable risk is made on a case-by-case basis, given the inherently unique nature of chemical-specific risk evaluations under TSCA.

6.1.1 Populations and Exposures Assessed for Human Health

EPA evaluated risk to workers (aged 16+ years) and ONUs; consumers and bystanders; as well as the general population (including fenceline communities)—using reasonably available monitoring and modeling data for inhalation, dermal, and ingestion exposures, as applicable. More specifically, the Agency has evaluated risk from inhalation and dermal exposure of *trans*-1,2-dichloroethylene to workers, inhalation exposure to ONUs, and inhalation and dermal exposures of *trans*-1,2-dichloroethylene to consumers. Finally, the Agency evaluated risk from exposures from surface water, drinking water, soil from air to soil deposition, and land pathways (*i.e.*, landfills and application of biosolids) to the general population (Section 4.1). EPA’s evaluation of the general population included populations living near facilities releasing *trans*-1,2-dichloroethylene to the air as part of the ambient air exposure assessment.

In developing the exposure and hazard assessments for *trans*-1,2-dichloroethylene, EPA has analyzed reasonably available information to ascertain whether some human populations may have greater exposure and/or susceptibility than the general population to the hazard posed by *trans*-1,2-dichloroethylene. For the draft risk evaluation, EPA accounted for the following PESS: women of reproductive age; pregnant women; infants; children; people who frequently use consumer products and/or articles containing high concentrations of *trans*-1,2-dichloroethylene; people exposed to *trans*-1,2-dichloroethylene in the workplace; and people in close proximity to releasing facilities, including fenceline communities. Section 4.3.5 summarizes the PESS that were incorporated into the draft risk evaluation through consideration of potentially increased exposures and/or potentially increased biological susceptibility and summarizes additional sources of uncertainty related to consideration of PESS.

6.1.2 Summary of Human Health Effects

EPA has preliminarily determined that the unreasonable risk presented by *trans*-1,2-dichloroethylene is due to non-cancer effects in the following populations via the following exposures:

- Workers and ONUs from acute (15-minute and 8-hour TWAs), intermediate, and chronic non-cancer risk from inhalation exposures; and
- consumers from acute and intermediate non-cancer risk from inhalation exposures.

Human health risks were evaluated for acute (15-minute and 8-hour), intermediate, and chronic exposure scenarios, as applicable based on reasonably available exposure and hazard data for *trans*-1,2-dichloroethylene as well as the relevant populations for each.

EPA identified ocular irritation from *trans*-1,2-dichloroethylene in air as the basis of the acute inhalation POD, with a benchmark MOE of 30. The hazard level associated with ocular irritation was also

associated with acute solvent neurotoxicity effects such as central nervous system depression. Relevant endpoints were not identified via acute dermal or oral exposures. The overall confidence in the acute inhalation POD value was moderate-to-robust.

For repeat-dose exposures, immunosuppression was the basis of the intermediate and chronic PODs for all routes. The resulting benchmark MOE for all intermediate exposures is 30. The intermediate inhalation adverse effects are based on immune response, which may have lasting consequences for those that have been exposed and are at risk. EPA applied different uncertainty factors for chronic exposures. For inhalation and dermal chronic exposures, a benchmark MOE of 100 was applied, whereas a benchmark MOE of 300 was applied for chronic oral exposure to account for uncertainties associated with interspecies variability ($UF_A = 3$), interindividual variability ($UF_H = 10$), and uncertainties from extrapolating a subchronic hazard value to a chronic exposure scenario ($UF_S = 3-10$). The UF_S of 10 used for chronic oral scenarios reflects the increase in observed effects between 14- and 90-day exposures ([Shopp et al., 1985](#)). EPA reduced this UF_S to 3 for inhalation and dermal routes because the extrapolation to these routes from an oral POD is already health-protective. The overall confidence in the intermediate oral and inhalation POD values is moderate-to-robust. The overall confidence in the intermediate dermal POD value is considered moderate. Lastly, the overall confidence in the chronic oral and inhalation POD values are moderate whereas the chronic dermal POD value has an overall confidence of slight-to-moderate. There is reduced confidence in the dermal POD that was extrapolated across routes from the oral POD due to uncertainty in dermal absorption estimates from ([TDCE Consortium, 2023](#)) that required additional statistical adjustments ([U.S. EPA, 2026k](#))

6.1.3 Basis for the Unreasonable Risk to Workers

Based on the occupational risk estimates and related risk factors, EPA has preliminarily determined that 19 COUs significantly contribute to unreasonable risk to workers from *trans*-1,2-dichloroethylene due to a combination of acute (15-minute and 8-hour), intermediate, and/or chronic inhalation exposures (EPA did not identify risk from dermal exposures). Thirteen of the 19 COUs also have significant contributions to ONUs (with 3 of these COUs being associated with actual ONU monitoring data). Risk estimates are numerical expressions of many assumptions, modeling choices, exposure data, and toxicity values derived by EPA specifically for the purposes of the COUs included in this draft risk evaluation. Because of these reasons, the Agency uses benchmarks not as bright-lines for unreasonable risk determinations but rather part of the larger picture that considers other risk-based factors, including uncertainty.

EPA analyzed dermal and inhalation exposure in the occupational scenarios using an acute TWA for a typical 8-hour shift (see Section 4.3.2) for both male and female workers. When information was available, the Agency also analyzed inhalation exposure in some occupational scenarios for a 15-minute duration. Using the 8-hour TWA exposure concentrations, EPA then calculated acute, intermediate, and chronic (non-cancer) exposures. Estimates of central tendency and high-end inhalation and dermal exposures were made for workers directly working with *trans*-1,2-dichloroethylene as well as estimates for inhalation exposures for ONUs not directly handling *trans*-1,2-dichloroethylene. Non-cancer risk estimates were calculated from acute, intermediate, and chronic exposures. For most OESs, acute refers to an exposure timeframe of one 8-hour workday, intermediate refers to an exposure timeframe of 22 workdays (8 hours per day), and chronic refers to an exposure timeframe of 250 days per year for 31 to 40 years (8 hours per day). In a few scenarios, an acute 15-minute exposure timeframe was utilized to calculate acute risks. For acute inhalation exposures (both 15-minute and 8-hour), high-end estimates were utilized for making preliminary risk determinations for most COUs. For intermediate exposures, high-end estimates were generally utilized unless EPA had information that the high-end tasks did not occur on a daily basis for certain SEGs; for example, for Domestic Manufacturing, Processing –

Incorporation into a formulation, mixture, or reaction product – Solvents (which become part of a product formulation or mixture); and Incorporation into a formulation, mixture, or reaction product – Solvent purification (for semiconductor manufacturing). If the data were determined to be appropriate for chronic inhalation exposures, central tendency estimates were the basis for making preliminary risk determinations as high-end estimates may, in some cases, overestimate risk for long-term exposures.

The Agency has incorporated the final study report published by the TDCE Consortium ([Exponent, 2023](#)), which details worker activities per SEG that occurred at the *trans*-1,2-dichloroethylene manufacturing as a primary product site. The SEGs of Outside Lead Operator/B-Operator – Batch Manufacturing; Operator – Distillation Operation; Shipping/Warehouse Worker – Batch Manufacturing; Laboratory Technician – Batch Manufacturing; and ONUs were identified and monitored for inhalation exposure. For dermal exposures, EPA did not identify any dermal exposure monitoring data for any OES and used the EPA Dermal Exposure to Volatile Liquids Model (DEVL) to calculate the acute absorbed dose rate (AADR) for each OES. EPA utilized information on fraction absorption data that was developed from a TSCA section 4 Test Order ([Labcorp Early Development, 2023](#)). EPA's dermal assessment generally did not indicate unreasonable risk to workers with no MOEs below the non-cancer benchmark for any COU at both the high-end and central tendency. The Agency did not assess dermal exposures to ONUs because EPA does not expect ONUs to directly handle *trans*-1,2-dichloroethylene as part of their workplace duties. Therefore, ONUs are not expected to have dermal exposures during the course of their work.

EPA calculated inhalation risk estimates for both central tendency and high-end exposure levels for workers and ONUs. Risk estimates based on high-end exposure levels are generally intended to cover exposure levels representative of 95th percentile values, whereas risk estimates at the central tendency exposure are generally intended to cover average or typical worker exposure. For all COUs, EPA based its preliminary unreasonable risk determination on the risk estimates that best represent the COU. For COUs where the Agency was not able to estimate ONU inhalation exposure from monitoring data or models, ONU exposure was assumed to be equivalent to the central tendency exposure for workers for the corresponding COU. Because no dermal exposures were below their corresponding benchmarks, EPA has preliminarily determined that there is no unreasonable risk to workers for dermal exposures and corresponding hazards.

6.1.3.1 COUs Covered by *trans*-1,2-Dichloroethylene Test Order Data

EPA evaluated 15 COUs based on test order data submitted to the Agency by the TDCE Consortium. The Agency has confidence that the risk estimates reflect working conditions at facilities handling *trans*-1,2-dichloroethylene because the occupational risk assessment incorporates *trans*-1,2-dichloroethylene inhalation monitoring data collected under a TSCA section 4 test order (e.g., PBZ monitoring) by SEG at sites engaged in the manufacture of *trans*-1,2-dichloroethylene ([Exponent, 2023](#)). However, uncertainty in estimates derived from a statistical distribution of multiple single-day measurements increases as those results are extrapolated to longer durations. In addition, available evidence indicates that high-exposure tasks are not performed on a daily basis over the course of a working year. As explained in Section 4.3.2, high-end exposure and risk estimates are most appropriate for consideration of shorter duration exposures (acute), while central tendency values are more representative for chronic exposures for COUs associated with *trans*-1,2-dichloroethylene data. Therefore, EPA's risk determination generally relies on high-end estimates to support its determination for workers for shorter-term inhalation exposures. This is because consistent high-end exposures are more likely to occur over a duration of time representative of an 8-hour work shift vs. central tendency estimates that were used for longer-term exposures (i.e., several decades for chronic non-cancer effects). For intermediate durations,

either central tendency or high-end risk estimates may be utilized based on the underlying data and representativeness of the corresponding statistic.

EPA has determined that the following 15 COUs associated with *trans*-1,2-dichloroethylene test order monitoring data significantly contribute to unreasonable risk to workers and ONUs from acute (15-minute or 8-hour durations), intermediate, and/or chronic non-cancer inhalation exposures:

- Manufacture – Domestic manufacture as a primary product [intermediate and chronic non-cancer inhalation for workers]
- Manufacture – Import [acute, intermediate, and chronic non-cancer inhalation for workers; chronic non-cancer inhalation for ONUs]
- Processing – Processing as a reactant – Intermediate [acute inhalation for workers]
- Processing – Incorporation into a formulation, mixture, or reaction product – Solvents (which become part of a product formulation or mixture) [acute, intermediate, and chronic non-cancer inhalation for workers; intermediate inhalation for ONUs]
- Processing – Incorporation into a formulation, mixture, or reaction product – Solvent purification (for semiconductor manufacturing) [intermediate and chronic non-cancer inhalation for workers]
- Processing – Repackaging [acute, intermediate, and chronic non-cancer inhalation for workers; chronic non-cancer inhalation for ONUs]
- Processing – Recycling [acute inhalation for workers]
- Industrial/Commercial use – Cleaning agent – Vapor degreasing [intermediate and chronic non-cancer inhalation for workers; chronic non-cancer inhalation for ONUs]
- Industrial/Commercial use – Cleaning agent – Aerosol spray cleaner/degreaser [intermediate and chronic non-cancer inhalation for workers]
- Industrial/Commercial use – Cleaning agent – Non-aerosol spray cleaner/degreaser [acute, intermediate, and chronic non-cancer inhalation for workers; intermediate and chronic non-cancer inhalation for ONUs]
- Industrial/Commercial use – Anti-adhesive/cohesive – Mold release [intermediate and chronic non-cancer inhalation for both workers and ONUs]
- Industrial/Commercial use – Lubricants and greases [acute, intermediate, and chronic non-cancer inhalation for workers]
- Industrial/Commercial use – Surface modifier – Smoothing fluid in additive manufacturing [intermediate and chronic non-cancer inhalation for workers; chronic non-cancer inhalation for ONUs]
- Industrial/Commercial use – Refrigerants [intermediate and chronic non-cancer for both workers and ONUs]
- Industrial/Commercial use – Other uses – Specialized detection indicator materials [intermediate and chronic non-cancer for both workers and ONUs].

6.1.3.1.1 Manufacture – Domestic Manufacture

The preliminary determination that the Manufacture – Domestic manufacture COU significantly contributes to unreasonable risk to workers is driven by intermediate and chronic non-cancer inhalation central tendency exposures associated with the Manufacturing as a Primary Product (OES #1) (shipping/warehouse worker – batch manufacturing). Shipping/warehouse workers are responsible for drumming and truck loading of the final *trans*-1,2-dichloroethylene product. The drum loading activity occurs indoors where the truck loading process occurs outside of the facility. Neither activity occurs every day. EPA's preliminary determination under this COU is not driven by significant contributions to unreasonable risk from *trans*-1,2-dichloroethylene Manufactured as Byproduct (OES #2).

As previously mentioned, EPA's assessment under this COU is informed by PBZ data from Westlake's Eagle US 2 in Westlake, Louisiana, site between January 2023 and March 2023 published by the TDCE Consortium ([Exponent, 2023](#)); therefore, EPA has confidence in both the central tendency and high-end exposures as a supporting basis in its preliminary risk determination for the acute duration. There is less certainty in EPA's extrapolation of multiple single-day measurements to longer durations and the assumption of consistent high-end exposures over a person's working lifetime (*i.e.*, chronic durations). Additionally, the test order report suggests that these activities do not occur every day, which increases EPA's uncertainty in the high-end risk estimates being representative of real intermediate and chronic exposure. Therefore, intermediate and chronic risk are driven by central tendency exposures. The data included 29 worker and 37 ONU full-shift PBZ samples at 1 manufacturing facility (out of the 66 total samples, 26 were below the method detection limit). Based on the strengths and limitations outlined in Section 4.3.2, EPA has concluded that the weight of scientific evidence for this COU provides a robust estimate of exposures for workers and ONUs.

EPA has information indicating that workers associated with the COU use PPE. For example, the test order report states that shipping/warehouse workers wear a 3M half-face air purifying respirator with organic vapor cartridges, goggles, gloves, and other PPE. Additionally, the report states that the data are from facilities located in the United States and are representative of the industries and occupational scenarios being evaluated in the scope of this risk evaluation. However, based on EPA's assessment, the respirators in use would not be sufficient to address the unreasonable risk being preliminarily identified (*i.e.*, a respirator with an APF 50 or full-face respirator would mitigate the inhalation risk identified). EPA will consider any additional information to inform PPE use provided during the comment period in the development of the final risk evaluation.

Table 6-1. Supporting Basis for the Manufacture – Domestic Manufacture COU

COU	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exp. Route	Exp. Level	Human Health Effects (with APF to Address Risk)	
					Intermediate Non-Cancer (MOE = 30)	Chronic Non-Cancer (MOE = 100)
Manufacture – Domestic manufacture	Manufacturing as a Primary Product (OES #1)	Shipping/Warehouse Worker – Batch Manufacturing	Inhal.	CT	7.1 (APF 50)	7.6 (APF 50)
				HE	2.0	2.1
APF = assigned protection factor; COU = condition of use; CT = central tendency; Exp. = exposure; HE = high-end; Inhal. = inhalation; MOE = margin of exposure ONU = occupational non-user						
Bolded/shaded cells indicate MOEs below the benchmark, contributing to unreasonable risk.						

6.1.3.1.2 Manufacture – Import; and Processing – Repackaging

The preliminary determination that the Manufacture – Import; and processing – Repackaging COUs significantly contribute to unreasonable risk to workers (*i.e.*, Packaging Operators, Drum Fillers) and ONUs driven by acute (8-hour TWA), intermediate, and chronic inhalation exposures leading to non-cancer risks. These COUs were assessed under the Repackaging OES (OES #3). EPA assessed full-shift inhalation exposure concentrations based on analogous test order data that were personal worker monitoring data collected during *trans*-1,2-dichloroethylene incorporation into formulation. The short-term data were collected for the repackaging of dichloromethane and used the vapor pressures to correct the difference in exposures due to the differences in volatility.

MOEs were well below benchmark for all durations associated with the Package Operator SEG (MOEs below benchmark ranged from 0.47–16) and were below benchmark only for the chronic duration at

both central tendency (MOE = 66) and high-end (MOE = 44) for ONUs. However, as noted previously, for the purpose of this draft risk evaluation, EPA considers central tendency exposures to be appropriate for chronic durations. According to the test order report, package operators work 8-hour shifts dedicated to *trans*-1,2-dichloroethylene product activities and are responsible for transferring the blended material into final product containers. ONUs include supervisors, managers, and other employees who work at the import site, where repackaging occurs, but do not directly handle *trans*-1,2-dichloroethylene. Therefore, EPA expects ONUs to have lower inhalation exposures and lower vapor-through-skin uptake compared to workers who may handle the chemicals directly. For both the Package Operator and ONU SEG, EPA was able to use *trans*-1,2-dichloroethylene-specific data from multiple facilities that processes the chemical into formulations, mixtures, or reaction products; the data included 15 worker full-shift PBZ samples at 2 facilities. Out of the 15 total samples, 3 were below the method detection limit. EPA has moderate confidence that the assessed exposure concentrations, including the assessed high-end values, are not overestimates of actual exposure for the OES, because EPA expects that the incorporation into formulation exposures to be the result of filling containers with a less concentrated form than what typically happens during the repackaging of neat *trans*-1,2-dichloroethylene. Therefore, both the Package Operator and ONU SEG significantly contribute to the unreasonable risk under this COU.

The Drum Filler SEG also had inhalation risk estimates that were slightly below the benchmark only for the chronic duration at both central tendency (MOE = 95) and high-end (MOE = 42). With an MOE so close to the benchmark (*i.e.*, MOE = 95 with a benchmark MOE of 100), it warrants careful consideration in making a preliminary determination on whether this SEG significantly contributes to the unreasonable risk from *trans*-1,2-dichloroethylene. As characterized in Section 4.3.2, EPA does not consider the risk estimates for this SEG to be an overestimate of actual exposure; rather, the Agency expects that the incorporation into formulation exposures to be the result of filling containers with a less concentrated form than what typically happens during the repackaging of neat *trans*-1,2-dichloroethylene. For example, the underlying monitoring data informing the assessment for this SEG is from working with a formulation that is 1 to 5% *trans*-1,2-dichloroethylene, where the Repackaging OES considers handling up to 100% *trans*-1,2-dichloroethylene. Therefore, because of the uncertainty and potential *underestimation* of risk for the Repackaging COU since the monitoring data captured packaging activities after a new formulation of *trans*-1,2-dichloroethylene was created, rather than the repackaging of the chemical without reformulation as is the intent of this OES, EPA is preliminarily determining that this SEG significantly contributes to unreasonable risk under this COU due to chronic exposures. There was also risk indicated for the Drum Filler based on dichloromethane repackaging data for high-end exposures with an MOE, which borders the benchmark MOE (MOE = 25) for acute short-term (15-minute) exposures only. However, EPA has preliminarily determined that this assessment based on surrogate dichloromethane data does not contribute to unreasonable risk. The Agency has less confidence in the use of surrogate data over *trans*-1,2-dichloroethylene-specific data; therefore, the risk associated with Drum Fillers is driven by the chronic exposure as previously discussed. Consequently, risk estimates calculated from dichloromethane data are not presented in Table 6-2.

Information on typical PPE used at repackaging sites is limited for any SEG under this COU. A chemical wholesaler list commonly used PPE such as safety glasses, face shields, aprons, and gloves, while engineering controls at another site include vacuum system and centrifugal degassing ([U.S. EPA, 2022a](#)). According to the test order report, the drum fillers wear nitrile gloves, a chemical protective apron, safety goggles with face shield, a uniform with long sleeves, safety boots, and a hard hat. EPA does not have sufficient information to suggest that respirators are worn for the entirety of the workday for any job group/SEG under this COU where unreasonable risk was preliminarily identified. Additionally, it is uncertain how similar packaging activities and worker protections described in the test

order report are to repackaging activities and represent repackaging and import facilities for *trans*-1,2-dichloroethylene.

Table 6-2. Supporting Basis for the Manufacture – Import; and Processing Repackaging COUs

COUs	Occupational Exposure Scenario (OES)	Pop	Exp Route	Exp Level	Human Health Effects (with APF to Address Risk)		
					Acute, 8-Hour Exposure (MOE = 30)	Intermediate Non-Cancer (MOE = 30)	Chronic Non-Cancer (MOE = 100)
Manufacture – Import Processing – Repackaging	Repackaging (OES #3)	Drum Filler	Inhal.	CT	2.0E03	59	95 (APF 10)
				HE	1.3E03	40	42
		Packaging Operator	Inhal.	CT	72	2.1 (APF 50)	3.4 (APF 50)
				HE	16 (APF 10)	0.47 (APF 1,000)	0.50
		ONU	Inhal.	CT	1.4E03	41	66 (APF 10)

APF = assigned protection factor; COU = condition of use; CT = central tendency; Exp. = exposure; HE = high-end; Inhal. = inhalation; OES = occupational exposure scenario; MOE = margin of exposure; ONU = occupational non-user
Bolded/shaded cells indicate MOEs below the benchmark, contributing to unreasonable risk.

6.1.3.1.3 Processing – Processing as a Reactant – Intermediate; and Processing – Recycling COUs

The determination that the Processing – Processing as a Reactant – Intermediate and the Processing – Recycling COUs significantly contribute to unreasonable risk to workers is driven by non-cancer inhalation risks from acute (short-term; 15-minutes) central tendency and high-end scenarios for the Dichloromethane (DCM) – Reactant SEG. This COU was assessed under the Processing as a Reactant OES (OES #4). Exposure was assessed using analogous monitoring data from *trans*-1,2-dichloroethylene test order data from manufacturing as a primary product for full shifts and surrogate personal worker monitoring data collected during the use of dichloromethane during its use as a reactive intermediate for short-term exposures. No unreasonable risk was identified for ONUs and other SEGs (including those associated with the *trans*-1,2-dichloroethylene test order data) under this COU.

When comparing acute risks from short-term surrogate data to full-shift analogous data, EPA has more confidence in the full-shift data as the short-term data are significantly older and lacks some metadata. Additionally, EPA generally has more confidence in the full-shift PBZ air concentration data from a manufacturing facility of *trans*-1,2-dichloroethylene as a primary product. However, even considering those uncertainties associated with the use of surrogate data from dichloromethane, EPA is preliminarily determining that this COU has significant contributions to unreasonable risk with MOEs well below benchmark at both central tendency and high-end exposures.

No information was provided regarding respirator use for this COU; therefore, the draft risk determination is based on risk estimates that do not reflect use of PPE for respiratory protection.

Table 6-3. Supporting Basis for the Processing – Processing as a Reactant – Intermediate; and Processing – Recycling COUs

COUs	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exposure Route	Exposure Level	Human Health Effects (with APF to Address Risk)
					Acute, 15-Minute Exposure (MOE = 30)
Processing – Processing as a reactant – Intermediate	Processing as a Reactant (OES #4)	DCM – Reactant	Inhalation	CT	6.8 (APF 10)
Processing – Recycling				HE	4.3 (APF 10)
APF = assigned protection factor; COU = condition of use; CT = central tendency; DCM = dichloromethane; HE = high-end; MOE = margin of exposure; ONU = occupational non-user					
Bolded/shaded cells indicate MOEs below the benchmark, contributing to unreasonable risk.					

6.1.3.1.4 Processing – Incorporation into a Formulation, Mixture, or Reaction Product – Solvents (Which Become Part of a Product Formulation or Mixture); and Processing – Incorporation into a Formulation, Mixture, or Reaction Product – Solvent Purification (for Semiconductor Manufacturing)

The preliminary determination that the Processing – Incorporation into a formulation, mixture, or reaction product – Solvents (which become part of a product formulation or mixture); and Incorporation into a formulation, mixture, or reaction product – Solvent purification (for semiconductor manufacturing) COUs significantly contributes to unreasonable risk to workers is driven by acute, chronic, and/or intermediate non-cancer inhalation risks and to ONUs driven by high-end intermediate exposure. These COUs were assessed under the Incorporation into Formulation, Mixture, or Reaction Product OES (OES #5). For these COUs, EPA was able to utilize data submitted by the TDCE Consortium, which was *trans*-1,2-dichloroethylene-specific from multiple facilities that processes the chemical into formulations, mixtures, or reaction products; the data included 70 worker and 60 ONU full-shift PBZ samples at 5 facilities. Out of the 130 total samples, 26 were below the method detection limit. EPA has moderate-to-robust confidence in the risk estimates associated with these COUs, including high-end risk estimates for shorter durations (*i.e.*, acute and intermediate) for many SEGs. However, there were data in the test order summary report that indicated that certain tasks are done less frequently (*i.e.*, not on a daily basis). Because EPA assumed 250 exposure days/year based on *trans*-1,2-dichloroethylene exposure each working day for a typical worker schedule, the central tendency risk estimates for those SEGs (*i.e.*, all but the Packaging Operator – Container Packaging (3M 1) and Process Operator (3M 1) SEGs) would be more appropriate for intermediate and chronic durations. In summary, central tendency and high-end unreasonable risks are identified when there is sufficient data to support that both are representative of worker exposures.

Data were available in the test order summary report on respiratory protection used at the monitored facilities. Two of the nine batch makers indicated that full-face negative pressure respirators were worn. Two of the three distillation operation technicians indicated that a full-face air purifying respirator with multi-gas cartridges was worn, while the third indicated that it was worn if needed. Three of the six return goods authorization (RGA) technicians wore a full-face air purifying respirator with multi-gas cartridges. Because not all facilities were explicit in PPE use, the Agency is providing risk estimates without PPE and also providing the APF needed to mitigate those inhalation risks. EPA seeks additional information on PPE use for this COU.

