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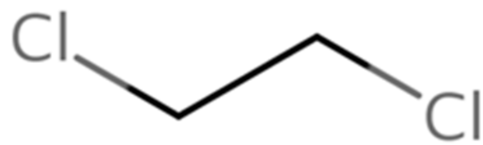
United States
Environmental Protection Agency

Risk Evaluation for 1,2-Dichloroethane

CASRN 107-06-2



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Docket

Supporting information can be found in the public docket, Docket ID EPA-HQ-OPPT-2018-0427.

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EXECUTIVE SUMMARY

Background

EPA evaluated the chemical 1,2-dichloroethane across its conditions of use (COUs) under section 6 of the Toxic Substances Control Act (TSCA), ranging from manufacture to disposal (see Table 1-1). In this risk evaluation, the Agency has determined that of 20 COUs, 15 significantly contribute to unreasonable risk of injury to workers and 12 to occupational non-users (ONUs[1]) from risks of cancer and non-cancer health effects. No COUs significantly contribute to unreasonable risk for consumers (including bystanders), the general population, or the environment.

Also known as ethylene dichloride, 1,2-dichloroethane is a volatile, colorless, and oily liquid with a chloroform-like odor that is primarily used in the synthesis of vinyl chloride; over 90% of produced 1,2-dichloroethane is converted to vinyl chloride (EPA-HQ-OPPT-2018-0427-0040). Although volatile, it is also soluble in water (up to its solubility limit of 8,600 mg/L) and is miscible in most organic solvents. 1,2-Dichloroethane is persistent in the environment and slowly degrades over months to years if released to air, water, soil, and sediment. Estimated bioconcentration and bioaccumulation factors indicate that 1,2-dichloroethane is not likely to bioaccumulate in aquatic or terrestrial organisms.

In December 2019, EPA designated 1,2-dichloroethane as a high-priority substance for TSCA evaluation and in August 2020 released the *Final Scope of the Risk Evaluation for 1,2-Dichloroethane; CASRN 107-06-2* (U.S. EPA, 2020c). This risk evaluation assesses human health risk to workers, including ONUs; consumers, including bystanders; and the general population exposed to 1,2-dichloroethane from environmental releases. It also assesses risk to the environment, including risk to aquatic and terrestrial species. Manufacturers report 1,2-dichloroethane production volumes through the Chemical Data Reporting (CDR) rule under the associated Chemical Abstracts Service Registry Number (CASRN) 107-06-02. The production volume, which includes imports for 1,2-dichloroethane between 2016 and 2019, ranged from 30 to 40 billion pounds (lbs) based on the 2020 CDR data (U.S. EPA, 2026bb). Review of 2024 CDR data shows that total production volume for the years 2020 to 2023 are similar to the previously reported range from the 2020 CDR.

Laboratory animal studies have been conducted to determine whether exposure to 1,2-dichloroethane can cause a range of non-cancer and cancer health effects and suggest that 1,2-dichloroethane can be harmful to people if they are exposed at sufficient levels. See the *Human Health Hazard Assessment for 1,2-Dichloroethane* (also called "human health assessment for 1,2-dichloroethane") that was released as a draft for public comment in July 2024 and independent peer review by the Science Advisory Committee on Chemicals (U.S. EPA, 2024f) in September 2024 as part of their review of the *Draft Risk Evaluation for 1,1-Dichloroethane* (U.S. EPA, 2024d). This risk evaluation reflects SACC and public comments received on the draft human health assessment for 1,2-dichloroethane (U.S. EPA, 2024c).

In this assessment, EPA evaluated whether manufacturing, processing, distribution in commerce, use, or disposal of 1,2-dichloroethane contributes to unreasonable risk of injury to human health or the environment under the COUs. Human or environmental exposure to 1,2-dichloroethane through uses that are not subject to TSCA (*e.g.,* tobacco smoke) were not specifically evaluated by the Agency in reaching its determination. This is because such uses are excluded from TSCA's definition of "chemical substance." Thus, conclusions in this evaluation that 15 COUs contribute to an unreasonable risk determination for 1,2-dichloroethane cannot be extrapolated to form conclusions about other uses of 1,2-dichloroethane that are not subject to TSCA and that the Agency did not evaluate.

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

EPA also evaluated risks resulting from exposure to the following byproducts produced during the manufacture of 1,2-dichloroethane (collectively referred to as "the byproducts"): 1,1-dichloroethane (CASRN 75-34-3), trichloroethylene (CASRN 79-01-6), perchloroethylene (CASRN 127-18-4), methylene chloride (CASRN 75-09-2), and carbon tetrachloride (CASRN 56-23-5). Although the manufacture of 1,2-dichloroethane also produces *trans*-1,2-dichloroethylene (CASRN 156-60-5) and 1,1,2-trichloroethane (CASRN 79-00-5) as byproducts, these chemicals will be assessed in forthcoming TSCA risk evaluations.[2]

As reported in multiple EPA databases,[3] 1,2-dichloroethane is released to air, surface waters (including sediments), and land and will partition between these environmental media. The Agency evaluated facility-specific or modeled releases to air, water, and land for each COU scenario and estimated potential exposures to the general population and environment. EPA also evaluated risks to workers and ONUs exposed to 1,2-dichloroethane in and near the workplace. For acute, intermediate, and chronic inhalation exposures, personal breathing zone (PBZ) inhalation monitoring data obtained through two test orders were used.[4] For dermal exposures, EPA also considered test order information.[5] The general population—specifically, people who reside near facilities that manufacture or process 1,2-dichloroethane—can be exposed when those facilities release 1,2-dichloroethane into the environment. EPA used chemical-specific data where available; however, surrogate data and modeling were used to characterize certain scenarios that lacked monitoring data (*e.g.,* industrial application of adhesives and sealants use of 1,2-dichloroethane). The Agency also assessed risk to consumers from 1,2-dichloethane-containing articles.

Determining Unreasonable Risk to Human Health

In TSCA existing chemical risk evaluations, EPA must determine whether a chemical substance under the COUs, does or does not present unreasonable risk of injury to human health or the environment. The unreasonable risk must be consistent with the best available science. The Agency, in determining whether 1,2-dichloroethane *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 (U.S. EPA, 2024e). Risk-related factors beyond the levels of 1,2-dichloroethane that can impact the unreasonable risk determination 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); population exposed (including any potentially exposed or susceptible subpopulations [PESS]); as well as EPA's confidence in the information used to inform the hazard and exposure values. These considerations are included as part of the evaluation of hazard and exposure to 1,2-dichloroethane. 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 1,2-dichloroethane under TSCA is both case-by-case and context-driven. EPA

[2] Hazards values for these chlorinated solvents are still under review and will be included in separate draft risk evaluations for *trans*-1,2-dichloroethylene and 1,1,2-trichloroethane.
[3] EPA compiled release data for 1,2-dichloroethane from TRI (Toxics Release Inventory), NEI (National Emissions Inventory), and DMR (Discharge Monitoring Reports) during the 2015 to 2020 timeframe. Preliminary review of the 2021 to 2023 TRI, 2021 to 2025 DMR, and 2020 NEI release data indicates that releases are generally on the same order of magnitude as the 2015 to 2020 releases.
[4] TSCA section 4(a)(2)(A)(i) allows the EPA to impose testing requirements via "rule, order, or consent agreement" whenever new information "is necessary" in order to perform a risk evaluation (15 U.S.C. 2603(a)(2)(A)(i)). The Agency issued a test order for 1,2-dichloroethane on January 14, 2021 (Stantec ChemRisk, 2024). EPA also received inhalation monitoring data from the test order submission for 1,1-dichloroethane manufactured as a byproduct in the manufacture of 1,2-dichloroethane (Stantec ChemRisk, 2023).
[5] EPA received additional data on dermal exposure from the same test order for 1,2-dichloroethane (Labcorp Early Development, 2024).

considers all of the aforementioned risk-related factors when making a determination of whether a COU under TSCA significantly contributes to unreasonable risk.

To determine whether 1,2-dichloroethane presents an unreasonable risk of injury to human health, EPA considered the following PESS in its assessment: infants exposed to drinking water during formula bottle feeding, subsistence and tribal fishers, males of reproductive age, individuals with preexisting conditions such as chronic kidney disease, people with the CYP2E1 and aldehyde dehydrogenase-2 polymorphisms, lifestyle factors such as smoking cigarettes or secondhand smoke, and fenceline communities. These subpopulations are PESS because some have greater exposure to 1,2-dichloroethane per body weight (*e.g.,* infants, children, adolescents) while others can experience exposure from multiple sources, higher exposures than others, or exhibit greater biological susceptibility than the general population. Although variability in susceptibility across the human population is likely, EPA did not identify specific human groups that are expected to be more susceptible to cancer or non-cancer effects following 1,2-dichloroethane exposure; however, it should be noted that the Agency used an uncertainty factor (UF) of 10 to account for human variability that would include the PESS identified above.

The Agency assessed risks to people exposed to 1,2-dichloroethane at work, indoors, and outdoors using a combination of screening level and more refined approaches. EPA evaluated reasonably available information for human health hazards from 1,2-dichloroethane, including the following:

- non-cancer renal effects in workers from acute, intermediate, and chronic dermal exposure;
- non-cancer olfactory effects from acute inhalation exposure;
- non-cancer male reproductive effects from intermediate and chronic inhalation exposure; and
- cancer risk for tumors.

Workers with the greatest potential for exposure are those who work directly with the chemical in environments where 1,2-dichloroethane is manufactured, processed, or disposed of.

EPA considered the weight of scientific evidence to determine confidence levels in underlying datasets and risk estimates of 1,2-dichloroethane for human health (Section 5.3.8). For the general population, the Agency has slight[6]-to-robust confidence in inhalation risk estimates from ambient air. EPA has robust confidence in the modeling methods used for estimating inhalation risks to the general population, and robust confidence that these methods resulted in the best available modeling estimates based on the inputs used. In general, for inhalation risk estimates to the general population, the Agency has robust confidence that the risk estimates are representative of high-end exposures to actual exposed populations when there are facility-reported release data from multiple reporting databases (Toxics Release Inventory and NEI), moderate confidence where there was data from only one database, and low confidence for the occupational exposure scenario (OES) where the Agency relied only on EPA-estimated releases from generic facilities/sites.

The Agency has robust confidence in oral and dermal risk estimates from other pathways (drinking water intake, fish ingestion, and incidental ingestion via swimming and pica[7] of soil; Section 5.3.8.2) and that these estimates represent the high-end risk and are protective of highly exposed populations. For workers, EPA has slight-to-robust confidence in the risk estimates calculated for inhalation exposure scenarios, moderate confidence in the risk estimates for non-cancer dermal exposure scenarios, and slight-to-moderate confidence in the risk estimates for cancer dermal exposure scenarios—depending on

[6] EPA has slight confidence in inhalation risk estimates from ambient air for the Commercial aerosol products occupational exposure scenario (OES).
[7] Pica is characterized by the persistent craving and ingestion of non-nutritive substances like soil.

the source of data for each COU (Section 5.3.8.2). For consumers, EPA has robust confidence in the risk estimates calculated for inhalation, ingestion, and dermal exposure scenarios and robust confidence that the consumer exposure scenarios represent a conservative upper bound on exposure (Section 5.3.8.4).

Determining Unreasonable Risk to the Environment

In determining whether 1,2-dichloroethane presents an unreasonable risk of injury to the environment, EPA considered the following groups of organisms in its assessment: aquatic vertebrates, invertebrates, plants, and algae; benthic and soil invertebrates; and terrestrial mammals, birds, and plants. Specifically, the Agency assessed 1,2-dichloroethane exposures to the environment through the manufacturing, processing, use, or disposal of 1,2-dichloroethane. Exposure to aquatic species was evaluated through surface water and sediment, whereas exposure to terrestrial species was evaluated through soil, surface water, and sediment. To characterize benthic environmental hazard, EPA used 1,1-dichloroethane, 1,2-dichloropropane, and 1,1,2-trichloroethane as chemical analogs for 1,2-dichloroethane.

The Agency weighed the scientific evidence to determine confidence levels in underlying datasets and risk estimates for the environment (Section 4.3). EPA has moderate-to-robust confidence that its environmental risk estimates represent levels of exposure at which ecologically relevant effects will occur, depending on the source of environmental release information for each COU (Section 4.3.5). The Agency did not identify significant contributions to unreasonable risk to the environment for 1,2-dichloroethane for any COU.

Summary, Considerations, and Next Steps

EPA has determined that of the 20 COUs evaluated for 1,2-dichloroethane, 15 COUs significantly contribute to unreasonable risk of injury to human health.

EPA evaluated 19 COUs of 1,2-dichloroethane with exposures to workers (the Consumer use – Plastic and rubber products COU was evaluated for consumers but not for workers) and ONUs. The Agency has determined that 15 COUs significantly contribute to unreasonable risk of 1,2-dichloroethane driven by non-cancer health effects and cancer risk to workers from inhalation and dermal exposures. Of these 15 workplace COUs, 12 significantly contribute to unreasonable risk of 1,2-dichloroethane due to inhalation risks to ONUs. Table ES-1 (below) indicates the COUs where EPA identified significant contributions to unreasonable risk of non-cancer health effects and cancer risk to workers and ONUs by 1,2-dichloroethane exposure route and duration.

Again, no 1,2-dichloroethane COUs significantly contribute to unreasonable risk for consumers (including bystanders), the general population, or the environment.

EPA has determined that the following five COUs do not contribute significantly to unreasonable risk of injury to human health (*i.e.*, workers, ONUs, consumers, and general population in proximity to 1,2-dichloroethane-releasing facilities):

- Distribution in commerce;
- Industrial use – Functional fluids (closed systems) – Heat transferring agent;
- Commercial use – Plastic and rubber products;
- Commercial use – Fuels and related products; and
- Consumer use – Plastic and rubber products.

Based on the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j), the Agency has considered the risk (*i.e.,* human health and environmental risks related to exposures to byproducts) and concluded that, based on the reasonably available information, the risk identified in the byproducts assessment did not change the risk determination for the Manufacturing – Domestic manufacture COU.

The *Draft Human Health Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2024c) was peer reviewed by the SACC in September 2024 as part of their review of the *Draft Risk Evaluation for 1,1-Dichloroethane* (U.S. EPA, 2024d). Recommendations from the SACC and public commenters on both the draft human health assessment for 1,2-dichloroethane and draft 1,1-dichloroethane risk evaluation were used to inform this assessment of 1,2-dichloroethane. In this risk evaluation, the Agency has determined that 1,2-dichloroethane presents unreasonable risk of injury to human health. As a next step, EPA will initiate risk management for 1,2-dichloroethane by applying one or more of the requirements under TSCA section 6(a) to the extent necessary so that 1,2-dichloroethane no longer presents an unreasonable risk.

Table ES-1. Conditions of Use of 1,2-Dichloroethane Contributing to a Determination of Unreasonable Risk to Human Health

Condition of Use	Workers								ONUs			
	Inhalation				Dermal[a]				Inhalation			
	Non-Cancer			Lifetime Cancer	Non-Cancer			Lifetime Cancer	Non-Cancer			Lifetime Cancer
	A	I	C		A	I	C		A	I	C	
Manufacturing – Domestic manufacture	×	×	×	×				×	×	×		×
Manufacturing – Import	×	×		×				×	×	×		×
Processing – As a reactant – Intermediate in: Petrochemical manufacturing; Plastic material and resin manufacturing; All other basic organic chemical manufacturing; All other basic inorganic chemical manufacturing	×	×		×				×				
Processing – Incorporated into a formulation, mixture, or reaction product – Fuels and fuel additives: All other petroleum and coal products manufacturing	×	×		×				×				×
Processing – Incorporated into a formulation, mixture, or reaction product – Processing aids: Specific to petroleum production; Plastics material and resin manufacturing	×	×		×				×				×
Processing – Incorporated into a formulation, mixture, or reaction product – Adhesives and sealants; Lubricants and greases; Oxidizing/reducing agents; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing	×	×		×				×				×
Processing – Repackaging	×	×		×				×	×	×		×
Processing – Recycling	×	×		×				×				
Distribution in commerce												
Industrial use – Adhesives and sealants	×	×	×	×				×	×	×	×	×
Industrial use – Functional fluids (closed systems) – Heat transferring agent												
Industrial use – Lubricants and greases – Solid film lubricants and greases	×	×	×	×					×	×	×	×
Industrial use – Other use – Process solvent	×	×		×				×				×
Industrial use – Process regulator – *e.g.,* Catalyst moderator, oxidation inhibitor	×	×		×				×				
Industrial use – Solvents (for cleaning and degreasing) – Degreasing and cleaning solvents	×	×	×	×				×	×	×	×	×
Commercial use – Plastic and rubber products												
Commercial use – Fuels and related products												
Commercial use – Other use – Laboratory chemical	×	×	×	×	×			×				×

Condition of Use	Workers								ONUs			
	Inhalation				Dermal[a]				Inhalation			
	Non-Cancer			Lifetime Cancer	Non-Cancer			Lifetime Cancer	Non-Cancer			Lifetime Cancer
	A	I	C		A	I	C		A	I	C	
Consumer use – Plastic and rubber products												
Disposal	×			×				×				×

ONU = occupational non-user
[a] Dermal exposure was not assessed for ONUs.
Shaded cells with × are COUs that significantly contribute to a determination of unreasonable risk of injury for workers and/or ONUs.

1 INTRODUCTION

EPA has evaluated 1,2-dichloroethane (CASRN 107-06-2), also known as ethylene dichloride, pursuant to section 6(b) of the Toxic Substances Control Act (TSCA). 1,2-Dichloroethane is used primarily in the synthesis of vinyl chloride—over 90% of produced 1,2-dichloroethane is converted to vinyl chloride (EPA-HQ-OPPT-2018-0427-0040). Section 1.1 summarizes the scope of this 1,2-dichloroethane risk evaluation and provides information on production volume and a life cycle diagram (LCD). Section 1.2 provides the conditions of use (COUs) under TSCA, conceptual models used for 1,2-dichloroethane, and populations and durations of exposure assessed; Section 1.3 includes an overview of the systematic review process. This risk evaluation also includes the following major sections and a total of 11 appendices:

- Section 2 summarizes basic physical and chemical characteristics as well as the fate and transport of 1,2-dichloroethane.
- Section 3 includes an overview of releases and concentrations of 1,2-dichloroethane in the environment.
- Section 4 provides a discussion and analysis of the environmental risk assessment, including the environmental exposure, hazard, and risk characterization based on the COUs.
- Section 5 presents the human health risk assessment, including the exposure, hazard, and risk characterization for 1,2-dichloroethane.
- Section 6 presents EPA's determination of whether 1,2-dichloroethane presents an unreasonable risk to human health or the environment under the assessed COUs.

Figure 1-1 describes the major inputs, phases, and outputs/components of the TSCA risk evaluation process, from scoping to releasing the final risk evaluation.

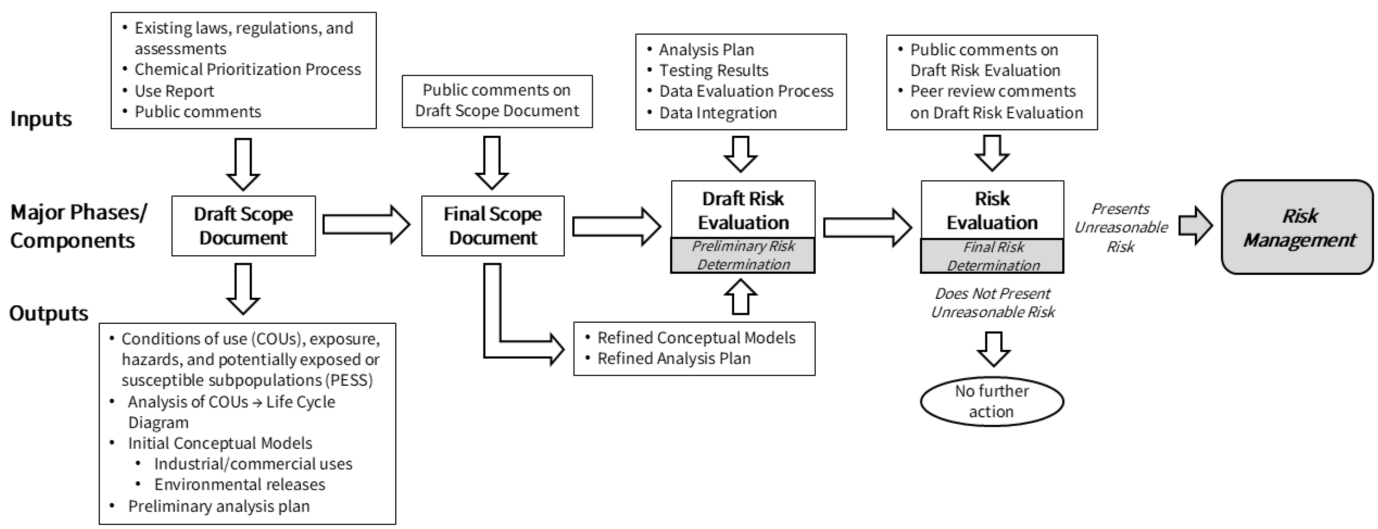

Figure 1-1. TSCA Existing Chemical Risk Evaluation Process

1.1 Scope of the Risk Evaluation

EPA evaluated risk to human and environmental populations for 1,2-dichloroethane. Specifically, for human populations, the Agency evaluated risk to (1) workers and occupational non-users (ONUs; workers who do not directly handle chemicals but may be indirectly exposed in the workplace) via inhalation and workers via dermal routes; (2) consumers via inhalation, dermal, and oral routes; and (3) the general population, including potentially exposed or susceptible subpopulations (PESS; infants exposed to drinking water during formula bottle feeding, subsistence and tribal fishers, men of reproductive age, individuals with preexisting conditions such as chronic kidney disease, people with the

CYP2E1 and aldehyde dehydrogenase-2 polymorphisms, lifestyle factors such as smoking cigarettes or secondhand smoke, and fenceline communities) via oral, dermal, and inhalation routes. For environmental populations, EPA evaluated risk to aquatic species via surface water and sediment and to terrestrial species via air (deposition to soil), surface water, sediment, and soil pathways leading to dietary and direct ingestion exposure.

The 1,2-dichloroethane risk evaluation comprises a series of technical support documents (TSDs) and supplemental files. Each TSD contains an assessment with sub-assessments that inform adjacent, "downstream" TSDs. A basic diagram showing the layout and relationship of these assessments to the risk evaluation is provided below in Figure 1-2. High-level summaries of each relevant TSD are presented throughout this risk evaluation. Detailed information for each TSD can be found in the corresponding documents. Appendix C incudes a list and citations for all TSDs and supplemental files included in the risk evaluation for 1,2-dichloroethane.

The TSDs leveraged the data and information sources already identified in *Final Scope of the Risk Evaluation for 1,2-Dichloroethane; CASRN 107-06-2* (also called the "final scope document" or "final scope") (U.S. EPA, 2020c). EPA's OPPT conducted a comprehensive search for reasonably available information to identify relevant 1,2-dichloroethane data for use in this risk evaluation as required by TSCA. The approach used to identify specific relevant risk assessment information was discipline-specific and is detailed in the *Risk Evaluation for 1,2-Dichloroethane – Systematic Review Protocol* (also called the "1,2-dichloroethane systematic review protocol") (U.S. EPA, 2026bi), or as otherwise noted in relevant TSDs.

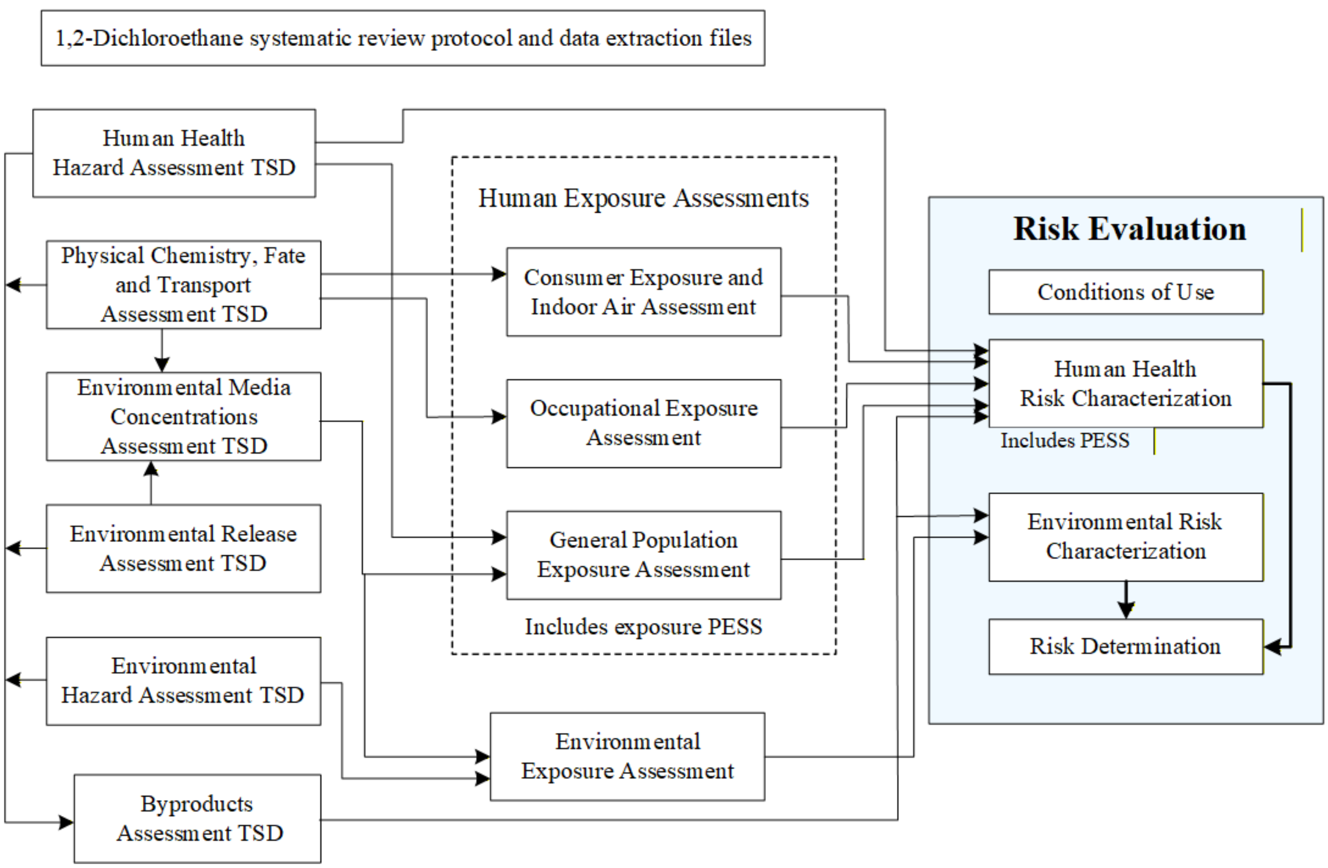

Figure 1-2. Risk Evaluation for 1,2-Dichloroethane Document Summary Map

1.1.1 Life Cycle and Production Volume

The LCD for 1,2-dichloroethane (see Figure 1-3) depicts the COUs assessed in this risk evaluation during various life cycle stages, including manufacturing, processing, distribution, use (industrial, commercial, and consumer), 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 uses). The CDR Rule under TSCA 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 2006, 2012, 2016, 2020, and 2024.

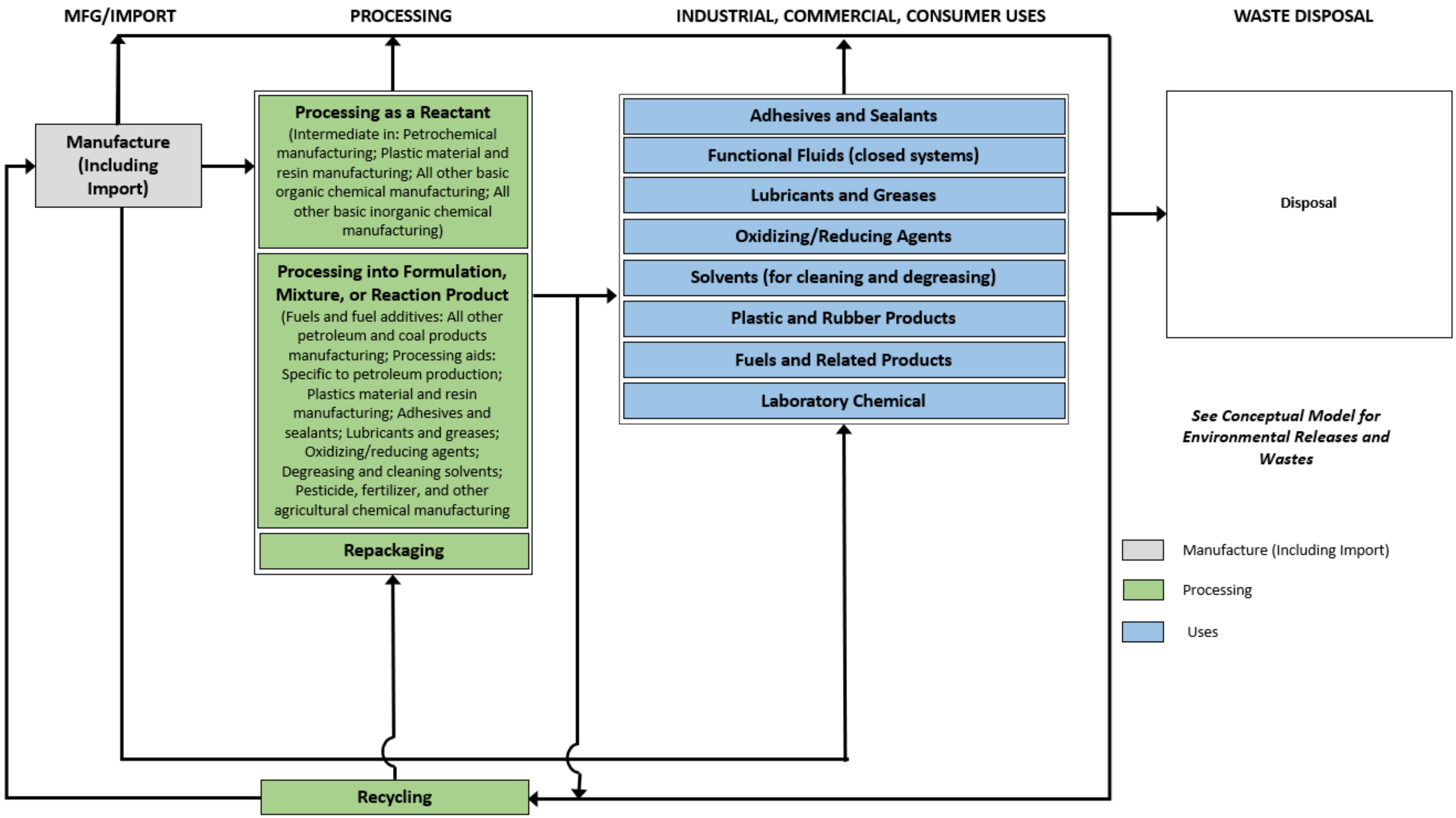

Figure 1-3. 1,2-Dichloroethane Life Cycle Diagram

See Table 1-1 below for categories and subcategories of COUs. 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 occupational exposure scenario (OES).