Table 6-4. Supporting Basis for Processing – Incorporation into a Formulation, Mixture, or Reaction Product – Solvents (Which Become Part of a Product Formulation or Mixture); and Processing – Incorporation into a Formulation, Mixture, or Reaction Product – Solvent Purification (for Semiconductor Manufacturing) COUs

COUs	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exp. Route	Exp. Level	Human Health Effects (with APF to Address Risk)		
					Acute, 8-Hour Exposure (MOE = 30)	Intermediate Non-Cancer (MOE = 30)	Chronic Non-Cancer (MOE = 100)
Processing – Incorporation into a formulation, mixture, or reaction product – Solvent (which become part of product formulation or mixture)	Incorporation into Formulation, Mixture, or Reaction Product (OES #5)	Packaging Operator – Container packaging (3M 1)	Inhal.	CT	30	0.88 (APF 1,000)	0.94 (APF 1,000)
				HE	16 (APF 10)	0.49 (APF 1,000)	0.52
		Process Operator (3M 1)	Inhal.	CT	1.3E03	39	42 (APF 10)
				HE	664	20 (APF 10)	21
		Technician - Aerosol Packaging (Microcare)	Inhal.	CT	157	4.6 (APF 50)	5.0 (APF 50)
				HE	35	1.0	1.1
		Technician - Blending (Microcare)	Inhal.	CT	337	10 (APF 10)	11 (APF 10)
				HE	44	1.3	1.4
		Production Technician (BASF)	Inhal.	CT	2.6E03	78	84 (APF 10)
				HE	385	11	12
		Drum filler (Huntsman)	Inhal.	CT	2.0E03	59	64 (APF 10)
				HE	1.3E03	40	42
		ONU	Inhal.	CT	6.3E03	187	201
				HE	335	9.9 (APF 10)	11
Processing – Incorporation into a formulation, mixture, or reaction product – Solvent purification (for semiconductor manufacturing)	Incorporation into Formulation, Mixture, or Reaction Product (OES #5)	RGA Operations Tech (Versum)	Inhal.	CT	839	25 (APF 10)	27 (APF 10)
				HE	311	9.2	9.8

APF = assigned protection factor; COU = condition of use; CT = central tendency; Exp. = exposure; HE = high-end; Inhal. = inhalation; MOE = margin of exposure; ONU = occupational non-user; RGA = return goods authorization
Bolded/shaded cells indicate MOEs below the benchmark, contributing to unreasonable risk.

6.1.3.1.5 Four Industrial/Commercial COUs Associated with Aerosol Products

The preliminary determination that the following four Industrial/Commercial COUs associated with commercial aerosol products were found to significantly contribute to unreasonable risk to workers is driven by acute, intermediate, and/or chronic non-cancer inhalation risks to workers:

- Industrial/Commercial use – Cleaning agent – Aerosol spray cleaner/degreaser;
- Industrial/Commercial use – Anti-adhesive/cohesive – Mold release;
- Industrial/Commercial use – Lubricants and greases; and
- Industrial/Commercial use – Other uses – Specialized detection indicator paints [unreasonable risk to ONUs from non-aerosol use].

The inhalation estimates for the Commercial Aerosol Product OES (OES #8), which is mapped to all four of the above COUs, were informed by test order data received for cleaning agents. The Final Study Report submitted to EPA by the TDCE Consortium ([Exponent, 2023](#)) detailed worker activities per similar SEG that occurred during inhalation monitoring at sites where *trans*-1,2-dichloroethene was used as a commercial aerosol degreasing product. The Agency identified 16 worker and 2 ONU samples at 2 facilities from the test order data to estimate inhalation exposures. All samples were above the detection limit except one sample for an ONU.

Two of the four discussed COUs (*i.e.*, Industrial/Commercial use – Anti-adhesive/cohesive – Mold release; and Industrial/Commercial use – Other uses – Specialized detection indicator paints) were also mapped to an additional OES: Miscellaneous Non-Aerosol Industrial and Commercial Uses (Cleaning and Degreasing Agents, Lubricants and Greases, Mold Release) Use (all SEG) (OES #7). Similar to the Commercial Aerosol Product OES, the inhalation occupational exposure estimates for this OES include the use of personal breathing zone samples directly applicable to this OES. With MOEs well below benchmark for both workers and ONUs for risk estimates informed by real world data from *trans*-1,2-dichloroethene facilities, EPA is preliminarily determining that these two COUs also significantly contribute to unreasonable risk due to OES #7.

One COU, Industrial/Commercial use – Lubricants and greases, was mapped to the Commercial Aerosol Products Mechanics (Auto) SEG and found to significantly contribute to unreasonable risk to workers. This determination is driven by low, medium, and high exposure for acute and chronic non-cancer effects. Mechanics in auto repair shops use aerosol/degreasers daily to clean various parts of the vehicle including brakes, transmissions, and rotors. If used daily for brake replacement, 3.75 brake replacements were assumed to happen in an auto repair shop on a single day. Mechanics were assumed to use between one and three cans of aerosol/degreaser per day, and these assumptions were modeled in CEM with one can being the low-intensity scenario, two cans for a medium-intensity scenario, and three cans for a high-intensity scenario. Confidence in the exposure frequencies were based on manufacturer product descriptions and a State of California Air Resources Board report on emissions of chlorinated toxicants from automotive maintenance and repair activities ([CARB, 2000b](#)) that concluded that the weight of scientific evidence is moderate because the frequency use of products could be highly variable. Overall, the confidence in the inhalation estimate range (across low-, medium-, and high-intensity scenarios) is moderate.

EPA has robust confidence that the assessed exposure concentrations, including the assessed high-end values, are representative of actual worker exposure because the monitoring data comes from the test order and is of the actual OES. EPA has moderate-to-robust confidence in the exposure estimates for ONUs based on the limited sample size. Based on the strengths and limitations outline in Section 4.3.2, EPA has concluded that the weight of scientific evidence for this assessment provides a moderate estimate of short term inhalation exposure to workers and ONUs. The *trans*-1,2-dichloroethylene test

order study report from the TDCE Consortium indicated that the workers using the aerosol cleaners or degreasers did not use respiratory protection. However, the test and evaluation technicians sprayed their aerosol in an industrial spray booth while the mechanics had no local exhaust ventilation. In consideration of this confidence and the lack of respiratory protection reported for these COUs, EPA is preliminarily determining that these COUs significantly contribute to unreasonable risk due to intermediate (HE MOE = 8.6) and chronic (CT MOE = 91) inhalation exposures associated with the Technician (Boeing 1) SEG. In summary, central tendency and high-end contributions to unreasonable risks are identified when there is sufficient data to support that both are representative of worker exposures.

Table 6-5. Supporting Basis for Industrial/Commercial COUs Associated with Aerosol Products

COUs	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exp Route	Exp Level	Human Health Effects (with APF to Address Risk)		
					Acute, 15-Minute Exposure (MOE = 30) [I]	Intermediate Non-Cancer (MOE = 30) [I & D]	Chronic Non-Cancer (MOE = 100) [I & D]
Industrial/Commercial use – Cleaning agent – Aerosol spray cleaner/degreaser	Commercial Aerosol Products (OES #8)	Technician (Boeing 1)	I	CT	–	85	91 (APF 10)
Industrial/Commercial use – Anti-adhesive/cohesive – Mold release							
Industrial/Commercial use – Lubricants and greases				HE	–	8.6 (APF 50)	9.2
Industrial/Commercial use – Other uses – Specialized detection indicator paints							
Industrial/Commercial use – Anti-adhesive/cohesive – Mold release	Misc. Non-Aerosol Use (OES #7)	All SEG	I	CT	–	9.7 (APF 10)	10 (APF 10)
				HE	–	2.7 (APF 50)	2.9
Industrial/Commercial use – Other uses – Specialized detection indicator paints		ONU	I	CT	–	9.7 (APF 10)	10 (APF 10)
				HE	–	9.7	10
Industrial/Commercial use – Lubricants and greases	Commercial Aerosol Products (OES #8)	Mechanics (Auto)	I	Low	24 (APF 10)	–	34 (APF 10)
				Medium	11 (APF 10)	–	1 (APF 1,000)
				High	4 (APF 10)	–	0.30 (APF 1,000)
“–” = Not estimated either due to a lack of data or a lack of appropriate POD; APF = assigned protection factor; CT = central tendency; COU = condition of use; D = dermal; Exp. = exposure; HE = high-end; I = inhalation; ONU = occupational non-user							
Bolded/shaded cells indicate MOEs below the benchmark, contributing to unreasonable risk.							

6.1.3.1.6 Industrial/Commercial Use – Cleaning Agent – Non-Aerosol Cleaner/Degreaser

The preliminary determination that the Industrial/Commercial use – Cleaning agent – Non-aerosol cleaner/degreaser COU significantly contributes to unreasonable risk to workers is driven by acute, intermediate, and chronic inhalation exposures leading to non-cancer risks for workers and intermediate and chronic non-cancer inhalation risks to ONUs associated with the Miscellaneous Non-Aerosol OES (OES #7). As previously mentioned, EPA’s assessment under this COU is informed by PBZ data from a monitoring study published by the TDCE Consortium ([Exponent, 2023](#)), including 22 full-shift worker samples at facilities where *trans*-1,2-dichloroethylene is used during miscellaneous non-aerosol industrial and commercial uses. EPA did not identify any full-shift ONU PBZ sample and thus used the central tendency from workers to represent ONU exposures.

Five SEGs were assessed under this COU and the Agency has varying levels of confidence in each. EPA has robust confidence that the assessed exposure concentrations for workers in the Flight Mechanics Performing Flush Cleaning, Technician (tube dipping, edge cutting, and buffing), and Technician (slitter knife cleaning) SEGs, including the assessed high-end value, are representative of actual worker exposure because the monitoring data come from the test order and is of the actual OES. EPA has moderate-to-robust confidence in the exposure estimates for the Aircraft Technician Performing Cleaning Task SEG, which was limited by a small sample size, as well as for the ONUs, which were estimated using the worker central tendency. The full-shift worker samples collected were from aircraft technicians and technicians at three sites.

Contributions to unreasonable risk were preliminarily identified for intermediate and chronic inhalation exposure at central tendency and high-end for workers in two SEGs (Technician – Tube Dipping, Edge Cutting and Buffing, and Technician – Slitter Knife Cleaning). Contributions to unreasonable risk were also preliminarily identified for chronic inhalation exposure for workers in the Aircraft Technician Performing Cleaning Task SEG at the central tendency and for acute high-end exposure to Flight Mechanics Performing Flush Cleaning SEG. Non-cancer contributions to unreasonable risk were also preliminarily identified for intermediate and chronic inhalation exposures for ONUs.

There is less certainty in EPA’s extrapolation of multiple single-day measurements to longer durations and the assumption of consistent high-end exposures over a person’s working lifetime (*i.e.*, chronic durations). Additionally, the test order report suggests that these activities do not occur every day, which increases EPA’s uncertainty in the high-end risk estimates being representative of real chronic exposure. Therefore, the Agency is relying on central tendency exposures to inform unreasonable risk determinations. Based on the strengths and limitations outline in Section 4.3.2, EPA has concluded that the weight of scientific evidence for this assessment provides a moderate estimate of inhalation exposure to workers and ONUs. The *trans*-1,2-dichloroethylene test order study report from the TDCE Consortium indicated that the workers using the non-aerosol cleaners or degreasers did not use respiratory protection or local exhaust ventilation. No unreasonable risks were identified for dermal exposure.

According to the *trans*-1,2-dichloroethylene test study report for the TDCE Consortium, flight mechanics performing flush cleaning and ONUs all wore nitrile gloves, goggles or safety glasses, but the use of respiratory protection and local exhaust ventilation (LEV) was not indicated ([Exponent, 2023](#)).

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Table 6-6. Supporting Basis for Industrial/Commercial Use – Cleaning Agent – Non-Aerosol Cleaner/Degreaser COU

COU	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exp. Route	Exp. Level	Human Health Effects (with APF to Address Risk)		
					Acute, 15-minute Exposure (MOE = 30)	Intermediate Non-Cancer (MOE = 30)	Chronic Non-Cancer (MOE = 100)
Industrial/ Commercial use – Cleaning agent – Non-aerosol cleaner/degreaser	Misc. Non-Aerosol Use (OES #7)	Aircraft Technician Performing Cleaning Task (Boeing 2)	I	CT	1.6E3	66	71 (APF 10)
				HE	914	41	44
		Flight Mechanics Performing Flush Cleaning (Boeing 1)	I	CT	2.1E3	–	–
				HE	24 (APF 10)	–	–
		Technician – Tube Dipping, Edge Cutting and Buffing (3M 3)	I	CT	–	7.3 (APF 50)	7.8 (APF 50)
				HE	–	2.1 (APF 50)	2.2
		Technician – Slitter Knife Cleaning (3M 5)	I	CT	–	11 (APF 10)	11 (APF 10)
				HE	–	3.5 (APF 50)	3.7
		ONU	I	CT	1.0E4	9.7 (APF 10)	10 (APF 10)
				HE	1.5E3	9.7	10
“–” = Not estimated either due to a lack of data or a lack of appropriate POD; APF = assigned protection factor; CT = central tendency; COU = condition of use; Exp. = exposure; HE = high-end; I = inhalation; MOE = margin of exposure; ONU = occupational non-user Bolded/shaded cells indicate MOEs below the benchmark, contributing to unreasonable risk.							

6.1.3.1.7 Industrial/Commercial Use – Cleaning Agent – Vapor Degreasing; and Industrial/Commercial Use – Surface Modifier – Smoothing Fluid in Additive Manufacturing

The preliminary determination that the Industrial/Commercial Use – Cleaning agent – Vapor degreasing; and Industrial/Commercial Use – Surface modifier – Smoothing fluid in additive manufacturing COUs significantly contribute to unreasonable risk to workers and ONUs is driven by intermediate and chronic non-cancer inhalation risks from three SEGs (Technician/Process Mechanic Operating Degreaser, Assembler Operating Ultrasonic Machine, and Waste Handling/Maintenance Worker) in the Vapor Degreasing OES (OES #6). Unreasonable risks were determined in central tendency and high-end exposure scenarios, except for the intermediate exposure to the Assembler Operating Ultrasonic Machine SEG, where risk was limited to high-end. Chronic non-cancer inhalation unreasonable risks were preliminarily identified for ONUs at central tendency exposures.

EPA’s assessment under this COU is informed by PBZ data from a monitoring study published by the TDCE Consortium ([Exponent, 2023](#)), including 31 full-shift samples at 2 facilities where *trans*-1,2-dichloroethylene is used for vapor degreasing. The data include 20 full-shift workers and 11 full-shift

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ONU inhalation samples at 2 sites. No samples were below the detection limit. As a result, EPA has robust confidence that the assessed exposure concentrations, including the assessed high-end value, are representative of actual exposure because the monitoring data comes from the test order and is of the actual OES.

As for PPE, the technicians/process mechanics operating the degreaser and ONUs all wore nitrile gloves, goggles or safety glasses, but no respiratory protection or LEV ([Exponent, 2023](#)). There is less certainty in EPA's extrapolation of multiple single-day measurements to longer durations and the assumption of consistent high-end exposures over a person's working lifetime (*i.e.*, chronic durations). Because the ONU full-shift PBZ samples are from the same study which was used for workers and no samples were below the detection limit, EPA has concluded that the weight of scientific evidence for this assessment provides a robust estimate of inhalation exposure to workers and moderate-to-robust estimates of inhalation exposures to ONUs. No unreasonable risks were identified for dermal exposure.

Table 6-7. Supporting Basis for Industrial/Commercial Use – Cleaning Agent – Vapor Degreasing; and Industrial/Commercial Use – Surface Modifier – Smoothing Fluid in Additive Manufacturing COUs

COU	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exp. Route	Exp. Level	Human Health Effects (with APF to Address Risk)	
					Intermediate Non-Cancer (MOE = 30)	Chronic Non-Cancer (MOE = 100)
Industrial/Commercial use – Cleaning agent – Vapor degreasing Industrial/Commercial use – Surface modifier – Smoothing fluid in additive manufacturing	Vapor Degreasing (OES #6)	Technician/Process Mechanic Operating Degreaser (Boeing 1)	I	CT	17 (APF 10)	18 (APF 10)
				HE	8.3 (APF 50)	8.8
		Assembler Operating Ultrasonic Machine (3M 2)	I	CT	45	48 (APF 10)
				HE	27 (APF 10)	29
		Waste Handling/Maintenance Worker (3M 2)	I	CT	5.2 (APF 50)	5.6 (APF 50)
				HE	3.2 (APF 50)	3.4
		ONU	I	CT	80	86 (APF 10)
				HE	41	44
“–” = Not estimated either due to a lack of data or a lack of appropriate POD; APF = assigned protection factor; CT = central tendency; COU = condition of use; Exp. = exposure; HE = high-end; I = inhalation; MOE = margin of exposure; ONU = occupational non-user Bolded/shaded cells indicate MOEs below the benchmark, contributing to unreasonable risk.						

6.1.3.1.8 Industrial/Commercial Use – Refrigerants

The preliminary determination that the Industrial/Commercial use – Refrigerants COU significantly contributes to unreasonable risk to workers is driven by intermediate and chronic non-cancer inhalation exposures leading to non-cancer risks for workers and ONUs for central tendency and high-end exposure scenarios associated with the Refrigerant Flush OES (OES #13). As previously mentioned, EPA's assessment under this COU is informed by PBZ data from a monitoring study published by the TDCE Consortium ([Exponent, 2023](#)), including 22 full-shift samples at facilities where *trans*-1,2-dichloroethylene is used as a non-aerosol cleaner and degreaser.

Therefore, EPA has moderate confidence in both the central tendency and high-end exposures as supporting basis in preliminary unreasonable risk determination for the intermediate and chronic durations. EPA also has moderate confidence that the assessed exposure concentrations, including the assessed high-end value, are not overestimates of actual exposure because the Agency expects that the monitoring data comes from uses of smaller quantities of *trans*-1,2-dichloroethylene than is expected of the Refrigerant Flush OES (#13). There is less certainty in EPA's extrapolation of multiple single-day measurements to longer durations and the assumption of consistent high-end exposures over a person's working lifetime (*i.e.*, chronic durations). The Agency is also uncertain about the similarity of worker exposures when comparing use of a cleaner/degreaser vs. use during the flushing of refrigerants, including the duration and frequency of such actions. Additionally, the test order report suggests that these activities do not occur every day, which increases EPA's uncertainty in the high-end risk estimates being representative of real chronic exposure.

As a result, chronic unreasonable risk is driven by central tendency exposures. The data include 22 full-shift worker PBZ samples at 3 sites. No samples were below the detection limit. Based on the strengths and limitations outlined in Section 4.3.2, EPA has concluded that the weight of scientific evidence for this assessment provides a moderate estimate of inhalation exposure to workers and slight-to-moderate confidence for ONUs. No unreasonable risks were identified for dermal exposure.

No specific information on exposure controls and PPE for refrigerant flush was found. The *trans*-1,2-dichloroethylene test study report for the TDCE Consortium provided some information for flight mechanics performing flush cleaning at one facility. The flight mechanics did not wear respiratory protection nor did they have LEV.

Table 6-8. Supporting Basis for Industrial/Commercial Use – Refrigerants COU

COU	Occupational Exposure Scenario	Pop	Exp. Route	Exp. Level	Human Health Effects (with APF to Address Risk)	
					Intermediate Non-Cancer (MOE = 30)	Chronic Non-Cancer (MOE = 100)
Industrial/ Commercial use – Refrigerants	Refrigerant Flush (OES #13)	Worker	I	CT	9.7 (APF 10)	10 (APF 10)
				HE	2.7 (APF 50)	2.9
		ONU	I	CT	9.7 (APF 10)	10 (APF 10)
				HE	9.7	10
“–” = Not estimated either due to a lack of data or a lack of appropriate POD; APF = assigned protection factor; CT = central tendency; COU = condition of use; Exp. = exposure; HE = high-end; I = inhalation; MOE = margin of exposure; ONU = occupational non-user Bolded/shaded cells indicate MOEs below the benchmark, contributing to unreasonable risk.						

6.1.3.2 COUs Only Covered by Surrogate Monitoring Data from Dichloromethane, 1-Bromopropane, or 1,2-Dichloroethane

Several COUs were not covered by test order data. EPA has preliminarily determined that the four COUs associated with exposure estimates informed only from PBZ monitoring from dichloromethane or 1-bromopropane for the same tasks significantly contribute to unreasonable risk to workers and ONUs from acute, intermediate, and/or chronic inhalation exposures:

- Processing – Incorporation into articles [intermediate and chronic non-cancer inhalation for both workers and ONUs];
- Industrial/Commercial use – Propellants, non-motive (blowing agent) – Polymer foam [acute, intermediate, and chronic non-cancer inhalation for workers; intermediate and chronic non-cancer inhalation for ONUs];
- Industrial/Commercial use – Adhesion/cohesion – Solvent-based adhesives, sealants, and adhesive accelerants [acute, intermediate, and chronic non-cancer inhalation for workers; intermediate and chronic non-cancer inhalation for ONUs]; and
- Industrial/Commercial use – Paints and coatings – Urethane coatings [intermediate and chronic non-cancer inhalation for both workers and ONUs].

6.1.3.2.1 Processing – Incorporation into Articles; and Industrial/Commercial Use – Propellants, Non-Motive (Blowing Agent) – Polyurethane Foam

The determination that both the Processing – Incorporation into articles and Industrial/Commercial use – Propellants, non-motive (blowing agent) – Polyurethane foam COUs significantly contribute to unreasonable risk is driven by risks to workers from acute (15-minute) non-cancer inhalation exposure—as well as intermediate and chronic non-cancer inhalation risks at the central tendency exposure scenario for both workers and ONUs for the Blowing agent in Spray Foam OES (OES #11). In addition, modeling was used to assess the commercial application of spray foam insulation products containing *trans*-1,2-dichloroethylene by contractors in residential spaces in alignment with a similar analysis conducted in the consumer exposure assessment.

EPA assessed full-shift inhalation exposure using surrogate personal worker monitoring data collected during the use of dichloromethane during the application of spray foam. The Agency has increased uncertainty with these risk estimates as the use of surrogate data is generally a less preferred approach when *trans*-1,2-dichloroethylene data are available and representative of the uses. Additionally, because the majority of the monitoring data was collected more than 30 years ago, there is uncertainty in whether worker practices and controls may have changed for these activities at these facilities affecting the potential for exposure. EPA also has confidence that it's assessment for this OES is not an underestimate, as the Agency expects a minimal amount of *trans*-1,2-dichloroethylene to be incorporated into the article leaving the worker to be exposed to a similar amount of chemical in both COUs. For these reasons, central tendency risk estimates are more appropriate for determining unreasonable risk under both COUs.

Based on these strengths and limitations, EPA has concluded that the weight of scientific evidence for this assessment provides moderate confidence in the estimate of exposures for workers and slight-to-moderate confidence in exposure estimates for ONUs, and the Agency is basing its unreasonable risk determination on the central tendency risk estimates for all durations. Although the Agency has lower confidence (slight-to-moderate) in the ONU risk estimates, EPA is using central tendency of worker risk estimates to account for this uncertainty.

EPA also assessed the Blowing Agent in Spray Foam OES (OES #11) using IECCU. EPA has uncertainty with these estimates as the Agency does not have data to support how common this activity is. However, EPA has moderate confidence in the inhalation exposures estimates from the use of *trans*-1,2-dichloroethylene-containing products due to availability of product-specific data. Exposure estimates are provided for a range of exposures corresponding to low-, medium-, and high-intensity use for each product and are based on the manufacturers or retailer's product-specific data regarding amount (mass) or product used, the weight fraction, and density of each product. Duration of use is based on cited data and on the *Exposure Factors Handbook* ([U.S. EPA, 2011](#)).

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No specific information on exposure controls or PPE was found for the use of *trans*-1,2-dichloroethylene blowing agents. According to the Industry Profile for the Flexible Polyurethane Foam Industry and the Industry Profile for the Rigid Polyurethane Foam Industry, many polyurethane manufacturers incorporate engineering controls such as enclosures or LEV due to exposure limits for diisocyanates and methylene chloride. Supplemental PPE includes eye protection, respiratory protection, as well as gloves and suits (U.S. EPA, 2004a, b). For spray polyurethane foam insulation, typical engineering controls include work zone containment and ventilation. The Alliance for the Polyurethanes Industry (API) offers guidelines for selecting appropriate protective equipment when handling diisocyanates or polyols, which includes eye protection, respiratory protection, and proper selection of chemical resistant gloves and suits (U.S. EPA, 2021a).

Table 6-9. Supporting Basis for Processing – Incorporation into Articles; and Industrial/Commercial Use – Propellants, Non-Motive (Blowing Agent) – Polyurethane Foam COUs

COU	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exp. Route	Exp. Level	Human Health Effects (with APF to Address Risk)			
					Acute, 15-Minute Exposure (MOE = 30)	Acute, 8-Hour Exposure (MOE = 30)	Intermediate Non-Cancer (MOE = 30)	Chronic Non-Cancer (MOE = 100)
Processing – Incorporation into articles	Blowing Agent in Spray Foam (OES #11)	Worker	I	CT	463	48	1.4 (APF 25)	1.5 (APF 1,000)
				HE	142	9.2	0.27	0.29
		ONU	I	CT	–	48	1.4 (APF 25)	1.5 (APF 1,000)
Industrial/ Commercial use – Propellants, non-motive (blowing agent) – Polyurethane foam		Worker	I	CT	463	48	1.4 (APF 25)	1.5 (APF 1,000)
				HE	142	9.2	0.27	0.29
		Residential Insulation – Gap Filler	I	Med ^a	227	–	–	13 (APF 10)
		Residential Insulation – Open Cell	I	High ^a	8 (APF 10)	–	–	0.31 (APF 1,000)
ONU		I	CT	–	48	1.4 (APF 25)	1.5 (APF 1,000)	

“–” = Not estimated either due to a lack of data or a lack of appropriate POD; APF = assigned protection factor; CT = central tendency; COU = condition of use; Exp. = exposure; HE = high-end; I = inhalation; MOE = margin of exposure; ONU = occupational non-user

Bolded/shaded cells indicate MOEs below the benchmark, contributing to unreasonable risk.

^a The medium intensity scenarios represent medium weight fractions, mass of product used, frequency of event or duration of use. The high-intensity scenario represents high-exposure estimates for each of the parameters based on available information.