EPA included descriptions of the industrial, commercial, and consumer use categories identified from the 2020 CDR in the LCD (Figure 1-3) (U.S. EPA, 2020a). The descriptions provide a brief overview of the use category. The *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae) and *Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026aw) contain more detailed descriptions (*e.g.,* process descriptions, worker activities, process flow diagrams, equipment illustrations) for each manufacture, processing, use, and disposal category.

The production volume for 1,2-dichloroethane in 2015 was between 20 and 30 billion pounds (lbs), based on the 2016 CDR data. The range increased in the latest 2020 CDR data (the reported total production volume in 2019 was between 30–40 billion lbs). Review of 2024 CDR data shows that that total production volume for the years 2020 to 2023 are similar to the previously reported range from 2020 CDR. Note that production volume is described herein as a range to protect production volumes that were claimed as confidential business information (CBI). For the 2016, 2020, and 2024 CDR cycles, collected data included the company name, volume of each chemical manufactured/imported, the number of workers at each site, and information on whether the chemical was 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. All COUs for 1,2-dichloroethane included in this risk evaluation are reflected in the LCD (Figure 1-3) and conceptual models provided in Section 1.2.1. Table 1-1 presents all COUs for 1,2-dichloroethane.

A complete list of updates and explanations of the updates made to COUs for 1,2-dichloroethane from the final scope document to this risk evaluation is provided in Appendix D. Minor changes were made to COU descriptions (see Appendix D.1) between the draft and final risk evaluations. Table 1-1 presents the revised COUs that were included and evaluated in this risk evaluation for 1,2-dichloroethane. Appendix E contains summary descriptions of each COU.

Table 1-1. Conditions of Use in the Risk Evaluation for 1,2-Dichloroethane

Conditions of Use			Reference(s)
Life Cycle Stage [a]	**Category [b]**	**Subcategory [c]**	
Manufacturing	Domestic manufacture [d]	Domestic manufacture	2012, 2016, 2020, 2024 CDR data
	Import	Import	2012, 2016, 2020, 2024 CDR data
Processing	Processing – As a reactant	Intermediate in: Petrochemical manufacturing; Plastic material and resin manufacturing; All other basic organic chemical manufacturing; All other basic inorganic chemical manufacturing	2012, 2016, 2020, 2024 CDR data; EPA-HQ-OPPT-2018-0427-0006; EPA-HQ-OPPT-2018-0427-0015; EPA-HQ-OPPT-2018-0427-0065
	Processing – Incorporated into formulation, mixture, or reaction product	Fuels and fuel additives: All other petroleum and coal products manufacturing	2012, 2016, 2020, 2024 CDR data; EPA-HQ-OPPT-2018-0427-0006; EPA-HQ-OPPT-2018-0427-0015
		Processing aids: Specific to petroleum production; Plastics material and resin manufacturing	2012, 2016, 2020, 2024 CDR data; EPA-HQ-OPPT-2018-0427-0065
		Adhesives and sealants; Lubricants and greases; Process regulators; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing	2012, 2016, 2020, 2024 CDR data; (Frigid Fluid Company, 2015)
	Repackaging	Repackaging	
	Recycling	Recycling	2012, 2016, 2020, 2024 CDR data
Distribution in commerce	Distribution in commerce	Distribution in commerce	
Industrial use	Adhesives and sealants	Adhesives and sealants	EPA-HQ-OPPT-2018-0427-0018
	Functional fluids (closed systems)	Heat transferring agent	(Baldwin Filters, 2015)
	Lubricants and greases	Solid film lubricants and greases	EPA-HQ-OPPT-2018-0427-0005
	Other use	Process solvent	BASF's 2022 TRI reporting at their Palmyra site
	Process regulator	*e.g.,* Catalyst moderator; Oxidation inhibitor	EPA-HQ-OPPT-2018-0427-0006; EPA-HQ-OPPT-2018-0427-0067
	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	EPA-HQ-OPPT-2018-0427-0005
Commercial use	Plastic and rubber products	Products such as plastic and rubber products	2012, 2016, 2020, 2024 CDR Data
	Fuels and related products	Fuels and related products	2012, 2016, 2020, 2024 CDR Data; ; EPA-HQ-OPPT-2018-0427-0006
	Other use	Laboratory chemical	(Thermo Fisher, 2012)
Consumer use	Plastic and rubber products	Plastic and rubber products	EPA-HQ-OAR-2002-0037-0203; EPA-HQ-OPPT-2018-0427-0040; (Doucette et al., 2010)

Conditions of Use			Reference(s)
Life Cycle Stage [a]	Category [b]	Subcategory [c]	
Disposal	Disposal	Disposal	

[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.

[b] These categories of COUs appear in the LCD reflect CDR codes and broadly represent COUs of 1,2-dichloroethane in industrial and/or commercial settings.

[c] These subcategories reflect more specific COUs of 1,2-dichloroethane.

[d] During the manufacture of 1,2-dichloroethane, the byproducts 1,1-dichloroethane (CASRN 75-34-3), trichloroethylene (CASRN 79-01-6), perchloroethylene (CASRN 127-18-4), methylene chloride (CASRN 75-09-2), and carbon tetrachloride (CASRN 56-23-5) are formed, and are assessed in this risk evaluation. The risk evaluation does not include the manufacture of 1,1,2-trichloroethane (CASRN 79-00-5) and *trans*-1,2-dichloroethylene (CASRN 156-60-5) as byproducts during the manufacture of 1,2-dichloroethane. Those exposures will be assessed in separate risk evaluations for 1,1,2-trichloroethane and *trans*-1,2-dichloroethylene, respectively. See also *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j).

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 1,2-dichloroethane. There is potential for exposures to workers via inhalation and dermal contact. There is also potential for exposures to ONUs via inhalation contact only because they are not expected to directly handle 1,2-dichloroethane. Although EPA considers the activities of loading and unloading of chemical products part of distribution in commerce, these activities were assessed as part of each COU's occupational exposure scenario (OES; see Table 3-2). The Agency's current approach for quantitively assessing releases and exposures for the remaining aspects of distribution in commerce consists of searching U.S. Department of Transportation (DOT) and National Response Center (NRC) data for incident reports pertaining to 1,2-dichloroethane distribution.

Figure 1-5 presents the conceptual model for 1,2-dichloroethane exposure pathways, exposure routes, and hazards due to consumer activities and uses. Figure 1-6 presents general population exposure pathways, exposure routes, and hazards for environmental releases and wastes, whereas Figure 1-7 presents the conceptual model for ecological exposures and hazards from environmental releases and wastes.

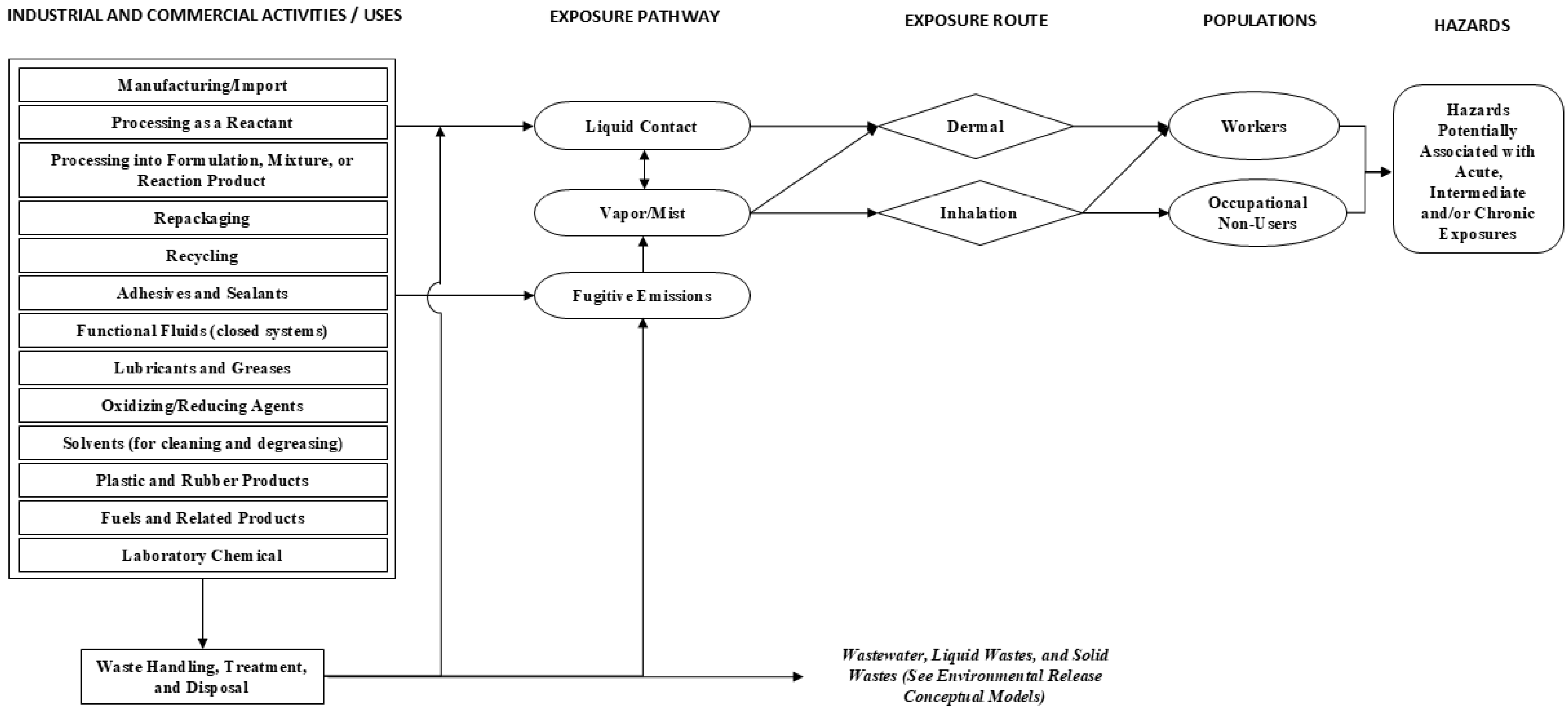

Figure 1-4. 1,2-Dichloroethane Conceptual Model for Industrial and Commercial Activities and Uses: Potential Exposure and Hazards

See Table 1-1 for categories and subcategories of COUs.

Notes: Fugitive air emissions are not routed through a stack and include fugitive equipment leaks from valves, pump seals, flanges, compressors, sampling connections and open-ended lines; evaporative losses from surface impoundment and spills; and releases from building ventilation systems.

Exposure can occur through mists that deposit in the upper respiratory tract; however, based on its physical and chemical properties, mists of 1,2-dichloroethane will likely be rapidly absorbed in the respiratory tract or evaporate and were evaluated as an inhalation exposure.

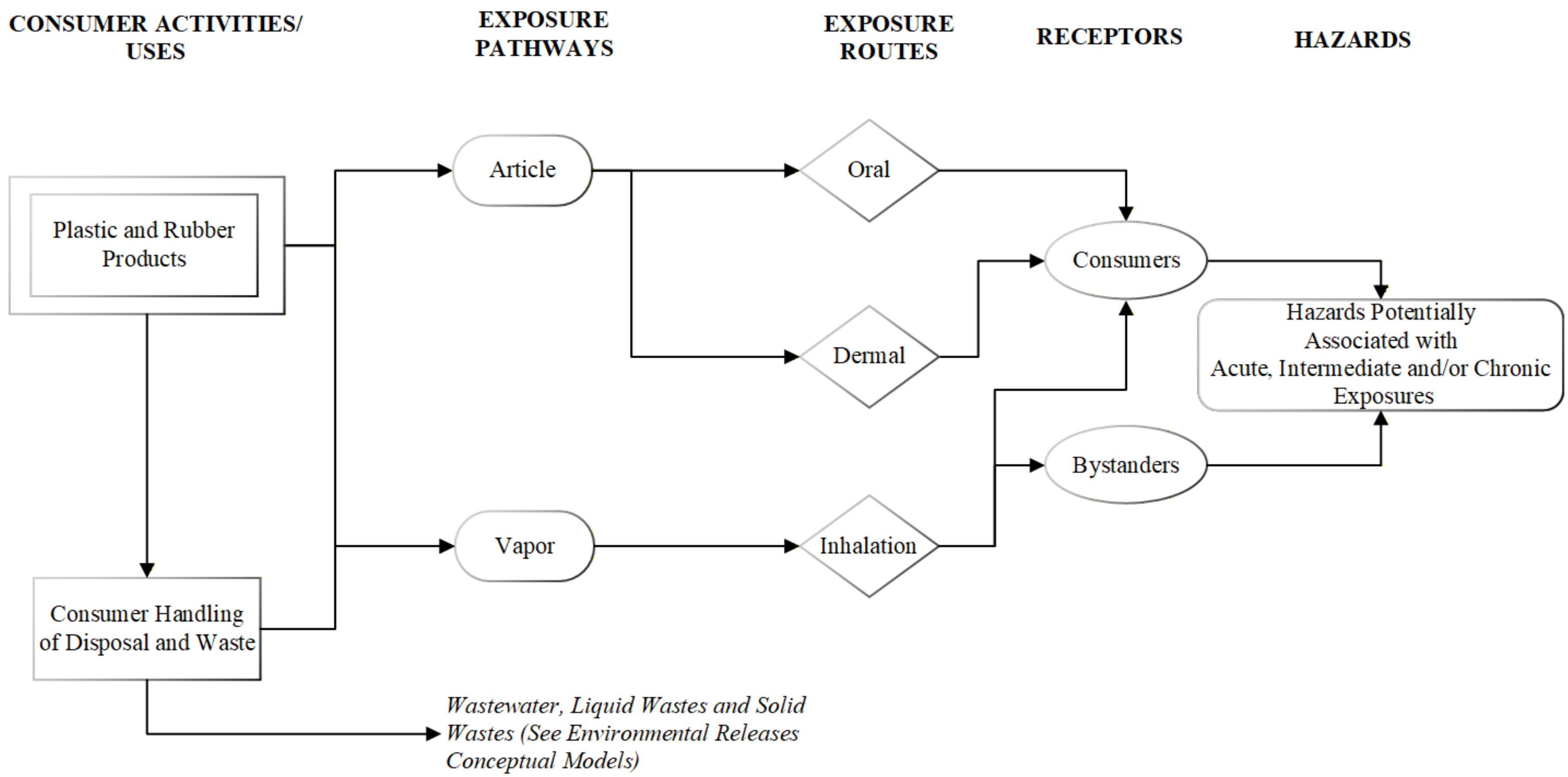

Figure 1-5. 1,2-Dichloroethane Conceptual Model for Consumer Articles: Consumer Exposures and Hazards
The conceptual model presents the exposure pathways, exposure routes, and hazards to human populations from consumer activities and uses of 1,2-dichloroethane.

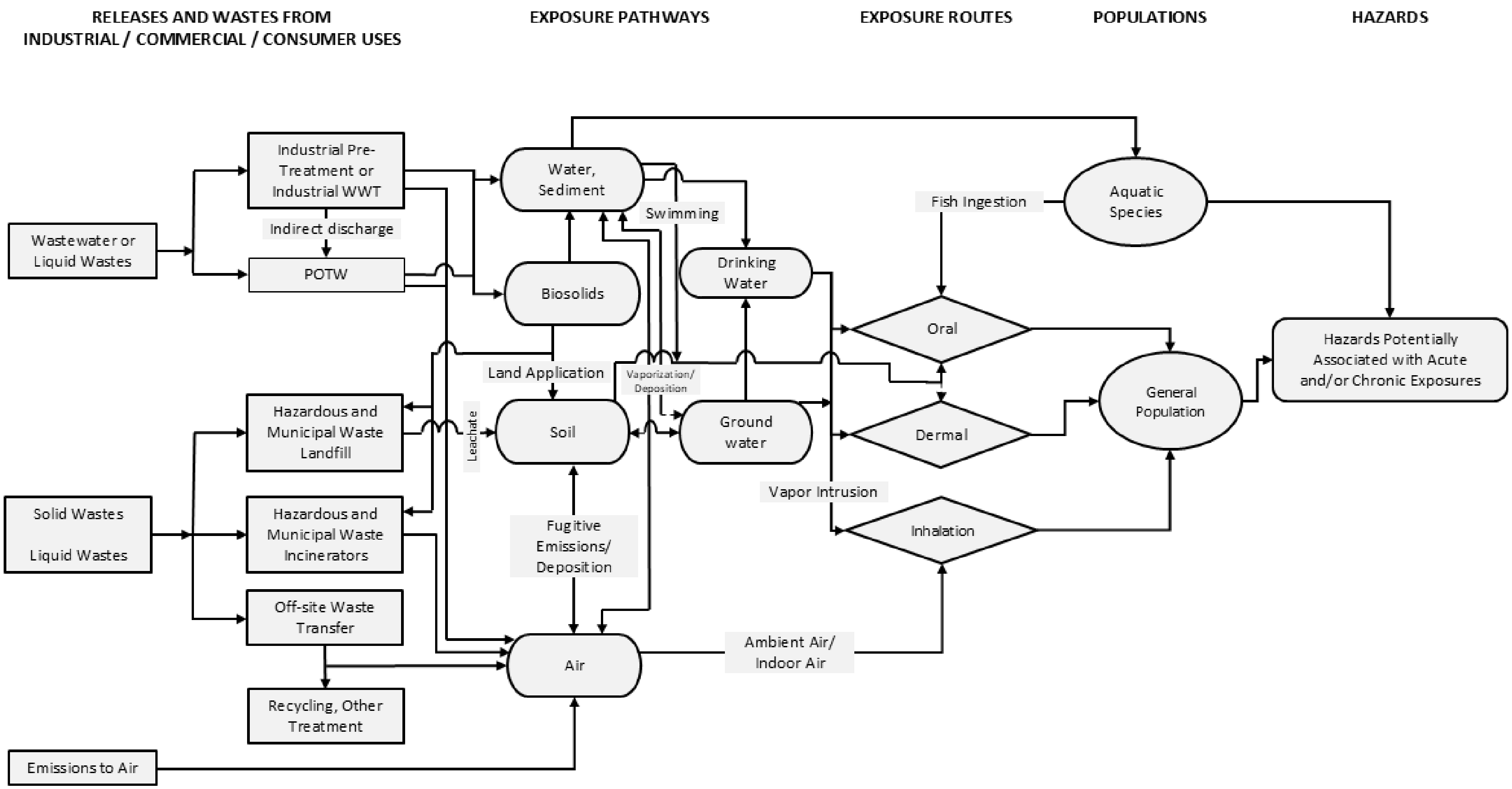

Figure 1-6. 1,2-Dichloroethane Conceptual Model for Environmental Releases and Wastes: General Population Exposures and Hazards

The conceptual model presents the exposure pathways, exposure routes, and hazards to human populations from releases and wastes from industrial, commercial, and consumer uses of 1,2-dichloroethane.

Notes: Industrial wastewater or liquid wastes may be treated on-site and then released to surface water (direct discharges) or pre-treated and released to a publicly owned treatment works (POTW) (indirect discharges). General population includes persons exposed to releases of 1,2-dichloroethane, including PESS such as infants exposed to drinking water from public drinking water treatment systems during formula bottle feeding; subsistence and tribal fishers; men of reproductive age; individuals with preexisting conditions such as chronic kidney disease; people with the CYP2E1 and aldehyde dehydrogenase-2 polymorphisms; lifestyle factors such as smoking cigarettes or secondhand smoke; and fenceline communities who live near facilities that release 1,2-dichloroethane.

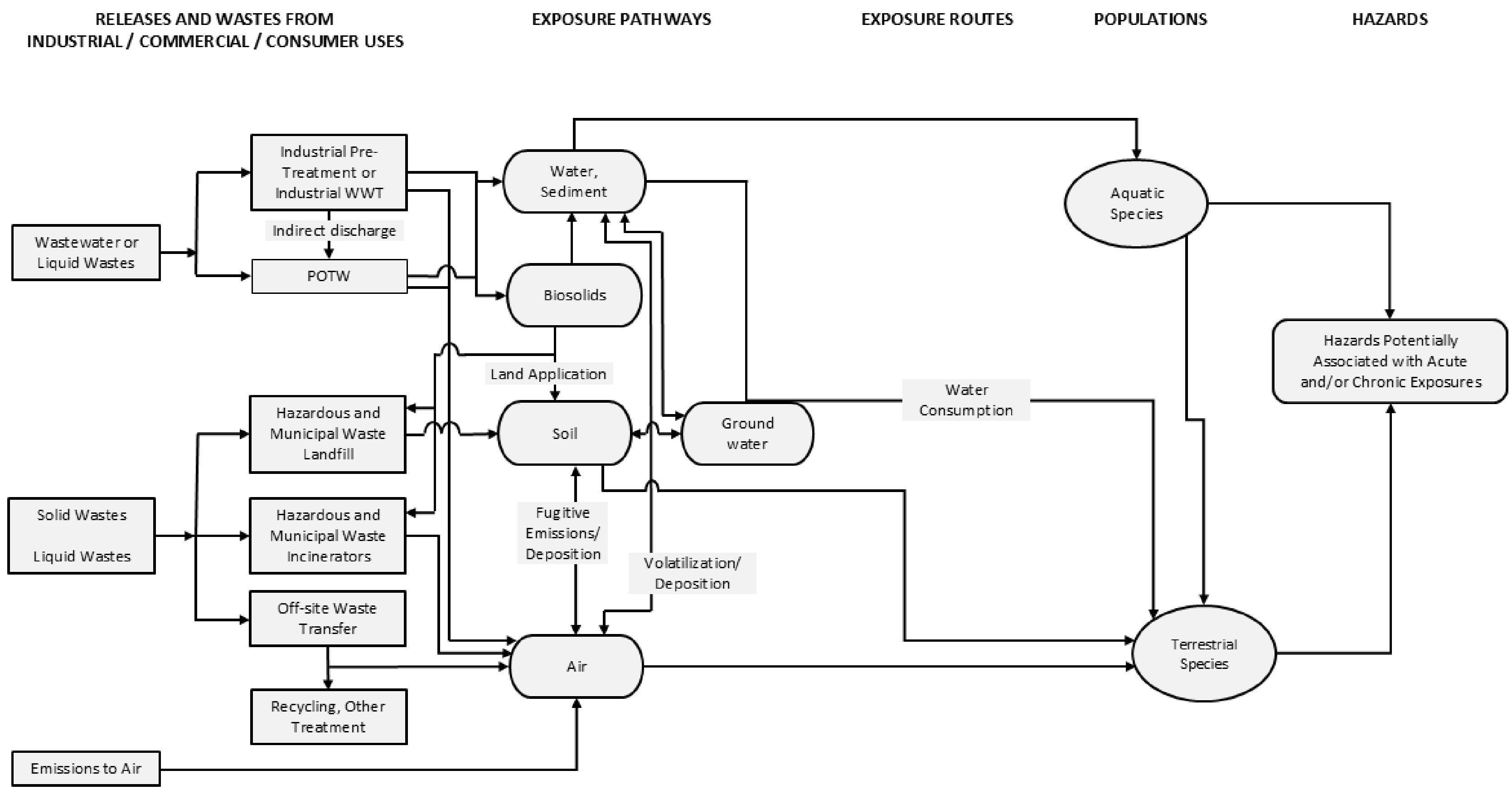

Figure 1-7. 1,2-Dichloroethane Conceptual Model for Environmental Releases and Wastes: Ecological Exposures and Hazards
The conceptual model presents the exposure pathways, exposure routes, and hazards to ecological populations from releases and wastes from industrial, commercial, and/or consumer uses of 1,2-dichloroethane.
Notes: Industrial wastewater or liquid wastes may be treated on-site and released to surface water (direct discharge) or pretreated and released to POTW (indirect discharge).

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, for (1) workers, including ONUs via inhalation exposure; (2) the general population via oral, dermal, and inhalation routes; and (3) consumer users via oral, dermal, and inhalation routes as well as bystanders via only the inhalation route.

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 [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 risk evaluation considers PESS throughout the human health risk assessment, including throughout the exposure assessment, hazard identification, dose-response analysis, and as summarized in the hazard characterization (see Section 5.3.2). Evaluation of the qualitative and quantitative evidence for PESS begins as part of the systematic review process (Section 1.3). Any available relevant published studies and other data are identified from a broad literature search strategy across several databases and focused only on the chemical name (including synonyms and trade names) with no additional search limits. This broad search process is described in the *Draft Systematic Review Protocol Supporting TSCA Risk Evaluations for Chemical Substances: A Generic TSCA Systematic Review Protocol with Chemical-Specific Methodologies* (also referred to as "2021 Draft Systematic Review Protocol"; see Section 1.3) (U.S. EPA, 2021). When adequate and complete, evidence related to PESS informs the derivation of exposure estimates and human health hazard endpoints/values that are protective of those PESS.

PESS factors can influence the selection of relevant exposure pathways, the sensitivity of derived hazard values, the identification of human subpopulations, and the discussion of uncertainties throughout the assessment. In this risk evaluation, EPA integrated and assessed available information on hazards and exposures for the COUs of 1,2-dichloroethane, including information relevant to specific risks of injury to PESS. In addition to workers, PESS identified as relevant include infants exposed to drinking water during formula bottle feeding, subsistence and tribal fishers, men of reproductive age, people with the CYP2E1 and aldehyde dehydrogenase-2 polymorphisms, lifestyle factors such as smoking cigarettes or secondhand smoke, and communities who live near facilities that emit 1,2-dichloroethane (Section 5.3.2).

1.3 Systematic Review

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

To meet the TSCA section 26(h) science standards, EPA used the TSCA systematic review process described in the 2021 Draft Systematic Review Protocol (U.S. EPA, 2021) and the *Systematic Review*

Protocol for 1,2-Dichloroethane (U.S. EPA, 2026bi) (also called the "1,2-Dichloroethane Systematic Review Protocol"). Systematic review supports the risk evaluation in that data searching, screening, evaluation, extraction, and evidence integration are used to develop the exposure and hazard assessments based on reasonably available information. EPA defines "reasonably available information" to mean information that the Agency possesses or can reasonably obtain and synthesize for use in risk evaluations, considering the deadlines for completing the evaluation (40 CFR 702.33).

The systematic review process is illustrated in Figure 1-8. Details regarding these steps are provided in the 2021 Draft Systematic Review Protocol (U.S. EPA, 2021) and the *Systematic Review Protocol for 1,2-Dichloroethane* (U.S. EPA, 2026bi). The latter is a chemical-specific systematic review protocol used to transparently document any updates or clarifications made to the systematic review process used for considering information identified for 1,2-dichloethane, as compared to the steps described and published in the Draft Systematic Review Protocol (U.S. EPA, 2021). For the *Risk Evaluation for 1,2-Dichloroethane* (U.S. EPA, 2026bb), the initial literature search was conducted in September 2019 and as described in Section 4 of the 2021 Draft Systematic Review Protocol (U.S. EPA, 2021), where the peer-reviewed and gray literature search followed the approach outlined in Sections 4.2 and 4.3 of the 2021 Draft Systematic Review Protocol, respectively (U.S. EPA, 2021). Occasionally additional data sources relevant for the risk evaluation may be identified after the initial search for peer-reviewed and gray literature; these data sources then undergo systematic review for the relevant discipline(s).

An update to the peer-reviewed literature search to capture information published since September 2019 was performed in April 2025 to identify any potential additional data sources for environmental and human health hazard that might have been identified since the initial literature search conducted in 2019 for 1,2-dichloroethane. Other disciplines considered to have sufficient information from the initial literature search in 2019 as well as additional sources (*e.g.*, assessor-identified references as well as facility-reported releases and monitoring data) to support the *Risk Evaluation for 1,2-Dichloroethane* (U.S. EPA, 2026bb) and did not proceed with an update to the peer-reviewed literature. Of the new additional sources of data that EPA identified for 1,2-dichloroethane from the updated peer-reviewed literature search for environmental and human health hazard information, 176 references went through screening (title and abstract as well as full-text screening). Upon completion of full-text screening, EPA identified seven references (HERO IDs: 3634375, 7697647, 10065941, 12815808, 12815852, 12815856, and 12833880) that met the full-text screening criteria and moved to the data evaluation and extraction step of the systematic review process.

In addition to the new data sources identified through the updated peer-reviewed literature search, EPA also considered new sources in response to public comments between the draft and final 1,2-dichloroethane risk evaluation. Specifically, EPA considered 10 additional animal toxicity studies (HERO IDs 5431770, 7697643, 7697651, 10065280, 10190107, 18158, 10065941, 12815808, 12815852, 12815856) and four additional epidemiology studies (HERO IDs 4821835, 12833880, 9089870, and 7714001) in assessing human health hazard.

Additional details on data evaluation and extraction as well as evidence integration are described in Sections 5 and 6 of the *Systematic Review Protocol for 1,2-Dichloroethane* (U.S. EPA, 2026bi).

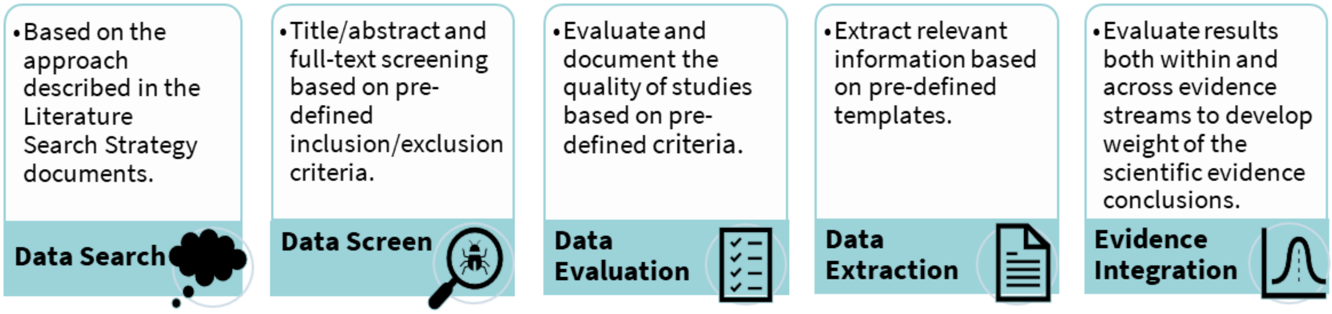

Figure 1-8. Diagram of the Systematic Review Process

EPA reviewed reasonably available information, defined in 40 CFR 702.33, in a fit-for-purpose approach to develop a risk evaluation that relies on the best available science and is based on the weight of scientific evidence in accordance with TSCA sections 6 and 26. The Agency reviewed reasonably available information and evaluated the quality of the methods and reporting of results of the individual studies using the evaluation strategies described in the Draft Systematic Review Protocol (U.S. EPA, 2021) and the 1,2-Dichloroethane Systematic Review Protocol (U.S. EPA, 2026bi).