6.1.3.2.2 Industrial/Commercial Use – Adhesion/Cohesion Promoter – Solvent-Based Adhesives, Sealants, and Adhesive Accelerants

The preliminary determination that the Industrial/Commercial use – Adhesion/cohesion promoter – Solvent-based adhesives, sealants, and adhesive accelerants COU significantly contributes to unreasonable risk to workers is driven by acute, intermediate, and chronic inhalation exposures leading

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to non-cancer risks for workers and ONUs associated with the Adhesive and Sealants OES (OES #10). As previously mentioned, EPA assessed full-shift inhalation exposure concentrations based on surrogate personal worker monitoring data collected on dichloromethane and 1-bromopropane during the use of adhesives and sealants. The dataset collected monitoring data from ten studies, including NIOSH HHEs and OSHA facility inspections, and contained 667 full-shift worker samples encompassing facilities using dichloromethane and 1-bromopropane in adhesive and coating applications. Application was evaluated for spray coating, non-spray coating, and unknown application methods, which all showed intermediate and chronic non-cancer inhalation risks for both workers and ONUs at central tendency and high-end. Unreasonable acute inhalation risks were also identified for workers in the Spray Coating (high-end 15-minute, central tendency and high-end 8-hour) and Non-Spray Coating (central tendency and high-end 15-minute), and Unknown Application Method (high-end 8-hour) SEG groups. Acute risks for 8-hour inhalation exposure were also identified for ONUs at both central tendency and high-end exposures.

Because the underlying data for this COU is from other chemicals' PBZ monitoring data, there is some uncertainty in whether worker exposures are the same, as this assumption may not capture actual worker schedules and exposures. As a result, EPA has higher confidence in central tendency exposures as the basis of the unreasonable risk determination. Based on these strengths and limitations, the Agency has concluded that the weight of scientific evidence for this assessment provides moderate confidence in the estimate of exposures for workers and slight-to-moderate confidence in exposure estimates for ONUs, and is basing its preliminary unreasonable risk determinations off the central tendency risk estimates for all durations. Although EPA has lower confidence (slight-to-moderate) in the ONU risk estimates, EPA is using central tendency of worker risk estimates to account for this uncertainty.

No specific information on exposure controls or PPE was found for application of adhesives containing *trans*-1,2-dichloroethylene. Typical PPE for the application and use of adhesive formulations focuses on minimizing exposure due to spray application or VOC emissions. Chemical Premanufacture Notice (PMN) submissions submitted to EPA by adhesive chemical manufacturers show that all manufacturers recommend the use of gloves and safety glasses with a side shield or goggles. Approximately half of the PMN submissions also recommended the use of some kind of ventilation and respirators if necessary ([OECD, 2015](#)).

Table 6-10. Supporting Basis for Industrial/Commercial Use – Adhesion/Cohesion Promoter – Solvent-Based Adhesives, Sealants, and Adhesive Accelerants COU

COU	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exp. Route	Exp. Level	Human Health Effects (with APF to Address Risk)			
					Acute, 15-Minute Exposure (MOE = 30)	Acute, 8-Hour Exposure (MOE = 30)	Intermediate Non-Cancer (MOE = 30)	Chronic Non-Cancer (MOE = 100)
Industrial/Commercial use – Adhesion/cohesion promoter – Solvent-based adhesives, sealants, and adhesive accelerants	Application of Adhesives and Sealants (OES #10)	Spray Coating	I	CT	54	7.7 (APF 10)	0.23 (APF 1,000)	0.24 (APF 1,000)
				HE	12	3.5	0.10	0.11

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COU	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exp. Route	Exp. Level	Human Health Effects (with APF to Address Risk)			
					Acute, 15-Minute Exposure (MOE = 30)	Acute, 8-Hour Exposure (MOE = 30)	Intermediate Non-Cancer (MOE = 30)	Chronic Non-Cancer (MOE = 100)
Industrial/ Commercial use – Adhesion/cohesion promoter – Solvent-based adhesives, sealants, and adhesive accelerants	Application of Adhesives and Sealants (OES #10)	Non-Spray Coating	I	CT	17 (APF 10)	872	26 (APF 10)	28 (APF 10)
				HE	13	31	0.91	0.98
		Unknown Application Method	I	CT	–	336	9.9 (APF 10)	11 (APF 10)
				HE	–	13	0.39	0.42
		ONU	I	CT	–	256	7.6 (APF 50)	8.1 (APF 50)
				HE	–	–	–	–
“–” = Not estimated either due to a lack of data or a lack of appropriate POD; APF = assigned protection factor; CT = central tendency; COU = condition of use; Exp. = exposure; HE = high-end; I = inhalation; MOE = margin of exposure; ONU = occupational non-user Bolded/shaded cells indicate MOEs below the benchmark, contributing to unreasonable risk.								

6.1.3.2.3 Industrial/Commercial Use – Paints and Coatings – Urethane Coatings

The preliminary determination that the Industrial/Commercial use – Paints and coatings – Urethane coatings COU significantly contributes to unreasonable risk to workers is driven by intermediate and chronic inhalation exposures leading to non-cancer risks for workers and ONUs based on surrogate data from the Application of Paints and Coatings OES (OES #9). No inhalation exposure monitoring data related to the use of *trans*-1,2-dichloroethylene during the application of paints and coatings was identified. As a result, full-shift inhalation exposures were informed by personal working monitoring data from dichloromethane exposure during the application of paints and coatings. The dataset includes 27 samples collected for workers during spray application, of 271 samples collected for workers during unknown application method, 2 samples were below the limit of detection for spray application. This OES was evaluated for spray application and an unknown application method, which showed intermediate and chronic non-cancer inhalation risks for both workers and ONUs at both central tendency and high-end.

EPA considered the assessment approach, the quality of the data, and uncertainties in assessment results to determine the weight of scientific evidence conclusion for the 8-hour TWA inhalation exposure estimates. The primary strength of these data is the use of PBZ data, some of the data indicate method of application, and they are expected to be applicable to *trans*-1,2-dichloroethylene activities. However, the primary limitation of this assessment is that it is based on data from a different chemical, which will cause inherent uncertainties due to differences in the chemical properties and possibly handling. Similarly, the data are older and may not be representative of current practices. Based on these strengths and limitations, EPA has concluded that the weight of scientific evidence for this assessment provides a moderate confidence in the estimate of exposures for workers and slight-to-moderate confidence in exposure estimates for ONUs, and is basing its preliminary unreasonable risk determination off the central tendency risk estimates for workers and ONUs for intermediate and chronic non-cancer health effects. Although EPA has lower confidence (slight-to-moderate) in the ONU risk estimates, the Agency is using central tendency of worker risk estimates to account for this uncertainty.

No specific information on exposure controls or PPE was found for application of paints and coatings containing *trans*-1,2-dichloroethylene.

Table 6-11. Supporting Basis for Industrial/Commercial Use – Paints and Coatings – Urethane Coatings COU

COU	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exp. Route	Exp. Level	Human Health Effects (with APF to Address Risk)	
					Intermediate Non-Cancer (MOE = 30)	Chronic Non-Cancer (MOE = 100)
Industrial/Commercial use – Paints and coatings – Urethane coatings	Application of Paints and Coatings (OES #9)	Spray Application	I	CT	3.9 (APF 50)	4.1 (APF 50)
				HE	0.74	0.79
		Unknown Application Method	I	CT	22 (APF 10)	23 (APF 10)
				HE	1.0	1.1
		ONU	I	CT	17 (APF 10)	18 (APF 10)

“–“ = Not estimated either due to a lack of data or a lack of appropriate POD; APF = assigned protection factor; CT = central tendency; COU = condition of use; Exp. = exposure; HE = high-end; I = inhalation; MOE = margin of exposure; ONU = occupational non-user

Bolded/shaded cells indicate MOEs below the benchmark, contributing to unreasonable risk.

6.1.3.3 COUs with No Significant Contributions to Unreasonable Risk

Based on the risk estimates and related risk factors, EPA is preliminarily determining that four COUs do not contribute to unreasonable risk determination. The rationale for these risk determinations is outlined below.

6.1.3.3.1 Industrial/Commercial Use – Other Uses – Laboratory chemicals

EPA assessed inhalation exposure concentrations based on analogous test order data that were personal worker monitoring data collected during the *trans*-1,2-dichloroethylene manufacturing as a primary product SEG of Laboratory Technician – Batch Manufacturing. This COU was assessed under the Laboratory Use OES (OES #12). No risk was identified for any duration of exposure or human health hazard effects. Therefore, EPA has made the preliminary determination that the *Industrial/commercial use – Other uses – Laboratory chemicals* COU does not contribute to unreasonable risk.

6.1.3.3.2 Distribution in Commerce

For Distribution in Commerce, EPA defined this COU as the transportation of *trans*-1,2-dichloroethylene-containing products between sites at which *trans*-1,2-dichloroethylene manufacturing, processing, and use occurs or the transportation of *trans*-1,2-dichloroethylene-containing wastes for recycling or disposal. This COU was assessed under the Distribution in Commerce OES (OES #16). The Agency expects all of the above-mentioned materials to be transported in a form (*e.g.*, articles containing *trans*-1,2-dichloroethylene) such that there is negligible potential for occupational exposure except during an incident. Other exposure opportunities during this life cycle are captured under other relevant COUs (*e.g.*, once distributed in commerce, *trans*-1,2-dichloroethylene in a truck or container may be transferred and repackaged, so this exposure point in the life cycle would fall under Repackaging). Therefore, EPA has preliminarily determined that the Distribution in Commerce COU does not contribute to unreasonable risk.

6.1.3.3.3 Industrial/Commercial Use – Processing Aids – Semiconductor and Photovoltaic Agents for Etching and Cleaning Processes in Electronic Articles

EPA preliminarily determined that *trans*-1,2-dichloroethylene exposure to workers from Industrial/Commercial use – Processing aids – Semiconductor and photovoltaic agents for etching and cleaning processes in electronic articles COU does not significantly contribute to the unreasonable risk based on the Processing Aid in Semiconductor Manufacturing OES (OES #14). As noted in Section 4.3.2.2.14, *trans*-1,2-dichloroethylene is received in hermetically sealed containers and fed into a closed system where it is completely reacted away. Because EPA believes that workers are not exposed to *trans*-1,2-dichloroethylene during semiconductor manufacturing, the Agency does not consider the exposure pathway to be complete and did not quantitatively assess their exposure for this OES.

6.1.3.3.4 Disposal

EPA preliminarily determined that exposure to workers and ONUs from *trans*-1,2-dichloroethylene from the Disposal COU does not significantly contribute to unreasonable risk. This COU was assessed under the Waste Handling, Disposal, and Treatment OES (OES #15). As described in Section 4.3.2.2.15, occupational exposure was determined using surrogate data from personal monitoring samples of equivalent tasks for workers handling dichloromethane (incineration workers) and 1,2-dichloroethane (POTW and non-POTW WWT workers), as well as area monitoring data for *trans*-1,2-dichloroethylene (landfill workers). EPA used 22 PBZ samples measuring dichloromethane to estimate worker exposures to *trans*-1,2-dichloroethylene during incineration ([\(DOEHRS-IH\), 2018](#); [Finkel, 2017](#); [U.S. EPA, 1985](#)). EPA used three 1,2-dichloroethane PBZ samples to estimate worker exposures at POTWs and non-POTW WWTs ([Lehtinen and Veijanen, 2011](#)). None of the samples were below the detection level. Surrogate inhalation sample concentrations were adjusted to *trans*-1,2-dichloroethylene values by correcting for differences in vapor pressure, given that dichloromethane has a vapor pressure of 435 mmHg and 1,2-dichloroethane has a vapor pressure of 78.9 mmHg compared to 331 mmHg for *trans*-1,2-dichloroethylene. After correcting for differences in vapor pressure for each data point, EPA used the 50th and 95th percentile values to represent the central tendency and high-end exposures for datasets with more than five points. For datasets with three to five points, EPA used the median value to estimate central tendency and the maximum value to estimate high-end exposures. The central tendency from monitored workers inhalation exposures was used to represent ONU inhalation exposures.

EPA considered the assessment approach, the quality of the data, and uncertainties in assessment results to determine the weight of scientific evidence conclusion for the 8-hour TWA inhalation exposure estimates. The primary strengths of these data are the use of PBZ data for workers performing disposal tasks directly relevant to this COU and the fact that all samples were above the detection limit. However, the primary limitation of this assessment is that it is based on data from a different chemical, which causes inherent uncertainties due to differences in the chemical properties. Based on these strengths and limitations, EPA has concluded that the weight of scientific evidence for this assessment provides moderate confidence in the estimate of exposures for Incinerator and POTW and Non-POTW SEGs for workers and slight-to-moderate confidence in the exposure estimates for the Worker – Landfill SEG and ONUs.

Risk estimates were above the benchmark for workers performing waste handling, disposal, and treatment at landfills across all relevant exposure durations. Similarly, risk estimates were above the benchmark for inhalation exposure to ONUs and dermal exposure to workers across all SEGs and relevant exposure durations risk estimates were below the benchmark only for high-end inhalation exposures for incineration workers from intermediate and chronic exposures and for wastewater treatment plant workers from chronic exposure. However, as stated previously, EPA does not consider it

likely that high-end exposure concentrations recur daily for chronic durations. Therefore, the Agency more closely considered the intermediate duration inhalation risk to incineration workers at high-end. Although this risk estimate was below the benchmark of 30 for high-end inhalation exposure to incineration workers (MOE = 3.3), as explained in Section 4.3.2.2.15, EPA considered the central tendency inhalation estimate to be more representative of worker exposure given (1) the majority of the monitoring data used to determine these exposure values was collected more than 30 years ago, and (2) there is uncertainty in whether worker practices and controls may have changed for these activities at these facilities affecting the potential for exposure. Therefore, given the risk estimate for inhalation exposure to incineration workers at central tendency was above the benchmark (MOE = 115), EPA preliminarily determined that inhalation exposures to incineration workers from disposal of *trans*-1,2-dichloroethylene does not significantly contribute to unreasonable risk. The Agency did not find information that indicates the extent that engineering controls and worker PPE are used at landfill, incineration, and WWT facilities.

6.1.4 Basis for Unreasonable Risk to Consumers

Based on the risk estimates and related risk factors, EPA is preliminarily determining that one COU, Consumer use – Cleaning agent – Cleaner/degreaser (aerosol and non-aerosol), significantly contributes to unreasonable risk to consumers from exposure to *trans*-1,2-dichloroethylene, driven by

- non-cancer effects from acute and intermediate inhalation exposure to consumers associated with the use of aerosol degreaser and flux remover.

EPA is also preliminarily determining that the other consumer COU, Consumer use – Propellants, non-motive (blowing agent) – Polymer foam, does not contribute to unreasonable risk to consumers for any health effect or duration.

EPA assessed consumer risks from inhalation and dermal exposures for each consumer COU. The consumer product user populations assessed included youths aged 11 to 20 years and adults (21+ years). The bystander population exposed to consumer products assessed comprised every other age group that was not a user of the product and located in a different indoor environment than the one where the product was in use. The inhalation and dermal assessments for consumers considered a range of possible exposures represented in the low- to high-intensity use exposure scenarios. For those COUs that indicated risk, including the one that contributes to the preliminary finding of unreasonable risk for *trans*-1,2-dichloroethylene, EPA conducted a sensitivity analysis to assess what inputs were driving risk, with concentration and exposure duration and frequency being the most sensitive inputs.

EPA based the preliminary risk determination on the risk estimates that best represent the COUs. Because the weight fractions driving the low-, medium-, and high-intensity risk estimates for the COU are consistent with the *trans*-1,2-dichloroethylene present in commercially available consumer products, all three intensity exposures are considered as a part of EPA's preliminary determination. More information about the individual consumer analysis is provided in Section 4.1.2 of this draft risk evaluation.

EPA evaluated two consumer COUs. The Cleaning agent – Cleaner/degreaser (aerosol and non-aerosol) COU was evaluated under two scenarios: aerosol spray/degreaser and flux remover inhalation exposures. The second COU, Propellants, non-motive (blowing agent) – Polymer foam, was evaluated under four scenarios: gap filler and sealant (one component cylinder), open cell non-structural sealant (two-component cylinder), closed cell rigid foam system (two-component cylinder), and roof tile adhesive (one-component cylinder). Acute inhalation exposures were assessed for both COUs; acute dermal human health hazards were not identified. Dermal and inhalation intermediate exposures were

assessed for both COUs. For purposes of this assessment, acute exposures are those within the activities that occur intermittently in 1 day and intermediate exposures are those within the activities that occur intermittently in 30 days.

6.1.4.1 Cleaning Agent – Cleaner/Degreaser (Aerosol and Non-Aerosol)

Acute and intermediate inhalation exposures were assessed for the Cleaning agent – Cleaner/degreaser (aerosol and non-aerosol) COU in two scenarios: aerosol spray degreaser and aerosol flux remover cleaners. EPA notes that, despite the name of the COU, no non-aerosol products were identified for this COU. Both scenarios exposure concentrations were quantitatively assessed with CEM. The aerosol spray degreaser products dissolve grease, oil, and sludge from mechanical equipment and components such as air tools, mechanical brakes, clutches, chains, motor, and other similar mechanical parts. The seven aerosol spray degreaser products *trans*-1,2-dichloroethylene content ranged from 3 to 90%. The aerosol flux remover cleaner products remove dirt, moisture, dust, flux, or oxides from the internal components of electronic or precision equipment, such printed circuit boards, barcode instruments, switch boxes, gear relays, and electronic motor controllers. The 14-aerosol flux remover cleaner products *trans*-1,2-dichloroethylene content ranged from 1 to 80% by weight.

For both exposure scenarios under this COU, the confidence in the weight fraction for CEM modeling is robust because they were informed by product-specific SDSs. Other inhalation exposure CEM inputs are duration of exposure, mass of product used, and environment of use. Confidence in the surface area to be cleaned, and thus the mass of product used, was moderate because product-specific mass of product used during application events could not be identified and EPA used CEM defaults. Confidence in the associated event durations was robust because they were based on the mass used along with manufacturer-provided product spray volumes in mass per second. Confidence in the exposure duration input values was moderate because there are uncertainties when using the *Exposure Factors Handbook* generic degreaser uses to the specific products under this assessment ([U.S. EPA, 2011](#)). Overall, the confidence in the inhalation exposure concentrations was moderate.

The aerosol spray degreaser scenario acute inhalation MOE for the high-intensity use exposure scenario was 3, while for the medium-intensity use exposure scenario MOE value was well above the benchmark of 30, at 264 (see Table 4-26). A sensitivity analysis of acute and intermediate inhalation exposures was performed for this scenario (see MOE values in the visual representation in Figure 4-5). In the sensitivity analysis, various combinations of weight fractions, duration of use, and mass of product used during the application event were calculated. The acute sensitivity analysis yielded MOEs above the benchmark of 30 for all combinations other than the combination using all high-intensity exposure inputs. The intermediate inhalation exposure assessment yielded MOE values of 5 and 34 for the high- and medium-intensity use exposure scenarios, respectively (see Table 4-26). A sensitivity analysis of intermediate inhalation exposures that calculated combinations of weight fractions, duration and frequency of exposure, and mass of product used during the application events yielded MOE values that were below the benchmark of 30 for most of the scenarios (6 of 9) using 90% by weight concentration and for about half of the combinations using 50% by weight (medium-intensity use exposure scenario; see Figure 4-5 for sensitivity analysis visual representation). All MOE values for the sensitivity analysis combinations at 3% by weight were above the benchmark. Six of the seven identified products reported *trans*-1,2-dichloroethylene concentrations above 20% by weight indicating that most of the products available to consumers are represented by the medium- and high-intensity use exposure scenarios. Additionally, the identified products are expected to be used in frequencies that match those represented by the intermediate exposure scenarios.

The aerosol flux remover cleaner scenario acute inhalation MOE for the high-intensity use exposure scenario was 2, while for the medium-intensity use exposure scenario MOE value was well above the benchmark of 30, at 293 (see Table 4-26). A sensitivity analysis of acute and intermediate inhalation exposures was performed calculating the MOEs for various combinations of weight fractions, duration of use, and mass of product used during the application event. See the sensitivity analysis MOE values in the visual representation in Figure 4-6. The acute sensitivity analysis yielded MOEs above the benchmark of 30 for all combinations other than the combination using all high-intensity exposure inputs. The intermediate inhalation exposure assessment yielded MOE values of 4 and 34 for the high- and medium-intensity use exposure scenarios, respectively (see Table 4-26). A sensitivity analysis of intermediate inhalation exposures that calculated combinations of weight fractions, duration and frequency of exposure, and mass of product used during the application events yielded MOE values that were below the benchmark of 30 for most (6 of 9) of the scenarios using 80% by weight concentration and for about half of the combinations using 36% by weight (medium intensity use exposure scenario). See Figure 4-6 for sensitivity analysis visual representation. All MOE values for the sensitivity analysis combinations at 1% by weight were above the benchmark. Nine of the 14 identified products reported *trans*-1,2-dichloroethylene concentrations above 20% by weight, indicating that most of the products available to consumers are represented by the medium- and high-intensity use exposure scenarios. Additionally, the identified products are expected to be used in frequencies that match those represented by the intermediate exposure scenarios. EPA considered the range of possible exposures from low to high intensity to determine risks and the inputs used in the calculations and confidence in using those inputs. The intermediate high- and medium-intensity exposure scenarios are likely to represent the bulk of the identified products and uses within this COU for inhalation risk determination.

Given that the MOEs for the high-intensity exposure scenarios (acute and intermediate), and some of the medium-intensity exposure scenarios, are below the inhalation benchmark of 30 for both the aerosol spray degreaser and aerosol flux remover cleaner exposure scenarios—and considering the robust confidence in the exposure and risk estimates and human risk-related factors—EPA has preliminarily determined that the Consumer use – Cleaning agent – Cleaner/degreaser (aerosol and non-aerosol) COU significantly contributes to unreasonable risk of *trans*-1,2-dichloroethylene due to acute and intermediate inhalation exposure to consumer users. The risk is driven by acute and intermediate inhalation exposure to consumers (but not bystanders), supported by both exposure scenarios.

The consumer dermal exposure approach used a delivery-limited fractional absorption approach based on the test order experiments that resulted in overestimations. The overestimated dermal MOEs were used in the dermal screening assessment because all MOEs were above the dermal benchmark of 30 (see Table 4-27 for dermal MOE values). Because the MOEs for the high-intensity exposure scenarios are above the benchmark of 30 and considering the overestimated exposure scenarios, and other risk-related factors, EPA is preliminarily determining that neither of the two scenarios significantly contribute to unreasonable risk of *trans*-1,2-dichloroethylene due to intermediate dermal exposure to consumer users.

6.1.4.2 Propellants, Non-Motive (Blowing Agent) – Polymer Foam

The Propellants, non-motive (blowing agent) – Polymer foam COU acute and intermediate inhalation exposures were assessed in four scenarios: gap filler and sealant (1 component cylinder), open cell non-structural sealant (2 component cylinder), closed cell rigid foam system (2 component cylinder), and roof tile adhesive (1 component cylinder). The scenarios that were quantitatively assessed for exposure concentrations were modeled with IECCU.

For the two exposure scenarios quantitatively assessed under this COU, the confidence in the weight fraction for IECCU modeling is robust because they were informed by product-specific SDSs. Other inhalation exposure IECCU inputs are gas-phase emissions, duration of exposure, mass of product used, and environment of use. Gas-phase emissions were determined based on test order data for which EPA has robust confidence. The mass of product used and area of application per event were determined based on the total area of an attic wall based on IECCU defaults. The fraction of the wall covered by each product and the yield per container, mass per container, and weight fractions were based on manufacturer specifications. Overall, the confidence in the inhalation exposure concentrations was robust.

The gap filler and sealant (1 component cylinder) scenario acute and intermediate inhalation MOE values for the high-intensity use exposure scenarios were 227 and 562 respectively, well above the benchmark of 30. The acute and intermediate inhalation exposures are considered representative of possible uses to some do-it-yourself (DIY) populations for home renovation projects. However, the intermediate inhalation exposures are less likely because these products application recommendations are in the order of years apart. Touch-ups and re-applications are likely to be best represented by the acute inhalation exposure scenario.

The open cell non-structural sealant (2 component cylinder) acute and intermediate inhalation MOE values for the high-intensity use exposure scenarios were 8 and 20 respectively. A refinement of this scenario was performed and consisted of using a higher tier modeling tool, IECCU, which offers flexibility to modify each input parameter, like emission factors, which aligned with the data obtained via the test order. A sensitivity analysis of intermediate inhalation exposures was performed calculating the MOEs for various combinations of duration of use and mass of product used during the application event. The intermediate sensitivity analysis yielded MOEs below the benchmark of 30 for all combinations other than the combination using low intensity use input parameters. The MOE values for the intermediate inhalation exposure assessment were 20 and 26 for the high- and medium-intensity use exposure scenarios, respectively. The intermediate inhalation medium- and high-intensity use exposure scenarios represent consumers that perform several application events in 30 days. The application of these products is expected to be completed in 1 to 2 hours per event, and each event entails the coverage of all four walls in the attic of a generic home. While it is possible that some users can apply these products in more than one attic in a month the product application recommendations are every 10 years. EPA selected the low-intensity use exposure scenario as the most likely to represent general uses, while the medium and high-intensity use exposure scenarios are not expected to be widespread occurrences.

The delivery-limited fractional absorption approach resulted in dermal exposure overestimations. The overestimated dermal MOEs were used in the dermal screening assessment because all MOEs were above the dermal benchmark of 30 and any combination of lower exposures would have yielded higher MOEs. Thus, the dermal screening-level assessment was sufficient to determine dermal exposures and risks.

Based on MOEs that are above the benchmark in the two scenarios selected as more likely to represent general consumer inhalation and dermal exposures, as well as consideration of other risk-related factors, EPA has preliminarily determined that the Consumer use – Propellants, non-motive (blowing agent) – Polymer foam does not significantly contribute to unreasonable risk of *trans*-1,2-dichloroethylene to consumers.

6.1.5 Basis for No Unreasonable Risk to the General Population

Based on the draft risk evaluation for *trans*-1,2-dichloroethylene—including the risk estimates, human health effects of *trans*-1,2-dichloroethylene, exposures, physical and chemical properties of *trans*-1,2-dichloroethylene, as well as the consideration of uncertainties—EPA preliminarily did not identify unreasonable risk to the general population from *trans*-1,2-dichloroethylene.

EPA considered the following exposure routes and pathways in this draft risk evaluation:

- exposure via the land pathway (*i.e.*, application of biosolids and landfills);
- fish ingestion;
- incidental ingestion and dermal contact from swimming;
- ingestion of drinking water; and
- inhalation exposure to ambient air in proximity to releasing facilities, including fenceline communities.

EPA does not expect general population exposure through soil and fish ingestion because *trans*-1,2-dichloroethylene in soil and surface water is expected to volatilize given its physical and chemical properties and has low potential to bioaccumulate in organisms based on measured BCF values, as described in Section 2. Therefore, the Agency considered exposure via the land pathway (*i.e.*, application of biosolids and landfills) and fish ingestion but did not quantify exposure and subsequent risk.

EPA quantitatively assessed risk to the general population for inhalation exposure to ambient air in proximity to releasing facilities, including fenceline communities, oral ingestion and dermal exposure from swimming in surface water, and ingestion of drinking water. For pathways assessed quantitatively, the Agency used the highest modeled *trans*-1,2-dichloroethylene concentration in the various environmental media due to both facility-specific releases and generic scenario releases for screening-level purposes. EPA used an MOE approach using upper-bound exposure estimates with the human health POD to determine whether an exposure pathway had non-cancer risk estimates below the benchmark.

EPA assessed acute and chronic non-cancer risk to the general population from inhalation of *trans*-1,2-dichloroethylene in ambient air in proximity to releasing facilities using a screening-level assessment with IIOAC modeling as discussed in Sections 4.1.3.1 and 4.3.4.1, and further detailed in *Draft Integrated Indoor Outdoor Air Calculator (IIOAC) TRI 2019-2023 Exposure and Risk Analysis for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026y](#)). For TRI releases, non-cancer screening-level risk estimates were above the non-cancer benchmark for acute and chronic exposures for each individual facility and for every reporting year for both stack and fugitive releases. For generic scenario releases, the non-cancer screening-level risk estimates for a single OES (Use of Adhesives; OES #10) was below the benchmark for chronic exposure to fugitive releases. However, EPA has low confidence in the exposure scenario for OES #10 and estimated using a generic scenario, due to factors such as the generic scenario, including high-end release estimates orders of magnitude higher than any TRI-reporting facility. Other factors leading to low confidence in the exposure scenario are also discussed in Sections 4.3.4.1 and 4.3.7.4.

Overall, EPA has preliminarily determined that there is no significant contribution to unreasonable risk from *trans*-1,2-dichloroethylene to general population from inhalation of ambient air for any OES or corresponding COU. The results of the screening-level assessment support EPA's preliminary determination that there is no significant contribution to unreasonable risk to the general population

from ambient air based on all OESs with facility-specific releases having no risk estimates below the benchmark.

EPA assessed non-cancer risk to the general population from dermal (Section 4.3.4.2) and oral (Section 4.3.4.3) exposure to *trans*-1,2-dichloroethylene while swimming in surface water using a screening-level assessment. Surface water concentrations were modeled for both facility-specific releases and generic scenario releases. For facility-specific releases, the facility release resulting in the highest estimated surface water concentration for each OES was used to represent a high-end estimate of surface water concentrations across the entire OES. For generic scenario releases, high-end release scenarios were combined with a P10 (10th percentile) 30Q5 flow to estimate high-end surface water concentrations. Due to the lack of acute oral endpoints, oral and dermal exposures from swimming utilized the intermediate POD and UF, which is a conservative assumption, as it assumes that exposures were repeated despite being characterized as acute. For all scenarios assessed using facility-specific releases and generic scenario releases, no screening-level risk estimates were below the benchmark for oral or dermal exposure while swimming.

As discussed in Section 4.1.3.2 and 4.1.3.3, EPA has robust confidence that (1) the modeled surface water concentrations presented for both the facility-specific releases and generic scenarios represent higher-end estimated concentrations, and (2) these concentrations are reasonably applied for estimation of potential dermal and oral exposure. Overall EPA has robust confidence, as discussed in Section 4.3.7, that no scenarios assessed for swimming underestimate risk because of the use of high-end dermal and oral exposures combined with the use of a health-protective intermediate POD and UF for an acute scenario, resulting in no risk estimates below the benchmark. The results of the screening-level assessment, showing no risk estimates below the benchmark for any OES/COU with robust confidence, support EPA's preliminary determination that there is no significant contribution to unreasonable risk to the general population from oral or dermal exposure from swimming.

EPA assessed chronic non-cancer risk to the general population from ingestion of *trans*-1,2-dichloroethylene in drinking water sourced from surface water estimated from both facility-specific releases identified in TRI/DMR and modeled generic scenario releases. For facility-specific releases, drinking water concentration from surface water were estimated using a Tier 2 surface water concentration modeling, which are detailed in *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)). EPA assessed the facility resulting in the highest modeled surface water concentration for each OES and found that no OES had exposure scenarios resulting in risk estimates below the benchmark (4.3.4.4.1). All OESs associated with modeled generic scenario releases also had no risk estimates below the benchmark (Section 4.3.4.4.2). EPA expects the assessed scenarios to be higher-end estimate of risk based on the use of higher-end inputs, such as high-end water concentrations and upper percentile ingestion rates, and therefore has robust confidence that EPA has not underestimated the risk and is preliminarily determining that drinking water exposure from *trans*-1,2-dichloroethylene does not contribute to unreasonable chronic non-cancer risk across its range of OES and corresponding COU (Section 4.3.7.4). The results of the assessment showing no risk estimates below the benchmark for any OES and corresponding COU with robust confidence, support EPA's preliminary determination that there is no significant contribution to unreasonable risk to the general population from drinking water sourced from surface water.

EPA also assessed chronic non-cancer risk from drinking water sourced from groundwater using estimated concentrations of *trans*-1,2-dichloroethylene in groundwater impacted by landfill leachate (Section 4.3.4.4.3). Details of how concentrations of *trans*-1,2-dichloroethylene in drinking water sourced from groundwater are estimated are provided in the *Draft Chemistry, Fate, Release, and*

Exposure Assessment for *trans*-1,2-Dichloroethylene (U.S. EPA, 2026g). Drinking water concentrations from groundwater were not OES/COU-specific but the assessment using various loading rates found that no risk estimates for the various scenarios were below the benchmark MOE. Despite EPA's moderate confidence that landfill leachate impacted groundwater with *trans*-1,2-dichloroethylene does not present a chronic non-cancer drinking-water risk given the uncertainties in the groundwater estimates (Sections 4.3.4.4.3 and 4.3.7.4), the use of conservative assumptions (loading rates and landfill leachate concentrations far above reported values) and no risk estimate below the benchmark support EPA's preliminary determination that there is no significant contribution to unreasonable risk to the general population from drinking water sourced from groundwater.

6.2 Unreasonable Risk to the Environment

EPA preliminarily did not identify any significant contributions to unreasonable risk to the environment from *trans*-1,2-dichloroethylene. The Agency expects *trans*-1,2-dichloroethylene to be released to the environment via air, surface water, and from biosolids to soils. Environmental risk of *trans*-1,2-dichloroethylene to aquatic organisms was assessed by COUs for the water pathway with either facility-specific release scenarios or generic scenario releases with surface water exposures near wastewater treatment outflows. For terrestrial species, environmental risk of *trans*-1,2-dichloroethylene in air was assessed using high-end exposure concentrations in a screening assessment. Environmental risk of *trans*-1,2-dichloroethylene to terrestrial organisms via exposures to soils via biosolids, air to soil deposition, and dietary exposure via bioaccumulation in fish was assessed based on weight of evidence approaches related to monitoring data, physical and chemical properties, fugacity modeling, and release information.

Risk quotients (RQs) can provide a risk profile by presenting a range of estimates for different environmental hazard effects for different COUs. An RQ equal to 1 indicates that the exposures are the same as the concentration that has been shown to cause effects. An RQ is less than 1 when the exposure is less than the effect concentration. This generally indicates that there is not risk of injury to the environment that would support a determination of unreasonable risk for *trans*-1,2-dichloroethylene. An RQ is greater than 1 when the exposure is greater than the effect concentration. This generally indicates that there is risk of injury to the environment that would support a determination of unreasonable risk for *trans*-1,2-dichloroethylene. An exception would be a screening-level assessment, through which an RQ greater than 1 would trigger the need for refinement to determine whether a refined assessment still leads to an RQ exceedance. In addition to RQ values, when an RQ is 1 or greater the Agency evaluates the number of days that a concentration exceeded a hazard threshold to align the durations of *trans*-1,2-dichloroethylene exposure to the acute or chronic exposure durations that lead to adverse population effects before making a determination of unreasonable risk. Risk was also characterized for specific receptor groups without the calculation of RQs to support conclusions (Table 5-6). Consistent with EPA's determination of unreasonable risk to human health, the RQ is not treated as a bright-line and other risk-based factors may be considered (e.g., confidence in the hazard and exposure characterization, duration, magnitude, uncertainty) for purposes of making an unreasonable risk determination.

6.2.1 Populations and Exposures Assessed for the Environment

EPA estimated environmental exposures to both aquatic and terrestrial species based on releases of *trans*-1,2-dichloroethylene and concentrations of *trans*-1,2-dichloroethylene in the environment as part of its environmental risk assessment. For aquatic organisms inhabiting the water column, the Agency estimated exposures from surface water. EPA also estimated exposure to algae from surface water. Exposures of *trans*-1,2-dichloroethylene within soils amended with biosolids were also assessed for soil dwelling terrestrial invertebrates and plants. Inhalation exposure of terrestrial mammals and plants to *trans*-1,2-dichloroethylene via the ambient air pathway were conducted via modeling.

6.2.2 Summary of Environmental Effects

EPA has preliminarily determined that none of the COUs assessed significantly contribute to unreasonable risk to the environment by *trans*-1,2-dichloroethylene as environmental concentrations are well below identified environmental hazard thresholds. Reasonably available data for *trans*-1,2-dichloroethylene has allowed for the identification of hazard thresholds for a variety of receptor groups (aquatic and terrestrial) and exposure durations (acute and chronic) that increase confidence in the risk determination for this chemical (Table 5-2). EPA has moderate confidence in the quality of the chronic aquatic database for use of trichloroethylene as an analog. The Agency has preliminarily determined that the effects of *trans*-1,2-dichloroethylene to aquatic organisms, including fish, invertebrates, and algae, do not significantly contribute to unreasonable risk of injury to the environment.

EPA has preliminarily determined that the effects of *trans*-1,2-dichloroethylene to terrestrial organisms, including soil-dwelling invertebrates and plants via *trans*-1,2-dichloroethylene in soil or soil from biosolids, do not significantly contribute to unreasonable risk to the environment. The Agency has also preliminarily determined that the effects to terrestrial organisms, including terrestrial mammals via inhalation or trophic transfer from fish ingestion, do not significantly contribute to an unreasonable risk to the environment. More information about EPA's confidence in the aquatic, terrestrial, and trophic transfer hazard assessments are provided in Section 5.2.2 of this draft risk evaluation.

6.2.3 Basis for No Unreasonable Risk to the Environment

EPA preliminarily did not identify unreasonable risk to the environment from *trans*-1,2-dichloroethylene. The Agency evaluated surface water, biosolids to soil, and the air pathway. Overall, EPA preliminarily did not identify unreasonable risk from *trans*-1,2-dichloroethylene to aquatic species. The overall risk characterization confidence for the assessment of water pathway is robust (Section 5.3.5), representing the use of both facility-specific and generic scenario releases, and moderate-to-robust in hazard thresholds used for aquatic COCs (Section 5.2.2).

6.2.3.1 Aquatic Species

For aquatic organisms, surface water was characterized by comparing hazard thresholds from exposures due to industrial releases. A screening-level assessment was conducted with facility-specific TRI or DMR data to produce modeled concentrations of *trans*-1,2-dichloroethylene in surface water (Section 5.3.2). COUs where facility-specific reported releases were not available were represented with generic scenario releases to produce high-end modeled concentration of *trans*-1,2-dichloroethylene in surface water (Section 5.3.2). EPA's confidence in the aquatic exposure assessment for the surface water pathways are robust as they represent protective modeling information to inform screening assessments (Section 5.1.5). Modeled *trans*-1,2-dichloroethylene concentrations resulting from facility-specific reported releases and generic scenario releases are represented within Section 3; no concentrations resulted in RQs greater than 1 for acute or chronic exposures. Although no monitored/measured data from direct releases linked to COUs were reasonably available, data from the WQP indicates that the highest reported concentration of *trans*-1,2-dichloroethylene (1.04 µg/L; in Section 6.2.1 ([U.S. EPA, 2026g](#))) within water is two orders of magnitude less than the chronic aquatic COC of 788 µg/L (Table 5-2). No measured concentrations of *trans*-1,2-dichloroethylene greater than the levels of detection have been reported within sediment (Section 6.2.2 of ([U.S. EPA, 2026g](#))). The assessment of risk to aquatic organisms via sediment exposure is based on robust confidence that *trans*-1,2-dichloroethylene will be present at concentrations in sediments at low concentrations or will not be present from lines of evidence that include monitoring data, physical and chemical properties, fugacity modeling, and release data.

6.2.3.2 Terrestrial Species

For terrestrial organisms, IIOAC modeling was used to assess inhalation exposures to terrestrial mammals and plants via the ambient air pathway using the COU with the highest resulting concentration from fugitive and stack emissions 100 m from the release source as a screening-level analysis (Section 5.3.3). Review of reasonably available monitoring data, such as the Air Quality System (AQS) monitoring dataset from 2018 to 2022, indicates a maximum concentration of 34.89 µg/m³ from the 4,926 reported maximum and mean monitored values across the AQS archive dataset for *trans*-1,2-dichloroethylene (Section 5.2.1 ([U.S. EPA, 2026g](#))). Concentrations of *trans*-1,2-dichloroethylene from monitored ambient air sampling represent all contributing sources and are not directly linked to COUs but can contextualize the IIOAC modeling results for fugitive and stack releases in Table 5-4 and Table 5-5, respectively. EPA's confidence in the exposure assessment for the air pathway is robust with modeling and monitoring data informing the exposure characterization (Section 5.1.5). The assessment of risk to terrestrial invertebrates and plants via soil exposure is assessed by calculating soil concentrations of *trans*-1,2-dichloroethylene from soils with biosolids application. EPA did not model deposition for *trans*-1,2-dichloroethylene largely based on environmental fate and transport properties (Section 4.1.3.1). Monitored soil concentration data for *trans*-1,2-dichloroethylene were identified from the WQP, with most concentrations at or near the limit of detection except for samples taken from a Superfund site (Section 7.4.1 ([U.S. EPA, 2026g](#))). Bioaccumulation estimates indicate low BCF and BAF values for *trans*-1,2-dichloroethylene (Section 2.2). EPA has robust confidence that low bioaccumulation potential and lack of empirical evidence for *trans*-1,2-dichloroethylene accumulation at any trophic level indicate that exposure via fish ingestion are not anticipated (Section 5.3.1).

Exposure pathways with media of release leading to deposition to sediment, air deposition to soil, and trophic transfer do not significantly contribute to any unreasonable risk presented by *trans*-1,2-dichloroethylene to the environment. This is based on multiple lines of evidence including physical and chemical properties, fugacity modeling, reasonably available environmental monitoring, and release data. Hazard toxicity testing was attempted; however, due to volatility and non-absorption of *trans*-1,2-dichloroethylene, hazard thresholds were not able to be determined, as explained in more detail within Section 6.3 of the *Draft Chemistry, Fate, Release, and exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#)) and Section 3.2.4 of the *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026w](#)).

Risk to sediment was assessed qualitatively since physical and chemical properties indicated that exposures to sediment organisms were unlikely to occur and confirmed with reviews of reasonably available monitoring data (Section 3.3.2). The physical and chemical properties of *trans*-1,2-dichloroethylene suggest it is unlikely to persist in soil (Section 2.2). Air deposition to soil is not a significant pathway for *trans*-1,2-dichloroethylene and is supported, in part, by reasonably available environmental monitoring data within soil and low affinity to partition to particulate matter vs. its existing as a vapor (Section 3.3.3). Both modeled and empirical studies on *trans*-1,2-dichloroethylene bioaccumulation indicate a limited ability for this compound to accumulate in fishes (Section 3.5.4 within *Draft Chemistry, Fate, Release, and exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#))). This is strengthened by review of the data landscape for fish tissue monitoring concluding that studies do not identify evidence of *trans*-1,2-dichloroethylene in tissues of wild-caught fish or other organisms (Section 6.1.4 within *Draft Chemistry, Fate, Release, and exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#))).

6.3 Additional Information Regarding the Basis for the Preliminary Risk Determination

Table 6-12 and Table 6-13 summarize the basis for the unreasonable risk determination of injury to human health presented in this *trans*-1,2-dichloroethylene risk evaluation. Because no dermal risk estimates were below the benchmark for this preliminary risk determination, no dermal risk estimates are provided in either table. Bolded and shaded numbers indicate estimates that were used to inform the significant contributions to unreasonable risk. Both tables identify the duration of exposure (*e.g.*, acute, intermediate, or chronic duration) and the exposure route to the population. The APFs of the PPE in parentheses for workers represent the minimum necessary measures required, when other exposure controls (*e.g.*, engineering controls) are not in place, so that the risk is no longer unreasonable. However, PPE is not included where the exposed population would not be expected to wear PPE (*e.g.*, ONUs and the general population).

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Table 6-12. Supporting Basis for the Preliminary Unreasonable Risk Determination for Human Health (Workers and ONUs)

COU	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exposure Route	Exposure Level	Human Health Effects (with APF to Address Risk) ^{a b}			
Life Cycle Stage – Category – Subcategory					Acute, Short-Term (Benchmark MOE = 30)	Acute, 8-Hour Exposure (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 100)
Manufacture – Domestic manufacture	Manufacturing as a Primary Product (OES #1)	Outside Lead Operator/B-Operator – Batch Manufacturing	Inhalation	Central Tendency	No Data	1.8E04	545	584
				High-End	No Data	3.5E03	103	110
		Operator – Distillation Operation	Inhalation	Central Tendency	No Data	1.6E05	4.7E03	5.1E03
				High-End	No Data	2.5E03	75	80
		Shipping/Warehouse Worker – Batch Manufacturing	Inhalation	Central Tendency	No Data	240	7.1 (APF 50)	7.6 (APF 50)
				High-End	No Data	67	2.0	2.1
		Laboratory Technician – Batch Manufacturing	Inhalation	Central Tendency	No Data	1.6E05	4.7E03	5.0E3
				High-End	No Data	1.6E05	4.6E03	4.9E03
		ONU	Inhalation	Central Tendency	No Data	1.1E05	3.4E03	3.6E03
				High-End	No Data	1.3E04	396	424
	Manufacturing as a Byproduct (OES #2)	Outside Lead Operator/B-Operator – Batch Manufacturing	Inhalation	Central Tendency	No Data	1.8E04	545	584
				High-End	No Data	3.5E03	103	110
		Operator – Distillation Operation	Inhalation	Central Tendency	No Data	1.6E05	4.7E03	5.1E03
				High-End	No Data	2.5E03	75	80
		Laboratory Technician – Batch Manufacturing	Inhalation	Central Tendency	No Data	1.6E05	4.7E03	5.0E03
				High-End	No Data	1.6E05	4.6E03	4.9E03
		ONU	Inhalation	Central Tendency	No Data	1.1E05	3.4E03	3.6E03
				High-End	No Data	1.3E04	396	424

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COU	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exposure Route	Exposure Level	Human Health Effects (with APF to Address Risk) ^{a b}			
Life Cycle Stage – Category – Subcategory					Acute, Short-Term (Benchmark MOE = 30)	Acute, 8-Hour Exposure (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 100)
Manufacture – Import	Repackaging (OES #3)	Drum Filler	Inhalation	Central Tendency	No Data	2.0E03	59	95 (APF 10)
				High-End	No Data	1.3E03	40	42
		Packaging Operator	Inhalation	Central Tendency	No Data	72	2.1 (APF 50)	3.4 (APF 50)
				High-End	No Data	16 (APF 1,000)	0.47 (APF 1,000)	0.50
		DCM Drum Filler	Inhalation	Central Tendency	215	No Data	No Data	No Data
				High-End	25	No Data	No Data	No Data
		ONU	Inhalation	Central Tendency	No Data	1.4E03	41	66 (APF 10)
				High-End	No Data	1.4E03	41	44
Processing – Repackaging	Repackaging (OES #3)	Drum Filler	Inhalation	Central Tendency	No Data	2.0E03	59	95 (APF 10)
				High-End	No Data	1.3E03	40	42
		Packaging Operator	Inhalation	Central Tendency	No Data	72	2.1 (APF 50)	3.4 (APF 50)
				High-End	No Data	16 (APF 10)	0.47 (APF 1,000)	0.50
		DCM Drum Filler	Inhalation	Central Tendency	215	No Data	No Data	No Data
				High-End	25	No Data	No Data	No Data
		ONU	Inhalation	Central Tendency	No Data	1.4E03	41	66 (APF 10)
				High-End	No Data	1.4E03	41	44
Processing – Processing as a reactant – Intermediate	Processing as a Reactant (OES #4)	Outside Lead Operator/B-Operator – Batch Manufacturing	Inhalation	Central Tendency	No Data	1.8E04	545	584
				High-End	No Data	3.5E03	103	110
		Operator – Distillation Operation	Inhalation	Central Tendency	No Data	1.6E05	4.7E03	5.1E03
				High-End	No Data	2.5E03	75	80

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COU	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exposure Route	Exposure Level	Human Health Effects (with APF to Address Risk) ^{a b}			
Life Cycle Stage – Category – Subcategory					Acute, Short-Term (Benchmark MOE = 30)	Acute, 8-Hour Exposure (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 100)
Processing – Processing as a reactant – Intermediate	Processing as a Reactant (OES #4)	Laboratory Technician – Batch Manufacturing	Inhalation	Central Tendency	No Data	1.6E05	4.7E03	5.0E03
				High-End	No Data	1.6E05	4.6E03	4.9E03
		DCM – Reactant	Inhalation	Central Tendency	6.8 (APF 10)	No Data	No Data	No Data
				High-End	4.3 (APF 10)	No Data	No Data	No Data
		ONU	Inhalation	Central Tendency	No Data	1.1E05	3.4E03	3.6E03
				High-End	No Data	1.3E04	396	424
Processing – Recycling	Processing as a Reactant (OES #4)	Outside Lead Operator/B-Operator – Batch Manufacturing	Inhalation	Central Tendency	No Data	1.8E04	545	584
				High-End	No Data	3.5E03	103	110
		Operator – Distillation Operation	Inhalation	Central Tendency	No Data	1.6E05	4.7E03	5.1E03
				High-End	No Data	2.5E03	75	80
		Laboratory Technician – Batch Manufacturing	Inhalation	Central Tendency	No Data	1.6E05	4.7E03	5.0E03
				High-End	No Data	1.6E05	4.6E03	4.9E03
		DCM – Reactant	Inhalation	Central Tendency	6.8 (APF 10)	No Data	No Data	No Data
				High-End	4.3 (APF 10)	No Data	No Data	No Data
		ONU	Inhalation	Central Tendency	No Data	1.1E05	3.4E03	3.6E03
				High-End	No Data	1.3E04	396	424
Processing – Incorporation into a formulation, mixture, or reaction product – Solvents (which become part of product formulation or mixture)	Incorporation into Formulation, Mixture, or Reaction Product (OES #5)	Packaging Operator – Container Packaging (3M 1)	Inhalation	Central Tendency	No Data	30	0.88 (APF 1,000)	0.94 (APF 1,000)
				High-End	No Data	16 (APF 10)	0.49 (APF 1,000)	0.52

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COU	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exposure Route	Exposure Level	Human Health Effects (with APF to Address Risk) ^{a b}			
Life Cycle Stage – Category – Subcategory					Acute, Short-Term (Benchmark MOE = 30)	Acute, 8-Hour Exposure (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 100)
Processing – Incorporation into a formulation, mixture, or reaction product – Solvents (which become part of product formulation or mixture)	Incorporation into Formulation, Mixture, or Reaction Product (OES #5)	Process Operator (3M 1)	Inhalation	Central Tendency	No Data	1.3E03	39	42 (APF 10)
				High-End	No Data	664	20 (APF 10)	21
		Technician – Aerosol Packaging (Microcare)	Inhalation	Central Tendency	No Data	157	4.6 (APF 50)	5.0 (APF 50)
				High-End	No Data	35	1.0	1.1
		Technician – Blending (Microcare)	Inhalation	Central Tendency	No Data	337	10 (APF 10)	11 (APF 10)
				High-End	No Data	44	1.3	1.4
		Production Technician (BASF)	Inhalation	Central Tendency	No Data	2.6E03	78	84 (APF 10)
				High-End	No Data	385	11	12
		Batch Maker (Huntsman)	Inhalation	Central Tendency	No Data	5.3E03	156	167
				High-End	No Data	1.2E03	36	39
		Drum Filler (Huntsman)	Inhalation	Central Tendency	No Data	2.0E03	59	64 (APF 10)
				High-End	No Data	1.3E03	40	42
Processing – Incorporation into a formulation, mixture, or reaction product – Solvent purification (for semiconductor manufacturing)	Incorporation into Formulation, Mixture, or Reaction Product (OES #5)	Coat and Wash Operations Tech (Versum)	Inhalation	Central Tendency	No Data	1.1E05	3.4E03	3.6E03
				High-End	No Data	1.1E05	3.4E03	3.6E03
		Distillation Operation Tech (Versum)	Inhalation	Central Tendency	No Data	4.7E03	138	148
				High-End	No Data	3.2E03	93	100
		Packaging Operator – Bubbler Packaging (Versum)	Inhalation	Central Tendency	No Data	1.2E05	3.4E03	3.7E03
				High-End	No Data	1.2E05	3.4E03	3.7E03