EPA also identified key assessments conducted by other Agency programs and other U.S. and international organizations. 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 1,2-dichloroethane risk evaluation include the following:

- California Environmental Protection Agency, OEHHA 1999 *Public Health Goals for 1,2-Dichloroethane in Drinking Water* and 2005 update memorandum (accessed June 16, 2025);
- U.S. Department of Human Health Services, Public Health Service, ATSDR 2024 *Toxicological Profile for 1,2-Dichloroethane* (accessed June 16, 2025) (also called "2024 ATSDR Tox Profile");
- U.S. EPA Integrated Risk Information System (IRIS) Chemical Assessment 1987 *1,2-Dichloroethane; CASRN 107-06-2* (accessed April 24, 2026); and
- U.S. EPA 2010 *Provisional Peer Reviewed Toxicity Values for 1,2-Dichloroethane; CASRN 107-06-2* (accessed April 24, 2026).

2 CHEMISTRY AND FATE AND TRANSPORT OF 1,2-DICHLOROETHANE

Physical and chemical properties determine the behavior and characteristics of a chemical that inform its conditions of use, environmental fate and transport, potential toxicity, exposure pathways, routes, and hazards. Environmental fate and transport includes 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 1,2-dichloroethane informs the specific exposure pathways and potential human and environmental exposed populations that EPA considered in this risk evaluation.

In general, under normal environmental conditions 1,2-dichloroethane is an oily liquid that (1) is expected to volatilize from water, but a portion will remain dissolved in water due to its solubility (8,600 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. Sections 2.1 and 2.2 summarize the physical and chemical properties and environmental fate and transport of 1,2-dichloroethane, respectively. See the *Chemistry and Fate and Transport Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026n) for additional details.

2.1 Summary of Physical and Chemical Properties

EPA gathered and evaluated physical and chemical property data and information according to the process described in the 1,2-Dichloroethane Systematic Review Protocol (U.S. EPA, 2026bi). The Agency considered both measured and estimated physical and chemical property data/information as described in the *Chemistry and Fate and Transport Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026n). The selected values are summarized below in Table 2-1, as applicable. Information on the full, extracted dataset is available in the *Risk Evaluation for 1,2-Dichloroethane – Systematic Review Supplemental File: Data Quality Evaluation and Data Extraction Information for Environmental Fate and Transport* (U.S. EPA, 2026r).

Table 2-1. Physical and Chemical Properties of 1,2-Dichloroethane*[a]*

Property	Selected Value(s)	Reference(s)	Overall Data Quality Determination
Molecular formula	$C_2H_4Cl_2$	N/A	N/A
Molecular weight	98.95 g/mol	N/A	N/A
Physical form	Colorless oily liquid with a chloroform-like odor	HSDB (2018), NCBI (2020a)	High
Melting point	−35.61 °C	Rumble (2018d)	High
Boiling point	83.43 °C	Rumble (2018d)	High
Density	1.24529 at 25 °C	Rumble (2018d)	High
Vapor pressure	78.9 mmHg at 25 °C	HSDB (2018)	High
Vapor density	3.4 (air = 1 g/cm^3)	NCBI (2020b)	High
Water solubility	8,600 mg/L at 25 °C	Rumble (2018a)	High
Octanol/water partition coefficient (log K_{ow})	1.48 at 25 °C	Elsevier (2019b)	High
Henry's Law constant	0.00154 atm m^3/mol at 25 °C	NIST (2022)	High
Flash point	13 °C	O'Neil (2013)	High
Autoflammability	413 °C	Rumble (2018b)	High

Property	Selected Value(s)	Reference(s)	Overall Data Quality Determination
Viscosity	0.779 cP at 25 °C	Rumble (2018c)	High
Refractive index	1.4539 at 25 °C	Elsevier (2019a)	High
Dielectric constant	10.13 at 25 °C	Elsevier (2019a)	High
[a] Additional information on value selection can be found in the *Chemistry and Fate and Transport Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026n).			

2.2 Summary of Environmental Fate and Transport

Reasonably available environmental fate data—including biotic and abiotic biodegradation rates, removal during wastewater treatment, volatilization from water sources, and partition coefficients—are parameters used in this risk evaluation. In assessing the environmental fate and transport of 1,2-dichloroethane, EPA considered the full range of results from the available high-quality data sources obtained during systematic review. Information on the full, extracted dataset is available in the supplemental file *Data Quality Evaluation and Data Extraction Information for Environmental Fate and Transport Studies for 1,2-Dichloroethane* (U.S. EPA, 2026r) and *Data Quality Evaluation and Data Extraction Information for Physical and Chemical Properties for 1,2-Dichloroethane* (U.S. EPA, 2026t).

The Agency evaluated the reasonably available information to characterize the environmental fate and transport of 1,2-dichloroethane. The key points of the fate assessment for 1,2-dichloroethane (U.S. EPA, 2025, 11816713) are summarized below and listed in Table 2-2.

Given the consistent results from numerous high-quality studies discussed in the *Chemistry and Fate and Transport Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026n), there is robust evidence of the following:

- 1,2-Dichloroethane is not expected to undergo significant direct photolysis but will undergo indirect photodegradation by reacting slowly with hydroxyl radicals (·OH) in the atmosphere with a half-life of 42 to 51 days.
- 1,2-Dichloroethane is expected to hydrolyze very slowly in water.
- 1,2-Dichloroethane is not expected to biodegrade in surface water or sediments under aerobic conditions.
- Under certain conditions, 1,2-dichloroethane may biodegrade rapidly.
    - Those conditions include groundwater under aerobic or nitrate-reducing conditions and with previous exposure to 1,2-dichloroethane, appropriate microbes, and/or in the presence of nutrients and supplemental substrates such as acetate, toluene, or benzene.
- 1,2-Dichloroethane is not expected to sorb to soil/sediment particles and therefore has the potential to reach groundwater.
- 1,2-Dichloroethane is not expected to partition to organic matter in the air and therefore will not undergo dry or wet deposition.
- 1,2-Dichloroethane is expected to have low bioaccumulation potential in aquatic and terrestrial organisms.
- 1,2-Dichloroethane is expected to be removed during wastewater treatment processes, mainly through a combination of volatilization and biodegradation.
    - Although the concentrations of 1,2-dichloroethane are likely to be low in biosolids due to volatilization during the treatment process, uncertainty remains regarding the concentrations in biosolids that could be land applied due to a lack of monitoring data.

As a result of limited studies identified, there is moderate evidence of the following:

- 1,2-Dichloroethane is expected to undergo long-range transport in air due to its slow photodegradation rate in air.
- 1,2-Dichloroethane is expected to biodegrade rapidly in soils.
- Except under specific circumstances, 1,2-dichloroethane is expected to generally biodegrade slowly under reducing conditions in groundwater.
- 1,2-Dichloroethane may enter groundwater from unlined or improperly managed landfills.
- 1,2-Dichloroethane is expected to have low removal rates from conventional drinking water treatment systems but may be highly removed by advanced treatment technologies (*e.g.,* low profile aeration).

Conclusions that were determined to have a robust weight of evidence supporting them had two or more high-quality studies that were largely in agreement with each other. Conclusions that were determined to have a moderate weight of evidence were based on less than two high-quality studies or two high-quality studies that varied in consistency of findings. The studies were supported by physical-chemical and fate properties and/or model outputs, where applicable.

Table 2-2. Summary of Environmental Fate Information for 1,2-Dichloroethane[a]

Property or Endpoint	Value[b]	Reference(s)	Overall Data Quality Determination
Indirect photodegradation	k_{OH} = 2.09 to 2.54E−13 cm^3/mol-s, 42 to 51-day half-life (assuming 12-hour day, 1.5E06 ·OH/cm^3)	Taylor et al. (1991), Qiu et al. (1992)	High
Hydrolysis half-life	6.1–72 years half-life	Barbash JE (1989), Jeffers et al. (1989)	High
Biodegradation in groundwater Aerobic conditions	0.8–9 days half-life	Cox et al. (2000), Cox et al. (1998)	High, Medium
Biodegradation in groundwater Nitrate reducing conditions	1–10 days half-life	Cox et al. (2000), Gerritse et al. (1999)	High
Biodegradation in groundwater Reducing conditions	33–843 days half-life	Huff et al. (2000); Henderson et al. (2007); Cox et al. (2000)	High
	58–11,242 days half-life	Lee et al. (1999); Ravi et al. (1998); Nobre and Nobre (2004); Bosma et al. (1998); Mayer (2006)	Medium
Biodegradation in river water or wetland sediments Aerobic conditions	No degradation detected in 4.5 days and 12 months	Mudder (1981), van der Zaan et al. (2009)	High

Property or Endpoint	Value[b]	Reference(s)	Overall Data Quality Determination
Biodegradation in river water or wetland sediments Reducing conditions	No degradation detected in 12 months	van der Zaan et al. (2009)	High
Biodegradation in river water or wetland microcosms Reducing conditions	6–51.5 days half-life	van der Zaan et al. (2009), Peijnenburg et al. (1998), Jafvert and Lee Wolfe (1987)	High
Biodegradation in soil Aerobic conditions	6 to >28 days half-life	Watwood et al. (1991), Olaniran et al. (2011)	High
Biodegradation in soil Anaerobic conditions	>28 days half-life	Watwood et al. (1991)	High
Bioconcentration factor (BCF)	2–4.4[c] L/kg	Barrows et al. (1980), OECD (2002), U.S. EPA (2012c)	High
Bioaccumulation factor (BAF)	3.78 L/kg [c]	U.S. EPA (2012c)	High
Soil organic carbon:water partition coefficient (Log K_{OC})	1.3–1.77	Valsaraj et al. (1999), Wilson et al. (1981), Wefer-Roehl et al. (2001)	High
Octanol:air partition coefficient (Log K_{OA})	2.7± 0.2 at 25 °C	Lei et al. (2019)	High
Air:water partition coefficient (Log K_{AW})	−1.201[c]	U.S. EPA (2012c)	High
Removal in wastewater treatment [d]	33–100% removal efficiency	O'Brien (1992), Kincannon et al. (1983), Roy F. Weston Inc (1980), U.S. EPA (1982)	High

[a] Additional information on value selection can be found in the *Chemistry and Fate and Transport Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026n).
[b] Measured unless otherwise noted.
[c] Information was estimated using EPI Suite™ (U.S. EPA, 2012c).
[d] Biodegradation studies mentioned in this table can also be used to contextualize biodegradation in wastewater treatment plants.

3 RELEASES AND CONCENTRATIONS OF 1,2-DICHLOROETHANE IN THE ENVIRONMENT

EPA estimated environmental releases and concentrations of 1,2-dichloroethane. Section 3.1 describes the approach and methodology for estimating releases; Section 3.2 presents estimates of environmental releases and an evaluation of the weight of scientific evidence for the environmental releases; and Section 3.3 presents the approach and methodology for estimating environmental concentrations, a summary of concentrations of 1,2-dichloroethane in the environment, as well as an evaluation of the weight of scientific evidence for the environmental concentrations.

3.1 Approach and Methodology

This section provides an overview of the approach and methodology for assessing releases of 1,2-dichloroethane to the environment from manufacture, processing, industrial, and commercial uses.

3.1.1 Manufacturing, Processing, Industrial and Commercial Uses

This subsection describes the grouping of manufacturing, processing, industrial, commercial, and disposal COUs into OESs as well as the use/function of 1,2-dichloroethane within each OES. Specifically, Section 3.1.1.1 provides a crosswalk of COUs to OESs and Section 3.1.1.2 provides descriptions for the function of 1,2-dichloroethane within each OES.

3.1.1.1 Crosswalk of Conditions of Use to Occupational Exposure Scenarios

EPA identified OESs to assess for each of the COUs listed in Table 1-1. Table 3-1 provides a crosswalk between the COUs and OESs whereas Table 3-3 provides the reverse—a crosswalk of OESs to COUs. The term "OES" is intended to describe the grouping of COUs for assessment of releases and occupational exposures as described in detail in Section 1.2 of the *Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026aw). OESs are developed based on data that EPA has collected on the COUs. EPA may assess a group of multiple COUs together as one OES due to similarities in exposure and release potential. Alternatively, EPA may assess multiple OES for one COU because there are different release and exposure potentials within a given COU. For each OES, EPA estimated occupational exposure and environmental releases based on available data and modeling approaches. The *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae) and *Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026aw) provide further information on OESs.

Table 3-1. Crosswalk of Conditions of Use (COUs) to Assessed Occupational Exposure Scenarios (OESs) for 1,2-Dichloroethane

COU			OES
Life Cycle Stage[a]	**Category**[b]	**Subcategory**[c]	
Manufacturing	Domestic manufacture	Domestic manufacture	Manufacturing[d]
			Manufacturing as an Unintended Byproduct
	Import	Import	Repackaging
Processing	Processing – As a reactant	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing	Processing as a Reactant

COU			OES
Life Cycle Stage[a]	Category[b]	Subcategory[c]	
Processing	Processing – Incorporated into formulation, mixture, or reaction product	Fuels and fuel additives: all other petroleum and coal products manufacturing	Processing into Formulation, Mixture, or Reaction Product
		Processing aids: specific to petroleum production	Processing into Formulation, Mixture, or Reaction Product
		Adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing	Processing into Formulation, Mixture, or Reaction Product
	Repackaging	Repackaging	Repackaging
	Recycling	Recycling	Processing as a Reactant
Distribution in commerce	Distribution in commerce	Distribution in commerce	Distribution in Commerce[e]
Industrial use	Adhesives and sealants	Adhesives and sealants	Industrial Application of Adhesives and Sealants
	Functional fluids (closed systems)	Heat transferring agent	Heat Transferring Agent[f]
	Lubricants and greases	Solid film lubricants and greases	Industrial Application of Lubricants and Greases
	Process regulator	*e.g.,* Catalyst moderator; oxidation inhibitor	Processing as a Reactant
	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Commercial Aerosol Products
			Non-Aerosol Cleaning and Degreasing
	Other use	Process solvent	Processing into Formulation, Mixture, or Reaction Product
Commercial use	Plastic and rubber products	Products such as: plastic and rubber products	Plastic and Rubber Products[f]
	Fuels and related products	Fuels and related products	Fuels and Related Products[f]
	Other use	Laboratory chemical	Laboratory Use
Consumer use	Plastic and rubber products	Plastic and rubber products	N/A[g]

COU			OES
Life Cycle Stage[a]	Category[b]	Subcategory[c]	
Disposal	Disposal	Disposal	Waste Handling, Treatment, and Disposal (Landfill)
			Waste Handling, Treatment, and Disposal (POTW)
			Waste Handling, Treatment, and Disposal (Remediation)
			Waste Handling, Treatment, and Disposal (Non-POTW WWT)
			Waste Handling, Treatment, and Disposal (Incinerator)

[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.

[b] These categories of COUs reflect CDR codes and broadly represent COUs for 1,2-dichloroethane in industrial and/or commercial settings.

[c] These subcategories reflect more specific uses of 1,2-dichloroethane.

[d] During the manufacture of 1,2-dichloroethane, the byproducts 1,1-dichloroethane, 1,1,2-trichloroethane, *trans*-1,2-dichloroethylene, trichloroethylene, perchloroethylene, methylene chloride, and carbon tetrachloride are formed, and are assessed in the risk evaluation. See *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j).

[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 use's OES. EPA's current approach for quantitatively assessing releases and exposures for the remaining aspects of distribution in commerce consists of searching DOT and NRC data for incident reports pertaining to 1,2-dichloroethane distribution.

[f] Although these uses were identified during scoping, upon further investigation, EPA made the decision to not quantitatively assess the releases and exposures. The rationale for not performing a quantitative assessment is described in Section 1.2 of both the *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae) and *Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026aw).

[g] Consumer uses are not assigned to OESs but are assessed elsewhere in this risk evaluation. See also the *Consumer Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026o).

As stated in table footnote *d* in Table 3-1 above, during the manufacture of 1,2-dichloroethane, the byproducts 1,1-dichloroethane (75-34-3), 1,1,2-trichloroethane (7900-5), *trans*-1,2-dichloroethylene (156-60-5), trichloroethylene (79-01-6), perchloroethylene (127-18-4), methylene chloride (75-09-2), and carbon tetrachloride (56-23-5) are unintentionally formed. Releases and associated exposures from byproducts are discussed in the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j) and summarized in the corresponding environmental and human exposure and risk sections (Sections 4 and 5) of this risk evaluation.

The production volume for each of the assessed byproducts resulting from 1,2-dichloroethane manufacturing is estimated based on the reported production volume of 1,2-dichloroethane as well as the weight percent of the byproduct in the non-purified 1,2-dichloroethane product stream provided by industry. EPA used information provided from the Vinyl Institute in several public comments (see EPA-HQ-OPPT-2018-0421-0027; EPA-HQ-OPPT-2016-0732-0013; and EPA-HQ-OPPT-2019-0500-0101) to estimate the maximum weight percent of each byproduct in various product streams to use in this risk evaluation (Table 3-2). The information provided in Table 3-2 was used to evaluate exposures to byproducts for the Manufacturing COU and represents maximum concentrations of byproducts that would be found in any 1,2-dichloroethane manufacturing facility. Although 1,1,2-trichloroethane and *trans*-1,2-dichloroethylene are not assessed in the risk evaluation, they are included in Table 3-2 for context (*i.e.,* to show 100% total of all chemicals within a product stream).

Table 3-2. Maximum Weight Percent of Byproducts in Product Streams During the Manufacturing of 1,2-Dichloroethane

Chemical	Percent Non-Purified Product Stream	Percent Purified Product Stream	Percent Heavy-Ends Liquid [c d]	Percent Light-Ends Liquid [c d]
1,2-Dichloroethane	98.94	99.4–100	27.7	30.7
1,1-Dichloroethane	0.291	<0.1	21	30
1,1,2-Trichloroethane [a]	0.472	0.02	50	0.1
trans-1,2-Dichloroethylene [a]	0.028	<0.1	0	9
Trichloroethylene	0.0035	0 [b]	0.23	0.0999 [e]
Perchloroethylene	0.015	0 [b]	1.1	0
Methylene chloride	0.0999 [e]	0 [b]	0	0 [e]
Carbon tetrachloride	0.15	0 [b]	0	30

[a] 1,1,2-Trichloroethane and *trans*-1,2-dichloroethylene are not assessed in this risk evaluation (or relevant TSD) but are included in the table to show 100% total of all chemicals within a product stream.
[b] No information provided; assumed 0 (%).
[c] For heavy- and light-liquid ends, the highest concentration of byproduct reported was applied with the remaining percent assumed to be 1,2-dichloroethane.
[d] Light-ends liquid streams are the more volatile fractions in the mixture, typically derived from the initial stages of refining process and known for their lower boiling points. Heavy-ends liquid streams are the less volatile, higher boiling point fractions obtained towards the later stages of the refining process.
[e] 0.0999% assumed when "ppm levels"/"quantities" was reported.

Table 3-3. Crosswalk of Assessed Occupational Exposure Scenarios (OESs) to Conditions of Use (COUs) for 1,2-Dichloroethane

OES	COU		
	Life Cycle Stage	Category	Subcategory
Manufacturing	Manufacturing	Domestic manufacture	Domestic manufacture
Manufacturing as an Unintended Byproduct			
Repackaging		Import	Import
Processing as a Reactant	Processing	Processing – As a reactant	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing
		Recycling	Recycling
	Industrial use	Process regulator	*e.g.,* Catalyst moderator; oxidation inhibitor
Processing into Formulation, Mixture, or Reaction Product	Processing	Processing – Incorporated into formulation, mixture, or reaction product	Fuels and fuel additives: All other petroleum and coal products manufacturing
			Processing aids: specific to petroleum production
			Adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing
	Industrial use	Other use	Process solvent
Repackaging	Processing	Repackaging	Repackaging
Distribution in Commerce	Distribution in commerce	Distribution in commerce	Distribution in commerce
Industrial Application of Adhesives and Sealants	Industrial use	Adhesives and sealants	Adhesives and sealants
Industrial Application of Lubricants and Greases	Industrial use	Lubricants and greases	Solid film lubricants and greases
Commercial Aerosol Products	Industrial use	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents
Non-aerosol Cleaning and Degreasing	Industrial use	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents
Plastic and Rubber Products	Commercial use	Plastic and rubber products	Products such as: plastic and rubber products – not quantitatively assessed
Laboratory Use	Commercial use	Other use	Laboratory chemical
N/A	Consumer use	Plastic and rubber products	Plastic and rubber products

OES	COU		
	Life Cycle Stage	Category	Subcategory
Waste Handling, Treatment, and Disposal (Landfill)	Disposal	Disposal	Disposal
Waste Handling, Treatment, and Disposal (POTW)			
Waste Handling, Treatment, and Disposal (Remediation)			
Waste Handling, Treatment, and Disposal (Non-POTW WWT)			
Waste Handling, Treatment, and Disposal (Incinerator)			

3.1.1.2 Description of Role/Function of 1,2-Dichloroethane for Each OES

An understanding of the role/function of 1,2-dichloroethane 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 1,2-dichloroethane for all OESs are presented in Table 3-4.

Table 3-4. Description of the Function of 1,2-Dichloroethane for Each OES

OES	Role/Function of 1,2-Dichloroethane
Manufacturing	This OES captures the Domestic manufacture COU category. 1,2-Dichloroethane may be produced by various methods, including by the vapor- or liquid-phase chlorination of ethylene. Additionally, 1,2-dichloroethane is manufactured as a byproduct or impurity during the intentional manufacturing of other chemical products such as dichloroethyl ether.
Repackaging	This OES captures the Import and Repackaging COU categories. 1,2-Dichloroethane may be transported in liquid cargo barges, railcars, tank trucks, tank containers, intermediate bulk containers (IBCs)/totes, and drums. A portion of the 1,2-dichloroethane manufactured is also expected to be repackaged into smaller containers for commercial laboratory use.
Processing as a Reactant	This OES captures the Processing as a Reactant, Recycling, and Industrial use of oxidizing/reducing agents COU categories. 1,2-Dichloroethane is primarily used to produce vinyl chloride via thermal cracking, but can also be used to produce ethyleneamines, polyethyleneamines, and it can be used as an oxidation inhibitor. Additionally, EPA assumes that waste streams containing 1,2-dichloroethane may be recycled on-site and then re-introduced into the facility's process waste stream or recycled as a feedstock to be used in the manufacture of other chemicals.

OES	Role/Function of 1,2-Dichloroethane
Processing into Formulation, Mixture, or Reaction Product	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. 1,2-Dichloroethane is expected to be mixed or blended into adhesives and sealants, lubricants and greases, oxidizing/reducing agents, cleaning and degreasing solvents, and pesticides.
Distribution in Commerce	This OES captures the Distribution in commerce COU category. 1,2-Dichloroethane is expected to be distributed in commerce for the purposes of each processing, industrial, and commercial use of 1,2-dichloroethane. EPA expects 1,2-dichloroethane to be transported from manufacturing sites to downstream processing and repackaging sites.
Industrial Application of Adhesives and Sealants	This OES captures the Industrial use of adhesives and sealants COU category. 1,2-Dichloroethane has been identified in some industrial adhesives as residual, and it is present in heat resistant adhesives used in the aerospace industry, and in adhesives for plastics. It may also be used in waterproofing membranes that support adhesion used in extrusion coating laminating and printing, and it may be a component of sealants that protect plastics and coatings from ultraviolet (UV) light degradation.
Industrial Application of Lubricants and Greases	This OES captures the Industrial use of lubricants and greases COU category. 1,2-Dichloroethane may be present in solid film lubricants used to prevent metal to metal contact when used in the presence of conventional lubricants. It is also used in the aerospace industry in low friction and anti-knock coatings. EPA has conservatively assumed that lubricants and greases are spray applied, and so for the occupational exposure assessment this OES is assumed the same as the commercial aerosol products OES described below.
Non-Aerosol Cleaning and Degreasing	This OES captures part of the Industrial use of solvents (for cleaning and degreasing) COU category. 1,2-Dichloroethane was reported to be a component of cleaning and degreasing solvents in the aerospace industry. EPA also identified 1,2-dichloroethane present in a process cleaner. EPA did not identify the primary methods used in the application of industrial solvents for cleaning and degreasing, and so for this OES vapor degreasing was assumed. Vapor degreasing is a popular cleaning method in the electronic and metal processing industries because it is effective in removing organics such as oils, greases, lubricants, coolants, and resins from crevices and hard to clean parts.
Commercial Aerosol Products	This OES captures part of the Industrial use of solvents (for cleaning and degreasing) COU category. 1,2-Dichloroethane was reported to be a component of cleaning and degreasing solvents in the aerospace industry. EPA also identified 1,2-dichloroethane present in a process cleaner. EPA did not identify the primary methods used in the application of industrial solvents for cleaning/degreasing, and so for this OES aerosol degreasing was assumed. Aerosol degreasing is a process that uses an aerosolized solvent spray, typically applied from a

OES	Role/Function of 1,2-Dichloroethane
	pressurized can, to remove residual contaminants for fabricated parts. A propellant is used to aerosolize the formulation, allowing it to be sprayed onto substrates. The aerosol droplets bead up on the fabricated part and then drip off, carrying away any contaminants and leaving behind a clean surface. Similarly, aerosol lubricant products use an aerosolized spray to help free frozen parts by dissolving rust and leave behind a residue to protect surfaces against rust and corrosion. In the occupational exposure assessment, this OES is used to represent exposure to lubricants and greases.
Laboratory Use	This OES captures the Commercial use of laboratory chemical COU subcategory. 1,2-Dichloroethane is used as a laboratory reference standard for instrument calibration and sample preparation. It was also reported to EPA that 1,2-dichloroethane is used as a fuel additive for the purposes of research in NASA facilities. This OES also captures the use of 1,2-dichloroethane in QA/QC laboratories at manufacturing sites. The Agency notes that the same applications and methods used for quality control can be applied in industrial and commercial settings, and that research can be conducted in non-commercial laboratories. All of these laboratory activities are included in this COU.
Waste Handling, Treatment, and Disposal (Incineration)	This OES captures the Disposal COU category. Each of the OES may generate waste streams of 1,2-dichloroethane that are collected and transported to third-party sites for incineration and these cases are assessed under this OES. Waste containing 1,2-dichloroethane may be shipped in containers or piped directly to incineration sites. Incineration can result in releases of 1,2-dichloroethane to air or water through volatilization at loading and unloading points, incomplete combustion, or container cleaning.
Waste Handling, Treatment, and Disposal (Landfill)	This OES captures the Disposal COU category. Each of the OES may generate waste streams of 1,2-dichloroethane that are collected and transported to third-party landfill sites for disposal and these cases are assessed under this OES. Waste containing 1,2-dichloroethane may be shipped in containers to landfill sites at various concentrations. 1,2-dichloroethane is a U-listed hazardous waste under code U0777 under RCRA; therefore, discarded, unused pure and commercial grades of 1,2-dichloroethane are regulated as a hazardous waste under RCRA (40 CFR § 261.33(f)). Hazardous waste landfills are excavated or engineered sites specifically designed for the final disposal of non-liquid hazardous wastes. Releases of 1,2-dichloroethane may occur through volatilization to air and leachate release to water.
Waste Handling, Treatment, and Disposal (POTW)	This OES captures the Disposal COU category. Each of the OES may generate waste streams of 1,2-dichloroethane that are collected and transported to third-party POTW sites for disposal and these cases are assessed under this OES. Disposal to POTW refers to the collection and routing of 1,2-dichloroethane-containing wastes to third-party publicly owned treatment works which treat the wastes utilizing water treatment units. Releases of 1,2-dichloroethane to air or water may occur through volatilization during loading/unloading and wastewater treatment, fugitive leaks, or container cleaning.
Waste Handling, Treatment, and Disposal (Non-POTW WWT)	This OES captures the Disposal COU category. Each of the OES may generate waste streams of 1,2-dichloroethane that are collected and transported to third-party Non-POTW WWT sites for disposal and these cases are assessed under this OES. Disposal to WWT refers to the collection and routing of 1,2-

OES	Role/Function of 1,2-Dichloroethane
	dichloroethane-containing wastes to third-party water treatment systems which treat the wastes utilizing water treatment units. Releases of 1,2-dichloroethane to air or water may occur through volatilization during loading/unloading and wastewater treatment, fugitive leaks, or container cleaning.
Waste Handling, Treatment, and Disposal (Remediation)	This OES captures the Disposal COU category. Remediation refers to the removal of 1,2-dichloroethane from contaminated soil, water, or air. Thermal, biological, physical, and chemical treatment methods can be applied to contaminated media at the release site.
COU = condition of use; OES = occupational exposure scenario	

3.1.2 Estimating the Number of Release Days per Year for Facilities in Each OES

EPA's general approach is to estimate both an annual (kg/site-year) and a daily (kg/site-day) release rate for a facility. The annual release and average daily release of 1,2-dichloroethane can be utilized in evaluating potential environmental concentrations, as discussed in Section 3.3. Data on the number of release days for a facility are not available from data sources such as Discharge Monitoring Reports (DMR) and the Toxics Release Inventory (TRI). NEI includes a field for operating days per year (days/year). EPA uses facility-reported operating days from NEI whenever available and defaults to generic values only when this information is missing. Generic estimates of number of operating days per year for each OES is presented in Table 3-5. Approximately 50% of 1,2-dichloroethane NEI facilities reported operating days. See the *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae) for further discussion on the methodologies used to estimate the number of operating days.

Table 3-5. Generic Estimates of Number of Operating Days per Year for Each OES[a]

OES	Operating Days (days/year)	Basis
Manufacturing	350	For the manufacture of the large-PV solvents, EPA assumed 350 days/year for release frequency. This assumes the plant runs 7 days/week and 50 weeks/year (with 2 weeks down for turnaround) and assumes that the plant is always producing the chemical.
Repackaging	250	Assumed operation 5 days/week for 50 weeks/year.
Processing as a Reactant	350	EPA assumed the manufacture of commodity chemicals occurs 350 days per year such that the use of a chemical as a reactant to manufacture a commodity chemical would also occur 350 days per year.
Processing into Formulation, Mixture, or Reaction Product	300	EPA assumed that the chemical of interest is not always in use at the facility, even if the facility operates 24/7. Therefore, in general, EPA used a value of 300 days/year based on the Specific Environmental Release Categories (SpERC) Fact Sheet – Formulation & (Re)Packing of Substances and Mixtures – Industrial (Solvent-Borne), which uses a default of 300 days/year for the chemical industry (ESIG, 2012).
Industrial Application of Adhesives and Sealants	260	The April 2015 ESD on Use of Adhesives (OECD, 2015) estimates a default of 260 operating days/year.