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COU	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exposure Route	Exposure Level	Human Health Effects (with APF to Address Risk) ^{a b}			
Life Cycle Stage – Category – Subcategory					Acute, Short-Term (Benchmark MOE = 30)	Acute, 8-Hour Exposure (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 100)
Processing – Incorporation into a formulation, mixture, or reaction product – Solvent purification (for semiconductor manufacturing)	Incorporation into Formulation, Mixture, or Reaction Product (OES #5)	QC Technician (Versum)	Inhalation	Central Tendency	No Data	1.2E05	3.4E03	3.7E03
				High-End	No Data	2.1E04	609	652
		RGA Operations Tech (Versum)	Inhalation	Central Tendency	No Data	839	25 (APF 10)	27 (APF 10)
				High-End	No Data	311	9.2	9.8
		ONU	Inhalation	Central Tendency	No Data	1.2E05	3.4E03	3.7E03
				High-End	No Data	5.1E04	1.5E03	1.6E03
Processing – Incorporation into articles	Blowing Agent in Spray Foam (OES #11)	Worker	Inhalation	Central Tendency	463	48	1.4 (APF 25)	1.5 (APF 1,000)
				High-End	142	9.2	0.27	0.29
		ONU	Inhalation	Central Tendency	No Data	48	1.4 (APF 1,000)	1.5 (APF 1,000)
				High-End	142	9.2	0.27	0.29
Industrial/Commercial use – Propellants, non-motive (blowing agent) – Polyurethane foam	Blowing Agent in Spray Foam (OES #11)	Worker	Inhalation	Central Tendency	463	48	1.4 (APF 1,000)	1.5 (APF 1,000)
				High-End	142	9.2	0.27	0.29
		ONU	Inhalation	Central Tendency	No Data	48	1.4 (APF 1,000)	1.5 (APF 1,000)
				High-End	142	9.2	0.27	0.29
		Residential Insulation – Gap Filler ^d	Inhalation	Representative	227	Not Estimated	Not Estimated	13 (APF 10)
		Residential Insulation – Open Cell ^d	Inhalation	Representative	8 (APF 10)	Not Estimated	Not Estimated	0.31 (APF 1,000)
Industrial/Commercial use – Adhesion/cohesion promoter – Solvent-based adhesives, sealants, and adhesive accelerants	Application of Adhesives and Sealants (OES #10)	Spray Coating	Inhalation	Central Tendency	54	7.7 (APF 10)	0.23 (APF 1,000)	0.24 (APF 1,000)
				High-End	12	3.5	0.10	0.11
		Non-Spray Coating	Inhalation	Central Tendency	17 (APF 10)	872	26 (APF 10)	28 (APF 10)
				High-End	13	31	0.91	0.98
		Unknown Application Method	Inhalation	Central Tendency	No Data	336	9.9 (APF 10)	11 (APF 10)
				High-End	No Data	13	0.39	0.42

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COU	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exposure Route	Exposure Level	Human Health Effects (with APF to Address Risk) ^{a b}			
Life Cycle Stage – Category – Subcategory					Acute, Short-Term (Benchmark MOE = 30)	Acute, 8-Hour Exposure (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 100)
Industrial/Commercial use – Adhesion/cohesion promoter – Solvent-based adhesives, sealants, and adhesive accelerants	Application of Adhesives and Sealants (OES #10)	ONU	Inhalation	Central Tendency	No Data	256	7.6 (APF 50)	8.1 (APF 50)
Industrial/Commercial use – Paints and coatings – Urethane coatings	Application of Paints and Coatings (OES #9)	Spray Application	Inhalation	Central Tendency	515	131	3.9 (APF 50)	4.1 (APF 50)
				High-End	101	25	0.74	0.79
		Unknown Application Method	Inhalation	Central Tendency	1.7E03	741	22 (APF 10)	23 (APF 10)
				High-End	515	131	3.9	4.1
		ONU	Inhalation	Central Tendency	No Data	561	17 (APF 10)	18 (APF 10)
Industrial/Commercial use – Cleaning agent – Aerosol spray cleaner/degreaser	Commercial Aerosol Products (OES #8)	Mechanic (Boeing 3)	Inhalation	Central Tendency	No Data	1.1E04	316	338
				High-End	No Data	2.0E03	59	63
		Technician (Boeing 1)	Inhalation	Central Tendency	No Data	2.9E03	85	91 (APF 10)
				High-End	No Data	290	8.6 (APF 50)	9.2
		Other Data	Inhalation	Central Tendency	398	No Data	No Data	No Data
				High-End	217	No Data	No Data	No Data
		ONU	Inhalation	Central Tendency	No Data	2.5E04	747	800
				High-End	No Data	1.7E04	499	534
Industrial/Commercial use – Anti-adhesive/cohesive – Mold release	Commercial Aerosol Products (OES #8)	Mechanic (Boeing 3)	Inhalation	Central Tendency	No Data	1.1E04	316	338
				High-End	No Data	2.0E03	59	63

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COU	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exposure Route	Exposure Level	Human Health Effects (with APF to Address Risk) ^{a b}			
Life Cycle Stage – Category – Subcategory					Acute, Short-Term (Benchmark MOE = 30)	Acute, 8-Hour Exposure (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 100)
Industrial/Commercial use – Anti-adhesive/cohesive – Mold release	Commercial Aerosol Products (OES #8)	Technician (Boeing 1)	Inhalation	Central Tendency	No Data	2.9E03	85	91 (APF 10)
				High-End	No Data	290	8.6 (APF 50)	9.2
		Other Data	Inhalation	Central Tendency	398	No Data	No Data	No Data
				High-End	217	No Data	No Data	No Data
		ONU	Inhalation	Central Tendency	No Data	2.5E04	747	800
				High-End	No Data	1.7E04	499	534
	Miscellaneous Non-Aerosol Use (OES #7)	All SEG	Inhalation	Central Tendency	No Data	330	9.7 (APF 10)	10 (APF 10)
				High-End	No Data	90	2.7 (APF 50)	2.9
		ONU	Inhalation	Central Tendency	No Data	330	9.7 (APF 10)	10 (APF 10)
Industrial/Commercial use – Lubricants and greases	Commercial Aerosol Products (OES #8)	Mechanic (Boeing 3)	Inhalation	Central Tendency	No Data	1.1E04	316	338
				High-End	No Data	2.0E03	59	63
		Technician (Boeing 1)	Inhalation	Central Tendency	No Data	2.9E03	85	91 (APF 10)
				High-End	No Data	290	8.6 (APF 50)	9.2
		Other Data	Inhalation	Central Tendency	398	No Data	No Data	No Data
				High-End	217	No Data	No Data	No Data
		ONU	Inhalation	Central Tendency	No Data	2.5E04	747	800
				High-End	No Data	1.7E04	499	534

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COU	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exposure Route	Exposure Level	Human Health Effects (with APF to Address Risk) ^{a b}			
Life Cycle Stage – Category – Subcategory					Acute, Short-Term (Benchmark MOE = 30)	Acute, 8-Hour Exposure (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 100)
Industrial/Commercial use – Lubricants and greases	Commercial Aerosol Products (OES #8)	(Mechanics (Auto)	Inhalation	Low	24 (APF 10)	Not Estimated	Not Estimated	34 (APF 10)
				Medium	11 (APF 10)	Not Estimated	Not Estimated	1 (APF 1,000)
				High	4 (APF 10)	Not Estimated	Not Estimated	0.30 (APF 1,000)
Industrial/Commercial use – Other uses – Specialized detection indicator paints	Commercial Aerosol Products (OES #8)	Mechanic (Boeing 3)	Inhalation	Central Tendency	No Data	1.1E04	316	338
				High-End	No Data	2.0E03	59	63
		Technician (Boeing 1)	Inhalation	Central Tendency	No Data	2.9E03	85	91 (APF 10)
				High-End	No Data	290	8.6 (APF 50)	9.2
		Other Data	Inhalation	Central Tendency	398	No Data	No Data	No Data
				High-End	217	No Data	No Data	No Data
		ONU	Inhalation	Central Tendency	No Data	2.5E04	747	800
				High-End	No Data	1.7E04	499	534
	Miscellaneous Non-Aerosol Use (OES #7)	Worker	Inhalation	Central Tendency	No Data	330	9.7 (APF 10)	10 (APF 10)
				High-End	No Data	90	2.7 (APF 50)	2.9
		ONU	Inhalation	Central Tendency	No Data	330	9.7 (APF 10)	10 (APF 10)
Industrial/Commercial use – Cleaning agent – Non-aerosol cleaner/degreaser	Miscellaneous Non-Aerosol Ues (OES #7)	Aircraft Technician Performing Cleaning Task (Boeing 2)	Inhalation	Central Tendency	1.6E03	2.2E03	66	71 (APF 10)
				High-End	914	1.4E03	41	44
		Flight Mechanics Performing Flush Cleaning (Boeing 1)	Inhalation	Central Tendency	2.1E03	No Data	No Data	No Data
				High-End	24 (APF 10)	No Data	No Data	No Data

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COU	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exposure Route	Exposure Level	Human Health Effects (with APF to Address Risk) ^{a b}			
Life Cycle Stage – Category – Subcategory					Acute, Short-Term (Benchmark MOE = 30)	Acute, 8-Hour Exposure (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 100)
Industrial/Commercial use – Cleaning agent – Non-aerosol cleaner/degreaser	Miscellaneous Non-Aerosol Ues (OES #7)	Technician – Tube Dipping, Edge Cutting And Buffing (3M 3)	Inhalation	Central Tendency	No Data	248	7.3 (APF 50)	7.8 (APF 50)
				High-End	No Data	71	2.1 (APF 50)	2.2
		Technician – Slitter Knife Cleaning (3M 5)	Inhalation	Central Tendency	No Data	360	11 (APF 10)	11 (APF 10)
				High-End	No Data	120	3.5 (APF 50)	3.7
		ONU	Inhalation	Central Tendency	1.0E04	330	9.7 (APF 10)	10 (APF 10)
				High-End	No Data	No Data	No Data	No Data
Industrial/Commercial use – Cleaning agent – Vapor degreasing	Vapor Degreasing (OES #6)	Technician/Process Mechanic Operating Degreaser (Boeing 1)	Inhalation	Central Tendency	No Data	566	17 (APF 10)	18 (APF 10)
				High-End	No Data	279	8.3 (APF 50)	8.8
		Assembler Operating Ultrasonic Machine (3M 2)	Inhalation	Central Tendency	No Data	1.5E03	45	48 (APF 10)
				High-End	No Data	908	27 (APF 10)	29
		Waste Handling/Maintenance Worker (3M 2)	Inhalation	Central Tendency	No Data	176	5.2 (APF 50)	5.6 (APF 50)
				High-End	No Data	109	3.2 (APF 50)	3.4
		Other Data	Inhalation	Central Tendency	118	No Data	No Data	No Data
				High-End	102	No Data	No Data	No Data
		ONU	Inhalation	Central Tendency	No Data	2.7E03	80	86 (APF 10)
				High-End	No Data	1.3E03	41	44
Industrial/Commercial use – Surface modifier – Smoothing fluid in additive manufacturing	Vapor Degreasing (OES #6)	Technician/Process Mechanic Operating Degreaser (Boeing 1)	Inhalation	Central Tendency	No Data	566	17 (APF 10)	18 (APF 10)
				High-End	No Data	279	8.3 (APF 50)	8.8

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COU	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exposure Route	Exposure Level	Human Health Effects (with APF to Address Risk) ^{a b}			
Life Cycle Stage – Category – Subcategory					Acute, Short-Term (Benchmark MOE = 30)	Acute, 8-Hour Exposure (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 100)
Industrial/Commercial use – Surface modifier – Smoothing fluid in additive manufacturing	Vapor Degreasing (OES #6)	Assembler Operating Ultrasonic Machine (3M 2)	Inhalation	Central Tendency	No Data	1.5E03	45	48 (APF 10)
				High-End	No Data	908	27 (APF 10)	29
		Waste Handling/Maintenance Worker (3M 2)	Inhalation	Central Tendency	No Data	176	5.2 (APF 50)	5.6 (APF 50)
				High-End	No Data	109	3.2 (APF 50)	3.4
		Other Data	Inhalation	Central Tendency	118	No Data	No Data	No Data
				High-End	102	No Data	No Data	No Data
		ONU	Inhalation	Central Tendency	No Data	2.7E03	80	86 (APF 10)
				High-End	No Data	1.3E03	41	44
Industrial/Commercial use – Refrigerants	Refrigerant Flush (OES #13)	Worker	Inhalation	Central Tendency	No Data	330	9.7 (APF 10)	10 (APF 10)
				High-End	No Data	90	2.7 (APF 2.7)	2.9
		ONU	Inhalation	Central Tendency	No Data	330	9.7 (APF 10)	10 (APF 10)
Industrial/Commercial use – Other uses – Laboratory chemical	Laboratory Use (OES #12)	Laboratory Technician – Batch Manufacturing	Inhalation	Central Tendency	No Data	1.6E05	4.7E03	7.6E03
				High-End	No Data	1.6E05	4.6E03	4.9E03
		ONU	Inhalation	Central Tendency	No Data	1.6E05	4.7E03	7.6E03
				High-End	No Data	1.6E05	4.7E03	5.0E03
Disposal	Waste Handling, Disposal, and Treatment (OES #15)	Landfills	Inhalation	Central Tendency	No Data	1.0E05	3.0E03	3.2E03
				High-End	No Data	6.9E03	204	218
		Incinerators	Inhalation	Central Tendency	No Data	3.9E03	115	123
				High-End	No Data	113	3.3	3.6

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COU	Occupational Exposure Scenario (OES)	Similar Exposure Group (SEG)	Exposure Route	Exposure Level	Human Health Effects (with APF to Address Risk) ^{a b}			
Life Cycle Stage – Category – Subcategory					Acute, Short-Term (Benchmark MOE = 30)	Acute, 8-Hour Exposure (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 100)
Disposal	Waste Handling, Disposal, and Treatment (OES #15)	POTW and Non-POTW WWT	Inhalation	Central Tendency	No Data	5.4E03	159	170
				High-End	No Data	2.0E03	60	64
		ONU	Inhalation	Central Tendency	No Data	4.2E03	125	134

APF = assigned protection factor; DCM = dichloromethane; MOE = margin of exposure; ONU = occupational non-user; POTW = publicly owned treatment works; QC = quality control; RGA = return goods authorization; WWT = wastewater treatment;

^a This value is the protection factor of personal protective equipment required to raise the acute MOE above the benchmark. The Assigned Protection Factors (APF) associated with different types of respirators based on function (air-purifying, powered air purifying, supplied air) and fit (quarter mask, half-mask, full-face piece, helmet/hood, loose-fitting facepiece) are presented above. It should be noted that certain respirators are only applicable to specific types of inhalation exposure. See the [OSHA Small Entity Compliance Guide for the Respiratory Protection Standard](#) (accessed July 21, 2026) for detailed descriptions on the respirators corresponding to the APFs in the table.

^b **Bolded/shaded** cells indicate that a risk estimate significantly contributes to unreasonable risk for *trans*-1,2-dichloroethylene.

Table 6-13. Supporting Basis for the Preliminary Unreasonable Risk Determination for Human Health (Consumers)

Consumer COU	Subcategory/ Consumer Condition of Use Scenario	Population	Exposure Route and Duration	Age Group	Acute Non-Cancer (Benchmark MOE = 30) ^a		Intermediate Non-Cancer (Benchmark MOE = 30) ^a	
					Medium	High	Medium	High
Consumer use – Cleaning agent – Cleaner/degreaser (aerosol and non-aerosol)	Aerosol spray cleaner/degreaser	User	Inhalation	N/A	264	3	34	5
		Bystander	Inhalation	N/A	871	44	135	19
	Flux remover	User	Inhalation	N/A	293	2	34	4
		Bystander	Inhalation	N/A	968	40	179	20
Consumer use – Propellants, non-motive (blowing agent) – Polymer foam	Spray foam – Gap filler	User	Inhalation	N/A	N/A	227	749	562
		Bystander	Inhalation	N/A	N/A	7,485	7,429	5,571
	Spray foam – Open cell	User	Inhalation	N/A	N/A	8	26	20

^a **Bolded/shaded** cells indicate that a risk estimate significantly contributes to unreasonable risk for *trans*-1,2-dichloroethylene.

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APPENDICES

Appendix A KEY ABBREVIATIONS AND ACRONYMS

5669	7Q10	Lowest 7-day average flow that occurs (on average) once every 10 years
5670	30Q5	Lowest 30-day average flow that occurs once every 5 years
5671	AAD	Acute absorbed dose
5672	AADR	Acute absorbed dose rate
5673	ACGIH	American Conference of Governmental Industrial Hygienists
5674	AD	Acute dose
5675	ADD	Chronic average daily dose
5676	AERMOD	American Meteorological Society (AMS)/EPA Regulatory Model
5677	AF	Adjustment factor
5678	AMTIC	Ambient Monitoring Technology Information Center
5679	APDR	Acute potential dose rate
5680	APF	Assigned protection factor
5681	BAF	Bioaccumulation factor
5682	BCF	Bioconcentration factor
5683	BLS	Bureau of Labor Service (U.S.)
5684	BMC	Benchmark concentration
5685	BMCL	Lower confidence limit of the BMC
5686	BMD	Benchmark dose
5687	BMDL	Lower confidence limit of the BMD
5688	BMR	Benchmark response
5689	CAD	Chronic absorbed dose
5690	CASRN	Chemical Abstracts Service Registry Number
5691	CBI	Confidential business information
5692	CDR	Chemical Data Reporting
5693	ChV	Chronic value
5694	COC	Concentration of concern
5695	COU	Condition of use
5696	DMR	Discharge Monitoring Report
5697	DOT	Department of Transportation (U.S.)
5698	ECEL	Existing chemical exposure limit
5699	ECHA	European Chemicals Agency
5700	ELCR	Excess lifetime cancer risk
5701	EPA	Environmental Protection Agency (U.S.)
5702	ESD	Emission scenario document
5703	GC/MS	Gas chromatography with mass spectroscopy
5704	GS	Generic scenario
5705	HCx	Hazardous concentration for x% of species
5706	HEC	Human equivalent concentration
5707	HED	Human equivalent dose
5708	HEM	Human Exposure Model
5709	HERO	Health and Environmental Research Online (Database)
5710	HLC	Henry's Law constant
5711	IAD	Intermediate absorbed dose
5712	IADD	Intermediate average daily dose
5713	IIOAC	Integrated Indoor-Outdoor Air Calculator (Model)

5714	IRIS	Integrated Risk Information System (EPA)
5715	K _{oc}	Organic carbon:water partition coefficient
5716	K _{ow}	Octanol: water partition coefficient
5717	LCAD	Lifetime chronic absorbed dose
5718	LADC	Lifetime average daily concentration
5719	LADD	Lifetime average daily dose
5720	LCD	Life cycle diagram
5721	LC _x	Lethal concentration at which x% of test organisms die
5722	LEV	Local exhaust ventilation
5723	LOAEL	Lowest-observed-adverse-effect level
5724	LOD	Limit of detection
5725	LOEC	Lowest-observed-effect concentration
5726	LOQ	Limit of quantification
5727	MCL	Maximum contaminant limit
5728	MOE	Margin of exposure
5729	NAICS	North American Industry Classification System
5730	ND	Non-detect
5731	NEI	National Emissions Inventory
5732	NESHAP	National Emission Standards for Hazardous Air Pollutants
5733	NHDPlus	National Hydrography Dataset Plus
5734	NIOSH	National Institute for Occupational Safety and Health
5735	NOAEL	No-observed-adverse-effect level
5736	NOEC	No-observed-effect concentration
5737	NPDES	National Pollutant Discharge Elimination System
5738	NPDWR	National Primary Drinking Water Regulation
5739	NRC	National Response Center
5740	NTP	National Toxicology Program
5741	OCSP	Office of Chemical Safety and Pollution Prevention (EPA)
5742	OECD	Organisation for Economic Co-operation and Development
5743	OEHHA	Office of Environmental Health Hazard Assessment (California)
5744	OEL	Occupational exposure limit
5745	OES	Occupational exposure scenario
5746	OEV	Occupational exposure value
5747	ONU	Occupational non-user
5748	OPPT	Office of Pollution Prevention and Toxics (EPA)
5749	OSHA	Occupational Safety and Health Administration (U.S.)
5750	PBZ	Personal breathing zone
5751	pOEL	Provisional occupational exposure limit
5752	PEL	Permissible exposure limit
5753	PESS	Potentially exposed or susceptible subpopulations
5754	PF	Protection factor
5755	POD	Point of departure
5756	POTW	Publicly owned treatment works
5757	PSC	Point Source Calculator
5758	RCRA	Resource Conservation and Recovery Act
5759	RQ	Risk quotient
5760	SACC	Science Advisory Committee on Chemicals
5761	SDS	Safety data sheet
5762	SDWA	Safe Drinking Water Act

5763	SEG	Similar exposure group
5764	SIC	Standard Industrial Classification
5765	SpERC	Specific Environmental Release Categories
5766	SSD	Species sensitivity distribution
5767	STEL	Short-term exposure limit
5768	TLV	Threshold Limit Value
5769	TRI	Toxics Release Inventory
5770	TRV	Toxicity reference value
5771	TSCA	Toxic Substances Control Act
5772	TSD	Technical support document
5773	TWA	Time-weighted average
5774	VOC	Volatile organic compound
5775	VVWM	Variable Volume Water Model
5776	WHO	World Health Organization
5777	WQP	Water Quality Portal
5778	WWT	Wastewater treatment
5779	UF	Uncertainty factor
5780	U.S.	United States

Appendix B REGULATORY AND ASSESSMENT HISTORY

The chemical substance, *trans*-1,2-dichloroethylene, is subject to federal and state laws and regulations in the United States (Table_Apx B-1 and Table_Apx B-2). Regulatory actions by other governments, tribes, and international agreements applicable to *trans*-1,2-dichloroethylene are listed in Table_Apx B-3. EPA also conducted a search of existing domestic and international laws, regulations, and assessments pertaining to *trans*-1,2-dichloroethylene.

B.1 Federal Laws and Regulations

Table_Apx B-1. Federal Laws and Regulations

Statute ^a	General Description of Authority or Regulation	Chemical-Specific Summary
EPA authorities		
Toxic Substances Control Act (TSCA) – section 4	Provides EPA with authority to issue rules and consent agreements and orders requiring manufacturers (including importers) and processors to test chemical substances and mixtures.	EPA issued 2 test orders for information on environmental hazard and occupational exposure for <i>trans</i> -1,2-dichloroethylene on January 2021 and March 2022. Also, 42 chemical data submissions from test rules and enforceable consent agreements were received for <i>trans</i> -1,2-dichloroethylene: 5 Ecotoxicity (1980–2019), 2 Bioaccumulation/Bioconcentration (2011), 6 Persistence (2002–2011), 3 Transport Between Environmental Compartments (Fugacity) (2004–2011), 19 Human Health (2002), 7 Physical-Chemical Properties (2004). (U.S. EPA, ChemView ; accessed August 20, 2026).
TSCA – section 6(b)	EPA is directed to identify high-priority chemical substances for risk evaluation; and conduct risk evaluations on at least 20 high-priority substances no later than three and one-half years after the date of enactment of the Frank R. Lautenberg Chemical Safety for the 21st Century Act.	<i>trans</i> -1,2-Dichloroethylene was one of the 20 chemicals EPA designated as a High-Priority Substance for risk evaluation under TSCA (84 FR 71924, December 30, 2019).
TSCA – section 8(a)	The TSCA section 8(a) CDR Rule requires manufacturers (including importers) to give EPA basic exposure-related information on the types, quantities, and uses of chemical substances produced domestically and imported into the United States.	<i>trans</i> -1,2-Dichloroethylene manufacturing (including importing), processing, and use information is reported under the CDR rule (85 FR 20122, April 4, 2020).
TSCA – section 8(b)	EPA must compile, keep current, and publish a list (the TSCA Inventory) of each chemical substance manufactured (including imported) or processed for commercial purposes in the United States.	<i>trans</i> -1,2-Dichloroethylene (CASRN 156-60-5) was on the initial TSCA Inventory and therefore not subject to EPA's new chemicals review process

Statute ^a	General Description of Authority or Regulation	Chemical-Specific Summary
		under TSCA section 5 (89 FR 102773, December 18, 2024).
TSCA – section 8(d)	Provides EPA with authority to issue rules requiring manufacturers (including importers), processors, and distributors of a chemical substance or mixture to submit lists and/or copies of ongoing and completed, unpublished health and safety studies. EPA’s Health and Safety Data Reporting Rule at 40 CFR part 716 generally requires such submissions for manufacturers (including importers) and (if specified) processors of substances covered by part 716.	EPA issued a final rule requiring manufacturers (including importers) of <i>trans</i> -1,2-dichloroethylene to submit lists and copies of certain unpublished health and safety studies to EPA; the submission deadline in that rule was later extended to December 1, 2021 (86 FR 34147, June 29, 2021; 86 FR 54386, Oct. 1, 2021). (U.S. EPA, ChemView ; accessed August 20, 2026). 12 health and safety studies were received for <i>trans</i> -1,2-dichloroethylene from September 20, 2021 through December 21, 2021. (ChemView ; accessed August 20, 2026).
TSCA – section 8(e)	Manufacturers (including importers), processors, and distributors must immediately notify EPA if they obtain information that supports the conclusion that a chemical substance or mixture presents a substantial risk of injury to health or the environment.	One Substantial Risk Report received for <i>trans</i> -1,2-dichloroethylene (U.S. EPA, ChemView Case Number 8EHQ-00-14748; accessed August 20, 2026)
Emergency Planning and Community Right-to-Know Act (EPCRA) – section 313	EPCRA section 313 – also known as the Toxics Release Inventory (TRI) – requires annual reporting from facilities in specific industry sectors that employ 10 or more full-time equivalent employees and that manufacture, process, or otherwise use a TRI-listed chemical in quantities above threshold levels. A facility that meets reporting requirements must submit a reporting form for each chemical for which it triggered reporting, providing data across a variety of categories, including activities and uses of the chemical, releases, and other waste management (<i>e.g.</i> , quantities recycled, treated, combusted) and pollution prevention activities (under section 6607 of the Pollution Prevention Act). These data include on- and off-site data as well as multimedia data (<i>i.e.</i> , air, land, and water).	<i>trans</i> -1,2-Dichloroethylene ⁷ , along with its <i>cis</i> - isomer under CASRN 540-59-0, is a listed substance mixture subject to reporting requirements under 40 CFR 372.65 effective as of January 1, 1987.
Clean Air Act (CAA) – section 183(e)	Section 183(e) requires EPA to list the categories of consumer and commercial products that account for at least 80% of all VOC emissions in areas that violate the National Ambient Air Quality Standards	<i>trans</i> -1,2-Dichloroethylene is listed under the National Volatile Organic Compound Emission Standards for Aerosol Coatings (40 CFR part 59, subpart E). <i>trans</i> -1,2-Dichloroethylene

⁷ The mixture of *trans*-1,2-dichloroethylene and its isomer *cis*-1,2-dichloroethylene is reportable under the singular CASRN 540-59-0.