OES	Operating Days (days/year)	Basis
Industrial Application of Lubricants and Greases	250	Assumed operation 5 days/week for 50 weeks/year.
Industrial and Commercial Non-Aerosol Cleaning and Degreasing	250	Assumed operation 5 days/week for 50 weeks/year.
Industrial and Commercial Aerosol Products	250	Assumed operation 5 days/week for 50 weeks/year.
Commercial Laboratory Use	260	The Generic Scenario (GS) on Use of Laboratory Chemicals (U.S. EPA, 2023c) estimates a default of 260 operating days/year per the Bureau of Labor Statistics OES data.
Waste Handling, Treatment, and Disposal (Incineration)	250	Assumed operation 5 days/week for 50 weeks/year, consistent with typical industry operating schedules.
Waste Handling, Treatment, and Disposal (Landfills)	250	Assumed municipal waste landfills operate 5 days/week for 50 weeks/year, consistent with typical industry operating schedules.
Waste Handling, Treatment, and Disposal (POTW)	365	POTWs are expected to operate continuously over 365 days/year; therefore, 365 days/year should be used.
Waste Handling, Treatment, and Disposal (Non-POTW WWT)	250	Non-POTW WWT facilities are typically associated with industrial facilities, therefore, EPA does not expect sites to operate continuously over 365 days/yr. EPA assumed operation 5 days/week for 50 weeks/year.
Waste Handling, Treatment, and Disposal (Remediation)	365	Remediate sites are expected to operate continuously over 365 days/year; therefore, 365 days/year should be used.

[a] When NEI reported facility-specific operating days, EPA used this data; otherwise, defaults were applied. Facility-specific values were available for most OES; Commercial Aerosol Products relied entirely on defaults. See Section 2.3.2 of the *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae) for more information on the number of days.

3.1.3 Daily Release Estimation

EPA collected facility release data for 1,2-dichloroethane from the TRI (years 2015–2024), DMR (years 2015–2024), and National Emissions Inventory (NEI; years 2014, 2017, and 2020). TRI provides facility-specific data on releases to air, water, and land; DMR includes data on water releases; and NEI provides process-level data (*i.e.,* contains data on air emissions). Data are available in each of these data 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, DMR, and/or NEI data or release data from systematic review are not available, EPA uses modeling to estimate releases. Modeling is 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 OESs: Industrial application of adhesives and sealants, Industrial and commercial non-aerosol cleaning and degreasing, Industrial and commercial aerosol products, and Commercial laboratory use. EPA 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 1,2-dichloroethane 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.

EPA 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 NEI, 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, DMR and NEI as a first approach to estimate the number of sites for an OES. If this data is not available, EPA uses Monte Carlo modeling approaches to estimate releases which require estimates of PV for a given OES and facility throughput.

For each OES, EPA develops 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 considers 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 *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae) 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 (2015-2024), NEI (2014, 2017 and 2020) (air), and DMR (2015-2024) (water) to support general population and environmental exposure assessments. These data are provided in the *Air Releases for 1,2-Dichloroethane* and *Water Releases for 1,2-Dichloroethane* supplemental files (U.S. EPA, 2026d, 2026bl).

3.1.4 Releases of 1,2-Dichloroethane from Disposal of Consumer Articles

Consumer articles containing 1,2-dichloroethane are not manufactured in the United States, rather these articles are only imported from China (Danish EPA, 2018; Doucette et al., 2010). As presented in the *Consumer Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026o), the emission rate of 1,2-dichloroethane varies by article. However, for all articles, the decay occurs within 2 months so that by the time the articles are disposed, the remaining levels of 1,2-dichloroethane are expected to be very low. Therefore, EPA did not quantitatively assess releases from disposal of consumer articles containing 1,2-dichloroethane in this risk evaluation. 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 2015 to 2024 and NEI data from reporting years 2014. 2017 and 2020. Table 3-6 presents a summary of these ranges across facilities. See the *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae) for additional detail.

3.2 Summary of Environmental Releases

3.2.1 Manufacturing, Processing, 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 2015 to 2024 and NEI data from reporting years 2014. 2017 and 2020. Table 3-6 presents a summary of these ranges across facilities. See the *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae) for additional detail.

Table 3-6. Summary of Environmental Releases by Occupational Exposure Scenario for 1,2-Dichloroethane

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 Facilities[f]	Source(s)
		Central Tendency[g]	High-End	Central Tendency	High-End		
Manufacturing	Surface water	1.4	190	3.9E−03	0.54	70	2015−2024 TRI/DMR
	Fugitive air	3,174	1.7E04	9.1	48	22	2015−2024 TRI
	Stack air	1,102	1.2E04	3.1	35	23	2015−2024 TRI
	Fugitive air	2,665	1.0E04	7.6	29	21	2014, 2017, and 2020 NEI
	Stack air	833	6,192	2.4	18	23	2014, 2017, and 2020 NEI
	Land	6.8	621	1.9E−02	1.8	18	2015−2024 TRI
Repackaging	Surface water	4.1E−02	227	1.6E−04	0.91	27	2015−2024 TRI/DMR
	Fugitive air	113	227	0.45	0.91	4	2015−2024 TRI
	Stack air	38	227	0.15	0.91	4	2015−2024 TRI
	Fugitive air	1.4E−02	105	5.7E−05	0.42	28	2014, 2017, and 2020 NEI
	Stack air	2.0	545	7.8E−03	2.2	11	2014, 2017, and 2020 NEI
	Fugitive or stack air	3.6	5.8	8.4E−02	0.15	1 generic site	Environmental release modeling
	Hazardous waste landfill or incineration [j]	275	320	6.5	10	1 generic site	Environmental release modeling
Processing As a Reactant	Surface water	0.26	227	7.4E−04	0.65	38	2015−2024 TRI/DMR
	Fugitive air	37	399	0.10	1.1	11	2015−2024 TRI
	Stack air	5.4	445	1.6E−02	1.3	10	2015−2024 TRI
	Fugitive air	63	4,216	0.18	12	17	2014, 2017, and 2020 NEI
	Stack air	14	1,622	3.9E−02	4.6	14	2014, 2017, and 2020 NEI
	Land	6.8	621	1.9E−02	1.8	4	2015−2024 TRI

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 Facilities[f]	Source(s)
		Central Tendency[g]	High-End	Central Tendency	High-End		
Processing into Formulation, Mixture, or Reaction Product	Surface water	0.50	18	1.7E−03	6.1E−02	40	2015−2024 TRI/DMR
	Fugitive air	72	3,012	0.24	10	11	2015−2024 TRI
	Stack air	31	2,167	0.10	4.4	9	2015−2024 TRI
	Fugitive air	113	438	0.38	1.5	10	2014, 2017, and 2020 NEI
	Stack air	8.6	1,595	2.9E−02	5.3	9	2014, 2017, and 2020 NEI
	Land	227	1.3E04	0.76	42	3	2015−2024 TRI
Industrial Application of Adhesives and Sealants	Fugitive air	1.8	261	6.9E−03	1.0	39	2014, 2017, and 2020 NEI
	Stack air	4.6	274	1.8E−02	1.1	69	2014, 2017, and 2020 NEI
	Fugitive or stack air	4.4E03[h]	4.4E03[h]	59	162	1 generic site	Environmental release modeling
	Hazardous landfill or incineration [j]	155	174	2.1	5.8	1 generic site	Environmental release modeling – modeled releases to incineration further assessed by applying a DRE to estimate the resulting stack air release
Industrial Application of Lubricants and Greases	Fugitive air	7.3E−02	82	2.9E−04	0.33	2	2014, 2017, and 2020 NEI
	Stack air	8.8E−03		3.5E−05		1	2014, 2017, and 2020 NEI
Industrial and Commercial Non-Aerosol Cleaning/ Degreasing	Surface water	0.43	13	1.7E−03	5.0E−02	4	2015−2024 TRI/DMR
	Fugitive air	4.1	1,738	1.6E−02	7.0	1	2015−2024 TRI
	Stack air	11	995	4.5E−02	4.0	1	2015−2024 TRI
	Fugitive air	2.2	42	8.9E−03	0.17	13	2014, 2017, and 2020 NEI
	Stack air	3.0	402	1.2E−02	1.6	15	2014, 2017, and 2020 NEI
	Land	0.5	9	1.8E−03	3.8E−02	1	2015−2024 TRI
	Fugitive or stack air	2.8E03	4.1E03	9	14	1 generic site	Environmental release modeling

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 Facilities[f]	Source(s)
		Central Tendency[g]	High-End	Central Tendency	High-End		
Industrial and Commercial Non-Aerosol Cleaning/ Degreasing	Wastewater treatment	149	269	0.6	1.1	1 generic site	Environmental release modeling – modeled releases to wastewater treatment are further assessed by applying a removal efficiency to estimate the resulting surface water discharge
	Hazardous waste incineration [j]	1,425	3,429	0.11	0.28	1 generic site	Environmental release modeling – modeled releases to incineration are further assessed by applying a DRE to estimate the resulting stack air release
	Hazardous waste landfill [j]	14	23	0.24	0.86	1 generic site	Environmental release modeling
Commercial aerosol products	Fugitive air	379	382	1.5	1.5	1 generic site	Environmental release modeling
Laboratory use	Surface water	1.1E−02	0.38	4.1E−05	1.4E−03	4	2015−2024 TRI/DMR
	Fugitive air	1.3	10	5.2E−03	3.8E−02	6	2014, 2017, and 2020 NEI
	Stack air	126	233	0.48	0.90	2	2014, 2017, and 2020 NEI
	Fugitive or stack air	1.7	11	7.3E−03	4.5E−02	1 generic site	Environmental release modeling
	Hazardous landfill or incineration [j]	15	812	6.5E−02	3.5	1 generic site	Environmental release modeling – modeled releases to incineration are further assessed by applying a DRE to estimate the resulting stack air release
Waste handling, treatment, and disposal (incinerator)	Surface water	5.8E−03	116	2.3E−05	0.46	7	2015−2024 TRI/DMR
	Fugitive air	1.2	310	4.7E−03	1.2	20	2015−2024 TRI
	Stack air	0.48	263	1.9E−03	1.1	22	2015−2024 TRI
	Fugitive air	0.49	97	2.0E−03	0.39	26	2014, 2017, and 2020 NEI
	Stack air	3.0E−02	39	1.2E−04	0.16	61	2014, 2017, and 2020 NEI
	Land	6.4	2.3E04	2.5E−02	91	9	2015−2024 TRI

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 Facilities[f]	Source(s)
		Central Tendency[g]	High-End	Central Tendency	High-End		
Waste handling, treatment, and disposal (landfill)	Surface water	5.0E−02	11	2.0E−04	4.5E−02	8	2015−2024 TRI/DMR
	Fugitive air	5.1	33	2.1E−02	0.13	665	2014, 2017, and 2020 NEI
	Stack air	0.41	22	1.6E−03	8.9E−02	145	2014, 2017, and 2020 NEI
Waste handling, treatment, and disposal (Non-POTW WWT POTW)	Surface water	1.2	272	4.7E−03	1.1	8	2015−2024 TRI/DMR
	Fugitive air	7.7	329	3.1E−02	1.3	12	2014, 2017, and 2020 NEI
	Stack air	1.1	186	4.4E−03	0.74	9	2014, 2017, and 2020 NEI
Waste handling, treatment, and disposal (POTW)	Surface water	1.9	134	5.1E−03	0.37	122	2015−2024 DMR
	Fugitive air	7.0	128	2.8E−02	0.51	29	2014, 2017, and 2020 NEI
	Stack air	15	37	6.0E−02	0.15	3	2014, 2017, and 2020 NEI
Waste handling, treatment, and disposal (remediation)	Surface water	4.3E−02	2.0	1.2E−04	5.5E−03	29	2015−2024 TRI/DMR
	Fugitive air	1.8	29	4.8E−03	8.0E−02	30	2014, 2017, and 2020 NEI
	Stack air	18	1,369	4.8E−02	3.8	5	2014, 2017, and 2020 NEI
Facilities not mapped to an OES	N/A					617[i]	–

DMR = Discharge Monitoring Report; DRE = Destruction and Removal Efficiency; NEI = National Emissions Inventory; OES = occupational exposure scenario; TRI = Toxic 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, 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 1,2-dichloroethane within a COU.

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 Facilities[f]	Source(s)
		Central Tendency[g]	High-End	Central Tendency	High-End		

[f] Where available, EPA used the 2020 CDR (U.S. EPA, 2020a), NEI (U.S. EPA, 2023a), DMR (U.S. EPA, 2022b) and TRI databases (U.S. EPA, 2022c), 2020 U.S. County Business Practices (U.S. Census Bureau, 2022), and Monte Carlo models to estimate the number of sites that use 1,2-dichloroethane for each COU. Some modeled OES 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.
[g] The central tendency values for NEI air were calculated using the median of the reported releases at each site.
[h] These central tendency and high-end releases appear equivalent in the table due to rounding.
[i] There were 157 facilities not mapped to an OES with 1,2-dichloroethane releases that EPA was unable to map due to the lack of information regarding the activity of 1,2-dichloroethane at the site. These sites do not fit in any of the 1,2-dichloroethane OESs because they are mainly hotels, businesses, and various chemical facilities where 1,2-dichloroethane use is unknown.
[j] 1,2-dichloroethane is a U-listed hazardous waste under code U0777 under RCRA; therefore, discarded, unused pure and commercial grades of 1,2-dichloroethane are regulated as a hazardous waste under RCRA (40 CFR 261.33(f)). Hazardous landfill or incineration are grouped together due to uncertainty in modeled release media.

Table 3-7 to Table 3-9 provide data for release trends over the reporting years included in this risk evaluation.

Table 3-7. 1,2-Dichloroethane TRI Release Trends for Reporting Years 2015–2024

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)	
2024	8.6E04	5.4E04	1.4E05	1,105	162	896	4.7E04
2023	1.1E05	6.3E04	1.7E05	503	84	1,290	5.4E04
2022	1.5E05	5.8E04	2.1E05	702	28	877	3.4E04
2021	1.3E05	5.2E04	1.9E05	1,824	63	1,767	2.0E04
2020	1.0E05	5.1E04	1.5E05	3,533	503	1,992	46
2019	9.3E04	5.6E04	1.5E05	829	1,281	2,668	17
2018	1.4E05	6.3E04	2.1E05	2,432	929	1,540	416
2017	1.4E05	6.0E04	2.0E05	1,501	572	1,571	4,419
2016	1.1E05	5.6E04	1.7E05	1,550	571	796	98
2015	1.1E05	7.8E04	1.9E05	2,066	1,026	1.1E04	92
POTW = publicly owned treatment works; TRI = Toxics Release Inventory; WWT = wastewater treatment plant							

Table 3-8. 1,2-Dichloroethane NEI Release Trends for Reporting Years 2014, 2017, and 2020

Reporting Year	Stack Air (kg/yr)	Fugitive Air (kg/yr)	Fugitive and Stack Air (kg/yr)
2020	7.6E04	1.3E05	2.1E05
2017	7.0E04	1.5E05	1.0E05
2014	7.7E04	1.0E05	1.8E05
NEI = National Emissions Inventory			

Table 3-9. 1,2-Dichloroethane DMR Release Trends for Reporting Years 2015–2025

Reporting Year	Annual Releases to Surface Water (kg/yr)
2025	1,767
2024	2,007
2023	1,538
2022	4,478
2021	1.2E04
2020	6.6E04
2019	1,626
2018	2,222
2017	1.0E04

Reporting Year	Annual Releases to Surface Water (kg/yr)
2016	6,275
2015	3,210

3.2.1.1 Environmental Releases of Byproducts from 1,2-Dichloroethane Manufacturing

EPA received data from Vinyl Institute on the formation of byproducts resulting from the manufacture of 1,2-dichloroethane. The Agency presents the methodology and release estimates of byproducts in the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j). Across all but one of the assessed byproducts (1,1-dichloroethane), the estimated releases for these chemicals when produced as a byproduct were lower.

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

EPA integrates evidence streams across systematic review sources to develop environmental release estimates for 1,2-dichloroethane. The Agency made a judgment on the weight of scientific evidence supporting the release estimates based on the strengths, limitations, and uncertainties associated with the release estimates. The conclusion is summarized using confidence descriptors: robust, moderate, or slight. EPA considers 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 for the whole industry).

In general, higher-rated studies (as determined through data evaluation) increase the weight of scientific evidence when compared to lower-rated studies, and EPA gives preference to chemical- and scenario-specific data over surrogate data (*e.g.,* data from a similar chemical or scenario). See the 2021 Draft Systematic Review Protocol (U.S. EPA, 2021) for additional information on weight of scientific evidence conclusions.

Table 3-10 summarizes EPA's overall weight of scientific evidence conclusions for its release estimates for each of the assessed OES. For more detail, see the *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae).

Table 3-10. Summary of Overall Confidence in Release Estimates by OES for 1,2-Dichloroethane

OES[a]	Confidence Rating	Weight of Scientific Evidence Conclusion in Release Estimate
Manufacturing	Moderate to Robust	For this OES, EPA had release information for water, land, and air from TRI, water from DMR, and air from NEI. For the Draft Risk Evaluation, EPA considered release years 2015–2020 TRI and DMR, and 2014 and 2017 NEI. For the Final Risk Evaluation, EPA also considered the data years of 2021–2024 TRI and DMR and 2020 NEI. Water releases are assessed using reported releases from TRI and DMR. These databases received a medium to 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. Factors that decrease the overall confidence for this estimate include the uncertainty in the accuracy of reported releases, and uncertainty in mapping sites to DMR to the Manufacturing OES. Most facilities only report NAICS code; therefore, it is uncertain whether the site performs manufacturing or another chemical process, such as processing as a reactant. Additionally, there are 15 manufacturing sites that report releases to other media in other reporting databases (DMR, NEI, etc.), but do not report releases to water in TRI. It is unclear whether these sites do not release to water, or the site does not meet reporting thresholds for TRI. Air releases are assessed using reported releases from TRI and NEI. A strength of NEI data is that NEI captures additional sources that are not included in TRI due to reporting thresholds. A factor that decreases the overall confidence for this OES is that EPA made assumptions on the number of operating days to estimate daily releases. Land releases are assessed using reported releases from TRI. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. Factors that decrease the overall confidence for this estimate include the uncertainty in the accuracy of reported releases, and the limitations in representativeness to all sites because TRI and DMR may not capture all relevant sites. Based on other reporting databases (CDR, DMR, NEI, etc.), there are 30 additional manufacturing sites that report releases to other media but do not report releases to land. In 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 directly from a wide number of manufacturing facilities. Based on this information, EPA concluded that the weight of scientific evidence for this assessment provides a moderate-to-robust estimate of releases in consideration of the strengths and limitations of reasonably available data.
Repackaging	Moderate to Robust	For this OES, EPA had release information for water and air from TRI, water from DMR, and air from NEI. For the Draft Risk Evaluation, EPA considered release years 2015–2020 TRI and DMR, and 2014 and 2017 NEI. For the Final Risk Evaluation, EPA also considered the data years of 2021–2024 TRI and DMR and 2020 NEI. Water releases are assessed using reported releases from TRI and DMR. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. Factors that decrease the overall confidence for

OES[a]	Confidence Rating	Weight of Scientific Evidence Conclusion in Release Estimate
Repackaging *(continued)*	Moderate to Robust *(continued)*	this estimate include the uncertainty in the accuracy of reported releases, and the limitations in representativeness to all sites because TRI and DMR may not capture all relevant sites. There is uncertainty in mapping sites to TRI and DMR as most facilities only report NAICS code; therefore, it is uncertain what type of chemical process the site performs and whether it is directly applicable to the assessed OES. Based on other reporting databases (CDR, NEI, etc.), there are 47 additional repackaging sites that report releases to other media but do not report releases to water. Air releases are assessed using reported releases from TRI and NEI. A strength of NEI data is that NEI captures additional sources that are not included in TRI due to reporting thresholds. Factors that decrease the overall confidence for this OES include the uncertainty in the accuracy of reported releases, and the limitations in representativeness to all sites because TRI and NEI may not capture all relevant sites. Additionally, EPA made assumptions on the number of operating days to estimate daily releases. Based on other reporting databases (CDR, DMR etc.), there are 16 additional repackaging sites that report releases to other media but do not report releases to air. Land releases are assessed using reported releases from TRI; however, there were no land releases reported to any database for repackaging of 1,2-dichloroethane. These releases needed to be modeled, as there may be releases from container cleaning that are sent to landfill, based on typical releases during the repackaging process (see the *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae)). In conclusion, although there is uncertainty of whether the databases capture all sites releasing to each medium, the release data are rated high in systematic review and provide releases directly from a wide number of repackaging facilities. For the modeling, EPA assessed releases using the assumptions and values from the July 2022 Chemical Repackaging GS (U.S. EPA, 2022a), which the systematic review process rated high for data quality. 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. EPA believes 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. Based on this information, EPA concluded that the weight of scientific evidence for this assessment provides a moderate-to-robust estimate of releases in consideration of the strengths and limitations of reasonably available data.

OES[a]	Confidence Rating	Weight of Scientific Evidence Conclusion in Release Estimate
Processing as Reactant	Moderate to Robust	For this OES, EPA had release information from water, land, and air from TRI, water from DMR, and air from NEI. For the Draft Risk Evaluation, EPA considered release years 2015–2020 TRI and DMR, and 2014 and 2017 NEI. For the Final Risk Evaluation, EPA also considered the data years of 2021–2024 TRI and DMR and 2020 NEI. Water releases are assessed using reported releases from TRI and DMR, which have a medium to high overall data quality determination from the systematic review process. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. The water release assessment is based on 28 reporting sites. There is uncertainty in mapping sites to TRI and DMR as most facilities only report NAICS code; therefore, it is uncertain what type of chemical process the site performs (manufacturing, processing as a reactant, etc.) Based on other reporting databases (CDR, NEI, etc.), there are 14 additional sites that report releases to other media but do not report releases to water. Air releases are assessed using reported releases from TRI and NEI. A strength of NEI data is that NEI captures additional sources that are not included in TRI due to reporting thresholds. Factors that decrease the overall confidence for this OES include the uncertainty in the accuracy of reported releases, and the limitations in representativeness to all sites because TRI and NEI may not capture all relevant sites. Based on other reporting databases (CDR, DMR, etc.), 12 additional sites that report releases to other media but do not report releases to air. Land releases are assessed using reported releases from TRI. The primary limitation is that the land release assessment is based on 4 reporting sites and EPA did not have additional sources to estimate land releases from this OES. Based on other reporting databases (CDR, DMR, NEI, etc.), there are 38 additional sites that report releases to other media but do not report releases to land. In 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 directly from a wide number of facilities that process 1,2-dichloroethane as a reactant. Based on this information, EPA concluded that the weight of scientific evidence for this assessment provides a moderate-to-robust estimate of releases in consideration of the strengths and limitations of reasonably available data.
Processing into Formulation, Mixture, or Reaction Product	Moderate to Robust	For this OES, EPA had release information from water and air from TRI, water from DMR, and air from NEI. For the Draft Risk Evaluation, EPA considered release years 2015–2020 TRI and DMR, and 2014 and 2017 NEI. For the Final Risk Evaluation, EPA also considered the data years of 2021–2024 TRI and DMR and 2020 NEI. Water releases are assessed using reported releases from TRI and DMR, which have a medium to high overall data quality determination from the systematic review process. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. The water release assessment is based on 18 reporting sites.

OES[a]	Confidence Rating	Weight of Scientific Evidence Conclusion in Release Estimate
		There is uncertainty in mapping sites to TRI and DMR as most facilities only report NAICS code; therefore, it is uncertain what type of chemical process the site performs and whether it is directly applicable to the assessed OES. Based on other reporting databases (CDR, NEI, etc.), there are 6 additional sites that report releases to other media but do not report releases to water. Air releases are assessed using reported releases from TRI and NEI. A strength of NEI data is that NEI captures additional sources that are not included in TRI due to reporting thresholds. Factors that decrease the overall confidence for this OES include the uncertainty in the accuracy of reported releases, and the limitations in representativeness to all sites because TRI and NEI may not capture all relevant sites. Based on other reporting databases (CDR, DMR, etc.), there are nine additional sites that report releases to other media but do not report releases to air. In conclusion, though 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 directly from a wide number of facilities that use 1,2-dichloroethane during processing into formulation, mixture, or reaction product. Based on this information, EPA concluded that the weight of scientific evidence for this assessment provides a moderate-to-robust estimate of releases in consideration of the strengths and limitations of reasonably available data.
Application of Adhesives and Sealants	Slight to Moderate	For this OES, EPA only had air release information from NEI. EPA identified 83 facilities reporting air releases of 1,2-dichloroethane that were potentially relevant to the application of adhesives and sealants. EPA determined these data are not sufficient to confidently capture the entirety of environmental releases for this scenario due to the fact they were from the NEI database and only reported on releases to air. Therefore, releases to the environment were also assessed using the Emission Scenario Document on Use of Adhesives (OECD, 2015). This ESD has a high data quality rating from the systematic review process (U.S. EPA, 2023c). EPA used this ESD combined with Monte Carlo modeling to estimate the amount of chemical that gets released from the process and then may go to air, wastewater treatment, landfill or destruction by incineration with media of release assessed using assumptions from the ESD model. More information about the details and assumptions of the model can be found in Appendix A.5 of the *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae) EPA believes 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. EPA also believes the primary limitation to be the uncertainty in the representativeness of model values toward the true distribution of potential releases. In addition, EPA lacks 1,2-dichloroethane chemical throughput data (*i.e.*, kg of chemical used per site per year); therefore, the number of facilities is based on one generic site and a maximum throughput of 10,000 lbs/yr was assumed based on TRI reporting thresholds.

OES[a]	Confidence Rating	Weight of Scientific Evidence Conclusion in Release Estimate
		Comparison of modeled values with the NEI data is difficult due to uncertainty on the throughput (kg/site-yr) of 1,2-dichloroethane at the NEI sites in comparison to the throughput value used in the modeling. Overall, EPA concludes the weight of scientific evidence for this assessment is moderate for the NEI air release data with lower confidence in the modeling results due to uncertainty in the throughput (kg/site-yr) value assumed and whether that may overestimate releases from the process.
Application of Lubricants and Greases	Slight to Moderate	For this OES, EPA had release information for air from NEI. EPA identified 4 facilities reporting air releases of 1,2-dichloroethane in NEI. A strength of NEI data is that NEI captures additional sources that are not included in TRI due to reporting thresholds. Factors that decrease the overall confidence for this OES include the uncertainty in the accuracy of reported releases as well as the limitations in representativeness to all sites because NEI may not capture all relevant sites. This is a particular concern for application of lubricants and greases because only 4 facilities were mapped to this use. To bolster the limited release data provided by NEI, Application of lubricants and greases was assessed by modeling the release of 1,2-dichloroethane due to the use of aerosol product. EPA applied a methodology, described in Section 3.9 of the *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae), based on a 100% release scenario to fugitive air which means that all 1,2-dichloroethane used in this scenario is assumed to be released to fugitive air. The 100% assumption is conservative. From a mass balance perspective: the quantity purchased and applied is not expected to be chemically converted or remain on the applied surface. A small percentage of residual material may remain in the container that would likely go to landfill. EPA does expect that a high percentage of the quantity of chemical purchased and applied at the sites would eventually be released to air. This methodology calculated the release amounts using the amount of 1,2-dichloroethane used per application, number of applications per job, and number of jobs per site-year. The release model uses data from the California Air Resources Board (CARB) to estimate use rates; 100% of the sprayed 1,2-dichloroethane is expected to be released to air. EPA used this methodology combined with Monte Carlo modeling to estimate releases to the environment with media of release assessed only for fugitive air. More information about the details and assumptions of the model can be found in Appendix A.6 of the *Environmental Release Assessment for Risk Evaluation for 1,2-Dichloroethane* (U.S. EPA, 2026ae). EPA believes 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. EPA also believes the primary limitation to be the uncertainty in the representativeness of values toward the true distribution of potential releases. In addition, EPA lacks 1,2-dichloroethane chemical throughput data, number of facilities, and estimates for other release media.

OES[a]	Confidence Rating	Weight of Scientific Evidence Conclusion in Release Estimate
		Based on this information, EPA concluded that the weight of scientific evidence for this assessment provides a slight-to-moderate estimate of releases in consideration of the strengths and limitations of reasonably available data.
Industrial and Commercial Non-Aerosol Cleaning/ Degreasing	Slight to Moderate	For this OES, EPA had release information for water and air from TRI, for water from DMR, and for air from NEI. EPA considered release years 2015–2024 TRI and DMR, and 2014, 2017, and 2020 NEI. EPA identified 25 facilities reporting air releases of 1,2-dichloroethane potentially related to cleaning/degreasing. Due to the difficulty of determining the exact activities that occur at each site and the method of use (aerosol vs. non-aerosol), EPA assumed that the 25 sites may potentially use non-aerosol cleaning/degreasing based on the industry and source classification codes for each source. Since so few sites reported to the databases and data points from NEI report only air releases, EPA also chose to model releases for non-aerosol cleaning and degreasing to obtain estimates for releases to other media. Therefore, releases to the environment are also assessed using the ESD on the Use of Vapour Degreasers (OECD, 2013). This ESD has a high data quality rating from the systematic review process (U.S. EPA, 2023c). EPA used this ESD combined with Monte Carlo modeling to estimate releases to the environment, with media of release assessed using assumptions from the ESD model. More information about the details and assumptions of the model can be found in Appendix A.4 of *the Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae) Water releases are assessed using reported releases from TRI and DMR, which have a medium to high overall data quality determination from the systematic review process. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. The water release assessment is based on 3 reporting sites. There is uncertainty in mapping sites to TRI and DMR as most facilities only report NAICS code; therefore, it is uncertain what type of chemical process the site performs and whether it is directly applicable to the assessed OES. Based on other reporting databases (CDR, NEI, etc.), there are 2 additional sites that report releases to other media but do not report releases to water. Air releases are assessed using reported releases from NEI. A strength of NEI data is that NEI captures additional sources that are not included in TRI due to reporting thresholds. Factors that decrease the overall confidence for this OES include the uncertainty in the accuracy of reported releases, and the limitations in representativeness to all sites because NEI may not capture all relevant sites. Based on other reporting databases (CDR, DMR, etc.), 3 additional sites that report releases to other media but do not report releases to air. To bolster the limited release data for this OES, EPA also modeled this OES under the assumption that Vapor Degreasing is the method used for cleaning and degreasing using products containing 1,2-dichloroethane. EPA believes a strength of the Monte Carlo modeling approach is that variation in model input values and a range of potential release values is more

OES[a]	Confidence Rating	Weight of Scientific Evidence Conclusion in Release Estimate
		likely than a discrete value to capture actual releases at sites. EPA also believes the primary limitation to be the uncertainty in the actual method when 1,2-dichloroethane is used in non-aerosol cleaning and degreasing (vapor degreasing was chosen as a conservative assumption), and uncertainty about the representativeness of values toward the true distribution of potential releases. In addition, the Agency lacks 1,2-dichloroethane throughput data and number of facilities; therefore, the number of facilities and throughput estimates are based on ~~stock~~ throughputs provided by the ESD and applying conservative assumptions from public comments provided to EPA (see Appendix A.4 of the *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae)). Based on this information, EPA concluded that the weight of scientific evidence for this assessment is slight-to-moderate.
Industrial and Commercial Aerosol Products	Slight to Moderate	For this OES, EPA had no release information from standard sources. The lack of release information from the databases introduces some uncertainty to the estimation because EPA could only rely on modeled results. EPA applied a methodology based on a 100% release scenario to fugitive air, which means that all 1,2-dichloroethane used in this scenario is assumed to be released to fugitive air. The 100% assumption is conservative, but EPA does expect that a high percentage of the quantity of chemical purchased and applied at the sites would eventually be released to air. This methodology calculated the release amounts using the amount of 1,2-dichloroethane used per application, number of applications per job, and number of jobs per site-year. The release model uses data from CARB to estimate 1,2-dichloroethane use rates; 100% of the sprayed 1,2-dichloroethane is expected to be released to air. EPA used this methodology combined with Monte Carlo modeling to estimate releases to the environment with media of release assessed only for fugitive air. More information about the details and assumptions of the model can be found in Appendix A.6 of the *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae). EPA believes 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. EPA further believes the primary limitation to be the uncertainty in the representativeness of values toward the true distribution of potential releases. In addition, the Agency lacks 1,2-dichloroethane chemical throughput data, number of facilities, and estimates for other release media. Based on this information, EPA concluded that the weight of scientific evidence for this assessment provides a slight-to-moderate estimate of releases in consideration of the strengths and limitations of reasonably available data.
Laboratory Use	Moderate	For this OES, EPA had release information for water from DMR and for air from NEI. EPA considered release years 2015–2024 DMR and 2014, 2017, and 2020 NEI.

OES[a]	Confidence Rating	Weight of Scientific Evidence Conclusion in Release Estimate
		EPA identified 14 facilities reporting water and air releases of 1,2-dichloroethane potentially related to laboratory use. However, EPA determined this data is not sufficient to capture the entirety of environmental releases for this scenario. Therefore, releases to the environment are assessed using the GS on the Use of Laboratory Chemicals, which has a high data quality rating from the systematic review process (U.S. EPA, 2023c). The Agency used EPA/OPPT models combined with Monte Carlo modeling to estimate releases to the environment with media of release assessed using assumptions from the ESD and EPA/OPPT models. EPA assumed that the media of release for disposal of laboratory waste is to hazardous waste landfill or incineration, per the GS. EPA believes 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. EPA further believes the primary limitation to be the uncertainty in the representativeness of values toward the true distribution of potential releases. In addition, EPA lacks 1,2-dichloroethane laboratory chemical throughput data; therefore, throughput estimates are based on stock solution throughputs from the GS on the Use of Laboratory Chemicals and on CDR reporting thresholds. EPA also has an estimate for the number of laboratories only through the fourteen facilities reporting to DMR and NEI, which may not capture all sites if some laboratories do not report to the programmatic databases. EPA has more certainty regarding the use of 1,2-dichloroethane for this OES from safety data sheets (SDSs) and combines that with the facility release data available and supporting evidence from the model. Based on this information, EPA concluded that the weight of scientific evidence for this assessment provides a moderate estimate of releases in consideration of the strengths and limitations of reasonably available data.
Waste Handling, Treatment, and Disposal	Moderate to Robust	***Waste Handling, Treatment, and Disposal (Incinerator, Landfill, and Non-POTW WWT)*** For these OESs, EPA had release information for air and water from TRI, for water from DMR, and for air from NEI. EPA considered release years 2015–2024 TRI and DMR, and 2014, 2017 and 2020 NEI. Water releases for Non-POTW sites are assessed using reported releases from TRI and DMR. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. Air releases for Non-POTW sites are assessed using reported releases from TRI and NEI. A strength of NEI data is that NEI captures additional sources that are not included in TRI due to reporting thresholds. 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 and NEI may not capture all relevant sites. Additionally, EPA made assumptions on the number of operating days to estimate daily releases. Based on this information, EPA concluded that the weight of scientific evidence for this assessment provides a moderate-to-robust estimate of releases in consideration of the strengths and limitations of reasonably available data.

OES[a]	Confidence Rating	Weight of Scientific Evidence Conclusion in Release Estimate
		Waste Handling, Treatment, and Disposal (POTW and Remediation) For these OESs, EPA had release information for water from TRI, for water from DMR, and for air from NEI. EPA considered release years 2015–2024 TRI and DMR, and 2014, d 2017, and 2020 NEI. Water releases for POTW and remediation sites are assessed using reported releases from DMR. DMR has a medium overall data quality determination from the systematic review process and NEI has a high rating. Of note, the Variability and Uncertainty data quality metric was determined to be medium. 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. Based on this information, for POTW and remediation site releases, EPA concluded that the weight of scientific evidence for this assessment provides a moderate-to-robust estimate of releases in consideration of the strengths and limitations of reasonably available data.

[a] OES for Distribution in Commerce is not present in this table because it was not quantitatively assessed.

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

Strengths

EPA compiled release information using reported releases from the 2015 through 2024 TRI (U.S. EPA, 2022c), 2015 through 2024 DMR (U.S. EPA, 2022b), as well as the 2014, 2017 and 2020 NEI (U.S. EPA, 2023a). NEI and TRI obtained a high data quality rating from EPA'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. Although NEI does not require stack testing or continuous emissions monitoring and reporting, agencies may use different emission estimation methods, and reasonable estimates may be obtained through mass-balance calculations, the use of emission factors, and engineering calculations.

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 lbs for manufacturers and processors and 10,000 lbs for users). For NEI, the Air Emissions Reporting Requirements (AERR) only requires Criteria Air Pollutants (CAP) data reporting, Hazardous Air Pollutants (HAP) data reporting is voluntary. 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 1,2-dichloroethane 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 lbs. Sites can also claim their production volume as CBI. As a result, the total production volume for a given OES may be underestimated. For sites not captured by CDR, whether—and to what extent—they release 1,2-dichloroethane 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 non-representative 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 while NEI reports annual air emissions and the estimated number of release days. 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 1,2-dichloroethane 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 30 to 40 billion lbs for 1,2-dichloroethane 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. 1,2-Dichloroethane 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 (BLS, 2023).
- **Uncertainties Associated with Facility Throughputs:** EPA estimated facility throughputs of 1,2-dichloroethane 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 1,2-dichloroethane from CDR for the given OES. Due to these uncertainties, the facility throughputs may be overestimated.
- **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 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 1,2-dichloroethane specific facility operations, release days may be overestimated.

3.3 Summary of Concentrations of 1,2-Dichloroethane in the Environment

Based on the environmental release assessment summarized in Section 3.2 and presented in EPA's *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae), 1,2-dichloroethane is released to the environment via air, water, biosolids, and disposal to landfills. Environmental media concentrations of 1,2-dichloroethane were quantified in ambient air, soil from ambient air deposition, soil from biosolids application, surface water, and sediment. Additional analysis of surface water used as drinking water was conducted for the Human Health Risk Assessment (Section 5).

Ambient air concentrations and deposition rates of 1,2-dichloroethane were estimated using the American Meteorological Society (AMS)/EPA Regulatory Model (AERMOD) and Human Exposure

Model (HEM), as described in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad) and *General Population Exposures for 1,2-Dichloroethane* (U.S. EPA, 2026ah). Soil concentrations were calculated using air deposition rates as estimated by AERMOD. Soil concentrations resulting from land application of biosolids were estimated using a screening method that incorporated SimpleTreat 4.0 and a European Chemicals Agency (ECHA) guidance document (ECHA, 2016; RIVM, 2015). Soil pore water concentrations were calculated using a modified equilibrium partitioning methodology (Fuchsman, 2003).

1,2-Dichloroethane is reported to be released to surface waters and, due to its water solubility (8,600 mg/L), a portion will remain in water (U.S. EPA, 2026n). For estimates of 1,2-dichloroethane in surface water, EPA utilized facility-specific releases from TRI and DMR and site-specific receiving water flow data. The availability of reported facility releases provides EPA the data to conduct representative estimates of 1,2-dichloroethane surface water concentrations resulting from COUs.

EPA also conducted a literature search to identify concentrations of 1,2-dichloroethane reported in peer-reviewed and gray literature sources. Where applicable, the Agency compared relevant monitored and modeled concentrations to support the use of the modeled concentrations.

3.3.1 Ambient Air Pathway

The Agency estimated ambient air concentrations using releases from three separate datasets: (1) EPA-estimated releases from generic facilities/sites (*i.e.,* where there was no site-specific location data); (2) TRI facility-reported releases; and (3) NEI facility-reported releases. TRI provides annual facility aggregated release data. EPA considered TRI release data from the years 2015 to 2024 for this analysis. For each facility, EPA used the highest total emissions across the years of 2015 to 2024 as inputs to HEM5.0. TRI reporters may report either with a Form R or a Form A. To use Form A, reporters must release less than 500 lbs/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.

NEI provides process-level release data every 3 years, with release data from 2014, 2017, and 2020 used in this risk evaluation. For NEI data, EPA considered releases from the years 2014, 2017, and 2020 in this analysis. In the draft risk evaluation, EPA modeled all available data for 2014 and 2017 (2020 data were not modeled in the draft risk evaluation because the data were not available when the analysis was performed). Table 3-8 shows that 2020 NEI releases were comparable to 2014 and 2017 data. (U.S. EPA, 2025a). For this evaluation, EPA modeled each facility that showed a risk greater than 1×10^{-6} based on the 95th percentile concentration at 10 m from the release location. EPA also modeled any releases that were new to the 2020 NEI if they were greater than the lowest release from 2014 and 2017 that resulted in a risk greater than 1×10^{-6} based on the 95th percentile concentration at 10 m from the release location. If a facility reported in multiple years and had total releases greater than the threshold described above, then EPA used the maximum release across all years in this analysis. EPA did not model releases that were assigned to the OES of Fuels and Related Products or if the SCC level one code was “internal combustion engine” or “external combustion engine”, even if they met the previously stated criteria, as they were considered to be part of the OES of Fuels and Related Products, which was not quantitatively evaluated in this evaluation (U.S. EPA, 2026ae).

For some facilities, release data from TRI and NEI can be the same, but there are often differences between the two datasets due to differences in reporting requirements. Additionally, NEI has a lower reporting threshold than TRI and therefore might capture more facilities and OESs (Section 3.2.1.3). The results of the modeling of TRI and NEI data will be used as two separate lines of evidence and will be used in conjunction to inform the overall risk characterization (Section 5.3.6). EPA also modeled ambient air concentrations for OESs where there were either no reported releases or only a limited number of releases that the Agency determined were not representative of the OES, using estimated releases for generic facilities/sites (see the *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae) for a full description of the modeled releases where there was no site-specific location data).

In this risk evaluation, EPA used HEM5.0 to estimate ambient air concentrations and deposition rates from all modeled and reported releases. HEM5.0 is the highest tier model currently used by EPA for estimating ambient air concentrations from industrial point and area sources. For each release, EPA calculated the 10th, 50th, and 95th percentile annual average ambient air concentrations at distances from 10 to 50,000 m from the release location. Where available, EPA used site-specific data associated with the releasing facility, as reported in TRI and/or NEI (see Table 5-46 for which data sources were available for each OES and the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad) for a full description of the HEM5.0 methodology).

For OESs where there was no site-specific location or limited facility-reported data (*i.e.,* OESs where EPA used estimated releases from generic facilities/sites as inputs for modeling of ambient air concentrations) (see Table 5-46 for which data sources were available for each OES), EPA used AERMOD to estimate ambient air concentrations. EPA ran the AERMOD Model using two sets of meteorological data (Lake Charles, Louisiana, and Sioux Falls, South Dakota) and using two land use scenarios (urban and rural) to represent a variety of release locations. Sioux Falls, South Dakota, and Lake Charles, Louisiana, were chosen as two meteorological stations because they represent meteorological datasets that tend to provide central tendency and high-end concentration estimates relative to the other stations within Integrated Indoor-Outdoor Air Calculator Model (IIOAC)-based on a sensitivity analysis of the average concentration and deposition predictions conducted in support of IIOAC development (see the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad) for more details).

To support the modeling results of ambient air concentrations, the EPA compared HEM5.0-modeled ambient air concentrations of 1,2-dichloroethane with measured concentrations from Ambient Monitoring Technology Information Center (AMTIC) monitoring sites, which were modeled concurrently with TRI facilities (U.S. EPA, 2026ad) (downloaded March 2026). The comparison shows that annual average and 95th percentile daily modeled concentrations are within approximately an order of magnitude of the mean and 90th percentile monitored 1,2-dichloroethane concentrations at 10 monitoring stations with the highest modeled concentrations.

Additional monitoring was conducted by EPA at three sampling locations near the same facility in Calvert City, Kentucky, from October 2020 to December 2021 (U.S. EPA, 2024b). The monitoring site with the highest measured 1,2-dichloroethane concentrations was located 370 m from the facility and reported concentrations ranging from 4.29×10^{-2} to 221 $\mu g/m^3$ (mean 22.1 $\mu g/m^3$) with a detection frequency of 99%. The two other sampling sites were located approximately 1,900 and 2,500 m from the facility and had reported concentrations of 5.91×10^{-2} to 15.4 $\mu g/m^3$ (mean 1.6 $\mu g/m^3$) and 2.83×10^{-2} to 11.2 $\mu g/m^3$ (mean 1.1 $\mu g/m^3$). For comparison, the modeled 95th percentile concentrations for this facility were 3.4 and 0.75 $\mu g/m^3$ at 1,000 and 2,500 m based on the 2020 TRI-reported releases. Additionally, the modeled 50th percentile concentrations for this facility were 1.6 $\mu g/m^3$ and 0.34 $\mu g/m^3$ at 1,000 and 2,500 m based on the 2020 TRI-reported releases.

Based on the ambient air exposure analysis performed for the *Risk Evaluation for 1,1-Dichloroethane* (U.S. EPA, 2025d), EPA did not perform a tiering analysis for 1,2-dichloroethane. For 1,1-dichloroethane, the tiering analysis performed resulted in EPA using the most refined approach available at the time because cancer risk estimates above benchmark were found in the lower-tier analyses. Because 1,1- and 1,2-dichloroethane use the same inhalation unit risk (IUR) and reported releases of 1,2-dichloroethane to ambient air are higher than those of 1,1-dichloroethane, EPA only performed the highest-tier of exposure analysis available. For this analysis, the Agency used a combination of AERMOD and HEM5.0 to estimate ambient air exposures to the general population because both models are the highest-tier models currently used by EPA for estimating ambient air concentrations as well as exposures from industrial point and area sources.

3.3.2 Surface Water and Aquatic Sediment Pathways

For the evaluation of surface water and aquatic sediment, EPA considered two lines of evidence: (1) results of modeling of facility-specific releases to surface water, and (2) review of available monitoring data. The Agency modeled 1,2-dichloroethane concentrations in surface water and aquatic sediment resulting from facility specific releases from COUs (COUs presented in Table 1-1). Thirteen OESs supporting the COUs had facility-specific release information in DMR databases which were used for the facility-specific modeling,

3.3.2.1 Surface Water

As mentioned in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad), and based on public comments to update facility data, EPA updated the collection of facility-reported releases of 1,2-dichloroethane to surface receiving water bodies as reported to TRI and DMR databases to include the years 2021 to 2024 in addition to the 2015 to 2020 data. The expanded data set identified additional facility release data associated 1,2-dichloroethane COUs/OESs (see Table 3-11 below). For the water pathway, different hydrological flow rates were used to estimate 1,2-dichloroethane surface water concentrations for different exposure scenarios.

Based on public comments, EPA included the review and use of effluent monitoring data in developing and implementing a tiering approach for estimating surface water concentrations. The criteria for tiering were based on the specific needs of estimating exposures to environmental biota and the corresponding development of the risk evaluation for 1,2-dichloroethane dictated which tiers are applied. These tiers are described in more detail in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026) for facility-specific data and generally required the estimation of provisional risk estimates to determine if these estimates were below benchmark for aquatic species and therefore informed whether refined analysis is necessary.

The surface water concentrations based on 30Q5 flows (lowest 30-day average flow that occurs [on average] in a 5-year period) are used to estimate acute, incidental human exposure through swimming or recreational contact. The surface water concentration based on harmonic mean flows provide a more conservative estimate as compared to annual average flows and are therefore preferred for assessing potential chronic human exposure via drinking water. The harmonic mean is also used for estimating human exposure through fish ingestion because it takes time for chemical concentrations to accumulate in fish. Lastly, for aquatic or ecological exposure, a 7Q10 flow (lowest 7-day average flow that occurs [on average] in a 10-year period) is used to estimate exceedances of concentrations of concern for aquatic life (U.S. EPA, 1991). EPA estimated surface water concentrations per facility and mapped it to its corresponding OES.

Table 3-11. Surface Water Estimates per OES for Various Flow Metrics

OES (NPDES)	Release Days	Release Estimate (kg/day)	7Q10 Flow (mld)	30Q5 Flow (mld)	Harmonic Mean Flow (mld)	7Q10 Conc. (µg/L)	30Q5 Conc. (ug/L)	Harmonic Mean Conc. (µg/L)
Manufacturing (LA0000761)	21	398	876 [a]	876 [a]	876 [a]	454	454	454
	350	24				27	27	27
Processing as a Reactant (IL0000141)	21	0.44	5.7E−02 [a]	5.7E−02 [a]	0.10	7,780	7,780	4,280
	350	2.6E−02				467	467	257
	Effluent monitoring data[b]					5	5	5
Processing into Formulation, Mixture, or Reaction Product (LA0004090)	21	3.3	82	129	189	40	26	18
	350	0.20				2.4	1.5	1.1
Laboratory Use (MI0001911)	21	1.2E−02	1.2	2.1	6.0	0.84	0.46	0.16
	260	9.9E−04				10	5.7	2.0
Repackaging (LA0056600)	21	3.8E−03	1.9 [a]	1.9 [a]	1.9 [a]	2.0	2.0	2.0
	250	3.2E−04				0.17	0.17	0.17
Industrial and Commercial Non-Aerosol Cleaning/ Degreasing (NJ0000019)	21	2.8E−02	87	137	208	0.33	0.21	0.14
	350	1.7E−03				2.0E−02	1.2E−02	8.2E−03
Waste Handling, Treatment, and Disposal (POTW) (CA0023671)	21	0.30	0.40	0.75	2.3	757	399	131
	365	1.7E−02				44	23	7.6
	Effluent monitoring data[b]					93	93	93
Waste Handling, Treatment, and Disposal (Non-POTW WWT) (PA0080594)	21	20	0.98	1.8	2.0	2.1E04	1.1E04	1.0E04
	250	1.7				1,730	940	861
	Effluent monitoring data[b]					2,200	2,200	2,200
Waste Handling, Treatment, and Disposal (Incinerator) (AR003780)	21	17	4.4 [a]	4.4 [a]	4.4 [a]	3,860	3,860	3,860
	250	1.4				325	325	325
	Effluent monitoring data[b]					416	416	416
Waste Handling, Treatment, and Disposal (Landfill) (PA0043818)	21	3.3E−03	5.3E−02	0.11	8.1E−02	63	31	41
	250	2.8E−04				5.3	2.7	3.5
Waste Handling, Treatment and Disposal (Remediation) (NV0023621)	21	2.1E−02	1.6	1.8	2.5	13	12	8.4
	250	1.8E−03				1.1	0.99	0.71

OES (NPDES)	Release Days	Release Estimate (kg/day)	7Q10 Flow (mld)	30Q5 Flow (mld)	Harmonic Mean Flow (mld)	7Q10 Conc. (µg/L)	30Q5 Conc. (ug/L)	Harmonic Mean Conc. (µg/L)
7Q10 = the modeled 7Q10 flow, in MLD (million liters per day); 30Q5 = the lowest monthly average flow from NHD, in MLD; OES = occupational exposure scenario [a] Facility reported effluent/plant flow [b] Facility-specific effluent monitoring data is available for download in EPA's Enforcement and Compliance History Online (ECHO) Database.								

3.3.2.2 Aquatic Sediment

EPA used a higher tier model, the U.S. EPA's Variable Volume Water Model with Point Source Calculator tool (VVWM-PSC), to estimate concentrations of 1,2-dichloroethane within water column and sediment for the COU/OES resulting in the highest surface water concentration (Disposal/Waste Handling, Treatment and Disposal [Incinerator]) associated with the 7Q10 hydrologic flow metric. 7Q10 flow metric and the corresponding surface water concentrations are utilized for the aquatic species assessment. Selecting the highest surface water concentration across all facilities releasing 1,2-dichloroethane to surface waters across the 2015 to 2024 years identifies the highest exposures and provides a screening analysis for sediment dwelling organisms. These receiving waterbody concentrations and corresponding sediment and pore water concentrations represented an upper bound of 1,2-dichloroethane concentrations in these media (see Table 3-12).

Table 3-12. Point Source Calculator Water and Benthic Sediment Concentration Estimates in the Receiving Water Body, Applying a 7Q10 Flow

OES	Number of Operating Days Per Year	Daily Release (kg/day)	7Q10 Total Water Column Conc. (µg/L)	7Q10 Benthic Pore Water Conc. (µg/L)	7Q10 Benthic Sediment Conc. (µg/kg)
Waste Handling, Treatment and Disposal (Non-POTW WWT)	21	20	20,600	5,060	13,800
	250	1.7	1,720	1,590	4,320
7Q10 = lowest 7-day average flow that occurs (on average) once every 10 years; POTW = publicly owned treatment works					

3.3.3 Land Pathway (Soils, Groundwater, and Biosolids)

The physical and chemical properties of 1,2-dichloroethane suggest that it is unlikely to be present in soil; however, there were monitored soil concentration data of 1,2-dichloroethane identified. The identified data were limited and were not associated with sites releasing 1,2-dichloroethane as reported in TRI and DMR. In order to assess the site-specific impacts of releases, soil concentrations were estimated via ambient air deposition from 1,2-dichloroethane TRI releasing facilities and via land application of biosolids from POTWs. Of these pathways, application of biosolids is estimated to result in lower concentrations of 1,2-dichloroethane (0.63 mg/kg) than deposition from ambient air deposition (1.4 mg/kg).

Monitoring data from the WQP show that 1,2-dichloroethane is detected in groundwater at numerous locations across the United States. While disposal of 1,2-dichloroethane to landfills could contribute to groundwater via leachate under certain conditions, as indicated by the Hazardous Waste Delisting Risk Assessment Software (DRAS) modeling (see Section 6.2.2 of the *Environmental Media Assessment for*

1,2-Dichloroethane (U.S. EPA, 2026ad)), 1,2-dichloroethane 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 1,2-dichloroethane releases and the prevalence of legacy chlorinated-solvent sites, observed detections likely reflect a combination of direct disposal and *in situ* formation from legacy sources of other chlorinated solvents. The DRAS modeling suggests that groundwater concentrations are not expected to exceed 8.2 μg/l based on the maximum reported TRI releases of 1,2-dichloroethane to landfills between 2015 and 2024.

3.3.4 Weight of Scientific Evidence Conclusions for Environmental Concentrations

Ambient Air Monitored and Modeled Concentrations

The Agency modeled ambient air concentrations from TRI- and NEI facility-reported releases using HEM5.0. Concentrations of 1,2-dichloroethane due to EPA estimated releases from generic facilities/sites were estimated using AERMOD. The TRI and NEI data are reported by facilities and state/government entities and provide EPA with data on the level of 1,2-dichloroethane being released into ambient air.

HEM5.0 uses the latitude/longitude information reported by each facility to TRI as the location of the point of release. While this is generally a close approximation of the release point for a small facility, it might not represent the release point within a much larger facility. Therefore, there is some uncertainty associated with the modeled distances from each release point and the associated exposure concentrations to which the general population living proximity to releasing facilities might be exposed. For a subset of facilities reporting to TRI, EPA determined that the coordinates reported to TRI were not representative of apparent emission sources according to aerial imagery. To account for this uncertainty, the coordinates in the 1,2-dichloroethane TRI inventory were compared to the 1,2-dichloroethane NEI inventory using the EPA Federal Registry Service (FRS) ID. For facilities where that crosswalk failed, the crosswalk was done by facility name and city/state location. When both crosswalks failed, EPA used the coordinates reported to TRI for modeling. For successful crosswalks, the coordinates reported to the NEI for the point source (*i.e.,* stack) with the highest rate of 1,2-dichloroethane emissions were used. If multiple point sources had the same high emission rate, then one was selected randomly. If the NEI contained only fugitive sources, then the same process as the point sources was followed but with fugitive sources; however, the dimensions of the source were not reported, so the coordinates (which are for the southwest corner of the fugitive source) could not be translated into centerpoint coordinates. The TRI-reported data used for HEM5.0 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 Integrated Indoor-Outdoor Air Calculator (IIOAC) to represent stack parameters of all TRI-reporting facilities modeled using HEM5.0. 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).

The above 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 facilities modeled. 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. Facility-specific stack parameters were used in the modeling of NEI releases, when reported.

EPA also used meteorology data for Lake Charles, Louisiana, and Sioux Falls, South Dakota, for OESs that had EPA-estimated releases for generic facilities/sites where facility-specific data were not available. Sioux Falls and Lake Charles were chosen as two meteorological stations because they represent 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 *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad) for more details).

Contrary to TRI-reported data, NEI-reported data used for AEMOD include source-specific stack parameters. Therefore, site-specific parameter values were used in modeling, when available. When parameters were not available, and/or values were reported outside of normal bounds, reported values were replaced using procedures outlined in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad).

EPA has robust confidence in the use of HEM5.0 and AERMOD to model ambient air concentrations because they have been peer reviewed and are fit for the purposes of this risk evaluation. EPA additionally has robust confidence in the use of facility-reported release data from TRI and NEI as model inputs. Furthermore, the use of both datasets ensures that high-end releases were likely captured in this analysis and the two databases, which have different reporting requirements, can be used in conjunction with each other to strengthen the overall confidence in modeled concentrations of 1,2-dichloroethane. Overall, EPA has robust confidence in the ambient air concentrations modeled using HEM5.0 when either NEI or TRI-reported releases were used as model inputs. The robust confidence is supported by the analysis showing the agreement of modeled and measured data as discussed in *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad). In contrast, the Agency has either slight or 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 and Sediment Pathways

EPA estimated 1,2-dichloroethane surface water concentrations based on facility-specific releases as reported to TRI and DMR from 2015 to 2024. EPA utilized National Hydrography Dataset Plus (NHDPlus) flow database to provide site specific receiving water body flow metrics. EPA utilized facility-specific effluent monitoring data as a Tier 2 analysis of surface water concentrations thereby providing refinement for concentrations of 1,2-dichloroethane in surface water. EPA is confident that the surface water concentration estimates at the point of release are representative of site-specific conditions for environmental and human exposures.

Land Pathway (Soils, Groundwater, and Biosolids)

Current reported releases to landfills are not anticipated to result in measurable 1,2-dichloroethane groundwater concentrations because modern landfills are highly regulated and engineered (*e.g.*, liners, leachate collection, and monitoring). Nevertheless, EPA estimated 1,2-dichloroethane groundwater concentrations based on landfill releases reported to TRI between 2015 and 2024 using the DRAS model. 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, 1988). 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 therefore has moderate confidence in the accuracy of modeled estimates of 1,2-dichloroethane in groundwater from TSCA releases and that the modeled estimates are protective of human health.

Monitoring data from the WQP shows that low levels of 1,2-dichloroethane are widespread in wells across the United States. However, data from EPA sources such as CDR, TRI, and DMR, indicate that releases from the conditions of use are not as geographically widespread; accordingly, the broad pattern of detections is most consistent with legacy influences—both direct historical disposal (*e.g.,* landfill-related pathways) and *in situ* formation under anaerobic conditions from higher-chlorinated solvents.

EPA identified limited monitoring data reporting concentrations of 1,2-dichloroethane in soil; however, the physical and chemical properties of 1,2-dichloroethane suggest that it might be present in soil. Therefore, EPA modeled soil concentrations via ambient air deposition from 1,2-dichloroethane TRI releasing facilities and via land application of biosolids from POTWs. EPA used SimpleTreat 4.0, a modified equilibrium partitioning model, and an ECHA guidance document to estimate concentrations of 1,2-dichlorethane in biosolids (ECHA, 2016; RIVM, 2015). Although EPA is uncertain of the precision of the estimates of 1,2-dichloroethane concentrations in soils from biosolids land application, the Agency is highly confident that the low estimated concentrations from POTWs releasing 1,2-dichloroethane-containing biosolids when combined with the lack of 1,2-dichloroethane detected in EPA's national biosolids monitoring data result in a conclusion of negligible presence of 1,2-dichloroethane in biosolids applied to soil. To calculate concentrations of 1,2-dichloroethane in soil due to air deposition, EPA used HEM5.0 to estimate deposition rates from TRI reporting facilities. The Agency has moderate confidence in the modeled 1,2-dichloroethane air deposition results due to the moderate confidence in the input parameter values used for HEM5.0 deposition modeling (*e.g.,* cuticular uptake rate).

4 ENVIRONMENTAL RISK ASSESSMENT

1,2-Dichloroethane – Environmental Risk Assessment (Section 4): Key Points

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

Environmental Exposure

- 1,2-Dichloroethane is expected to be released to air, water, and land.
  - Based on the fate and transport and environmental media analyses (Sections 1.2, and 3.3), the main environmental exposure pathways for 1,2-dichloroethane are surface water and soil.
  - Exposure to surface water was assessed at the point of release based on TRI- and DMR-reported releases and effluent concentrations from monitoring data.
  - The contribution of air releases to exposure was assessed via air deposition to soil and water.