Statute ^a	General Description of Authority or Regulation	Chemical-Specific Summary
	(NAAQS) for ozone and to issue standards for these categories that require “best available controls.” In lieu of regulations, EPA may issue control techniques guidelines if the guidelines are determined to be substantially as effective as regulations.	has a reactivity factor of 1.70 g O ³ /g VOC.
Clean Air Act (CAA) – section 612	Under section 612 of the CAA, EPA’s Significant New Alternatives Policy (SNAP) program reviews substitutes for ozone-depleting substances within a comparative risk framework. EPA publishes lists of acceptable and unacceptable alternatives. A determination that an alternative is unacceptable, or acceptable only with conditions, is made through rulemaking.	Under the SNAP program, EPA listed <i>trans</i> -1,2-dichloroethylene as an acceptable substitute for methyl chloroform and CFC-113 in metals, electronics, and precision cleaning and in aerosol solvents (59 FR 44240, August 26, 1994). Later, EPA listed <i>trans</i> -1,2-dichloroethylene as an acceptable substitute for methyl chloroform and CFC-113 in adhesives (61 FR 47012, September 5, 1996). EPA also listed Transcend™ Technologies, which contains <i>trans</i> -1,2-dichloroethylene, when used as an additive to other SNAP-approved foam blowing agents, in blends making up to 5% by weight of the total foam formulation, as a substitute for CFCs and HCFCs in a number of polyurethane foam end-uses (71 FR 15589, March 29, 2006). EPA has also listed the refrigerant blend HFO-1336mzz(Z)/ dichloroethylene blend (74.7/25.3) (also known as R-514A), which contains 25.3% <i>trans</i> -1,2-dichloroethylene by weight, as acceptable for use in centrifugal chillers and positive displacement chillers (81 FR 32241, May 23, 2016).
Clean Water Act (CWA) – section 304(a)(1)	Requires EPA to develop and publish ambient water quality criteria (AWQC) reflecting the latest scientific knowledge on the effects on human health that may be expected from the presence of pollutants in any body of water.	In 2015, EPA published updated AWQC for <i>trans</i> -1,2-dichloroethylene, including a recommendation of 100 (µg/L) for human health for the consumption of water and organisms and 4,000 (µg/L) for human health for the consumption of organisms-only for states and authorized tribes to consider when adopting criteria into their water quality standards. [EPA-HQ-OW-2014-0135-0249]
Clean Water Act (CWA) –	Clean Water Act section 307(a) establishes a list of toxic pollutants or combination of pollutants under the CWA. The statute	Under CWA section 304, <i>trans</i> -1,2-dichloroethylene is included in the list of total toxic organics (TTO) for at

Statute ^a	General Description of Authority or Regulation	Chemical-Specific Summary
sections 301, 304, 306, 307 and 402	specifies a list of families of toxic pollutants also listed at 40 CFR 401.15. The “priority pollutants” specified by those families are listed in 40 CFR part 423 Appendix A. These are pollutants (along with non-conventional pollutants) for which best available technology (BAT) effluent limitations must be established on either a national basis through rules (CWA sections 301(b), 304(b), 307(b), 306) or on a case-by-case best professional judgement basis in National Pollutant Discharge Elimination System (NPDES) permits, see section 402(a)(1)(B). EPA identifies BATs as economically achievable for that industry after considering statutorily prescribed factors and sets regulatory requirements based on the performance of that technology.	least two point source categories; Electroplating (40 CFR 413.02(i)); Metal Finishing (40 CFR 433.11). <i>trans</i> -1,2-Dichloroethylene is designated as a priority pollutant under section 307(a)(1) of the CWA and as such is subject to effluent limitations and any associated monitoring requirements of NPDES permits (40 CFR 401.15; 40 CFR part 423 Appendix A).
Safe Drinking Water Act (SDWA) – section 1412	Requires EPA to publish non-enforceable maximum contaminant level goals (MCLG) and a National Primary Drinking Water Regulation (NPDWR) for a contaminant for which EPA makes the determination that the contaminant: 1. may have an adverse effect on the health of persons; 2. is known to occur or there is a substantial likelihood that the contaminant will occur in public water systems with a frequency and at levels of public health concern; and 3. in the sole judgement of the Administrator, regulation of the contaminant presents a meaningful opportunity for health risk reductions for persons served by public water systems. The NPDWR includes either an enforceable maximum contaminant level (MCL), or a required treatment technique. Public water systems are required to comply with NPDWRs.	<i>trans</i> -1,2-Dichloroethylene is subject to NPDWR under the SDWA with a MCLG of 0.1 mg/L and an enforceable MCL or treatment technique, if there is no MCL, of 0.1 mg/L (section 1412) (40 CFR part 141).
Safe Drinking Water Act (SDWA) – section 1412(b)	Every 5 years, EPA must publish a list of contaminants that: (1) are not subject to any proposed or promulgated national primary drinking water regulations, (2) are known or anticipated to occur in public water systems (PWSs), and (3) may require regulation under SDWA. EPA must also determine whether to regulate at least 5 contaminants from the list every 5 years.	Under 40 CFR 141.61 of National Primary Drinking Water Regulations, <i>trans</i> -1,2-dichloroethylene is identified to have a maximum contaminant level of 0.1 mg/L.
Resource Conservation and Recovery Act (RCRA) – section 3001	Directs EPA to develop and promulgate criteria for identifying the characteristics of hazardous waste, and for listing hazardous waste, taking into account toxicity,	<i>trans</i> -1,2-Dichloroethylene is included on the list of hazardous wastes pursuant to RCRA 3001. RCRA

Statute ^a	General Description of Authority or Regulation	Chemical-Specific Summary
	persistence, and degradability in nature, potential for accumulation in tissue, and other related factors such as flammability, corrosiveness, and other hazardous characteristics.	Hazardous Waste Code: U079 (40 CFR 261.33).
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) – sections 102(a) and 103	Authorizes EPA to promulgate regulations designating as hazardous substances, in addition to those referred to in section 101(14) of CERCLA, those elements, compounds, mixtures, solutions, and substances that, when released into the environment, may present substantial danger to the public health or welfare or the environment. EPA must also promulgate regulations establishing the quantity of any hazardous substance the release of which must be reported under section 103. Section 103 requires persons in charge of vessels or facilities to report to the National Response Center if they have knowledge of a release of a hazardous substance above the reportable quantity threshold. CERCLA Hazardous substances listed under 40 CFR Table 302.4 are subject to EPCRA section 304 notification requirements.	<i>trans</i> -1,2-Dichloroethylene is a hazardous substance under CERCLA. Releases of <i>trans</i> -1,2-dichloroethylene in excess of 1,000 lb must be reported (40 CFR 302.4).
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) – section 104(i), as amended by the Superfund Amendments and Reauthorization Act (SARA)	Amendments made several important changes to CERCLA, for example: requires the Agency to revise the hazardous ranking system and update the National Priorities List of hazardous waste sites, increases state and citizen involvement in the Superfund program and provides new enforcement authorities and settlement tools.	<i>trans</i> -1,2-Dichloroethylene is listed on the Substance Priority List. This list includes substances most commonly found at facilities on the CERCLA National Priorities List (NPL) that have been deemed to pose the greatest threat to public health.
Superfund Amendments and Reauthorization Act (SARA)	Requires EPA to revise the hazardous ranking system and update the National Priorities List of hazardous waste sites, increases state and citizen involvement in the superfund program and provides new enforcement authorities and settlement tools.	<i>trans</i> -1,2-Dichloroethylene is listed on SARA, an amendment to CERCLA, and the CERCLA Priority List of Hazardous Substances. This list includes substances most commonly found at facilities on the CERCLA National Priorities List (NPL) that have been deemed to pose the greatest threat to public health (atsdr.cdc.gov/SPL/ , accessed August 20, 2026).
Other federal statutes/regulations		
Occupational Safety and Health Act	Requires employers to provide their workers with a place of employment free from	In 1971, OSHA issued occupational safety and health standards that

Statute ^a	General Description of Authority or Regulation	Chemical-Specific Summary
(OSH Act)	recognized hazards to safety and health, such as exposure to toxic chemicals, excessive noise levels, mechanical dangers, heat or cold stress, or unsanitary conditions (29 U.S.C section 651 et seq.). Under the Act, OSHA can issue occupational safety and health standards including such provisions as permissible exposure limits (PELs), exposure monitoring, engineering and administrative control measures, and respiratory protection.	included a PEL of 200 ppm TWA for <i>trans</i> -1,2-dichloroethylene. (29 CFR 1910.1000). See OSHA Annotated Table Z-1 (accessed August 20, 2026).
Hazardous Materials Transportation Act (HMTA)	Section 5103 of the Act directs the Secretary of Transportation to: • Designate material (including an explosive, radioactive material, infectious substance, flammable or combustible liquid, solid or gas, toxic, oxidizing or corrosive material, and compressed gas) as hazardous when the Secretary determines that transporting the material in commerce may pose an unreasonable risk to health and safety or property. • Issue regulations for the safe transportation, including security, of hazardous material in intrastate, interstate, and foreign commerce.	<i>trans</i> -1,2-Dichloroethylene is listed as a hazardous material with regard to transportation and is subject to regulations prescribing requirements applicable to the shipment and transportation of listed hazardous materials (70 FR 34381, June 14, 2005).
Department of Energy	Protective Action Criteria (PAC)	PAC listed for <i>trans</i> -1,2-dichloroethylene as a hazardous material with regard to transportation and is subject to regulations prescribing requirements applicable to shipment and transportation of listed hazardous materials (70 FR 34381, June 14 2005).
^a Unless noted otherwise, Federal actions regarding <i>trans</i> -1,2-dichloroethylene generally reference the mixture of the <i>cis</i> - and <i>trans</i> - isomers under CASRN 540-59-0.		

B.2 State Laws and Regulations

Table_Apx B-2. State Laws and Regulations

State Actions ^a		Description of Action ^b
State Air Regulations	Idaho Administrative Code 58.01.01	Screening emission level of 52.7 lb/hour and acceptable ambient concentrations of 39.5 mg/m ³
	Code of Maryland Regulations 26.11.15	Identifies <i>trans</i> -1,2-dichloroethylene as Class II toxic air pollutant. Requires new/modified installations that discharge into the atmosphere install and operate toxic best available control technology.

	State Actions ^a	Description of Action ^b
State Air Regulations <i>Continued</i>	Massachusetts Department of Environmental Protection Chapter 21I, 301 CMR 40.00, 301 CMR 41.00, 310 CMR 50.00, Ambient Air Toxics Guidelines	Health-based guideline values for toxics during facility permitting. Facilities that manufacture, processes, or otherwise using <i>trans</i> -1,2-dichloroethylene above TURA thresholds pay annual fees, submit toxic reports, and develop plans to reduce use. Exposure limit is 54.42 ppb (24-hours average) and allowable ambient limit is 27.21 ppb (annual average).
	Michigan Air Pollution Control Rules (Part 2, Rules 224 – 230)	Designate <i>trans</i> -1,2-dichloroethylene as a Toxic Air Contaminant. Requires application of the best available control technology for toxics for new/modified emission sources. <i>trans</i> -1,2-Dichloroethylene has chronic initial screening level of 100 µg/m ³ as annual average. Requires that facility's emissions do not exceed health-based screening level at ambient boundaries and air dispersion modeling demonstrate compliance.
	New Hampshire Allowable Ambient Levels (AAL) (Env-A 1400: Regulated Toxic Air Pollutants)	Business, industry, or stationary source that emit <i>trans</i> -1,2-dichloroethylene. Requires compliance demonstration where emissions do not result in ambient air concentrations that exceed: 24-hour Ambient Air Limits of 3,989 µg/m ³ , Annual Ambient Air Limits of 2,659 µg/m ³ , 24-hour <i>de minimis</i> of 47 lb/day, and an annual <i>de minimis</i> of 17,298 lb/year.
	New Jersey Vapor Intrusion Guidance (NJAC 7:26E)	State permit for emission thresholds that are lower than federal <i>de minimis</i> levels. <i>trans</i> -1,2-Dichloroethylene is regulated such that if vapors migrate into buildings from contaminated soil or groundwater, NJDEP enforces indoor air screening level.
	New York Air Toxics Program at (6 NYCRR Part 212) and DAR-1 Guidelines for the Control of Ambient Air Contaminants	Facilities emitting <i>trans</i> -1,2-dichloroethylene ensure ambient air does not exceed short-term guideline concentrations and annual guideline concentrations. Process emission sources assigned a state rating where facilities, depending on the toxicity of the emission, may be required to apply maximum available control technology or implement other measures that ensure lower emissions. No facility may emit any toxic contaminant in quantities that are injurious.
	Ohio Toxic Air Contaminants Rule (OAC 3745-114-01)	Allows state to review ambient air impacts of toxic emissions using the best available technology determination.
	Oregon Cleaner Air Oregon (CAO) OAR Chapter 340, Division 245 and OAR 340-247-8010	Facilities required to calculate exact health risks to nearby communities. Oregon DEQ requires state-specific exposure benchmark, or toxicity reference value. Permitted facilities may be required to track and submit inventory data on 3-year cycle.
	Rhode Island Annual Acceptable Ambient Level (Air Pollution Regulation No. 22)	Facility-specific limit on the amount of <i>trans</i> -1,2-dichloroethylene that may cross the property line. If facility owner constructs, installs, or modifies any stationary source that emits <i>trans</i> -, entity must comply

State Actions ^a		Description of Action ^b
State Air Regulations <i>Continued</i>		with state-specific restrictions, which include registry if emitting over 300 lb/year. Air modeling must be conducted for facilities. Facilities may not cause concentrations at or beyond the property line that exceed acceptable ambient levels.
	South Carolina Air Pollution Control Regulations and Standards 61-62.5, Standard No. 8	Air emitters required to obtain operating permit for facilities that emit in excess of 1,000 lb/month.
	Vermont Subchapter V, section 5-261 of the Vermont Air Pollution Control Regulations	Requires maximum allowable concentrations in ambient air. Facilities prohibited from emitting <i>trans</i> - in quantities that cause ground-level concentrations to exceed health-based thresholds. State permitting system based on chemical-specific emission thresholds (action levels). If entity's rate of emission exceeds action level, entity required to use maximum achievable control technology or lowest achievable emission rate technology.
	Wisconsin Ch. NR 445 of the Wisconsin Administrative Code	<i>trans</i> -1,2-Dichloroethylene treated as a state-regulated toxic air pollutant. Imposes mass emission thresholds and ambient air quality standards. If facility exceeds thresholds based on the potential to emit, best available control technology required to be implemented. Facilities must report actual emissions of <i>trans</i> -1,2-dichloroethylene if emissions exceed 6,000 lb per year, facility-wide. Facility operators required to conduct reasonable search and inquiry to identify, quantify, and report hazardous air contaminants and maintain records for exemptions.
State Drinking Water Standards and Guidelines	Alaska Table C 18 AAC 75.345, Table B1 AAC 75, 18 AAC 75.325(g), and 18 AAC 70.020	Groundwater cleanup level for <i>trans</i> -1,2-dichloroethylene at 0.1 mg/L (100 ppb). Cleanup levels for <i>trans</i> -1,2-dichloroethylene method two – soil cleanup levels. Requires that labs performing analysis with <i>trans</i> -1,2-dichloroethylene must be certified by Alaska Department of Environmental Conservation for specific methods. Regulates water quality criteria from toxic substances including <i>trans</i> -1,2-dichloroethylene.
	California (Cal Code Regs. Title 26, § 22-64444)	Maximum Contaminant Level (MCL): 0.01 mg/L Detection Limit for Reporting (DLR): 0.0005 mg/L Public Health Goal (PHG): 0.05 mg/L
	Minnesota Rules, Part 4717.7860	Chronic health risk limit for groundwater and drinking water is 9 µg/L for <i>trans</i> -1,2-dichloroethylene. For exposures less than 30 days, the limit is 50 µg/L.
	North Carolina Groundwater Quality Standards 15A NCAC 02L .0202	Regulates <i>trans</i> -1,2-dichloroethylene and <i>cis</i> -1,2-dichloroethylene isomer mixture (CASRN 540-59-0) with a maximum allowable concentration of 60 µg/L. North Carolina implements federal standards, which typically only apply to public water systems under

State Actions ^a		Description of Action ^b
		SDWA, to all groundwaters of the state including site cleanups and wells.
State PELs	California Cal/OSHA (1971)	200 ppm 8-hour TWA (<i>cis-/trans-</i> isomer mixture; CASRN 540-59-0) (https://www.dir.ca.gov/title8/5155.html , accessed August 6, 2026)
	Washington State OSHA (2004)	200 ppm 8-hour TWA, 250 ppm STEL (<i>cis-/trans-</i> isomer mixture; CASRN 540-59-0) (Washington Administrative Code at WAC 296-841-20025 , accessed August 6, 2026)
State Right-to-Know Acts	California Air Resources Board (CARB)	Disclosure of consumer products if ingredient is in excess of 1.0%
	Connecticut Title 22a Environmental Protection	Inventory reporting to emergency planning committees
	Delaware Title 16 section 6306	Tier II inventory reporting if <i>trans</i> -1,2-dichloroethylene (hazardous chemical) is stored above 55 gallons or 500 lb
	Massachusetts Right to Know Law (105 CMR 670.000)	All public sector employees document, label, and report <i>trans</i> -1,2-dichloroethylene.
	Michigan Part 92 and Part 431	Extends EPCRA requirements to all employers including non-manufacturing sectors
	New Jersey NJAC8:59-5.8 and NJAC 8:59-10	If <i>trans</i> -1,2-dichloroethylene is present in a mixture in excess of 1%, must be disclosed. <i>trans</i> -1,2-Dichloroethylene recognized in the New Jersey Special Health Hazard Substance List due to its flammability, therefore manufacturers and employers are not able to claim trade secret protections for its use.
^a Unless noted otherwise, all hyperlinks accessed June 1, 2026. ^b Unless noted otherwise, State actions regarding <i>trans</i> -1,2-dichloroethylene generally reference the mixture of the <i>cis</i> - and <i>trans</i> - isomers under CASRN 540-59-0.		

B.3 International Laws and Regulations

Table_Apx B-3. International Laws and Regulations

Country/Organization	Requirements and Restrictions ^{a b}
Canada	<i>trans</i> -1,2-Dichloroethylene has an established indoor air reference level for chronic exposure at 110 µg/m ³ . Hazardous Products Regulations and Workplace Hazardous Materials Information System classifies <i>trans</i> -1,2-dichloroethylene as a flammable, corrosive, and toxic chemical requiring use of respirators, solvent-resistant gloves, and safety goggles. An inhalation exposure limit is set at 200 ppm for an 8-h TWA by the Canadian Centre for Occupational Health and Safety, based on the ACGIH TLV (https://ccinforeweb2.ccohs.ca/legislation/documents/notes/oshleg/leg_tlv.htm , accessed August 19, 2026).
European Union	<i>trans</i> -1,2-Dichloroethylene is classified as a hazardous, flammable chemical under the Classification and Labeling regulation. REACH Regulation No 1907/2006 registers this chemical for industrial and professional uses and can be imported in quantities of 1 ton or more annually. Under Industrial Emissions Directive EU 2010/75, large installations must control and limit emissions to the atmosphere.

Country/Organization	Requirements and Restrictions ^{a b}	
Australia	Australia's Work Health and Safety classifies <i>trans</i> -1,2-dichloroethylene as a hazardous, flammable chemical.	
Japan	PRTR Act classifies <i>trans</i> -1,2-dichloroethylene as a Class 1 designated chemical substance under the Pollutant Release and Transfer Registry law, which requires tracking and reporting releases and transfers.	
Institute for Occupational Safety and Health of the German Social Accident Insurance (IFA) GESTIS (accessed June 2, 2026)	Austria (2001)	TWA: 200 ppm STEL: 800 ppm
	Belgium (1993)	TWA: 200 ppm
	Denmark (1993)	TWA: 200 ppm STEL: 400 ppm
	Finland (1981)	TWA: 200 ppm STEL: 250 ppm
	Germany (1980)	TWA: 200 ppm STEL: 400 ppm
	Ireland (2007)	TWA: 200 ppm
	New Zealand (2002)	TWA: 200 ppm
	Norway (2013)	TWA 100 ppm
	China (2007)	TWA: 800 mg/m ³
	Poland (2018)	TWA: 700 mg/m ³
	Romania (2006)	TWA: 50 ppm STEL: 76 ppm
	Singapore (1996)	TWA: 200 ppm
	South Africa (2021)	TWA: 400 ppm
	South Korea	TWA: 200 ppm
	Spain (2013)	TWA: 200 ppm
	Switzerland (2001)	TWA: 100 ppm STEL: 200 ppm
STEL = short-term exposure limit; TWA = time-weighted average		
^a Unless noted otherwise, all hyperlinks accessed June 2, 2026.		
^b Unless noted otherwise, international actions regarding <i>trans</i> -1,2-dichloroethylene generally reference the mixture of the <i>cis</i> - and <i>trans</i> - isomers under CASRN 540-59-0.		

B.4 Assessment History

Table_Apx B-4. Assessment History of *trans*-1,2-Dichloroethylene

Authoring Organization	Publication ^{a b}
EPA publications	
U.S. Environmental Protection Agency (EPA), Integrated Risk Information System (IRIS)	IRIS Summary. <i>trans</i> -1,2-Dichloroethylene; CASRN 156-60-5 U.S. EPA (2010a)
EPA, Office of Chemical Safety and Pollution Prevention (OCSPP)	<i>Final Scope of the Risk Evaluation for trans-1,2-dichloroethylene; CASRN 156-60-5</i> (2020) U.S. EPA (2020b)
EPA, Office of Pollution Prevention and Toxics (OPPT)	ChemView (TSCA submissions – chemical test rule data and substantial risk reports)

August 2026

Authoring Organization	Publication ^{a b}
EPA, Superfund Health Risk Technical Support Center, National Center for Environmental Assessment, Office of Research and Development	<i>Provisional Peer Reviewed Toxicity Values for trans-1,2-Dichloroethylene (CASRN 156-60-5)</i> U.S. EPA (2020c)
Other U.S.-based organizations	
Agency for Toxic Substances and Disease Registry (ATSDR)	<i>Toxicological Profile for 1,2-Dichloroethene CAS#: 156-60-5, April 2025</i> ATSDR (2025)
National Institute for Occupational Safety and Health (NIOSH)	1,2-Dichloroethylene. Immediately Dangerous to Life or Health Concentrations (IDLH) , 1994. NIOSH (2014)
	1,2-Dichloroethylene. NIOSH Pocket Guide to Chemical Hazards (CASRN 540-59-0)
National Toxicology Program (NTP)	<i>NTP Technical Report on the Toxicity Studies of trans-1,2-Dichloroethylene (CAS No. 156-60-5) Administered in Microcapsules in Feed to F344/N Rats and B6C3F₁ Mice</i> , 2002. NTP (2002)
Occupational Safety and Health Administration (OSHA)	1,2-Dichloroethylene, Mixed Isomers (Acetylene Dichloride) . (CASRN 540-59-0)
California EPA Office of Environmental Health Hazard Assessment (OEHHA)	<i>Public Health Goals: cis- and trans-1,2-Dichloroethylene in Drinking Water</i> . CalEPA (2018)
International	
World Health Organization	1,2-Dichloroethylene in Drinking Water. Background Document for Development of WHO Guidelines for Drinking-Water Quality , 2003
^a All hyperlinks accessed August 20, 2026 ^b Unless noted otherwise, U.S.-based and international assessments regarding <i>trans</i> -1,2-dichloroethylene generally reference the mixture of the <i>cis</i> - and <i>trans</i> - isomers under CASRN 540-59-0.	

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Appendix C LIST OF TECHNICAL SUPPORT AND SUPPLEMENTAL DOCUMENTS

The below list indicates all technical support documents (TSDs) and supplemental files associated with this *Risk Evaluation for trans-1,2-Dichloroethylene* (document “01”). These include discipline-specific assessments, systematic review results, risk calculations, modeling outputs, and public communication documents. Files are numbered to correspond with the filenames uploaded to the docket: [EPA-HQ-OPPT-2018-0465](#).

Associated **Technical Support Documents (TSDs)** – Provide additional details and information on exposure, hazard, and risk assessments.

02. *Draft Chemistry, Fate, Release, and Exposure Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026g](#))
03. *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026w](#))

Associated **Systematic Review Protocol and Data Quality Evaluation and Data Extraction Documents** – Provide additional detail and information on systematic review methodologies used as well as the data quality evaluations and extractions criteria and results.