Environmental Hazard

- Aquatic Species
  - The acute aquatic and benthic concentration of concern (COC) of 11,909 µg/L was derived from the lower 95th percentile of the HC05 based on a species sensitivity distribution (SSD).
  - The chronic aquatic COC of 480 µg/L was derived from the chronic value (ChV) of the 21- and 28-day LOECs/NOECs for reproductive inhibition of adult *Daphnia magna*.
  - The algal COC of 12,400 µg/L was derived from the 72-hour EC50 for growth and development effects for *Raphidocelis subcapitata*.
  - The chronic COC for comparison with benthic pore water was 9,300 µg/L and the chronic COC for comparison with sediment was 2,900 µg/kg. Both COCs were derived from the analog 1,1,2-trichloroethane ChVs of two-generation LOECs/NOECs for growth and development effects for second generation *Chironomus riparius* larvae.
- Terrestrial Species
  - The mammalian wildlife TRV of 93 mg/kg-bw/day was derived from the geometric mean of NOAELs for reproduction and growth effects on human health model mice and rats.
  - The avian hazard threshold of 16 mg/kg-bw/day was derived from the geometric mean of an 8.5-month NOAEL/LOAEL for reduced reproductive success in white leghorn chickens.
  - The terrestrial plant hazard threshold of 9,200 µg/L was derived from the 2-hour ED25 for germination effects for *Nicotiana tabacum*.

Environmental Risk

- Risk quotients (RQs) exceeding 1 were observed from exposure in surface water and sediment and across taxonomic groups, representing aquatic plants and algae, invertebrates, and vertebrates. RQs exceeding 1 were observed for one facility in one COU: Disposal; for this facility, a new NPDES permit was issued newly limiting discharges and effluent concentrations of 1,2-dichloroethane, reducing aquatic media concentrations below COCs.
  - EPA has moderate-to-robust confidence in the determination of no risk to aquatic organisms.
- EPA does not expect risk for any assessed pathways for exposure of 1,2-dichloroethane to terrestrial organisms.
  - The COU with the highest soil and soil pore water concentrations, Manufacturing – Domestic manufacture, was evaluated quantitatively for risk to terrestrial species from air deposition to soil.
  - RQ values were below 1 for terrestrial plants exposed to 1,2-dichloroethane in soil pore water and for dietary exposure to representative mammals and birds via trophic transfer.
  - The Agency has moderate confidence in the determination of no risk to terrestrial organisms.
- EPA does not expect risk for any assessed pathways for exposure of the assessed byproducts to aquatic and terrestrial organisms.
  - EPA has moderate confidence in the determination of no environmental risk from the byproducts.

4.1 Summary of Environmental Exposures

Based on the fate and transport and environmental media analyses presented in Sections 2 and 3.3, the main environmental exposure pathways for 1,2-dichloroethane are surface water and soil. Inhalation is not expected to be a significant pathway. Air deposition to soil may result in exposure to terrestrial organisms via uptake from soil and soil pore water and subsequent trophic transfer. Although 1,2-dichloroethane exposure also occurs via land application of biosolids, soil concentrations of 1,2-dichloroethane through biosolid application are expected to be negligible based on low sorption of 1,2-dichloroethane to solids. Additionally, the modeled quantities are lower than the estimated amount occurring from air deposition to soil (see Section 3.3.3). Thus, the land application of biosolids pathway was not assessed quantitatively.

Due to the low availability of biomonitoring data for exposure media or biota, exposures to aquatic and terrestrial species were assessed using modeled data and known maximum facility air and water releases of 1,2-dichloroethane for each COU/OES. Dietary exposure resulting from air deposition to soil and releases to surface water was assessed via trophic transfer which is the process by which chemical contaminants can be taken up by organisms through dietary and media exposures and transfer from one trophic level to another. Chemicals can be transferred from contaminated media and diet to biological tissue and accumulate throughout an organisms' lifespan (bioaccumulation) if they are not readily excreted or metabolized. Through dietary consumption of prey, a chemical can subsequently be transferred from one trophic level to another. If biomagnification occurs, higher trophic level predators will contain greater body burdens of a contaminant compared to lower trophic level organisms.

1,2-Dichloroethane is not expected to be bioaccumulative in tissues with a reported bioaccumulation factor [BAF] of 3.78 L/kg and bioconcentration factors [BCFs] ranging from 2 to 4.4 L/kg. 1,2-Dichloroethane is expected to have low degradation rates under most environmental conditions, and ongoing releases could sustain its presence in aquatic and terrestrial environments. Fugacity modeling indicates that when constantly released to either soil or water, it will primarily remain in the media of release (100% release to water = 82.8% partitioning to water; 100% release to soil = 71.1% partitioning to soil) (U.S. EPA, 2026n). Volatilization from soil and water can mitigate persistence, consistent with its Henry's law constant (1.54×10^{-3} atm-m^3/mol) and vapor pressure (78.9 mmHg), although it is also water soluble (8,600 mg/L) and thus some portion will remain dissolved in water. Measured concentrations in tissues of aquatic organisms have been reported; accordingly, dietary exposure is a relevant pathway for wildlife.

Aquatic trophic transfer included the ingestion of fish and crayfish by mink (representative aquatic-dependent mammal) and belted kingfisher (representative aquatic-dependent bird). Terrestrial trophic transfer included the ingestion of plants by meadow vole and northern bobwhite (representative herbivores), ingestion of earthworms by short-tailed shrew and American woodcock (representative insectivores), and ingestion of the representative herbivores and representative insectivores by kestrel (representative avian predator).

The COUs with the highest media concentrations were the Disposal COU for releases to surface water and the Manufacturing – Domestic manufacture COU for the air deposition to soil pathway. Estimated surface water concentrations are 1,720 µg/L for a 250-day release scenario and 20,600 µg/L for a 21-day release scenario. Estimated soil and soil pore water concentrations for daily deposition at the 10 m distance are 1,353 µg/kg and 621 µg/L, respectively.

4.1.1 Weight of Scientific Evidence Conclusions for Environmental Exposures

EPA used a combination of chemical-specific parameters and generic default parameters when estimating surface water, sediment, soil, and fish-tissue concentrations. Concentrations of 1,2-dichloroethane in environmental media are expected to vary by exposure scenario. Release from industrial facilities, either by water or air, contributes to concentrations of 1,2-dichloroethane in the environment. Proximity to facilities and other sources is likely to lead to elevated concentrations via air deposition compared to locations that are more remote. The ability to identify releases by location reduces uncertainty in assumptions when selecting model input parameters that are typically informed by location (*e.g.,* meteorological data, land cover parameters for air modeling, flow data for water modeling).

The available measured ambient surface water monitoring data for 1,2-dichloroethane are poorly co-located with 1,2-dichloroethane facility release sites and the corresponding facility's permit effluent monitoring data. Therefore, EPA relied primarily on facility-specific releases to surface waters as reported to EPA through NPDES permit databases to estimate aqueous concentrations. The estimated 1,2-dichloroethane surface water concentrations are based on effluent monitoring data, which are several orders of magnitude greater than concentrations reported in ambient surface water monitoring data. 1,2-Dichloroethane concentrations are estimated at the point of release based on facility's permit effluent monitoring data, whereas ambient surface water monitoring locations are neither spatially nor temporally aligned with known facility COU sites of release. For additional details, see Section 3.3.4 of this document and Section 7.2 of the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad). Environmental exposures of aquatic invertebrates, vertebrates, and plants to 1,2-dichloroethane were assessed using estimated surface water, benthic pore water, and sediment concentrations resulting from reported releases to surface water (Section 3.3.2) using site-specific information such as facility plant flow rate or the flow rate for the receiving water body at a release location. The confidence in the estimated surface water, benthic pore water, and sediment concentrations resulting from surface water releases is characterized as moderate-to-robust. For additional details see Section 3.3.4.

There were no monitoring studies conducted in the United States with data on concentrations of 1,2-dichloroethane in soil identified during systematic review. Thus, environmental exposures of soil invertebrates, terrestrial plants, and vertebrates to 1,2-dichloroethane were assessed using modeled air deposition to soil and estimation of resulting bulk soil and soil porewater concentrations using conservative assumptions regarding persistence and mobility (Section 3.3.1). The screening level models and methods used to estimate soil concentrations from air deposition are commonly used, peer-reviewed methods. Thus, there is robust confidence that actual soil concentrations will not exceed the estimated soil concentrations resulting from air deposition. For additional details see Section 3.3.4.

4.2 Summary of Environmental Hazards

4.2.1 Environmental Hazard Thresholds

EPA evaluated the reasonably available information for environmental hazard endpoints for aquatic and terrestrial species following exposure to 1,2-dichloroethane or its chemical analogs 1,1-dichloroethane, 1,2-dichloropropane, and 1,1,2-trichloroethane in the *Environmental Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ac). There were no reasonably available empirical data on acute exposures to sediment-dwelling species and there were limited empirical data on chronic exposures to sediment-dwelling species for 1,2-dichloroethane; thus, EPA supplemented with empirical data for the analogs 1,1-dichloroethane, 1,2-dichloropropane, and 1,1,2-trichloroethane.[8]

Aquatic Species Hazard

To estimate aquatic hazards (mortality or immobilization) from acute exposures, the Agency supplemented empirical data on 1,2-dichloroethane aquatic species and empirical data on sediment-dwelling species on the analogs 1,1-dichloroethane and 1,2-dichloropropane with hazard predictions from an EPA predictive tool, Web-based Interspecies Correlation Estimation (Web-ICE). These data, which included toxicity predictions for a total of 80 species, were used with the empirical aquatic invertebrate, fish, and amphibian data and empirical sediment-dwelling invertebrate data to create a species sensitivity distribution (SSD) and calculate an HC05 (17,860 µg/L); that is, a hazardous concentration threshold for 5% of species (*i.e.,* hazard concentration that is protective of 95% of the species in the SSD). The concentration of concern (COC) of 11,909 µg/L for acute exposures of aquatic species was derived by using the lower 95% CI of the HC05 to account for uncertainty, which is analogous to EPA's use of an assessment factor (AF) for chronic and algal COCs.

EPA also calculated a COC of 480 µg/L (based on reproduction in *Daphnia magna*) for chronic exposures to aquatic species using empirical 1,2-dichloroethane hazard data. EPA calculated COCs for chronic exposures in benthic pore water and sediment to sediment-dwelling species (based on growth and development of *Chironomus riparius*; 9,300 µg/L in benthic pore water and 2,900 µg/kg in sediment) using empirical, sediment-dwelling invertebrate hazard data on an analog chemical, 1,1,2-trichloroethane.

EPA also calculated an algal COC of 12,400 µg/L for exposures to aquatic plants using empirical 1,2-dichloroethane hazard data on algae (based on growth of *Raphidocelis subcapitata*).

Table 4-1. Environmental Hazard Thresholds for Aquatic Environmental Toxicity

Environmental Aquatic Toxicity	Analog	Hazard Value (µg/L)	Assessment Factor (AF)	COC (µg/L)	Assessment Medium
Acute aquatic exposure: Lower 95% CI of HC05 from SSD	N/A	11,909	N/A[a]	11,909	Water column
Acute benthic exposure: Lower 95% CI of HC05 from SSD	1,1-Dichloroethane, 1,2-Dichloropropane	11,909	N/A[a]	11,909	Benthic pore water
Chronic aquatic exposure: daphnid ChV	N/A	4,800	10	480	Water column
Chronic benthic exposure: midge ChV	1,1,2-Trichloroethane	93,000	10	9,300	Benthic pore water
Chronic benthic exposure: midge ChV	1,1,2-Trichloroethane	29,000[b]	10	2,900[b]	Sediment
Aquatic plant exposure: algae EC50	N/A	124,000	10	12,400	Water column

AF = adjustment factor; ChV = chronic value; CI = confidence interval; COC = concentration of concern; EC50 = effect concentration at which 50% of test organisms exhibit an effect; HC05 = hazardous concentration for 5% of species; SSD = species sensitivity distribution
[a] EPA used the lower 95% CI of the HC05 to account for uncertainties rather than an adjustment factor.
[b] Hazard value for sediment is in ug/kg.

[8] EPA used the same approach to select these analogs as was used in the *Risk Evaluation for 1,1-Dichloroethane* to select analogs for use in the environmental hazard and risk assessment (U.S. EPA, 2025d). This approach was peer reviewed by the SACC (see EPA-HQ-OPPT-2024-0114-0087).

Terrestrial Species Hazard
Terrestrial hazard data for 1,2-dichloroethane were available for mammals, birds, and plants. Empirical toxicity data for mice and rats were used to derive a chronic toxicity reference value (TRV) for terrestrial mammals of 93 mg/kg-bw/day (based on reproduction and growth). Based on empirical toxicity data for chickens (*Gallus gallus domesticus*) from a dietary study, the chronic hazard threshold for terrestrial birds is 16 mg/kg-bw/day based on reduced flock production. Based on empirical toxicity data for tobacco pollen exposed via gas injected into germination medium, the acute hazard threshold for terrestrial plants is 9.2 mg/L.

Table 4-2. Environmental Hazard Thresholds for Terrestrial Environmental Toxicity

Environmental Terrestrial Toxicity	Hazard Value or TRV	Assessment Medium
Mammal: TRV	93 mg/kg-bw/day	Dietary
Avian (*Gallus gallus domesticus*): ChV	16 mg/kg-bw/day	Dietary
Soil invertebrate	No data	No data
Terrestrial plant (*Nicotiana tabacum*): ED25	9.2 mg/L	Soil pore water
ChV = chronic value; ED25 = dose at which 25% effect occurs; TRV = toxicity reference value		

4.2.2 Weight of Scientific Evidence Conclusions for Environmental Hazards

EPA considered all reasonably available information identified through the systematic review process under TSCA to characterize environmental hazard endpoints for 1,2-dichloroethane. The following summarizes the hazard values and overall hazard confidence. For additional details, see the *Environmental Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ac).

Aquatic Species
LC50 and EC50 values from eight exposures to 1,2-dichloroethane in aquatic invertebrates, amphibians, and fish and immobilization EC50 values from exposure to the analogs 1,1-dichloroethane and 1,2-dichloropropane in a benthic invertebrate species were used alongside Web-ICE-derived hazard estimates to develop an aquatic and benthic SSD. The lower confidence interval of the HC05 was used as the COC and indicated that acute aquatic toxicity occurs at 11,909 µg/L. EPA has robust confidence that this hazard value represents the level of acute 1,2-dichloroethane exposure at which ecologically relevant effects will occur in aquatic invertebrates and vertebrates.

Chronic aquatic effects were observed in aquatic invertebrates and fish. Reproduction inhibition in *D. magna* resulted from 21- and 28-day exposures to 1,2-dichloroethane. The COC based on these studies indicated that chronic toxicity to aquatic species occurs at 480 µg/L. EPA has robust confidence that this hazard value represents the level of chronic 1,2-dichloroethane exposure at which ecologically relevant effects will occur in aquatic species.

Population growth effects were observed in freshwater and marine algae. A 72-hour exposure to 1,2-dichloroethane in the green algae *Raphidocelis subcapitata* found a significant reduction in population growth. The COC based on this study indicated that toxicity in algae occurs at 12,400 µg/L. EPA has robust confidence that this hazard value represents the level of 1,2-dichloroethane at which ecologically relevant effects will occur in algae.

Benthic Species
An acute benthic COC of 11,909 µg/L was selected based on an aquatic and benthic SSD developed as described above. EPA has moderate confidence that this hazard value represents the level of acute

benthic 1,2-dichloroethane exposure at which ecologically relevant effects will occur in benthic invertebrates.

A two-generation study in the freshwater midge *C. riparius* exposed to the analog 1,1,2-trichloroethane resulted in significantly decreased emergence in second-generation larvae. The COCs based on this study indicated that chronic toxicity occurs at 2,900 µg/kg in benthic invertebrates exposed via sediment and at 9,300 µg/L in benthic invertebrates exposed via benthic pore water. EPA has moderate confidence that these hazard values represent the level of 1,2-dichloroethane exposure at which ecologically relevant effects will occur in benthic invertebrates, because hazard information for only two species was identified, and one of the studies was based on exposure to an analog rather than the target chemical.

Terrestrial Species

Subchronic and chronic exposure to 1,2-dichloroethane resulted in behavior, growth, reproduction, and mortality effects in rats and mice. The TRV derived from the dataset was ultimately set based on the geometric mean of the no-observed-adverse-effect levels (NOAELs) for reproduction and growth, which was 93 mg/kg-bw/day. EPA has moderate confidence that this hazard value represents the level of 1,2-dichloroethane exposure at which ecologically relevant effects will occur in terrestrial vertebrates, because no wildlife mammalian studies were available and exposure for the studies used to set the TRV was primarily via gavage, which is considered a less environmentally relevant form of exposure.

Chronic exposure to 1,2-dichloroethane resulted in effects on feed consumption and reproduction in chickens. The hazard value derived from this study indicated that chronic toxicity in terrestrial birds occurs at 16 mg/kg-bw/day. EPA has moderate confidence that this hazard value represents the level of 1,2-dichloroethane exposure at which ecologically relevant effects will occur in terrestrial birds, because only a single study in a non-wildlife species was available in the database.

Acute exposure to 1,2-dichloroethane resulted in inhibition of germination in tobacco pollen. The hazard value derived from this study indicated that acute toxicity in terrestrial plants occurs at 9.2 mg/L. EPA has slight confidence that this hazard value represents the level of acute 1,2-dichloroethane exposure at which ecologically relevant effects will occur in terrestrial plants, because only one study in an agricultural crop species was represented in the database and the exposure route was via growth medium, which could be considered less environmentally relevant than tests conducted in soil.

4.3 Environmental Risk Characterization

EPA considered fate, exposure, and environmental hazard to characterize the environmental risk of 1,2-dichloroethane. For environmental receptors, the Agency quantitatively estimated risks to (1) aquatic species via water and sediment (including benthic pore water and sediment), and (2) terrestrial species via exposure to soil and soil pore water by air deposition and diet through trophic transfer. Risk estimates to aquatic-dependent terrestrial species were conducted to include exposures to 1,2-dichloroethane via diet, water, and incidental ingestion of sediment. As described in Section 2.2, when released to the environment, 1,2-dichloroethane is expected to partition primarily to air with lesser amounts to water, sediment and soil. Based on its physical and chemical properties, 1,2-dichloroethane may persist in the environment when releases exceed volatilization and biodegradation rates (Table 2-2) but is not expected to bioaccumulate in biota (BAF = 3.78 L/kg; BCF = 2–4.4 L/kg). Direct exposure of 1,2-dichloroethane to terrestrial receptors via air was not assessed quantitatively because dietary exposure was determined to be the driver of exposure to wildlife. In general, for terrestrial mammals and birds, relative contribution to total exposure associated with inhalation is secondary in comparison to exposures by diet and indirect ingestion. EPA has quantitatively evaluated the relative contribution of inhalation exposures for terrestrial mammals and birds in the *Guidance for Developing Ecological Soil Screening Levels* (Eco-SSLs) (U.S. EPA, 2005a, 2003).

Section 4.2 details reasonably available environmental hazard data and indicates that 1,2-dichloroethane presents hazard to aquatic and terrestrial organisms. For acute exposures, 1,2-dichloroethane is a hazard to aquatic animals in the water column and benthic pore water at 11,909 µg/L based on the lower 95% CI of the HC05 resulting from an SSD utilizing EPA's Web-ICE (Raimondo, 2010) and SSD toolbox applications (Etterson, 2020). For chronic exposures, 1,2-dichloroethane is a hazard to aquatic organisms in the water column with a COC of 480 µg/L for fish. For exposures to algal species, 1,2-dichloroethane is a hazard to algae in the water column with a COC of 12,400 µg/L. For chronic exposures to sediment-dwelling organisms, 1,2-dichloroethane is a hazard with COCs of 9,300 µg/L and 2,900 µg/kg in benthic pore water and sediment, respectively. For terrestrial exposures, 1,2-dichloroethane is a hazard to (1) mammals at 93 mg/kg-bw/day, (2) birds at 16 mg/kg-bw/day, and (3) terrestrial plants with a hazard value of 9,200 µg/L. As detailed in Section 4.2.2, EPA considers the evidence for aquatic and algal hazard thresholds robust, benthic/sediment thresholds as moderate, terrestrial mammalian threshold moderate, terrestrial avian threshold moderate, and the evidence for terrestrial plants threshold slight.

Facility emissions data were obtained from databases such as TRI, DMR, and the NEI. The emissions data from these sources are the facility-specific releases of 1,2-dichloroethane to air, water, and land on an annual basis (lbs/site-yr or kg/site-yr). The total number of operating days per year for these facilities can be confidently estimated (Section 3.2.1.1). For example, manufacturing processes are typically continuous processes that run year-round with potential brief shut-down periods. The total number of operating days per year for manufacturing processes can be reliably estimated as 350. However, the number of days per year that the site manufactures, processes, or uses and releases the chemical is uncertain. The number of release days per year may be less than the total number of operating days for the facility. To address this uncertainty, EPA has modeled two distinct "what-if" scenarios for releases to surface water to cover a range of possible release days at the facility. One scenario assumes the number of release days is equivalent to the shortest hazard duration from which the chronic COCs were derived (21 days). A second scenario assumes that the release is averaged out over the total number of operating days (Table 3-5), so an equal average daily release occurs on each of the operating days. Exposure concentrations from both scenarios were compared to the acute, algal, and chronic COCs.

4.3.1 Risk Assessment Approach

EPA conducted the environmental risk characterization for 1,2-dichloroethane to evaluate whether the releases of 1,2-dichloroethane to air, water, and land and subsequent exposures to aquatic and terrestrial species exceed the concentrations of 1,2-dichloroethane observed to cause hazardous effects in aquatic and terrestrial species. The Agency quantitatively estimated risks to aquatic species via water and sediment (including benthic pore water and sediment), and to terrestrial species via exposure to soil and soil pore water and diet through trophic transfer. A weight of evidence approach was used to select hazard thresholds for use in the derivation of risk quotients for aquatic and terrestrial organisms.

EPA characterized environmental risk of 1,2-dichloroethane by calculating risk quotients (RQs) for quantitative assessments (U.S. EPA, 1998; Barnthouse et al., 1982). The RQ is defined in Equation 4-1 below.

Equation 4-1. Calculating the Risk Quotient (RQ)

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

Environmental concentrations for each compartment (*i.e.,* surface water, sediment, and soil) were based on modeled (*e.g.,* VVWM-PSC, HEM) and/or calculated (*i.e.,* soil and soil pore water concentrations estimated from HEM-modeled air deposition rates) concentrations of 1,2-dichloroethane from Sections 3.3 and 4.1. Exposure concentrations in the water column, benthic pore water, and sediment were determined according to two different release scenarios[9]: Scenario 1, a hazard based-release duration; and Scenario 2, which averaged the release across the total number of facility operating days. Days of exceedance information was used to determine whether the exposure concentrations resulting from these release scenarios exceeded the COCs for a relevant length of time. For aquatic species dwelling in the water column, acute RQ days of exceedance were determined as equal to or greater than 1 day, whereas for chronic RQs days of exceedance are equal to or greater than 21 days. RQs for algal species are presented separately and neither described as acute or chronic due to the relatively rapid replication time of most algal species. Algal RQs days of exceedance are equal to or greater than 3 days. For sediment-dwelling species, acute RQ days of exceedance were determined as equal to or greater than 1 day, whereas for chronic RQs days of exceedance are equal to or greater than 35 days. The days of exceedance for the algal and chronic COCs are based on the exposure durations from the associated hazard studies.

EPA calculates hazard thresholds to identify potential concerns to aquatic and terrestrial species. These terms describe how the values are derived and can encompass multiple taxa or ecologically relevant groups of taxa as the environmental risk characterization serves populations of organisms within a wide diversity of environments. For hazard thresholds, EPA used the COCs calculated for aquatic organisms, and the hazard values or TRVs calculated for terrestrial organisms as detailed within Section 4.2.1.

RQs equal to 1 indicate that environmental exposures are the same as the hazard threshold. If the RQ is above 1, the exposure is greater than the hazard threshold and risk is indicated. If the RQ is below 1, the exposure is less than the hazard threshold and risk is not indicated. RQs derived from modeled data for 1,2-dichloroethane are described in Section 4.3.2 for aquatic organisms and Sections 4.3.3 and 4.3.4 for terrestrial organisms.

Aquatic Risk Characterization Approach; Surface Water, Benthic Pore Water, and Sediment

Quantitative risk estimates for the Disposal COU were developed for releases of 1,2-dichloroethane to surface water. Within the aquatic environment, a tiered approach was employed, whereby the specific needs of estimating exposures to environmental biota and the corresponding development of the risk evaluation for 1,2-dichloroethane dictates which tiers were applied. These tiers are described in more detail in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad). Surface water releases were first assessed using methodologies based on EPA's Exposure and Fate Assessment Screening Tool (E-FAST) by comparing surface water concentrations resulting from a 21-day release scenario and a facility operating days release scenario to the most sensitive COC—the chronic water-column COC of 480 µg/L. If the initial Tier I estimates resulted in surface water concentrations that were higher than the chronic aquatic COC (480 µg/L) for a facility, then that facility proceeded to the

[9] This approach is similar to approaches used in prior peer-reviewed risk evaluations including the *Risk Evaluation for 1,1-Dichloroethane* (U.S. EPA, 2025d). The SACC was supportive of including a conservative release duration scenario due to data availability constraints (EPA-HQ-OPPT-2024-0114-0087).

second tier. For 1,2-dichloroethane, 14 COUs/12 OESs reported water releases and were assessed at Tier I, and 6 COUs/4 OESs proceeded to Tier II as shown in Table 4-3.

In Tier II, EPA considered effluent concentrations from effluent monitoring data as a refinement of the initial Tier I surface water concentrations. If the effluent concentrations identified in Tier II were higher than the chronic aquatic COC (480 µg/L) for a facility, then that facility proceeded to the third tier. For 1,2-dichloroethane, one COU/OES (Disposal/Waste Handling, Treatment and Disposal [Non-POTW WWT]) proceeded from Tier II to Tier III as showing in Table 4-3.

In Tier III, EPA uses a higher tier model, the Variable Volume Water Model with Point Source Calculator tool (VVWM-PSC), to estimate concentrations of 1,2-dichloroethane within water column, benthic pore water, and sediment. VVWM-PSC considers model inputs of physical and chemical properties of 1,2-dichloroethane (*i.e.,* K_{OW}, K_{OC}, water column half-life, photolysis half-life, hydrolysis half-life, and benthic half-life) allowing EPA to model predicted benthic pore water and sediment concentrations. The VVWM-PSC modeled 7Q10 surface water concentrations from facility-specific release pollutant loads. If the media concentrations corresponding to the respective exposure durations represented by the various COCs exceeded the acute, chronic, or algal COCs in the water column, benthic pore water, or sediment, the VVWM-PSC model was then used to confirm the days of exceedance as determined by the respective COCs.

Table 4-3. Occurrence of Releases to Surface Water per COU/OES and Associated Risk Estimation Decisions

COU (Lifecycle Stage/Category/Subcategory)	OES	Releases to Surface Water	Tier I RQ > 1 [a]	Tier II RQ > 1 [a]	Tier III Conducted[a]
Manufacturing/Domestic manufacture/Domestic manufacture	Manufacturing	Yes	No	N/A	N/A
Manufacturing/Import/Import	Repackaging	Yes	No	N/A	N/A
Processing/Repackaging/Repackaging					
Processing/Processing – As a reactant/Intermediate in: Petrochemical manufacturing; Plastic material and resin manufacturing; All other basic organic chemical manufacturing; All other basic inorganic chemical manufacturing	Processing as a Reactant	Yes	Yes	No	N/A
Processing/Recycling/Recycling					
Industrial use/Process regulator/*e.g.,* Catalyst moderator; oxidation inhibitor					
Processing/Processing – Incorporated into formulation, mixture, or reaction product/Fuels and fuel additives: All other petroleum and coal products manufacturing	Processing into Formulation, Mixture, or Reaction Product	Yes	No	N/A	N/A
Processing/Processing – Incorporated into formulation, mixture, or reaction product/Processing aids: Specific to petroleum production; plastics material and resin manufacturing					

COU (Lifecycle Stage/Category/Subcategory)	OES	Releases to Surface Water	Tier I RQ > 1 [a]	Tier II RQ > 1 [a]	Tier III Conducted[a]
Processing/Processing – Incorporated into formulation, mixture, or reaction product/Adhesives and sealants; Lubricants and greases; Process regulators; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing					
Industrial use/Other use/Process solvent					
Distribution in commerce/Distribution in commerce/Distribution in commerce	Distribution in commerce	No	N/A	N/A	N/A
Industrial use/Adhesives and sealants/Adhesives and sealants	Industrial Application of Adhesives and Sealants	No	N/A	N/A	N/A
Industrial use/Functional fluids (closed systems)/Heat transferring agent	Heat Transferring Agent	No	N/A	N/A	N/A
Industrial use/Lubricants and greases/Solid film lubricants and greases	Industrial Application of Lubricants and Greases	No	N/A	N/A	N/A
Industrial use/Solvents (for cleaning and degreasing)/Degreasing and cleaning solvents	Commercial Aerosol Products	No	N/A	N/A	N/A
	Non-Aerosol Cleaning and Degreasing	Yes	No	N/A	N/A
Commercial use/Plastic and rubber products/Products such as: Plastic and rubber products	Plastic and Rubber Products	No	N/A	N/A	N/A
Commercial use/Fuels and related products/Fuels and related products	Fuels and Related Products	No	N/A	N/A	N/A
Commercial use/Other use/Laboratory chemical	Laboratory Use	Yes	No	N/A	N/A
Disposal/Disposal/Disposal	Waste Handling, Treatment and Disposal (Landfill)	Yes	No	N/A	N/A
	Waste Handling, Treatment, and Disposal (POTW)	Yes	Yes	No	N/A

COU (Lifecycle Stage/Category/Subcategory)	OES	Releases to Surface Water	Tier I RQ > 1 [a]	Tier II RQ > 1 [a]	Tier III Conducted[a]
Disposal/Disposal/Disposal	Waste Handling, Treatment, and Disposal (Remediation)	Yes	No	N/A	N/A
	Waste Handling, Treatment, and Disposal (Non-POTW WWT)	Yes	Yes	Yes	Yes – See Results in Section 4.3.2
	Waste Handling, Treatment, and Disposal (Incinerator)	Yes	Yes	No	N/A
N/A	Unknown[a]	Yes	No	N/A	N/A

[a] The most sensitive aquatic COC (chronic aquatic COC of 480 µg/L) was used to screen for risk in Tier I and Tier II. All COCs (Table 4-1) were compared to the media concentrations for COUs that progressed to Tier III.
[b] Some 1,2-dichloroethane-releasing facilities have not been mapped to an OES. The first tier of screening for those facilities indicated that resulting water concentrations did not exceed aquatic concentrations of concern.