04. *Draft Systematic Review Protocol for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026ak](#)) – In lieu of an update to the *Draft Systematic Review Protocol Supporting TSCA Risk Evaluations for Chemical Substances*, also referred to as the “2021 Draft Systematic Review Protocol” ([U.S. EPA, 2021b](#)), this systematic review protocol for the Risk Evaluation for *trans-1,2-Dichloroethylene* describes some clarifications and different approaches that were implemented than those described in the 2021 Draft Systematic Review Protocol in response to (1) SACC comments, (2) public comments, or (3) to reflect chemical-specific risk evaluation needs. This supplemental file may also be referred to as the “*trans-1,2-Dichloroethylene* Systematic Review Protocol.”
05. *Draft Data Quality Evaluation and Data Extraction Information for Physical and Chemical Properties for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026n](#))
06. *Draft Data Quality Evaluation and Data Extraction Information for Environmental Fate and Transport for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026l](#))
07. *Draft Data Quality Evaluation and Data Extraction Information for Environmental Release and Occupational Exposure for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026m](#))
08. *Draft Data Quality Evaluation Information for General Population, Consumer, and Environmental Exposure for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026p](#))
09. *Draft Data Extraction Information for General Population, Consumer, and Environmental Exposure for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026j](#))
10. *Draft Data Quality Evaluation Information for Dermal Absorption for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026k](#))
11. *Draft Data Quality Evaluation Information for Human Health Hazard Epidemiology for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026r](#))
12. *Draft Data Quality Evaluation Information for Human Health Hazard Animal Toxicology for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026q](#))
13. *Draft Data Quality Evaluation Information for Environmental Hazard for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026o](#))

14. *Draft Data Extraction Information for Environmental and Human Health Hazard Animal Toxicology and Epidemiology for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026i](#))
Associated **Supplemental Information Documents** – Provide additional details and information on fate, exposure, hazard, and risk assessments.
15. *Draft EPI Suite Modeling Results Supporting Fate Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026t](#))
16. *Draft Air Releases for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026d](#))
17. *Draft Water Releases for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026ao](#))
18. *Draft Land Releases for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026aa](#))
19. *Draft Repackaging Environmental Release Model for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026ag](#))
20. *Draft Aerosol Degreasing Environmental Release Model for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026b](#))
21. *Draft Vapor Degreasing Environmental Release Model for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026an](#))
22. *Draft Use of Adhesives Environmental Release Model for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026am](#))
23. *Draft Blowing Agent in Spray Foam Environmental Release Model for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026f](#))
24. *Draft Laboratory Chemical Environmental Release Model for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026z](#))
25. *Draft Occupational Exposure Monitoring Summary for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026ad](#))
26. *Draft Occupational Dermal Exposure Model for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026ac](#))
27. *Draft Estimates of Number of Workers and ONUs for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026u](#))
28. *Draft Occupational Risk Calculator for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026ae](#))
29. *Draft Consumer and Commercial Exposure Analysis and Risk Calculator for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026h](#))
30. *Draft Air Quality System Data 2018-2022 for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026c](#))
31. *Draft Integrated Indoor Outdoor Air Calculator (IIOAC) TRI 2019-2023 Exposure and Risk Analysis for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026y](#))
32. *Draft Integrated Indoor Outdoor Air Calculator (IIOAC) Generic Scenario Exposure and Risk Analysis for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026x](#))
33. *Draft Surface Water Concentration Modeling and Environmental Exposure for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026aj](#))
34. *Draft Surface Water and Sediment Monitoring Data for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026ai](#))
35. *Draft General Population Surface Water Exposure Estimates for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026v](#))
36. *Draft Summary of Water Quality Portal Data for trans-1,2-Dichloroethylene in Groundwater and Soil (2015–2025)* ([U.S. EPA, 2026ah](#))
37. *Draft Predicted Groundwater Concentrations, Exposure and Risks from Releases to Landfills for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026af](#))
38. *Draft Dermal Absorption Calculations for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026s](#))
39. *Draft Benchmark Dose Modeling Results for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026e](#))
40. *Draft Mammalian Reference Value (TRV) Calculator for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026ab](#))

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41. *Draft Tool Settings and Analog List for Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026a](#))

EPA issued Test Orders (EPA-HQ-OPPT-2018-0465) to inform the occupational exposure assessment, consumer exposure assessment, and environmental hazard assessment of *trans*-1,2-dichloroethylene, which are summarized in below.

Table_Apx C-1. Summary of Test Order Reports Supporting the *trans*-1,2-Dichloroethylene Risk Evaluation

Test Protocol	Final Report
NIOSH 1003/1013 Inhalation ^a	<i>Occupational Inhalation Exposure Assessment for trans-1,2-Dichloroethylene</i> (EPA-HQ-OPPT-2018-0465-0070)
OECD 428 Dermal Absorption ^b	<i>The In Vitro Percutaneous Absorption of a trans -1,2-Dichloroethylene (TDCE) at Three Concentrations Through Human Skin and Determination of Permeability Constants</i> (EPA-HQ-OPPT-2018-0465-0069)
Exposure Testing protocol 1: Source Characterization and Concentration ^c	<i>Consumer Exposure Chamber Testing for trans-1,2-Dichloroethylene</i> (EPA-HQ-OPPT-2018-0465-0071)
Exposure Testing protocol 3: Short-Term Emission Testing ^c	
OECD 219 Chironomid Toxicity ^d	<i>An Evaluation of Dosing Methods in Support of Sediment-Water Chironomid Toxicity Testing with trans -1,2-Dichloroethylene (TDCE)</i> (EPA-HQ-OPPT-2018-0465-0072)
OECD 233 Life-Cycle Sediment Invertebrate ^d	
^a Final report accepted by EPA (EPA-HQ-OPPT-2018-0465-0068 ; (Exponent, 2023))	
^b Final report accepted by EPA (EPA-HQ-OPPT-2018-0465-0067 , (TDCE Consortium, 2023))	
^c Final report accepted by EPA (EPA-HQ-OPPT-2018-0465-0066 , (Withheld], 2023)	
^d These tests were extinguished due to an inability to maintain <i>trans</i> -1,2-dichloroethylene within sediment (EPA-HQ-OPPT-2018-0465-0073 ; (U.S. EPA, 2024a)).	

Appendix D UPDATES TO THE CONDITIONS OF USE TABLE

D.1 Revisions to Categories and Subcategories of Conditions of Use

After publication of the *Final Scope of the Risk Evaluation for trans-1,2-Dichloroethylene* (CAS RN 156-60-5) ([U.S. EPA, 2020b](#)), EPA received updated submissions from the 2020 CDR cycle prior to releasing this draft risk evaluation. In addition to new submissions received under the 2020 CDR cycle, some industry code names were updated for the 2020 CDR cycle. Therefore, the Agency is amending the description of certain *trans*-1,2-dichloroethylene COUs based on those new submissions. Table_Apx D-1 summarizes the changes to the COUs based on the new reporting codes in the 2020 CDR cycle and any other information reasonably available to EPA since the publication of the final scope document.

These COU descriptions incorporate CDR submissions from the 2016 and 2020 CDR cycles. 2024 CDR cycle submissions were reviewed to evaluate whether the 2024 CDR cycle would further inform these COU descriptions. If EPA receives new information on the *trans*-1,2-dichloroethylene COUs during the comment period for the draft risk evaluation, then that information will be considered and if appropriate, incorporated into the final COU descriptions. EPA researched reasonably available market information and identified new products available that were not previously known and thus were not accounted for in the 2020 final scope document ([U.S. EPA, 2020b](#)).

The final scoping document ([U.S. EPA, 2020b](#)) indicated that EPA intended to evaluate the use of *trans*-1,2-dichloroethylene produced as a byproduct from the manufacture of 1,2-dichloroethane (CASRN 107-06-2) in the risk evaluation for 1,2-dichloroethane. Instead, EPA is evaluating *trans*-1,2-dichloroethylene produced as a byproduct during the manufacture of 1,2-dichloroethane in the *trans*-1,2-dichloroethylene risk evaluation. Manufacture of *trans*-1,2-dichloroethylene as a byproduct is assessed under the “Domestic manufacture” COU.

Table_Apx D-1. Revisions to Categories and Subcategories of Conditions of Use

Life Cycle Stage and Category	Original Subcategory in the Final Scope Document	Occurred Change	Revised Life Cycle Stage, Category, and Subcategory in the 2026 Draft Risk Evaluation
Manufacturing – Domestic manufacture/import	Domestic manufacture	Changed “Manufacturing” in the Life Cycle Stage to “Manufacture”. Changed the Subcategory from “Domestic manufacture” to “N/A” for consistency with other chemicals.	Manufacture – Domestic manufacture – N/A
	Import	Changed Subcategory from “Import” to “N/A” for consistency with other chemicals.	Manufacture – Import – N/A
Processing – Processing as a reactant	Intermediate in chemical product and preparation manufacturing	Changed Subcategory from “Intermediate in chemical product and preparation manufacturing” to “Intermediate” to align with 2024 CDR.	Processing – Processing as a reactant – Intermediate

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Life Cycle Stage and Category	Original Subcategory in the Final Scope Document	Occurred Change	Revised Life Cycle Stage, Category, and Subcategory in the 2026 Draft Risk Evaluation
Processing – Processing as a reactant	Plating agents and surface treating agents	Combined condition of use with “Processing – Processing as a reactant – Intermediate”.	
Processing – Incorporation into formulation, mixture or reaction product	Solvents (which become part of product formulation or mixture)	Changed Subcategory from “Solvents (which become part of product formulation or mixture)” to “Solvent (which become part of product formulation or mixture)”.	Processing – Incorporation into formulation, mixture, or reaction product – Solvent (which becomes part of product formulation or mixture)
	Solvents (for cleaning or degreasing)	Combined condition of use with “Processing – Incorporation into formulation, mixture, or reaction product – Solvent (which becomes part of product formulation or mixture)” to minimize duplication.	
	Adhesives and sealant chemicals	Combined condition of use with “Processing – Incorporation into formulation, mixture, or reaction product – Solvent (which becomes part of product formulation or mixture)” to minimize duplication.	
	Carrier solvent in adhesives, coatings, inks, lubricants, and silicones	Combined condition of use with “Processing – Incorporation into a Formulation, Mixture, or Reaction Product – Solvent (which becomes part of product formulation or mixture)” to minimize duplication.	
	Not included	Added condition of use “Processing – Incorporation into a formulation, mixture, or reaction product – Solvent purification (for semiconductor manufacturing)” based on new information from TSCA section 4 Test Order.	Processing – Incorporation into formulation, mixture, or reaction product – Solvent purification (for semiconductor manufacturing)
Processing – Incorporation into articles	Propellant and blowing agent in plastics product manufacturing; flexible polyurethane foam manufacturing	Changed Subcategory from “Propellant and blowing agent in plastics product manufacturing; flexible polyurethane foam manufacturing” to “N/A” for simplicity.	Processing – Incorporation in articles – N/A
Processing – Repackaging	Repackaging	Changed Subcategory to “N/A” for consistency with other chemicals.	Processing – Repackaging – N/A

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Life Cycle Stage and Category	Original Subcategory in the Final Scope Document	Occurred Change	Revised Life Cycle Stage, Category, and Subcategory in the 2026 Draft Risk Evaluation
Processing – Recycling	Recycling	Changed Subcategory to “N/A” for consistency with other chemicals.	Processing – Recycling – N/A
Distribute in commerce	Distribute in commerce	Changed Life Cycle Stage from “Distribute” to “Distribution” and changed Category and Subcategory to “N/A” for consistency with other chemicals.	Distribution in commerce – N/A – N/A
Industrial/Commercial use – Solvents (for cleaning or degreasing)	Vapor degreasing	Changed Category from “Solvents (for cleaning or degreasing)” to “Cleaning agent” to align with 2024 CDR.	Industrial/Commercial use – Cleaning agent – Vapor degreasing
Industrial/Commercial use – Solvents (for cleaning or degreasing)	Aerosol spray cleaner/degreaser	Changed Category from “Solvents (for cleaning or degreasing)” to “Cleaning agent” to align with 2024 CDR.	Industrial/ Commercial use – Cleaning agent – Aerosol spray cleaner/degreaser
	Flux remover (aerosol)	Combined condition of use with “Aerosol spray cleaner/degreaser” to minimize duplication and align with 2024 CDR.	
Industrial/commercial use – Cleaning and furnishing care products	Spot cleaner; stain remover	Combined condition of use with “Industrial/commercial use – Cleaning agent – Aerosol spray cleaner/degreaser” to minimize duplication.	
Industrial/commercial use – Solvents (for cleaning or degreasing)	Non-aerosol cleaner/degreaser	Changed Category from “Solvents (for cleaning or degreasing)” to “Cleaning agent” to align with 2024 CDR.	Industrial/Commercial use – Cleaning agent – Non-aerosol cleaner/degreaser
	Flux remover (liquid)	Combined condition of use with “Non-aerosol cleaner/degreaser” to minimize duplication and align with 2024 CDR.	
Industrial/commercial use – Cleaning and furnishing care products	Spot cleaner; stain remover	Combined condition of use with “Industrial/commercial use – Cleaning agent – Non-aerosol cleaner/degreaser” to minimize duplication.	
Commercial use – Solvents (for cleaning or degreasing)	Refrigerant flush	Combined condition of use with “Industrial/commercial use – Cleaning agent – Non-aerosol cleaner/degreaser” to minimize duplication.	

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Life Cycle Stage and Category	Original Subcategory in the Final Scope Document	Occurred Change	Revised Life Cycle Stage, Category, and Subcategory in the 2026 Draft Risk Evaluation
Industrial/commercial use – Anti-adhesive agent	Mold release	Changed Category from “Anti-adhesive agent” to “Anti-adhesive/cohesive” to align with 2024 CDR.	Industrial/Commercial use – Anti-adhesive/cohesive – Mold release
Industrial/Commercial use – Solvents (which become part of product formulation or mixture)	Urethane coatings	Changed Category from “Solvents (which become part of product formulation or mixture)” to “Paints and coatings” for accuracy.	Industrial/Commercial use – Paints and coatings – Urethane coatings
Industrial/Commercial use – Lubricants and greases	Liquid and spray lubricants and greases, and penetrating lubricants	Changed Subcategory from “Liquid and spray lubricants and greases, and penetrating lubricants” to “N/A” to reduce description redundancy.	Industrial/Commercial use – Lubricants and greases – N/A
Industrial/Commercial use – Adhesives and sealants	Solvent-based adhesives and sealants; Adhesive accelerant	Changed Category from “Adhesives and sealants” to “Adhesion/cohesion promoter” to align with 2024 CDR. Changed Subcategory from “Solvent-based adhesives and sealants; Adhesive accelerant” to “Solvent-based adhesives, sealants, and adhesive accelerants” for simplicity.	Industrial/Commercial use – Adhesion/cohesion promoter – Solvent-based adhesives, sealants, and adhesive accelerants
Industrial/Commercial use – Functional fluids (open systems)	Smoothing fluid in additive manufacturing	Changed Category from “Functional fluids (open systems)” to “Surface modifier” to align with 2024 CDR.	Industrial/Commercial use – Surface modifier – Smoothing fluid in additive manufacturing
Industrial/Commercial use – Functional fluids (closed systems)	Refrigerant	Changed Category from “Functional fluids (closed systems)” to “Refrigerants” to align with 2024 CDR. Changed Subcategory from “Refrigerant” to “N/A” for consistency with other chemicals.	Industrial/Commercial use – Refrigerants – N/A
Industrial/Commercial use – Processing aids	Extraction solvent for thermoplastics	Removed	N/A
	Not included	Added condition of use “Industrial/commercial use – Processing aids – Semiconductor and photovoltaic agents for etching and cleaning processes in electronic articles” based on <u>comment</u> received in <i>trans</i> -1,2-dichloroethylene docket and to align with 2024 CDR.	Industrial/Commercial use – Processing aids – Semiconductor and photovoltaic agents for etching and cleaning processes in electronic articles

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Life Cycle Stage and Category	Original Subcategory in the Final Scope Document	Occurred Change	Revised Life Cycle Stage, Category, and Subcategory in the 2026 Draft Risk Evaluation
Industrial/Commercial use – Other uses	Laboratory chemical	N/A	Industrial/Commercial use – Other uses – Laboratory chemical
	Not included	Added condition of use “Industrial/commercial use – Other uses – Specialized detection indicator materials due to product SDSs identified by EPA.	Industrial/Commercial use – Other uses – Specialized detection indicator materials
Commercial use – Propellants and blowing agents	Polyurethane foam building insulation	Changed Life Cycle Stage and Category from “Commercial use – Propellants and blowing agents” to “Industrial/commercial use – Propellants, non-motive (blowing agent)” to align with 2024 CDR. Changed Subcategory from “Polyurethane foam building insulation” to “Polymer foams” to for simplicity.	Industrial/Commercial use – Propellants, non-motive (blowing agent) – Polymer foam
Consumer use – Solvents (for cleaning or degreasing)	Aerosol degreaser	Changed Category from “Solvents (for cleaning or degreasing)” to “Cleaning agent” to align with 2024 CDR. Changed Subcategory from “Aerosol degreaser” to “Cleaner/degreaser (aerosol and non-aerosol)” to align with 2024 CDR and use specificity.	Consumer use – Cleaning agent – Cleaner/degreaser (aerosol and non-aerosol)
Consumer use – Propellants and blowing agents	Polyurethane foam building insulation	Changed Category from “Propellants and blowing agents” to “Propellants, non-motive (blowing agent)” to align with 2024 CDR. Changed Subcategory from “Polyurethane foam building insulation” to “Polymer foam aerosol spray” for simplicity.	Consumer use – Propellants, non-motive (blowing agent) – Polymer foam
Consumer use – Adhesives and sealants	Adhesive accelerant	Removed	N/A
Disposal – Disposal	Disposal	Change category and subcategory to “N/A” for consistency with other chemicals.	Disposal – N/A – N/A

D.2 Activities Determined Not to Be Conditions of Use

The Agency recognized that some products may no longer be available since publication of the 2020 final scope document for *trans*-1,2-dichloroethylene ([U.S. EPA, 2020b](#)) and others uses required revisions to align with the updated reporting categories in the 2024 CDR ([U.S. EPA, 2024b](#)). As a result, the “Occurred Change” column in Table_Apx D-1 provides details as to what COU additions, removals, and revisions were made between publication of the 2020 final scope document and this draft risk evaluation, and the following paragraphs expand on the more prominent COU removals that EPA considered.

Industrial/Commercial Use – Processing Aids – Extraction Solvent for Thermoplastics

The *trans*-1,2-dichloroethylene Final Scope document identified solvent extraction for thermoplastics as an industrial and commercial processing aid use. In Appendix E.1, EPA stated that, at the time of publication of the final scope document in August of 2020, the Agency had not identified specific process information for the use of *trans*-1,2-dichloroethylene as an extraction solvent for thermoplastics but that EPA planned to evaluate this condition of use during the risk evaluation ([U.S. EPA, 2020b](#)). The Agency is currently unaware of *trans*-1,2-dichloroethylene use as an extraction solvent for thermoplastics, the details of this process, or the scale of this use. Therefore, EPA has removed this occupational use from this draft risk evaluation. To the extent that information exists affirming this as a factual use and its process details, EPA requests such information from commenters for consideration in the final risk evaluation for *trans*-1,2-dichloroethylene.

Consumer Adhesives and Sealants

In the final scope document for *trans*-1,2-dichloroethylene, EPA identified an adhesive product for consumers ([U.S. EPA, 2020b](#)). At the time of publication of this draft risk evaluation, EPA reviewed all reasonably available information on the consumer use of *trans*-1,2-dichloroethylene in adhesives and sealants. While the Agency is confident that this condition of use is ongoing in the industrial and commercial sectors, EPA is less certain of adhesive or sealant product use by consumers and its availability to consumer markets since many products containing *trans*-1,2-dichloroethylene stipulate in their SDS or other product labeling that they are designated for professional, industrial, or commercial use ([Permabond Engineering Adhesives, 2018](#)). Therefore, EPA has removed this consumer use from the draft risk evaluation. To the extent that information is available on adhesive or sealant products that contain *trans*-1,2-dichloroethylene meant for general consumers, the Agency is requesting information on its use as well as its availability to the consumer market for consideration and potential inclusion in the final risk evaluation.

Appendix E CONDITIONS OF USE DESCRIPTIONS

The following descriptions are intended to include examples of uses, so as not to exclude other activities that may also be included in the COUs of *trans*-1,2-dichloroethylene. To better describe the COUs, EPA considered CDR submissions for *trans*-1,2-dichloroethylene from recent CDR cycles and other reasonably available information including information received from stakeholder engagements, published literature, company websites, product SDSs, government and commercial trade databases and publications. For CDR submissions, the COU descriptions reflect what EPA identified as the best fit for that submission.

Examples of articles, products, or activities that are included in the following descriptions to help describe the COU but may not be exhaustive. EPA uses the terms “articles” and “products” or “product mixtures” in the following descriptions and is generally referring to articles and products as defined by 40 CFR part 751. There may be instances where the terms are used interchangeably by a company or commenters, or by EPA in reference to a code from the CDR reports, *e.g.*, “plastic products manufacturing,” or “fabric, textile, and leather products.” The Agency will clarify as needed when these references are included throughout the COU descriptions below.

Additionally, the final scope ([U.S. EPA, 2020b](#)) indicated that EPA intended to evaluate the use of *trans*-1,2-dichloroethylene produced as a byproduct from the manufacture of 1,2-dichloroethane (CASRN 107-06-2) in the risk evaluation for 1,2-dichloroethane. Instead, the Agency is including *trans*-1,2-dichloroethylene produced as a byproduct during the manufacture of 1,2-dichloroethane in the *trans*-1,2-dichloroethylene risk evaluation.

E.1 Manufacture – Domestic Manufacture

Domestic manufacture means to manufacture or produce *trans*-1,2-dichloroethylene within the United States, including to manufacture or produce for export. For purposes of the *trans*-1,2-dichloroethylene draft risk evaluation, this includes the extraction of *trans*-1,2-dichloroethylene from a previously existing chemical substance or complex combination of chemical substances, and loading/unloading and repackaging (but not transport) associated with the manufacturing and production of *trans*-1,2-dichloroethylene.

trans-1,2-Dichloroethylene is manufactured as a byproduct through production of chlorinated hydrocarbons. Such production processes may include the manufacture of vinyl chloride (CASRN 75-01-4) and 1,2-dichloroethane (CASRN 107-06-2).

E.2 Manufacture – Import

This condition of use refers to the import of *trans*-1,2-dichloroethylene, including *trans*-1,2-dichloroethylene-containing products and articles, into the customs territory of the United States. This COU includes loading/unloading and repackaging (but not transport) associated with the import of *trans*-1,2-dichloroethylene. In general, chemicals may be imported into the United States in bulk via water, air, land, and intermodal shipments. For import purposes, *trans*-1,2-dichloroethylene may be imported neat or as a component in a formulation.

E.3 Processing – Processing as a Reactant – Intermediate

This condition of use refers to processing *trans*-1,2-dichloroethylene as a feedstock in the production of another chemical via chemical reactions in which *trans*-1,2-dichloroethylene is consumed to form the product, although trace amounts may be present in the product as an impurity. This includes but is not limited to processing in the synthesis of other useful chlorinated ethylenes in which *trans*-1,2-

6010 dichloroethylene is consumed to form the product, which is then distributed in commerce as well as all
6011 other basic organic chemical manufacturing.

E.4 Processing – Incorporation into a Formulation, Mixture, or Reaction Product – Solvent (Which Becomes Part of Product Formulation or Mixture)

6012 This condition of use refers to when *trans*-1,2-dichloroethylene is added to a product (or product
6013 mixture) as a solvent for further distribution and includes cleaning and degreasing agents,
6014 adhesion/cohesion promoters, waxes, resins, polyol blends, thermoplastics, and refrigerants. This
6015 condition of use includes when *trans*-1,2-dichloroethylene is processed into a formulated mixture to
6016 function as a carrier or deposition solvent to distribute suspended or dissolved materials including
6017 coatings, lacquers, cured ink removers, lubricants, debinding fluids, adhesives, sealants, or silicones.
6018 Such formulations may be used to deliver material to a substrate by using *trans*-1,2-dichloroethylene as
6019 a carrier or deposition solvent where the *trans*-1,2-dichloroethylene evaporates, leaving a uniform
6020 application of the deposited material.

E.5 Processing – Incorporation into a Formulation, Mixture, or Reaction Product – Solvent Purification (for Semiconductor Manufacturing)

6021 This condition of use refers to the preparation of a product; in this case, the incorporation of *trans*-1,2
6022 dichloroethylene into a formulation, mixture, or a reaction product that occurs when *trans*-1,2
6023 dichloroethylene is purified (*e.g.*, from 99.0 to 99.99%) for distribution in commerce.

E.6 Processing – Incorporation into Articles

6024 This condition of use refers to when *trans*-1,2-dichloroethylene intentionally becomes an integral
6025 component of an article and distributed for industrial, commercial, or consumer use (*e.g.*, rigid foam
6026 boardstock used in construction or foam used as thermal insulation within articles such as refrigerators).
6027 End use of these articles may contain *de minimis*, residual concentrations of *trans*-1,2-dichloroethylene.
6028

E.7 Processing – Repackaging

6029 This condition of use refers to preparation of *trans*-1,2-dichloroethylene for distribution in commerce in
6030 a different form, state, or quantity than originally received or stored by various industrial sectors,
6031 including chemical product and preparation manufacturing, wholesale and retail trade, and laboratory
6032 chemicals manufacturing. This condition of use includes transferring *trans*-1,2-dichloroethylene from a
6033 bulk storage container into smaller containers. This condition of use would not apply to the relabeling or
6034 redistribution of a chemical substance without removing the chemical substance from the original
6035 container it was supplied in.
6036

E.8 Processing – Recycling

6037 This condition of use refers to the process of treating generated waste streams (*i.e.*, which would
6038 otherwise be disposed of as waste), containing *trans*-1,2-dichloroethylene that are collected, either on-
6039 site or transported to a third-party site, for commercial purpose.
6040

E.9 Distribution in Commerce

6041 For purposes of assessment in this draft risk evaluation, distribution in commerce consists of the
6042 transportation associated with the moving of *trans*-1,2-dichloroethylene or *trans*-1,2-dichloroethylene-
6043 containing products and/or articles between sites that manufacture, process, or recycle *trans*-1,2-
6044 dichloroethylene or *trans*-1,2-dichloroethylene-containing products and/or articles, or to final use sites,
6045

or for final disposal of *trans*-1,2-dichloroethylene or *trans*-1,2-dichloroethylene-containing products and/or articles. More broadly under TSCA, “distribution in commerce” and “distribute in commerce” are defined under TSCA section 3(5): “The terms ‘distribute in commerce’ and ‘distribution in commerce’ when used to describe an action taken with respect to a chemical substance or mixture or article containing a substance or mixture mean to sell, or the sale of, the substance, mixture, or article in commerce; to introduce or deliver for introduction into commerce, or the introduction or delivery for introduction into commerce of, the substance, mixture, or article; or to hold, or the holding of, the substance, mixture, or article after its introduction into commerce.”

E.10 Industrial/Commercial Use – Cleaning Agent – Vapor Degreaser

This condition of use refers to the industrial or commercial use of *trans*-1,2-dichloroethylene by heating it, including various concentrations of *trans*-1,2-dichloroethylene blended with HFCs, HFEs, HFOs, to its volatilization point and using its vapors to remove dirt, oils, greases, and other surface contaminants (such as drawing compounds, cutting fluids, coolants, solder flux, and lubricants) from metal parts, electronics, or other substrates in batch open-top vapor degreasers or closed-loop vapor degreasing in industrial or commercial settings. This condition of use includes *trans*-1,2-dichloroethylene vapors used for precision cleaning and debinding. This is a use of *trans*-1,2-dichloroethylene after it has already been incorporated into the cleaning agent, as opposed to when it is used upstream, (e.g., when *trans*-1,2-dichloroethylene is processed into the cleaning agent).

E.11 Industrial/Commercial Use – Cleaning Agent – Aerosol Spray Cleaner/Degreaser

This condition of use refers to industrial or commercial use of *trans*-1,2-dichloroethylene in aerosol degreasing as an aerosolized solvent spray, typically applied from a pressurized can, to remove residual contaminants from fabricated parts, substrates, machinery, fabrics, mold surfaces, or electronics. Aerosolized products include but are not limited to flux removers, mold cleaners, electronics cleaners, metal cleaners, precision cleaners, and spot removers. This is a use of *trans*-1,2-dichloroethylene after it has already been incorporated into the cleaning agent, as opposed to when it is used upstream, (e.g., when *trans*-1,2-dichloroethylene is processed into the cleaning agent).

E.12 Industrial/Commercial Use – Cleaning Agent – Non-Aerosol Cleaner/Degreaser

This condition of use refers to the industrial or commercial use of *trans*-1,2-dichloroethylene in liquid degreasing to remove residual contaminants from fabricated parts, substrates, machinery, fabrics, mold surfaces, electronics, or as a refrigerant flush. Liquid products include but are not limited to flux removers, mold cleaners, electronics cleaners, metal cleaners, cured ink removers, spot removers, and refrigerant flushes. This is a use of *trans*-1,2-dichloroethylene after it has already been incorporated into the cleaning agent, as opposed to when it is used upstream, (e.g., when *trans*-1,2-dichloroethylene is processed into the cleaning agent).

E.13 Industrial/Commercial Use – Anti-Adhesive/Cohesive – Mold Release

This condition of use refers to the industrial and commercial use of *trans*-1,2-dichloroethylene in products that are applied to surfaces to prevent molds from sticking, ensuring easy removal process of the mold. This is a use of *trans*-1,2-dichloroethylene after it has already been incorporated into the anti-adhesive/cohesive, as opposed to when it is used upstream, (e.g., when *trans*-1,2-dichloroethylene is processed into the anti-adhesive/cohesive). This use includes mold release products that are applied in a liquid form or as an aerosol spray.

E.14 Industrial/Commercial Use – Paints and Coatings – Urethane Coatings

This condition of use refers to industrial or commercial use of *trans*-1,2-dichloroethylene in polyurethane urethane coatings applied to surfaces, usually to enhance properties such as water repellency, gloss, fade resistance, ease of application, or foam prevention, etc. This is a use of *trans*-1,2-dichloroethylene after it has already been incorporated into the paint or coating, as opposed to when it is used upstream, (e.g., when *trans*-1,2-dichloroethylene is processed into the paint or coating). This condition of use includes conformal urethane coatings used on printed circuit boards and other electronics to create a protective film that enhances properties such as dust prevention, moisture prevention, static prevention, anti-corrosion, thermal insulation, and extension of service life.

E.15 Industrial/Commercial Use – Lubricants and Greases

This condition of use refers to the industrial or commercial use of *trans*-1,2-dichloroethylene in liquids, pastes, or sprays that reduce friction, heat generation, and wear between surfaces. This includes liquid and spray lubricants and greases, penetrating lubricants and fluids, and cutting oils. This is a use of *trans*-1,2-dichloroethylene after it has already been incorporated into the lubricating agent, as opposed to when it is used upstream, (e.g., when *trans*-1,2-dichloroethylene is processed into the lubricating agent).

E.16 Industrial/Commercial Use – Adhesion/Cohesion Promoter – Solvent-Based Adhesives, Sealants, and Adhesive Accelerants

This condition of use refers to industrial or commercial use of *trans*-1,2-dichloroethylene in adhesives, sealants, and caulks to promote bonding between other substances, promote adhesion of surfaces, or prevent seepage of moisture or air. This is a use of *trans*-1,2-dichloroethylene after it has already been incorporated into the adhesion/cohesion promoter, as opposed to when it is used upstream, (e.g., when *trans*-1,2-dichloroethylene is processed into the adhesion/cohesion promoter).

E.17 Industrial/Commercial Use – Surface Modifier – Smoothing Fluid in Additive Manufacturing

This condition of use, which may also be commonly referred to as vapor smoothing, refers to the volatilization of liquid *trans*-1,2-dichloroethylene to produce vapors, including *trans*-1,2-dichloroethylene-blends, in additive manufacturing and plastics processing to polish, smooth, or create another desired finished surface to the substrate. This is a use of *trans*-1,2-dichloroethylene after it has already been incorporated into the surface modifier, as opposed to when it is used upstream, (e.g., when *trans*-1,2-dichloroethylene is processed into the surface modifier).

E.18 Industrial/Commercial Use – Refrigerants

This condition of use refers to the industrial or commercial use of *trans*-1,2-dichloroethylene for one or more operational properties in a closed system as a refrigerant. This is a use of *trans*-1,2-dichloroethylene after it has already been incorporated into the refrigerant, as opposed to when it is used upstream, (e.g., when *trans*-1,2-dichloroethylene is processed into the refrigerant).

E.19 Industrial/Commercial Use – Processing Aids – Semiconductor and Photovoltaic Agents for Etching and Cleaning Processes in Electronic Articles

6117 This condition of use refers to the industrial or commercial use of *trans*-1,2-dichloroethylene to enhance
6118 the oxidation rate and sequester metal ions and in wafer fabricators as liquid source material for
6119 oxidation and cleaning.

E.20 Industrial/Commercial Use – Other Uses – Laboratory Chemical

6120 This condition of use refers to the industrial or commercial use of *trans*-1,2-dichloroethylene as a
6121 laboratory chemical in a laboratory process or in specialized laboratory equipment for chemical
6122 standards, instrument calibration/maintenance chemical analysis, chemical synthesis, extracting and
6123 purifying other chemicals, dissolving other substances, executing research, development, test and
6124 evaluation methods, and similar activities. This use applies to research, government, academic
6125 institutions, as well as industrial and commercial laboratories. This use includes asphalt testing and
6126 recovery using manual centrifuge processes. This is a use of *trans*-1,2-dichloroethylene after it has
6127 already been processed or incorporated as a laboratory chemical (neat and stabilized mixtures), as
6128 opposed to when it is used upstream, (e.g., when *trans*-1,2-dichloroethylene is processed into a
6129 laboratory chemical).

E.21 Industrial/Commercial Use – Other Uses – Specialized Detection Indicator Material

6131 This condition of use refers to the industrial or commercial use of *trans*-1,2-dichloroethylene in
6132 specialized indicator materials for the purpose of detecting temperature differentials or leaks and
6133 seepage of target gases and fluids (ammonia, hydrocarbons, etc.). This condition of use includes
6134 specialty indicator materials used as paints, fluids, sprays, developers, and powders. This is a use of
6135 *trans*-1,2-dichloroethylene after it has already been incorporated into the indicator material, as opposed
6136 to when it is used upstream, (e.g., when *trans*-1,2-dichloroethylene is processed into the indicator
6137 material).

E.22 Industrial and Commercial Use – Propellants, Non-Motive (Blowing Agent) – Polymer Foam

6138 This condition of use refers to when *trans*-1,2-dichloroethylene is used to expel products from
6139 pressurized containers for the purpose of dissolving or suspending other substances from a container to
6140 impart a cellular structure. The *trans*-1,2-dichloroethylene formulation may be in solution, emulsion, or
6141 suspension and may be used to assist in the production of plastic products, as a propellant, foam blowing
6142 additive, or blowing agent in foam products. This condition of use includes *trans*-1,2-dichloroethylene
6143 in the use of foam-containing articles after they are produced. This is a use of *trans*-1,2-dichloroethylene
6144 after it has already been incorporated into the propellant, foam blowing additive, blowing agent, or
6145 article as opposed to when it is used upstream, (e.g., when *trans*-1,2-dichloroethylene is processed into
6146 the propellant, foam blowing additive, blowing agent, or article).

E.23 Consumer Use – Cleaning Agent – Cleaner/Degreaser (Aerosol and Non-Aerosol)

6147 This condition of use refers to consumer use of products containing *trans*-1,2-dichloroethylene as a
6148 solvent for cleaning or degreasing in the form of an aerosol spray degreaser or cleaner. The products are
6149 used to dissolve oils, greases, and similar materials from textiles, glassware, metal surfaces, and other

articles (including circuit boards and other electronics). This is a use of *trans*-1,2-dichloroethylene after it has already been incorporated into the cleaning agent, as opposed to when it is used upstream, (e.g., when *trans*-1,2-dichloroethylene is processed into the cleaning agent).

E.24 Consumer Use – Propellants, Non-Motive (Blowing Agent) – Polymer Foam

This condition of use refers to the consumer use of *trans*-1,2-dichloroethylene in the application of polymer foam as an aerosol spray. This condition of use includes *trans*-1,2-dichloroethylene in the use of foam-containing articles after they are produced. This is a use of *trans*-1,2-dichloroethylene after it has already been incorporated into the propellant, foam blowing additive, or blowing agent as opposed to when it is used upstream, (e.g., when *trans*-1,2-dichloroethylene is processed into the propellant, foam blowing additive, blowing agent, or article).

E.25 Disposal

Each of the conditions of use of *trans*-1,2-dichloroethylene may generate waste streams of the chemical that are collected and transported to third-party sites for disposal, treatment, or recycling. For purposes of the *trans*-1,2-dichloroethylene risk evaluation, this condition of use refers to the *trans*-1,2-dichloroethylene in a waste stream that is collected from facilities and commercial sites and is unloaded at and treated or disposed at third-party sites. This condition of use also encompasses *trans*-1,2-dichloroethylene contained in wastewater discharged by occupational users to a POTW or other, non-POTW for treatment, as well as other wastes. *trans*-1,2-Dichloroethylene is expected to be released to other environmental media, such as migration to water sources, or through waste disposal (e.g., disposal of formulations containing *trans*-1,2-dichloroethylene or transport containers). Disposal may also include destruction and removal by incineration. Recycling of *trans*-1,2-dichloroethylene and *trans*-1,2-dichloroethylene-containing products is considered a different condition of use. Environmental releases from manufacturing and processing sites that treat or dispose onsite waste are assessed under each of those respective conditions of use. Legacy disposal of parent chemicals that may anaerobically biodegrade into *trans*-1,2-dichloroethylene (e.g., 1,1,2-trichloroethane and 1,1,2,2-tetrachloroethane) are not assessed under this condition of use. For additional information on how EPA considered transformation products of parent chemicals into *trans*-1,2-dichloroethylene, see Section 3.3.3 of this draft risk evaluation.

Appendix F DRAFT OCCUPATIONAL EXPOSURE VALUE DERIVATION AND ANALYTICAL METHODS USED TO DETECT *trans*-1,2-DICHLOROETHYLENE

Based on the available hazard and exposure profile for *trans*-1,2-dichloroethylene, EPA has calculated an 8-hour time-weighted average (TWA) existing chemical occupational exposure value (OEV) to summarize the OES and health endpoints into a single value. This calculated value may be used to support risk management efforts for *trans*-1,2-dichloroethylene under TSCA section 6(a), 15 U.S.C. 2605. EPA calculated the draft OEV rounded to 0.63 ppm (2.5 mg/m³) for inhalation exposures to *trans*-1,2-dichloroethylene as an 8-hour TWA and for consideration in workplace settings (see Appendix F.1 below) based on the chronic non-cancer human equivalent concentration (HEC) for decreased humoral immune response.

EPA expects that at the draft occupational exposure value of 0.63 ppm (2.5 mg/m³) for chronic exposure, workers and occupational non-users also would be protected against decreased humoral immune response and ocular irritation resulting from acute and intermediate occupational exposures. The acute exposure value of 66.7 ppm is unchanged for all durations of a single exposure and can also serve as a potential short-term exposure value (STEV) to protect against 15-minute exposures (see Appendix F.3 below for details).

TSCA requires risk evaluations to be conducted without consideration of cost and other non-risk factors, and thus this occupational exposure value represents a value that was determined with only risk considerations. If risk management for *trans*-1,2-dichloroethylene is implemented following the final risk evaluation, EPA may consider cost and other non-risk factors, such as technological feasibility, the availability of alternatives, and the potential for critical or essential uses. Any existing chemical exposure limit (ECEL) used for occupational safety risk management purposes could differ from the draft occupational exposure values presented in this appendix based on additional consideration of exposures and non-risk factors consistent with TSCA section 6(c).

This calculated draft OEV represents the exposure concentration below which exposed workers and occupational non-users are not expected to exhibit any appreciable risk of adverse toxicological outcomes. This value also accounts for PESS. The values are derived based on EPA's evaluation of the best available science associated with deriving human health benchmarks for *trans*-1,2-dichloroethylene. This draft OEV is expressed relative to benchmarks and standard occupational scenario assumptions of 8 hours per day, 5 days per week exposures, for a total of 250 days exposure per year and a 40-year working life.

All draft hazard values used in these calculations are based on non-cancer HECs and associated uncertainty factor derivations from the *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026w](#)). Of the identified occupational monitoring data for *trans*-1,2-dichloroethylene, there have been measured workplace air concentrations below the calculated exposure value for all OES, indicating that the draft OEV can be achieved and measured. A summary table of available monitoring methods from the Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH), and EPA is included in Appendix F.2. The table presents validated methods from governmental agencies and is not intended to be a comprehensive list of available air monitoring methods for *trans*-1,2-dichloroethylene. The calculated exposure value is above the limit of detection (LOD) and limit of quantification (LOQ) using at least one of the monitoring methods identified.

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OSHA has set a permissible exposure limit (PEL) as an 8-hour TWA for an isomer mixture of 1,2-dichloroethylene of 200 ppm (29 CFR 1910.1000, Table Z-1; see also <https://www.osha.gov/annotated-pels>; accessed August 20, 2026), established in 1971. The PEL for 1,2-dichloroethylene was established in 1971 based on the American Conference of Governmental Industrial Hygienist's (ACGIH) 1968 to 1970 list of Threshold Limit Values (TLVs). See 36 FR 10466, 10503-04 (May 29, 1971); 79 FR 613834, 61388 (October 10, 2014). The PEL has not been updated since that time. Any update to OSHA's PEL must undergo both risk assessment and feasibility assessment analyses before OSHA selects a level that will substantially reduce risk under the Occupational Safety and Health Act. EPA's calculated exposure value is a lower value than the OSHA PEL and is based on newer information and analysis from this draft risk evaluation.

Other governmental agencies and independent groups have also set recommended exposure limits established for mixed isomers of 1,2-dichloroethylene. ACGIH most recently in 1990 re-issued the TLV at the same 200 ppm TWA (<https://www.acgih.org/12-dichloroethylene/>; accessed August 20, 2026). This chemical also has a NIOSH Recommended Exposure Limit (REL) of 200 ppm TWA (<https://www.cdc.gov/niosh/npg/>; accessed August 20, 2026), and a 30-minute Immediately Dangerous to Life or Health (IDLH) value of 1,000 ppm. For additional regulatory exposure limits from U.S. states and other countries, see Table_Apx F-1.

Table_Apx F-1. Summary of Occupational Exposure Limits for *trans*-1,2-Dichloroethylene Compared to Proposed OEV/STEV

State/Country/ Region	Limit Value (8-hour TWA)		Short-Term/ Ceiling (15-minute)		Notes / Reference
	ppm	mg/m ³	ppm	mg/m ³	
U.S. EPA [Proposed Non-Regulatory Values]	0.63	2.5	66.7	264.3	- Values derived in this draft risk evaluation (not considered regulatory limits).
California	200	794	—	—	Source: Cal/OSHA Table AC-1 in 8 CCR §5155 ; accessed August 6 2026. Applies to isomer mixture; matches OSHA PEL.
Washington	200	794	250	993	Source: Washington Administrative Code at WAC 296-841-20025 ; accessed August 6 2026. Applies to isomer mixture; matches OSHA PEL.
Canada	200	794	—	—	Established by the Canadian Centre for Occupational Health and Safety, based on the ACGIH TLV (https://ccinfoweb2.ccohs.ca/legislation/documents/notes/oshleg/leg_tlv.htm ; accessed August 19, 2026).
Austria	200	—	800	—	Institute for Occupational Safety and Health of the German Social Accident Insurance (IFA) GESTIS (accessed August 20, 2026).
Belgium	200	—	—	—	
Denmark	200	—	—	—	
Finland	200	—	250	—	
Germany	200	—	400	—	
Ireland	200	—	—	—	
New Zealand	200	—	—	—	
Norway	100	—	—	—	
China	—	800	—	—	

State/Country/ Region	Limit Value (8-hour TWA)		Short-Term/ Ceiling (15-minute)		Notes / Reference
	ppm	mg/m³	ppm	mg/m³	
Poland	–	700	–	–	Institute for Occupational Safety and Health of the German Social Accident Insurance (IFA) GESTIS (accessed August 20, 2026).
Romania	50	–	76	–	
Singapore	200	–	–	–	
South Africa	400	–	–	–	
South Korea	200	–	–	–	
Spain	200	–	–	–	
Switzerland	100	–	200	–	
“–” indicates that no value is available.					

F.1 Occupational Exposure Value Calculations

This section presents the calculations used to estimate the draft occupational exposure values using inputs derived in this draft risk evaluation. Multiple values are presented below for hazard endpoints based on different exposure durations. For *trans*-1,2-dichloroethylene, the draft occupational exposure value is based on decreased humoral immune response following chronic exposures and the resulting 8-hour TWA is rounded to 0.63 ppm. The human HECs used in the equations are derived in this draft risk evaluation and the *Draft Human Health and Environmental Hazard Assessment for trans*-1,2-Dichloroethylene ([U.S. EPA, 2026w](#)).

Draft Chronic Non-Cancer Occupational Exposure Value (Most Protective)

The chronic occupational exposure value (EV_{chronic}) was calculated as the concentration for decreased humoral immune response at which the chronic MOE would equal the benchmark MOE for 8-hour chronic occupational exposures with the following equation:

$$EV_{\text{chronic}} = \frac{HEC_{\text{chronic}}}{\text{Benchmark } MOE_{\text{chronic}}} * \frac{AT_{HEC \text{ chronic}}}{ED * EF * WY} * \frac{IR_{\text{resting}}}{IR_{\text{workers}}}$$

$$= \frac{29.4 \text{ ppm}}{100} * \frac{\frac{24h}{d} * \frac{365d}{y} * 40 y * 0.6125 \frac{m^3}{hr}}{\frac{8h}{d} * \frac{250d}{y} * 40 y * 1.25 \frac{m^3}{hr}} = 0.631 \text{ ppm}$$

$$EV_{\text{chronic}} \left(\frac{mg}{m^3} \right) = \frac{EV \text{ ppm} * MW}{\text{Molar Volume}} = \frac{0.631 \text{ ppm} * 96.94 \frac{g}{mol}}{24.45 \frac{L}{mol}} = 2.50 \frac{mg}{m^3}$$

Where:

Molar Volume = 24.45 L/mol, the volume of a mole of gas at 1 atm and 25 °C
MW = Molecular weight of *trans*-1,2-dichloroethylene (96.94 g/mole)

Draft Acute Non-Cancer Occupational Exposure Value

The acute occupational exposure value (EV_{acute}) was calculated as the concentration at which the acute margin of exposure (MOE) would equal the benchmark MOE for acute occupational exposures using the

following equation. Because ocular irritation is a peak effect and is based on external air concentration, there is no adjustment for exposure duration or breathing rate. As a peak concentration effect, the EV_{acute} is more relevant as a STEV (Appendix F.3).

$$EV_{acute} = \frac{HEC_{acute}}{Benchmark\ MOE_{acute}} = \frac{2,000\ ppm}{30} = 66.67\ ppm = 264.3\ \frac{mg}{m^3}$$

Draft Intermediate Non-Cancer Occupational Exposure Value

The intermediate occupational exposure value ($EV_{intermediate}$) was calculated as the concentration at which the intermediate MOE would equal the benchmark MOE for intermediate occupational exposure using the following equation:

$$EV_{intermediate} = \frac{HEC_{intermediate}}{Benchmark\ MOE_{intermediate}} * \frac{AT_{HEC\ intermediate} * IR_{resting}}{ED * EF} \\ = \frac{29.4\ ppm}{30} * \frac{\frac{24h}{d} * 30d}{\frac{8h}{d} * 22d} * \frac{0.6125\ \frac{m^3}{hr}}{1.25\ \frac{m^3}{hr}} = 1.96\ ppm = 7.79\ \frac{mg}{m^3}$$

The parameters used in the above equations are described here. Numerical values chosen for the parameters are described in relevant sections of this draft risk evaluation and *Draft Human Health and Environmental Hazard Assessment for trans-1,2-Dichloroethylene* ([U.S. EPA, 2026w](#)).

Where:

$AT_{HEC_{chronic}}$	=	Averaging time for the POD/HEC used for evaluating non-cancer, chronic occupational risk, based on study conditions and/or HEC adjustments (24 hours/day for 365 days/year) and assuming the number of years matches the high-end working years (WY, 40 years) for a worker
$AT_{HEC_{intermediate}}$	=	Averaging time for the POD/HEC used for evaluating non-cancer, intermediate occupational risk, based on study conditions and/or any HEC adjustments (24 hours/day for 30 days)
$AT_{HEC_{acute}}$	=	Averaging time for the POD/HEC used for evaluating non-cancer, acute occupational risk, based on study conditions and/or any HEC adjustments (24 hours/day)
$Benchmark\ MOE_{chronic}$	=	Chronic non-cancer benchmark margin of exposure, based on the total uncertainty factor of 100
$Benchmark\ MOE_{intermediate}$	=	Intermediate non-cancer benchmark margin of exposure, based on the total uncertainty factor of 30
$Benchmark\ MOE_{acute}$	=	Acute non-cancer benchmark margin of exposure, based on the total uncertainty factor of 30
EV_{acute}	=	Draft occupational exposure value based on ocular irritation
$EV_{intermediate}$	=	Draft occupational exposure value based on decreased humoral immune response
$EV_{chronic}$	=	Draft occupational exposure value based on decreased humoral immune response
ED	=	Exposure duration (8 hours/day)

6315	EF	=	Exposure frequency (1 day for acute, 22 days/month for intermediate, 250 days/year for chronic)
6316			
6317	HEC _{acute, intermediate, or chronic}	=	Human equivalent concentration for acute, intermediate, or chronic occupational exposure scenarios
6318			
6319	IR	=	Inhalation rate (default is 1.25 m ³ /hours for workers and 0.6125 m ³ /hours for the general population at rest)
6320			
6321	WY	=	Working years per lifetime at the 95th percentile (40 years)
6322	Molar Volume	=	24.45 L/mol, the volume of a mole of gas at 1 atm and 25 °C
6323	MW	=	Molecular weight of <i>trans</i> -1,2-dichloroethylene (96.94 g/mole)
6324			
6325	<i>Unit conversion:</i>		
6326	1 ppm = 3.97 mg/m ³ (based on the molecular weight of 96.94 g/mol for <i>trans</i> -1,2-dichloroethylene)		

F.2 Summary of Air Sampling Analytical Methods Identified

EPA conducted a search to identify relevant NIOSH, OSHA, and EPA analytical methods used to monitor for the presence of *trans*-1,2-dichloroethylene in air (see Table_Apx F-2). This table presents validated methods from governmental agencies and is not intended to be a comprehensive list of available air monitoring methods for *trans*-1,2-dichloroethylene. The sources used for the search included the following:

1. NIOSH Manual of Analytical Methods ([NMAM](#)); 5th Edition; accessed August 20, 2026)
2. NIOSH [NMAM 4th Edition](#) (accessed August 20, 2026)
3. OSHA [Index of Sampling and Analytical Methods](#) (accessed August 20, 2026)
4. EPA [Environmental Test Method and Monitoring Information](#) (accessed August 20, 2026)

Table_Apx F-2. Limit of Detection (LOD) and Limit of Quantification (LOQ) Summary for Air Sampling Analytical Methods Identified for *trans*-1,2-Dichloroethylene

Air Sampling Analytical Methods	Year Published	LOD ^a	LOQ	Notes	Source
NIOSH Method 1003	2003 (Issue 3)	0.4–10 mg/m ³ (0.10–2.5 ppm)	1.0–26.0 mg/m ³ (0.26–6.4 ppm)	Method reports the LOD as 2.0 µg per sample and provides procedures for collecting air samples between 0.2 and 5 L with a flow rate of 0.01 to 0.2 L/min. The reported LOQ is 5.1 µg per sample.	NIOSH NMAM 4th Edition (accessed August 20, 2026)
Modified NIOSH Method 1003 ^b	N/A	0.055 mg/m ³ (0.014 ppm) Not provided	0.14 mg/m ³ (0.036 ppm) 0.11 mg/m ³ (0.028 ppm)	Monitoring data from test order submission used a modified NIOSH 1003 method. This LOD is for a passive badge 8-hour shift. This LOD is for an active sampling pump. Only LOQ was provided based on sampling results; LOD would be a lower concentration.	(Exponent, 2023)
OSHA Method 7 (Withdrawn)	1979 (Updated 2000)	N/A	N/A	As of September 2017, OSHA no longer uses or supports this method.	OSHA Index of Sampling and Analytical Methods (accessed August 20, 2026)

Air Sampling Analytical Methods	Year Published	LOD ^a	LOQ	Notes	Source
					August 20, 2026)
ppm = parts per million; ppb = parts per billion; ppt = parts per trillion ^a These sources cover a range of LODs and LOQs both below and above the most sensitive occupational exposure value. This method provides the LOD based on sample size. For a sample size range of 0.2–5L, the LOD would be 0.4–10 mg/m³. With multiple media changeouts, a lower LOD/LOQ could be achieved. ^b The modified method primarily used Assay Technology 525 TraceAir® II Organic Vapor Monitors (AT525 badges) with a flow rate of 75.8 mL/min. For 1 facility, an active sampling pump with charcoal tube media and flow rate of approximately 100 mL/min was used.					

F.3 Short-Term Occupational Exposure Value Derivation

EPA derived a draft acute exposure value (EV_{acute}) of 66.67 ppm (264.3 mg/mg³) based on ocular irritation resulting from acute exposure ([Hurtt et al., 1993](#)) with an uncertainty factor of 30. This endpoint is considered a peak concentration effect and was not duration-adjusted. Therefore, the draft EV_{acute} (rounded to 66.7 ppm), which was calculated by dividing the HEC of 2,000 ppm by the benchmark of 30, can also be applied directly as a potential 15-minute TWA STEV.

The draft occupational exposure value for *trans*-1,2-dichloroethylene is 0.631 ppm based on the chronic non-cancer HEC for decreased humoral immune response, as an 8-hour TWA assuming a typical 40-hour work week.