Terrestrial Risk Characterization Approach

Risk to terrestrial species was assessed from exposure to 1,2-dichloroethane in soil and soil pore water resulting from air deposition. As described in Section 3.3, HEM was used to estimate the release of 1,2-dichloroethane to soil via air deposition from specific exposure scenarios. Estimated concentrations of 1,2-dichloroethane that could be in soil via air deposition 10 to 10,000 m from facility sources have been calculated for 1,2-dichloroethane releases reported to TRI in stack and fugitive emissions. EPA selected a distance of 10 m for evaluating 1,2-dichloroethane exposure to terrestrial organisms that could result from air deposition because this was the distance that resulted in the highest annual average deposition rate of 1,2-dichloroethane (U.S. EPA, 2026ad). Soil and soil pore water concentrations were obtained using the highest daily air deposition rates calculated from annual average deposition rates of 1,2-dichloroethane (U.S. EPA, 2026ad). EPA calculated RQs for exposure of terrestrial plants to 1,2-dichloroethane by directly comparing the 1,2-dichloroethane soil pore water concentrations to the terrestrial plant hazard value for 1,2-dichloroethane (Table 4-6).

4.3.1.1 Risk Assessment Approach for Trophic Transfer

EPA conducted screening level approaches for aquatic and terrestrial risk estimation based on exposure via trophic transfer using conservative assumptions for factors such as area use factor and 1,2-dichloroethane absorption from diet, soil, sediment, and water. A screening level analysis was conducted for trophic transfer and formulation of RQ values for aquatic and terrestrial pathways to representative mammalian and avian species. If RQ values were greater than or equal to 1, further refined analysis was warranted. If an RQ value was less than 1, no further assessment was necessary. The screening level approach employs a combination of conservative assumptions (*i.e.,* conditions for several exposure factors included within Equation 4-2 below) and utilization of the maximum values obtained from modeled and/or monitoring data from relevant environmental compartments.

Equation 4-2.

$$RQ_j = \frac{DE_j}{HT_j}$$

Where:

RQ_j = Risk quotient for contaminant (j) (unitless)
DE_j = Dietary exposure for contaminant (j) (mg/kg-bw/day)
HT_j = Hazard threshold (mg/kg-bw/day)

Dietary exposure estimates are presented in the *Environmental Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ab). Terrestrial hazard data are available for mammals and birds using hazard values detailed in Section 4.2. As described in Section 4.1, representative mammal and bird species were chosen to connect the 1,2-dichloroethane transport exposure pathway via trophic transfer of 1,2-dichloroethane uptake from contaminated soil and soil pore water to earthworm. This is followed by consumption by an insectivorous mammal (short-tailed shrew) or insectivorous bird (woodcock) that were then consumed by a carnivorous bird (kestrel). Also considered was 1,2-dichloroethane uptake from contaminated soil pore water to plant (*Trifolium* sp.) followed by consumption by an herbivorous mammal (meadow vole) and then an herbivorous bird (northern bobwhite) that were then consumed by a carnivorous bird (kestrel). For aquatic-dependent terrestrial species, a representative mammal (American mink) and representative bird (belted kingfisher) were chosen to connect the 1,2-dichloroethane transport exposure pathway via trophic transfer from fish or crayfish uptake of 1,2-dichloroethane from contaminated surface water and benthic pore water modeled from 1,2-dichloroethane surface water releases.

4.3.2 Risk Estimates for Aquatic Species

RQ values exceeding 1 were observed for one COU (Disposal) for the water column and sediment. No RQ values exceeding 1 were observed from exposure in benthic pore water. All RQ values presented in Table 4-4 were calculated using media concentrations estimated via VVWM-PSC, the Tier III assessment.

Although 1,2-dichloroethane's high water solubility (Table 2-1) and low log K_{OC} (Table 2-2) indicate biota in the water column are more likely to be exposed to 1,2-dichloroethane than biota in the sediment, RQ values exceeding 1 were observed from exposure in both the water column and in sediment. Additionally, RQ values exceeding 1 were observed across taxonomic groups, representing aquatic non-vascular plants, invertebrates, and vertebrates. There is uncertainty about the actual number of days of release. Since EPA lacks information on estimated days of 1,2-dichloroethane release to surface waters for each COU/OES, a chronic hazard study-based duration was assumed as a 21-day lower-end release duration (Scenario 1), and the total number of facility operating days was assumed as the maximum release duration (Scenario 2) to bound this uncertainty. However, it is likely that actual days of release of 1,2-dichloroethane to surface waters (and thereby refined RQ values) for each COU/OES falls somewhere in between these two release duration scenarios. RQ values exceeded 1 in both release scenarios. RQs>1 are associated with a single facility (NPDES ID: PA0080594). The RQ values presented in Table 4-4 are calculated based on the annual release for 2021 of 421 kg/year. Though EPA relies on actual annual discharges or effluent concentrations and not permitted levels in conducting an aquatic assessment, this facility's discharges have recently significantly changed. EPA verified that as of March 1, 2021, the state issued a new NPDES permit newly limiting discharges and effluent concentrations of 1,2-dichloroethane with the effective compliance date of February 2024. If this facility adheres to its permitted discharges of 1,2-dichloroethane (3.5×10^{-3} lbs/day), resulting aquatic media concentrations are expected to remain below the COCs. There were four instances where the discharge permit was exceeded in 2024 (4×10^{-3} lbs/day to 5×10^{-3} lbs/day), however these permit exceedances would not result in RQs>1 as they are three to four orders of magnitude below the daily pollutant loads presented in Table 4-4. Additionally, the effluent concentrations associated with the lbs/day volume exceedances did not exceed the permit limit (3.7×10^{-3} mg/L).

For byproducts, surface water concentrations were calculated as described in the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j) and compared to the most sensitive aquatic COC for each byproduct. The resulting RQ values are less than 1 for all evaluated byproducts. Thus, no risk is expected from exposure of the byproducts to aquatic species. Results are presented in detail in Table 4-4 and Table 4-5.

Table 4-4. Environmental RQs for Aquatic Organisms Exposed to 1,2-Dichloroethane Aquatic Media Concentrations for the Disposal COU/Waste Handling, Treatment, and Disposal (Non-POTW WWT) OES

Exposure Media	Number of Facilities with RQ>1	Days of Release[a]	Pollutant Load (kg/day) [b]	Media Concentration (µg/L or µg/kg) [c]	COC Type	COC (µg/L)	Days of Exceedance (days per year) [d]	RQ
Water column	1	21	20	20,600	Acute	11,909 [e]	20	1.7
	0	250	1.7	1,720	Acute	11,909	0	0.14
	1	21	20	20,600	Chronic	480 [f]	41	43
	1	250	1.7	1,720	Chronic	480	259	3.6
	1	21	20	20,600	Algal	12,400 [g]	0	1.7
	0	250	1.7	1,720	Algal	12,400	0	0.14
Benthic pore water	0	21	20	5,060	Acute	11,909 [e]	0	0.4
	0	250	1.7	1,590	Acute	11,909	0	0.13
	0	21	20	5,060	Chronic	9,300 [h]	0	0.5
	0	250	1.7	1,590	Chronic	9,300	0	0.17
Sediment	1	21	20	13,800	Chronic	2,900 [h]	127	5
	1	250	1.7	4,320	Chronic	2,900	225	1.5

COC = concentration of concern; COU = condition of use; OES = occupational exposure scenario; POTW= publicly owned treatment works; RQ = risk quotient; SSD = species sensitivity distribution; VVWM-PSC = Variable Volume Water Model – Point Source Calculator; WWT = wastewater treatment

[a] Highest days of release based on total number of facility operating days for the Disposal COU/Waste Handling, Treatment, and Disposal (Non-POTW WWT) OES.

[b] Based on facility release data.

[c] Media concentrations represent the maximum water column (µg/L), benthic pore water (µg/L), and sediment (µg/kg) concentrations over a 21-day or total number of operating day release duration.

[d] Days per year that the exposure concentration exceeds the COC.

[e] Based on the lower 95% CI of the SSD HC05 developed from empirical hazard data from *A. gracile, A. salina, D. magna*, *L. pipiens, O. mykiss*, and *P. promelas* exposed to 1,2-dichloroethane in water, *C. riparius* exposed to 1,1-dichloroethane and 1,2-dichloropropane in water, and Web-ICE predictions generated from empirical 1,2-dichloroethane studies

[f] Based on 21- and 28-day hazard data from *D. magna* exposed to 1,2-dichloroethane in water.

[g] Based on 3-day hazard data from *R. subcapitata* exposed to 1,2-dichloroethane in water.

[h] 35-day hazard data from sediment-dwelling *C. riparius* exposed to analog 1,1,2-trichloroethane in pore water and sediment.

Table 4-5. Aquatic Ecological Species Risk Screen for Estimated Byproduct Concentrations in Receiving Water Body

Chemical/ Byproduct	Daily Release (kg/day)	Days of Release (days)	Receiving Waterbody (Bayou D'Inde) 7Q10 Flow (mld[a])	Chemical Concentration in Receiving Water[b] (µg/L)	Ecological Chronic Concentration of Concern (µg/L) [c]	Risk Screen (RQ ≥ 1)
1,1-Dichloroethane	5.8E−02	350	875	6.7E−02	93	7.2E−04
Trichloroethylene	2.6E−04	350	875	3.1E−04	3	1.0E−04
Perchloroethylene	7.2E−04	350	875	8.3E−04	50	1.7E−05
Methylene chloride	1.7E−02	350	875	2.0E−02	90	2.2E−04
Carbon tetrachloride	4.8E−03	350	875	5.5E−03	3	1.8E−03

RQ = risk quotient

[a] Westlake Eagle2 Manufacturing facility receiving water body (Bayou d'Inde) 7Q10 flow (7 consecutive days of lowest flow over a 10-year period); mld = million liters per day

[b] Estimated concentration in receiving water body (Bayou d'Inde).

[c] Chemical-specific aquatic concentration of concern (see *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j)).

4.3.3 Risk Estimates for Terrestrial Species

1,2-Dichloroethane

The COU that resulted in the highest 1,2-dichloroethane soil pore water concentration (Manufacturing – Domestic manufacture) was assessed to screen risk to terrestrial plants. Soil pore water concentrations resulting from air deposition to soil from TRI-reported fugitive emissions of 1,2-dichloroethane were calculated using the highest HEM prediction for daily air deposition to soil at 10 m from the facility. The resultant RQ for terrestrial plants was less than 1 (Table 4-6). Additionally, soil pore water concentrations from releases to soil via biosolid land application were lower than the concentrations presented in Table 4-6; therefore, it is expected that no COU results in an RQ exceeding 1 for terrestrial plants exposed to soil pore water via either the air deposition pathway or the land release pathway.

Byproducts

No risk is expected from byproduct exposure to terrestrial species based on the previous risk evaluations. No risk was observed for terrestrial species in the 1,1-dichloroethane risk evaluation, which is the only risk evaluation of the byproduct chemicals that quantitatively assessed risk to terrestrial species. Trichloroethylene, perchloroethylene, methylene chloride, and carbon tetrachloride determined in their respective risk evaluations that there was no terrestrial exposure pathway based on the physical and chemical and fate properties of each chemical. Additionally, no risk is expected from the assessed byproducts as these chemicals possess similar physical chemical and fate properties to 1,1-dichloroethane and are volatile chemicals that are not expected to be bioaccumulative.

Table 4-6. Calculated RQ for Terrestrial Plants Based on Modeled Air Deposition of 1,2-Dichloroethane

COU (Life Cycle Stage/Category/ Subcategory)	OES	Source	Number of Facilities	Soil Pore Water Concentration (µg/L) at 10 m[a]	Hazard Threshold (µg/L) [b]	RQ
Manufacturing/ Domestic manufacture/ Domestic manufacture	Manufacturing	TRI	25	621	9,200	6.8E−02

COU = condition of use; OES = occupational exposure scenario; RQ = risk quotient; TRI = Toxics Release Inventory

[a] Soil pore water concentrations calculated from estimated soil catchment concentrations that could be in soil via daily air deposition of 1,2-dichloroethane at a distance of 10 m from facility based on releases reported to TRI.

[b] Based on hazard data from tobacco (*Nicotiana tabacum*) exposed to 1,2-dichloroethane for 2 hours in growth medium.

4.3.4 Risk Estimates Based on Trophic Transfer in the Environment

Trophic transfer of 1,2-dichloroethane and potential risk to terrestrial species was evaluated using a screening level approach conducted as described in the EPA's *Guidance for Developing Ecological Soil Screening Levels* (U.S. EPA, 2005a). 1,2-Dichloroethane concentrations within biota and resulting RQ values for the COUs/OESs with the highest environmental concentrations in soil, soil pore water, surface water, and sediment are presented below (Table 4-7, Table 4-8, Table 4-9, and Table 4-10). RQs were below 1 for representative species exposed to 1,2-dichloroethane through trophic transfer via soil and soil pore water based on the mammalian TRV, calculated using empirical toxicity data with mice and rats, and the avian hazard threshold, determined using empirical toxicity data with chickens.

Table 4-7. RQs for Screening Level Trophic Transfer of 1,2-Dichloroethane from Air Deposition in Insectivorous Terrestrial Ecosystems Using EPA's Wildlife Risk Model for Eco-SSLs

COU (Life Cycle Stage/Category/Subcategory)	OES	Organism	Concentration in Biota (mg/kg/day)	TRV or Hazard Threshold (mg/kg-bw/day)	1,2-Dichloroethane Dietary Exposure (mg/kg/day) [a]	RQ
Manufacturing/Domestic manufacture/Domestic manufacture	Manufacturing	Short-tailed shrew (*Blarina brevicauda*)	1.1	93	1.3	1.4E−02
		American woodcock (*Scolopax minor*)	1.8	16	1.8	0.11
		American kestrel (*Falco sparverius*)	1.5	16	1.6	0.10

COU = condition of use; OES = occupational exposure scenario; RQ = risk quotient; TRI = Toxics Release Inventory; TRV = toxicity reference value
[a] Dietary exposure to 1,2-dichloroethane includes consumption of biota, incidental ingestion of soil, and ingestion of water.

Table 4-8. RQs for Screening Level Trophic Transfer of 1,2-Dichloroethane from Air Deposition in Herbivorous Terrestrial Ecosystems Using EPA's Wildlife Risk Model for Eco-SSLs

COU (Life Cycle Stage/Category/Subcategory)	OES	Organism	Concentration in Biota (mg/kg/day)	TRV or Hazard Threshold (mg/kg-bw/day)	1,2-Dichloroethane Dietary Exposure (mg/kg/day) [a]	RQ
Manufacturing/Domestic manufacture/Domestic manufacture	Manufacturing	Meadow vole (*Microtus pennsylvanicus*)	0.22	93	0.35	3.8E−03
		Northern bobwhite (*Colinus virginianus*)	7.0E−02	16	0.14	8.8E−03
		American kestrel (*Falco sparverius*)	0.12	16	0.19	1.2E−02

COU = condition of use; OES = occupational exposure scenario; RQ = risk quotient; TRI = Toxics Release Inventory; TRV = toxicity reference value
[a] Dietary exposure to 1,2-dichloroethane includes consumption of biota, incidental ingestion of soil, and ingestion of water.

Table 4-9. RQ Based on Potential Trophic Transfer of 1,2-Dichloroethane from Fish Consumption by Aquatic Predators Using EPA's Wildlife Risk Model for Eco-SSLs

COU (Life Cycle Stage/Category/ Subcategory)	OES	Organism	SWC (µg/L) [a]	Fish Concentration (mg/kg)	TRV or Hazard Threshold (mg/kg-bw/day)	1,2-Dichloroethane Dietary Exposure (mg/kg/day) [b]	RQ
Disposal/Disposal/Disposal	Waste handling, Treatment, and Disposal (Non-POTW WWT)	American mink (*Mustela vison*)	1,720	7.6	93	1.8	2.0E−02
		Belted kingfisher (*Ceryle alcyon*)	1,720	7.6	16	4.0	0.25

COU = condition of use; OES = occupational exposure scenario; RQ = risk quotient; SWC = surface water concentration; TRI = Toxics Release Inventory; TRV = toxicity reference value
[a] 1,2-dichloroethane concentration represents the highest modeled surface water concentration via VVWM-PSC modeling.
[b] Dietary exposure to 1,2-dichloroethane includes consumption of biota (fish), incidental ingestion of sediment, and ingestion of water.

Table 4-10. RQ Based on Potential Trophic Transfer of 1,2-Dichloroethane from Crayfish Consumption by Aquatic Predators Using EPA's Wildlife Risk Model for Eco-SSLs

COU (Life Cycle Stage/Category/ Subcategory)	OES	Organism	BPWC (µg/L) [a]	Crayfish Concentration (mg/kg)	TRV or Hazard Threshold (mg/kg-bw/day)	1,2-Dichloroethane Dietary Exposure (mg/kg/day) [b]	RQ
Disposal/Disposal/Disposal	Waste Handling, Treatment, and Disposal (Non-POTW WWT)	American mink (*Mustela vison*)	1,590	7.0	93	1.7	1.8E−02
		Belted kingfisher (*Ceryle alcyon*)	1,590	7.0	16	3.7	0.23

COU = condition of use; OES = occupational exposure scenario; RQ = risk quotient; TRI = Toxics Release Inventory; TRV = toxicity reference value
[a] 1,2-dichloroethane concentration represents the highest modeled benthic pore water concentration (BPWC) via VVWM-PSC modeling.
[b] Dietary exposure to 1,2-dichloroethane includes consumption of biota (crayfish), incidental ingestion of sediment, and ingestion of water.

4.3.5 Overall Confidence and Remaining Uncertainties in Environmental Risk Characterization

The overall confidence in the risk characterization combines the confidence from the environmental exposure, hazard threshold, and trophic transfer sections. This approach aligns with the 2021 Draft Systematic Review Protocol (U.S. EPA, 2021) and 1,2-Dichloroethane Systematic Review Protocol (U.S. EPA, 2026bi). In the environmental risk characterization, confidence was evaluated from environmental exposures and environmental hazards. Exposure confidence has been synthesized from Section 3.3.4 and is further detailed within Section 4.1.1. Trophic transfer confidence was represented by evidence type as reported in Section 4.1.1 whereas hazard confidence was represented by evidence type as reported in Section 4.2.2. EPA has moderate-to-robust confidence that the environmental risk assessment represents levels of exposure at which ecologically relevant effects will occur.

RQ Inputs for Aquatic, Algal, Benthic, and Semi-Aquatic Mammalian and Avian Assessments

Uncertainties and confidence in modeled exposure estimates from VVWM-PSC have been described in Section 3.3.4. A moderate confidence has been assigned to the exposure component of the RQ input for the aquatic, algal, and benthic assessments as well as the mammalian assessments based on consumption of fish or crayfish by a semi-aquatic terrestrial mammal. Combining the moderate exposure confidence for the VVWM-PSC-modeled surface water, benthic pore water, and sediment, 1,2-dichloroethane concentrations with the hazard confidences for aquatic, algal, and benthic assessments (moderate-to-robust) resulted in an overall moderate-to-robust confidence in the aquatic assessment.

Combining the moderate exposure confidence for the VVWM-PSC-modeled surface water and benthic pore water 1,2-dichloroethane concentrations with the moderate hazard confidence for the mammalian and avian assessments and moderate trophic transfer confidence based on the consumption of fish (surface water) or slight trophic transfer confidence based on the consumption of crayfish (benthic pore water) resulted in overall confidences of moderate in the RQ inputs for the mammalian and avian assessments represented by an aquatic-dependent terrestrial mammal and bird.

RQ Inputs for Terrestrial Mammalian, Avian, and Plant Assessments

Uncertainties and confidence in air deposition from HEM have been described in Section 3.3.4. Despite the robust confidence in HEM air deposition estimates, calculations of soil and soil pore water concentrations from 1,2-dichloroethane daily air deposition rates may add further uncertainty due to assumptions in the equations, therefore resulting in a moderate confidence in the 1,2-dichloroethane soil and soil pore water concentrations from air deposition.

Combining the moderate exposure confidence for the calculated soil and soil pore water concentrations based on HEM modeling of 1,2-dichloroethane air deposition from TRI-reported emissions with the respective hazard confidences for terrestrial mammalian, terrestrial avian, and terrestrial plant assessments (moderate, moderate and slight, respectively) and trophic transfer confidence of moderate for the terrestrial mammalian and avian assessments resulted in overall confidences of moderate in the RQ inputs for the terrestrial mammalian, terrestrial avian, and terrestrial plant assessments, respectively.

Byproducts Assessment Confidence

Uncertainties and confidence in the exposure and hazard assessment for the byproducts are described in the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j). EPA has moderate confidence that exposure to the byproducts via releases to air, water, and land does not exceed hazard thresholds for aquatic and terrestrial species.

5 HUMAN HEALTH RISK ASSESSMENT

1,2-Dichloroethane – Human Health Risk Assessment (Section 5):
Key Points

EPA evaluated all reasonably available information to support human health risk characterization of 1,2-dichloroethane for workers (including ONUs), consumers, and the general population. Exposures to each group are described in Section 5.1, human health hazards in Section 5.2, and human health risk characterization in Section 5.3. The key points of the human health risk assessment are summarized below.

Exposure Key Points

- EPA assessed inhalation and dermal exposures for workers and inhalation for ONUs for each OES (Section 5.1.1). Dermal and inhalation were primary routes of exposure, depending on the OES.
- The Agency assessed inhalation, dermal, and oral exposures for consumers, as appropriate, for the consumer COU in scenarios that represent possible high-end exposures. The primary route of exposure was inhalation for most articles, followed by oral and dermal.
- EPA assessed inhalation, oral, and dermal exposures for the general population via ambient air, surface water, drinking water, and fish ingestion (Section 5.1.2).

Hazard Key Points

- EPA identified the following adverse effect as the most robust non-cancer hazard associated with oral exposure to 1,2-dichloroethane in experimental animal models (Section 5.2):
    - Renal effects, specifically increased relative kidney weight for the acute, intermediate, and chronic durations of exposure.
    - A non-cancer HED was calculated for both the occupational and general population for each exposure scenario and derived via benchmark dose modeling.
    - A total uncertainty factor (UF) of 30 was selected for the acute and intermediate durations of exposure and a UF of 100 was selected for the chronic duration of exposure.
- EPA identified the following adverse effects as the most robust non-cancer hazard associated with inhalation exposure to 1,2-dichloroethane in experimental animal models (Section 5.2):
    - Respiratory (olfactory) effects, specifically nasal necrosis for the acute duration of exposure
    - Male reproductive effects, specifically, decreased sperm concentrations for the intermediate and chronic exposure durations
    - A non-cancer HEC was calculated for both the occupational and general population for each exposure scenarios and derived via benchmark dose modeling.
    - A total UF of 30 was selected for the acute, intermediate and chronic durations of exposure
- EPA derived an inhalation unit risk (IUR) based on combined tumor model and was used to derive a cancer slope factor (CSF) via route-to-route extrapolation to both the oral and dermal routes.

Risk Assessment Key Points

- Estimated inhalation and dermal exposures drive risks to workers in occupational settings, particularly during repackaging activities and industrial uses that occur in open systems (Section 5.3.3).
- Estimated inhalation exposure to 1,2-dichloroethane releases to ambient air show risks to the general population residing within 1,000 m manufacturing facilities.
- No general population estimated risks were below the non-cancer benchmark for exposures to 1,2-dichloroethane in surface water via incidental dermal, incidental ingestion, drinking water or fish ingestion. No general population estimated risks were above cancer benchmark for drinking water exposure.
- No general population estimated risks were below the non-cancer benchmark or above the cancer benchmark for any of the byproducts resulting from 1,2-dichloroethane manufacturing.
- EPA estimates did not indicate MOEs below the non-cancer benchmarks nor above the cancer benchmark for consumer exposures to consumer articles containing 1,2-dichloroethane.
- EPA considered PESS throughout the exposure assessment, hazard identification, and dose-response analysis supporting this risk evaluation (Section 5.3.2).

5.1 Summary of Human Exposures

EPA evaluated all reasonably available information for occupational and general population human exposures, including consideration of increased exposure or susceptibility across PESS considerations (see Section 5.3.2).

1,2-Dichloroethane – Occupational Exposures (Section 5.1.1): Key Points

EPA evaluated the reasonably available information for occupational exposures to 1,2-dichloroethane. The following bullets summarize the key points of this section of the risk evaluation:

- EPA identified OESs and exposure groups for each COU to assess occupational exposure.
- For each OES, central tendency and high-end doses were estimated using probabilistic modeling approaches with Monte Carlo to identify the 50th and 95th percentile exposures.
- EPA estimated occupational inhalation exposure (in ppm as an 8-hour TWA) and dermal exposures (in mg/day) and provided high-end and central tendency exposures for the OESs.
- EPA evaluated the weight of scientific evidence for the exposure assessment of each OES.

5.1.1 Occupational Exposures

The following sections briefly describe EPA's approach to assessing occupational exposures and estimating inhalation and dermal exposures for each OES assessed. For additional details on development of approaches and results refer to *Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026aw). 1,2-Dichloroethane has a vapor pressure of approximately 78.9 mmHg at 25 °C. Based on this high volatility, EPA anticipates that workers and ONUs will be exposed to vapor via the inhalation route. EPA expects worker exposure to liquids via the dermal route but does not expect dermal exposure for ONUs because they do not directly handle 1,2-dichloroethane.

Where there was sufficient detail in the monitoring data, EPA assessed exposure to Similar Exposure Groups (SEGs). For example, EPA received inhalation monitoring data for 1,2-dichloroethane manufacturing where SEGs were identified and monitored. If SEGs were not available from the monitoring data or were not able to be assessed from the modeling approach used, EPA followed its standard practice to assess exposure to generic exposure groups (1) "workers" (*i.e.,* workers who work in close proximity to 1,2-dichloroethane, and may handle and have direct contact with 1,2-dichloroethane); and (2) "ONUs" who do not directly handle 1,2-dichloroethane but may be indirectly exposed to it as part of their employment. EPA identified tasks performed by the workers for each OES.

The Occupational Safety and Health Administration (OSHA; accessed July 24, 2025) set a permissible exposure limit (PEL; accessed July 24, 2025) as an 8-hour time-weighted average (TWA) for 1,2-dichloroethane of 50 ppm. California Division of Occupational Safety and Health (Cal/OSHA; accessed July 24, 2025) set an 8-hour TWA for 1,2-dichloroethane of 1 ppm, a short-term exposure limit (STEL) of 2 ppm, and a ceiling limit of 200 ppm. Other governmental agencies and independent groups have also set recommended exposure limits established for 1,2-dichloroethane. The American Conference of Governmental Industrial Hygienists (ACGIH) has set a Threshold Limit Value (TLV) at 10 ppm as an 8-hour TWA. This chemical also has a NIOSH Recommended Exposure Limit (REL) of 1 ppm TWA up to 10-hours and a 15-minute REL-STEL of 2 ppm (https://www.cdc.gov/niosh/npg/; accessed July 24, 2025).

5.1.1.1 Approach and Methodology

The steps that EPA followed in assessing occupational exposure to 1,2-dichloroethane are illustrated below in Figure 5-1.

Figure 5-1. Overview of EPA's Approach to Estimate Occupational Exposure for 1,2-Dichloroethane

EPA follows the hierarchy established in Table 5-1 in selecting data and approaches for assessing occupational exposures (based on (CEB, 1991)).

Table 5-1. Hierarchy of Data and Approaches for Assessing Occupational Exposures to 1,2-Dichloroethane

Type of Approach	Description
1. Monitoring data	a) Personal and directly applicable
	b) Area and directly applicable
	c) Personal and potentially applicable or similar
	d) Area and potentially applicable or similar
2. Modeling approaches	a) Surrogate or analogous monitoring data
	b) Fundamental modeling approaches
	c) Statistical regression modeling approaches
3. Occupational exposure limits	a) Company-specific occupational exposure limits (OELs) (for site-specific exposure assessments; for example, there is only one manufacturer who provided their internal OEL to EPA but did not provide monitoring data)
	b) OSHA permissible exposure limit
	c) Voluntary limits: ACGIH Threshold Limit Value (TLV); NIOSH Recommended Exposure Limit (REL); Occupational Alliance for Risk Science (OARS) workplace environmental exposure level (WEELs)

5.1.1.1.1 Identify and Describe Occupational Exposure Scenarios to Assess

As discussed in Section 3.1.1.1, EPA has 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 exposure groups for each OES as presented below in Table 5-2. Additional details on worker activities performed by the exposure groups for each OES can be found in *Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026aw).

Table 5-2. Similar Exposure Groups (SEGs) Assessed for 1,2-Dichloroethane

OES	SEGs Assessed by OES
Manufacturing / Manufacturing as an Unintended Byproduct	The final study report published by the Vinyl Institute Consortium (Stantec ChemRisk, 2024) detailed worker activities per SEG that occurred at 1,2-dichloroethane manufacturing sites. The SEGs of operators, logistic technicians, laboratory technicians, maintenance technicians, and ONUs were identified and monitored for inhalation exposure. Operators at facilities that manufacture 1,2-dichloroethane were reported to conduct process sample collection for quality assurance and control purposes, open process lines and equipment in preparation for maintenance activities, conduct process area walk-throughs, and monitor process equipment for leaks or abnormal activities. Routine daily tasks performed by logistics technicians during inhalation sampling included inspections, permitting, spotting for drivers, connecting and disconnecting hoses during chemical transfers, purging hoses, filling storage tanks, and loading and offloading bulk chemicals into and from ships, tanker trucks, totes, railcars, or barges. Laboratory technicians at manufacturing facilities handled samples and processed them for analysis under a fume hood. Typical tasks included processing samples collected from the field by other workers, and routine laboratory duties such as housekeeping, paperwork, and routine laboratory equipment maintenance. Routine duties performed by maintenance technicians include rounds, permitting (obtaining facility permits to do maintenance work), air monitoring, and preparation for maintenance tasks that may include preparing and setting up equipment and personal protective equipment (PPE). They also conduct instrumentation checks as well as line breaks and equipment opening. ONUs at manufacturing sites were maintenance supervisors, engineers, control board operators, project engineers and managers, senior process and technical advisors, maintenance coordinators, and environment, health, and safety (EHS) technicians. Routine tasks performed during sampling varied and included process area walk-throughs, equipment inspections, maintenance activity observations, logistics and maintenance trouble shooting, and indoor administrative and control room tasks. Additional information on worker tasks and activities was provided in the *Occupational Exposure Assessment for 1,2-Dichloroethane.*
Processing as a Reactant	The final study report published by the Vinyl Institute Consortium (Stantec ChemRisk, 2024) detailed worker activities per SEG that occurred at 1,2-dichloroethane processing sites. The SEGs of operators, logistic technicians, laboratory technicians, maintenance technicians, and ONUs were identified and monitored for inhalation exposure. General worker activities described for the SEGs in this OES were previously described for the Manufacturing OES, and additional information on worker tasks and activities was provided in the *Occupational Exposure Assessment for 1,2-Dichloroethane.*

OES	SEGs Assessed by OES
Repackaging	EPA assessed the SEG categories of workers and ONUs. Workers are potentially exposed to 1,2-dichloroethane when transferring 1,2-dichloroethane from bulk containers into smaller containers. Workers may also be exposed via inhalation of vapor or dermal contact with liquids when cleaning transport containers following emptying. ONUs include supervisors, managers, and other employees who work at sites that process 1,2-dichloroethane into formulations, mixtures, or reaction products but do not directly handle 1,2-dichloroethane and are expected to have lower inhalation exposures and no dermal exposure.
Processing into Formulation, Mixture, or Reaction Product	EPA assessed the general SEG categories of workers and ONUs. Workers are potentially exposed to 1,2-dichloroethane in processing of 1,2-dichloroethane into formulations, mixtures, or reaction products during container unloading, container cleaning, equipment cleaning, and packaging of formulation into containers. They may also be exposed to vapors due to volatilization during the mixing process itself, during product sample collection and analysis, and process maintenance. ONUs are expected to have lower inhalation exposures and no dermal exposure.
Industrial Application of Adhesives and Sealants	EPA assessed the general SEG categories of workers and ONUs. Worker exposures to 1,2-dichloroethane may occur from 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 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, and no expected dermal exposures.
Industrial Application of Lubricants and Greases	EPA assessed the general SEG categories of workers and ONUs. Workers are potentially exposed to 1,2-dichloroethane during application of lubricants and greases during container cleaning and unloading, equipment cleaning, and from inhalation of mist that may occur while spraying or otherwise applying the lubricant or grease. Exposure may also occur during the curing or drying. ONUs are expected to have lower inhalation exposures and no dermal exposure.
Industrial and Commercial Non-Aerosol Cleaning and Degreasing	EPA assessed the general SEG categories of workers and ONUs. Workers are potentially exposed to 1,2-dichloroethane during industrial and commercial non-aerosol cleaning and degreasing (particularly vapor degreasing) while unloading the chemical from transport containers, during degreaser operation, and during cleaning and maintenance activities. ONUs are expected to have lower inhalation exposures and no dermal exposure.
Industrial and Commercial Aerosol Products	EPA assessed the general SEG categories of workers and ONUs. A brake servicing scenario was modeled with the workers performing the tasks associated with brake servicing. ONUs are expected to have lower inhalation exposures and no dermal exposure.
Laboratory Use	EPA assessed the general SEG categories of workers and ONUs. Workers are potentially exposure to 1,2-dichloroethane during the following activities: transferring 1,2-dichloroethane from transport containers to labware,

OES	SEGs Assessed by OES
	sampling/analyses, and container/equipment cleaning. ONUs are expected to have lower inhalation exposures and no dermal exposure.
Waste Handling, Treatment, and Disposal –Landfills, POTW, and Non-POTW WWT	EPA assessed the general SEG categories of workers and ONUs. Workers are potentially exposed to 1,2-dichloroethane via inhalation of vapors or dermal contact with liquids during the unloading and cleaning of transport containers. ONUs are expected to have lower inhalation exposures and no dermal exposure. Note: EPA had data available to assess inhalation exposure for three of the five OES (Landfill, POTW, and Non-POTW WWT) for the Disposal COU which are included in this table. Two of these three OES were assessed together (POTW and Non-POTW WWT) using the same data sources. The two remaining OES for which EPA could not identify reasonably available data to assess inhalation exposure were the Incinerator and Remediation OESs.
OES = occupational exposure scenario; ONU = occupational non-user; POTW = publicly owned treatment works; SEG = similar exposure group: WWT = wastewater treatment	

5.1.1.1.2 Approaches Used to Estimate Inhalation Exposure for 1,2-Dichloroethane

EPA followed the exposure assessment hierarchy depicted in Table 5-1 and used the highest rated approach available for each OES. A summary of the approaches used to estimate inhalation exposure for each OES for 1,2-dichloroethane is presented below in Table 5-3. Additional details on worker activities performed by the exposure groups for each OES can be found in *Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026aw).

Table 5-3. Approaches Used to Estimate Inhalation Exposure for each OES for 1,2-Dichloroethane

OES	Approach Used to Estimate Inhalation Exposure [a]
Manufacturing / Manufacturing as an Unintended Byproduct	***1,2-Dichloroethane personal breathing zone (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 Vinyl Institute, which includes manufacturers (intentional 1,2-dichloroethane and unintentional 1,2-dichloroethane as a byproduct) (Stantec ChemRisk, 2024). The monitoring was conducted according to an EPA-approved study plan and exposures were monitored for 5 SEGs including ONUs. The test order submission includes 123 worker and 39 ONU full-shift PBZ samples across 5 manufacturing facilities for intentional production of 1,2-dichloroethane and 53 worker and 6 ONU full-shift PBZ samples from 2 facilities for the unintentional production of 1,2-dichloroethane as a byproduct. There were no full-shift samples below the limit of detection (LOD). The sample analysis method utilized had a limit of quantification (LOQ) of 17 ng/sample, and a range of 0.14–4 ppb equivalent airborne concentrations based on an 8-hour sampling duration. In response to public comments, EPA added a low-concentration (1%) scenario for the Manufacturing as an Unintended Byproduct OES in the Final Risk Evaluation. The test order inhalation monitoring data (described above) from two facilities—where byproduct streams were approximately 95–100% 1,2-dichloroethane—was used as surrogate data to represent streams with much lower 1,2-dichloroethane content. This analysis is discussed in more detail in Section 5.3.3.1.2.
Processing as a Reactant	***1,2-Dichloroethane PBZ monitoring data from test order:*** Occupational inhalation data for 1,2-dichloroethane during processing as a reactant were provided via a test order submission from the Vinyl Institute, which includes manufacturers and processors of 1,2-dichloroethane (Stantec ChemRisk, 2024). The monitoring was conducted according to an EPA-approved study plan and exposures were monitored for 5 SEGs including ONUs. The Agency identified 48 worker and 14 ONU full-shift PBZ samples from 2 processing facilities from this dataset to estimate inhalation exposures; 6 worker and 8 ONU samples were below the LOD (<0.1 ppb). The Vinyl Institute reported that non-detect values were replaced using regression on order (ROS) statistics. ***1,2-Dichloroethane PBZ monitoring data obtained from test order submission:*** EPA also reviewed inhalation data provided via a test order submission as a comparison, which was existing data generated during the manufacture of a herbicide used worldwide where the 1,2-dichloroethane is used as a processing solvent (BASF, 2021). This study contained 101 worker and 15 ONU personal full-shift samples; 66 worker and 15 ONU samples were below the LOD (range 0.1–2 ppm for workers and 0.1–0.3 ppm for ONUs).
Repackaging	***1,2-Dichloroethane PBZ monitoring data from test order used as an analogous scenario:*** EPA used logistics technician data at 1,2-dichloroethane manufacturing and processing facilities as an analogous scenario for bulk repackaging. EPA identified 26 full-shift PBZ samples collected on logistics technicians to estimate worker inhalation exposures; no samples were below the limit of detection (Stantec ChemRisk, 2024). The sample analysis method utilized had a LOQ of 17 ng/sample, and a range of 0.14–14 ppb equivalent airborne concentrations based on an 8-hour sampling duration. ***Exposure modeling:*** For repackaging into smaller containers for laboratory use, EPA modeled exposure based on exposure estimation approaches for worker activities using the July 2022 Chemical Repackaging GS (U.S. EPA, 2022a). The Agency

OES	Approach Used to Estimate Inhalation Exposure [a]
	used vapor generation rate and exposure duration parameters from the 1991 CEB Manual (CEB, 1991) and the EPA Mass Balance Inhalation Model to model the exposure and the modeling included Monte Carlo simulation to generate estimates at various percentiles including the 50th percentile for central tendency and 95th percentile for high-end. ***ONUs:*** For bulk repackaging, the central tendency from worker concentrations was used to represent ONU exposures. For small container repackaging, EPA used a default assumption of the central tendency from modeled workers inhalation exposures to represent ONU inhalation exposures.
Processing into Formulation, Mixture, or Reaction Product	***1,2-Dichloroethane PBZ monitoring data obtained from test order submission:*** EPA used inhalation data provided via a test order submission, which was existing data generated during the manufacture of a herbicide used worldwide where the 1,2-dichloroethane is used as a processing solvent (BASF, 2021). This study contained 101 worker full-shift personal breathing zone samples; 66 samples were below the limit of detection, which ranged from 0.1–2 ppm. ***ONUs:*** The study noted above included 15 ONU personal sample data points; all samples were below the LOD (0.1–0.3 ppm). These data were the same order of magnitude as the central tendency worker exposure sampling data.
Industrial Application of Adhesives and Sealants	***PBZ monitoring data for trichloroethylene from published risk evaluation used as a surrogate to estimate exposure to 1,2-dichloroethane:*** EPA used surrogate data from trichloroethylene during use of paints, coatings, adhesives, and sealants (U.S. EPA, 2020e). Trichloroethylene has a similar vapor pressure of 73.5 mm Hg, compared to 78.9 mm Hg for 1,2-dichloroethane. The data includes 22 samples for workers. ***ONUs:*** The data includes 2 samples for ONUs.
Industrial Application of Lubricants and Greases	***Exposure modeling:*** EPA did not identify inhalation exposure monitoring data related to the use of 1,2-dichloroethane in lubricant and grease applications. Therefore, EPA estimated inhalation exposures using EPA's Brake Servicing Near-Field/Far-Field Exposure Model with Monte Carlo simulation. The Agency used the brake servicing model as an analogous scenario for this OES due to aerosol use. The model determines the application rate of 1,2-dichloroethane based on its weight fraction in the aerosol product. EPA uses a uniform distribution for these weight fractions, ranging from 5–10%. The exposure concentration in the near-field is used to estimate exposure to the "worker." ***ONUs:*** The exposure concentration in the far-field is used to estimate exposure to the ONU.
Industrial and Commercial Non-Aerosol Cleaning and Degreasing	***PBZ monitoring data for trichloroethylene from published risk evaluation used as a surrogate to estimate exposure to 1,2-dichloroethane:*** EPA did not identify inhalation exposure monitoring data related to the use of 1,2-dichloroethane in non-aerosol degreasers. The Agency used surrogate data from trichloroethylene during Batch Open-Top Vapor Degreasing (U.S. EPA, 2020e). Batch open-top vapor degreasing was the non-aerosol cleaning and degreasing method chosen for this assessment because it has the highest exposure potential of the possible cleaning and degreasing methods 1,2-dichloroethane may be used for. The trichloroethylene data set included 113 samples for workers. Applying data from a batch open-top vapor degreasing process in assessment of this OES for 1,2-dichloroethane is a conservative estimate of exposure. ***ONUs:*** The trichloroethylene data set included 10 samples for ONUs.

OES	Approach Used to Estimate Inhalation Exposure [a]
Industrial and Commercial Aerosol Products	***Exposure modeling:*** EPA did not identify inhalation exposure monitoring data related to the use of 1,2-dichloroethane in lubricant and grease applications. Therefore, the Agency estimated inhalation exposures using EPA's Brake Servicing Near-Field/Far-Field Exposure Model with Monte Carlo simulation. The Agency used the brake servicing model as an analogous scenario for this OES due to aerosol use. The model determines the application rate of 1,2-dichloroethane based on its weight fraction in the aerosol product. EPA uses a uniform distribution for these weight fractions, ranging from 90–100%. The exposure concentration in the near-field is used to estimate exposure to the "worker". ***ONUs:*** The exposure concentration in the far-field is used to estimate exposure to the ONU.
Laboratory Use	***1,2-Dichloroethane PBZ monitoring data from test order for laboratory technicians used as analogous data for this OES:*** Occupational inhalation data for 1,2-dichloroethane were provided via a test order submission from Vinyl Institute, which includes manufacturers and processors of 1,2-dichloroethane. Within this dataset, EPA identified 48 worker full-shift PBZ samples for laboratory technicians. All samples were above the limit of detection. The Agency assumes the tasks described for laboratory technicians in a manufacturing or processing setting would be similar to tasks performed by laboratory technicians in a commercial laboratory setting and uses the data as analogous data to assess inhalation exposure for workers for the laboratory use OES. The sample analysis method utilized had a limit of quantification of 17 ng/sample, and a range validated of 0.14 to 14 ppb equivalent airborne concentrations based on an 8-hour sampling duration. ***1,2-Dichloroethane PBZ monitoring data obtained from test order submission:*** EPA also reviewed additional inhalation data provided via a test order submission, which was existing data generated during the manufacture of a herbicide (BASF, 2021). This study contained 4 worker full shift personal sample data points; all samples were below the LOD (<0.1 ppm). ***PBZ monitoring data for methylene chloride from public comment used as a surrogate to estimate exposure to 1,2-dichloroethane:*** A public commentor (Campus Safety, Health, and Environmental Management Association) provided inhalation monitoring data for exposures to methylene chloride in academic laboratories. The Agency used this data as surrogate to estimate exposures to 1,2-dichloroethane. The data included summary statistics from 80 full-shift (EPA-HQ-OPPT-2020-0465-0464; EPA-HQ-OPPT-2018-0427-0152). Methylene chloride is also a volatile solvent and this data included a large number of samples from an additional laboratory setting and was preferred over the use of modeling approaches. EPA identified one data point for perchloroethylene in the *Risk Evaluation for Perchloroethylene* (U.S. EPA, 2020d) but used methylene chloride data based on the number of samples that were available. This was the best available surrogate data EPA identified for this OES. ***ONUs:*** EPA did not identify data applicable to estimation of ONU exposure at commercial laboratories. Similar to previous Risk Evaluations, in the absence of ONU data, EPA assumed the central tendency from the workers inhalation exposures to represent ONU inhalation exposures.
Waste Handling, Treatment, and Disposal – Landfills	***Area monitoring data for 1,2-dichloroethane:*** EPA did not identify any PBZ monitoring data but did identify 12 area samples from a landfill study in Greece (Loizidou and Kapetanios, 1992). The landfill receives both municipal and industrial waste. All samples were above the limit of detection. While the limit of detection was not reported, the lowest individual sample concentration was 0.5 µg/m^3 (0.12 ppb).

OES	Approach Used to Estimate Inhalation Exposure [a]
	ONUs: EPA did not identify data applicable to estimation of ONU exposure at landfills. The Agency used a default assumption of the central tendency from modeled workers inhalation exposures to represent ONU inhalation exposures.
Waste Handling, Treatment, and Disposal – POTW, Non-POTW WWT	***1,2-Dichloroethane PBZ monitoring data obtained from test order and public comment:*** For POTW and Non-POTW WWT facilities, EPA used occupational inhalation monitoring data provided via a test order submission and public comment from the Vinyl Institute for wastewater process areas (VI, 2026; Stantec ChemRisk, 2024). From these two sources, EPA identified 71 operator samples; 35 of which were below the limit of detection (range: 0.024 ppm to 0.28 ppm). ***ONUs:*** EPA identified three full-shift, personal breathing samples for ONUs; two samples were below the limit of detection (0.024 and 0.21 ppm).
OES = occupational exposure scenario; ONU = occupational non-user; POTW = publicly owned treatment works; WWT = wastewater treatment [a] Values below the limit of detection were replaced with LOD/2, unless otherwise noted. EPA did not provide an LOD range for the surrogate dataset because the underlying values were taken directly from the trichloroethylene published risk evaluation (U.S. EPA, 2020e), which does not report LOD information.	

5.1.1.1.3 Approaches Used to Estimate Dermal Exposure for 1,2-Dichloroethane

Dermal exposure monitoring data were not available for any OES in the assessment from systematic review of the literature. 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. The dose estimates assume one dermal exposure event (applied dose) per work day and approximately 0.16% to 0.40% of the applied dose is absorbed through the skin, based on fractional absorption data that was developed from a TSCA Section 4 test order (Labcorp Early Development, 2024). This range is based on an adjustment resulting from the calculated coefficient of variation greater than 25% (calculated between ~30 and 100% from the test order) and mass balance of the calculated fraction absorption values across the various test preparations of 1,2-dichloroethane (neat and the 1, 10 and 50% 1,2-dichloroethane test preparations in 1,1,2-trichloroethane) (IOMC ED, 2022). As described in Section 2.4 (Dermal Exposure Approach and Methodology) of the Occupational Exposure TSD, EPA refined its approach by applying variable fraction absorption values (based on the neat and 1, 10 and 50% 1,2-dichloroethane in the vehicle of 1,1,2-trichloroethane) to the various exposure scenarios that were of greater representativeness to the 1,2-dichloroethane weight fractions being modeled (Table 2-1 in the Occupational Exposure TSD). The use of adjusted fraction absorbed values increases confidence in the appropriate use of the test order data. The DEVL (see Equation 5-1) modifieds 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 and estimates the acute absorbed dose rate (AADR):

Equation 5-1.

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

Where:

S	=	Surface area of skin in contact with the chemical formulation (cm^2)
Q_u	=	Dermal load (*i.e.,* the quantity of the chemical formulation on the skin after the dermal contact event, mg/cm^2-event)
f_{abs}	=	Fractional absorption, (*i.e.*, 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)

A summary of the dermal model input parameters is provided in Table 5-4.

Table 5-4. Summary of Dermal Model Input Values

Input Parameter	Symbol	Value(s)	Unit	Reference
Dermal load	Q_u	1.4 (central tendency) 2.1 (high-end)	mg/cm^2-event	(U.S. EPA, 1992)
Surface area	S	535 (central tendency) 1,070 (high-end)	cm^2	(U.S. EPA, 2011a)
Weight fraction of chemical	Y_{derm}	OES-dependent (see Table 5-5)	Unitless	–
Frequency of events	FT	1	Events/day	–
Fractional absorption	$f_{abs, a}$	0.30% (neat 1,2-dichloroethane sample)	Unitless	(Labcorp Early Development, 2024)
	$f_{abs, b}$	0.40% (50% 1,2-dichloroethane in 1,1,2-trichloroethane sample)	Unitless	
	$f_{abs, c}$	0.19% (10% 1,2-dichloroethane in 1,1,2-trichloroethane sample)	Unitless	
	$f_{abs, d}$	0.16% (1% 1,2-dichloroethane in 1,1,2-trichloroethane sample)	Unitless	
Body weight	BW	80	kg	(U.S. EPA, 2011a)

The weight fraction is determined based on EPA's review of currently available products and formulations containing 1,2-dichloroethane. The weight fraction used for each OES is summarized in Table 5-5.

Table 5-5. Summary of OES Weight Fraction Values

OES	Approach Used to Estimate Dermal Exposure
Manufacturing	The concentration evaluated for this OES is 100% because 1,2-dichloroethane is expected to be manufactured as a neat liquid. Based on the expected concentration of 1,2-dichloroethane of 100%, EPA applied a fraction absorbed value of 0.30%.
Processing as a Reactant	The concentration evaluated for this OES is 100% because 1,2-dichloroethane is expected to be processed as a reactant as a neat liquid. Based on the expected concentration of 1,2-dichloroethane of 100%, EPA applied a fraction absorbed value of 0.30%.
Repackaging	The concentration evaluated for this OES is 100% because 1,2-dichloroethane is expected to be repackaged as a neat liquid. Based on the expected concentration of 1,2-dichloroethane of 100%, EPA applied a fraction absorbed value of 0.30%.
Processing into Formulation, Mixture, or Reaction Product	EPA assessed dermal exposures for this OES using a uniform distribution from 5 to 100% based on the expected concentration received from manufacturing and the range of downstream formulated products. EPA applied fraction absorbed values of 0.16%, 0.19%, 0.40% and 0.30%, for 1,2-dichloroethane concentrations of 1%, 10%, 50% and 100%, respectively.

OES	Approach Used to Estimate Dermal Exposure
Industrial Application of Adhesives and Sealants	The concentration range evaluated for this OES is 60–91.8% based on an SDS for an adhesive containing 1,2-dichloroethane and typical organic solvent adhesive concentrations provided by the Use of Adhesives ESD (Co. and L, 2010). EPA applied fraction absorbed values of 0.40% and 0.30%, for 1,2-dichloroethane concentrations of 50% and 100%, respectively.
Industrial Application of Lubricants and Greases	The concentration range evaluated for this OES is 5–10% based on a product SDS for a low-friction coating containing 1,2-dichloroethane (Products, 2019). Based on the expected concentration of 1,2-dichloroethane of 1%, EPA applied a fraction absorbed value of 0.16%.
Industrial and Commercial Non-Aerosol Cleaning and Degreasing	EPA assessed dermal exposures for this OES using the concentration range reported in an SDS for a process cleaner, which is 99–100% (Corp, 2015). Based on the expected concentration of 1,2-dichloroethane of 100%, EPA applied a fraction absorbed value of 0.30%.
Industrial and Commercial Aerosol Products	The concentration range for this OES is 90–100% based on identified safety data sheets (Corp, 2015; Pharmco Products, 2013). Based on the expected concentration of 1,2-dichloroethane of 100%, EPA applied a fraction absorbed value of 0.30%.
Laboratory Use	EPA assessed dermal exposures for this OES using a concentration range of 10–100%, which was derived from the relevant safety data sheets (Corporation, 2019; LLC, 2019; Ladd Research, 2018; Phenova, 2018; Spex Certiprep, 2018; MilliporeSigma, 2016; Polysciences, 2013; Cerilliant, 2012; Thermo Fisher, 2012). EPA applied fraction absorbed values of 0.19%, 0.40% and 0.30%, for 1,2-dichloroethane concentrations of 10%, 50% and 100%, respectively.
Waste Handling, Treatment, and Disposal – Landfills	EPA assessed dermal exposures for this OES using a uniform distribution of 5–100% based on upstream concentrations. EPA applied fraction absorbed values of 0.16%, 0.19%, 0.40% and 0.30%, for 1,2-dichloroethane concentrations of 1%, 10%, 50% and 100%, respectively.
Waste Handling, Treatment, and Disposal – POTW, Non-POTW WWT	EPA assessed dermal exposures for this OES using a uniform distribution of 5–100% based on upstream concentrations. EPA applied fraction absorbed values of 0.16%, 0.19%, 0.40%, and 0.30%, for 1,2-dichloroethane concentrations of 1%, 10%, 50%, and 100%, respectively.
OES = occupational exposure scenario; POTW = publicly owned treatment works; WWT = wastewater treatment	

EPA used a probabilistic Monte Carlo simulation with 100,000 iterations and the Latin Hypercube sampling method using the Dermal Exposure to Volatile Liquids Model, in response to recommendations from the Science Advisory Committee on Chemicals (SACC; accessed October 21, 2025) on prior chemical risk evaluations such as the *Risk Evaluation for 1,1-Dichloroethane* (U.S. EPA, 2025g, 2024d).

5.1.1.2 Summary of the 1,2-Dichloroethane Inhalation and Dermal Exposure Assessment

Table 5-6 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. Table 5-6 also presents a summary of dermal exposure results. The *Occupational Exposure Assessment for 1,2-*

Dichloroethane (U.S. EPA, 2026aw) provides additional details regarding EPA's approach and methodology for estimating inhalation and dermal exposures.

The test order final study report published by the Vinyl Institute also provided short-term exposure limit (STEL) samples and task-length samples obtained during 1,2-dichloroethane manufacturing, manufacturing as a byproduct, and processing as a reactant. The STEL samples were collected over a sampling time of approximately 15 minutes to characterize peak exposures during routine tasks. Task length samples were collected over the duration of a given task. The sample duration varied based on the task. In addition to the test order data, a public commenter (Dow Chemical, 2026) provided short-term inhalation monitoring data for use of 1,2-dichloroethane as a catalyst moderator in the production of ethylene, which is mapped to the Processing as a Reactant OES. The results of these samples are presented in Table 5-7.

Using the 8-hour TWA exposure concentrations in Table 5-6, EPA then calculated acute, intermediate, and chronic (non-cancer and cancer) exposures. Table 5-8 and Table 5-9 provide summaries for inhalation and dermal metrics. The *Occupational Exposure Assessment for 1,2-Dichloroethane* provides more detail on the estimation of the inhalation and dermal exposure metrics.

When calculating cancer estimates, EPA utilized information on working years from both BLS (U.S. Census Bureau, 2019; U.S. BLS, 2014) and the Vinyl Institute (VI, 2026) for certain OES where data were applicable (manufacturing, manufacturing as a byproduct, processing as reactant (EPA-HQ-OPPT-2018-0427-0181). For all other OES, only data from BLS was utilized, as industry specific data were not provided. The central tendency and high-end estimates of working years from BLS represents an estimate of lifetime career working years and is not specific to the manufacturing of 1,2-dichloroethane. The demographic data provided by the Vinyl Institute is industry provided data on length of service (years) for workers currently employed at the facilities in which the inhalation monitoring was performed. Therefore, the working years provided by Vinyl Institute does not represent potential lifetime working years. 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 (see Appendix B, Equations B-4 to B-5). As such, EPA has included one set of chronic, non-cancer values. For cancer effects, the exposure dose over the working years is averaged over the lifetime years, which includes the years with no exposure. EPA uses a default of 78 years for the lifetime years.

Table 5-6. Summary of Occupational Inhalation and Dermal Exposure Results by Occupational Exposure Scenarios

OES	SEG Description	Exposure Days (day/yr)	Number of Samples	Number of Non-Detects	LOD (ppm)	Inhalation Estimates (ppm)		Worker Dermal Exposure Estimates (mg/day)		Sources/Notes for Inhalation Data
						Central Tendency	High-End	Central Tendency	High-End	
Manufacturing	Operators	250	53	0	N/A	0.48	7.3	3.2	5.5	Stantec ChemRisk (2024)
	Logistics technicians	250	9	0		1.7E−02	0.24			
	Maintenance technicians	250	32	0		4.9E−02	1.60			
	Laboratory technicians	250	29	0		4.7E−02	1.30			
	ONUs	250	39	0		1.4E−02	1.6			
Manufacturing of 1,2-Dichloroethane as an Unintended Byproduct	Operators	250	12	0	N/A	7.4E−02	0.27	3.2	5.5	Stantec ChemRisk (2024)
	Logistics technicians	250	12	0		6.5E−02	1.70			
	Maintenance technicians	250	14	0		2.1E−02	0.36			
	Laboratory technicians	250	9	0		2.6E−02	7.6E−02			
	ONUs	250	6	0		4.9E−03	0.16			
Repackaging (PBZ bulk repackaging)	Logistics Technicians	250	26	0	N/A	5.0E−02	2.4	3.2	5.5	Stantec ChemRisk (2024)
	ONUs	250	–	–		5.0E−02				
Repackaging (Modeled small container repackaging)	Workers	24 to 119	–	–	N/A	4.9	18	3.2	3.2	U.S. EPA (2022a)
	ONUs	24 to 119	–	–		4.9				
Processing as a Reactant	Operators	250	5	0	1.0E−04	1.3E−03	4.8E−03	3.2	5.5	Stantec ChemRisk (2024)
	Logistics technicians	250	18	3		0.17	2.3			
	Maintenance technicians	250	6	1		3.2E−03	2.1E−03			
	Laboratory technicians	250	10	2		6.9E−04	1.5E−03			
	ONUs	250	14	8		2.1E−04	2.6E−04			

OES	SEG Description	Exposure Days (day/yr)	Number of Samples	Number of Non-Detects	LOD (ppm)	Inhalation Estimates (ppm)		Worker Dermal Exposure Estimates (mg/day)		Sources/Notes for Inhalation Data
						Central Tendency	High-End	Central Tendency	High-End	
Processing as a Reactant (*continued*)	Herbicide manufacture	250	101	66	0.1 to 2	0.1	1.4			BASF (2021)
	Herbicide manufacture ONUs	250	15	15	0.1 to 0.3	0.1	0.11			
Processing into Formulation, Mixture, or Reaction Product	Herbicide manufacture	250	101	66	0.1 to 2	0.1	1.4	2.0	4.9	BASF (2021)
	ONUs	250	15	15	0.1 to 0.3	0.1	0.11			
Industrial Application of Adhesives and Sealants	Worker	250	22	0	N/A	4.6	40	3.2	5.7	(OSHA, 2017; Chrostek, 1981)
	ONU	250	2	0		0.90	1.0			
Industrial Application of Lubricants and Greases	Worker	250	–	–	N/A	3.5	9.0	0.13	0.24	(AIHA, 2009)
	ONU	250	–	–		2.3	7.4			
Industrial and Commercial Non-Aerosol Cleaning/ Degreasing	Worker	250	113	0	N/A	14	78	3.2	5.5	(Barsan, 1991; Seitz and Driscoll, 1989; Daniels et al. 1988; NIOSH, 1984, 1982; Ruhe et al., 1981; Lewis, 1980; Gilles et al., 1977; Rosensteel and Lucas, 1975; NIOSH, 1973)
	ONU	250	10	0		1.1	9.1			
Commercial Aerosol Products (Aerosol Degreasing, Aerosol Lubricants)	–	250	–	–	N/A	46	112	3.0	5.2	(AIHA, 2009)
	–	250	–	–		30	93			
Use as a Laboratory Chemical	Laboratory technicians	250	48	2	1.0E−04	2.9E−02	1.4	2.7	5.3	Stantec ChemRisk (2024)
	Herbicide manufacture	250	4	4	0.1	5.7 E−02	5.8 E−02			BASF (2021)
	Academic laboratory	250	80	Not Reported	N/A	6.9E−02	0.76			(EPA-HQ-OPPT-2020-0465-0464)

OES	SEG Description	Exposure Days (day/yr)	Number of Samples	Number of Non-Detects	LOD (ppm)	Inhalation Estimates (ppm)		Worker Dermal Exposure Estimates (mg/day)		Sources/Notes for Inhalation Data
						Central Tendency	High-End	Central Tendency	High-End	
Use as a Laboratory Chemical (*continued*)	ONU	250	–	–	N/A	2.9E−02				Stantec ChemRisk (2024)
Distribution in Commerce	Not estimated									N/A
Waste Handling, Treatment, and Disposal (Landfill)	Worker	250	12	0	N/A	7.8E−04	2.8E−03	2.0	4.9	Loizidou and Kapetanios (1992)
	ONU	250	–	–		7.8E−04				
Waste Handling, Treatment, and Disposal (POTW, Non-POTW WWT)	Worker	250	71	35	0.024 to 0.28	0.14	0.72	2.0	4.9	(EPA-HQ-OPPT-2018-0427-0169) (Stantec ChemRisk (2024)
	ONU	250	3	2	0.024 to 0.21	4.6E−02	0.13			
Waste Handling, Treatment, and Disposal – Incineration, Remediation	Not estimated									N/A

NIOSH = National Institute for Occupational Safety and Health; LOD = limit of detection; OES = occupational exposure scenario; ONU = occupational non-user; POTW = publicly owned treatment works; WWT = wastewater treatment

[a] Where EPA was not able to estimate ONU inhalation exposure from monitoring data or models, this was assumed equivalent to the central tendency experienced by workers for the corresponding OES; dermal exposure for ONUs was not evaluated because they are not expected to be in direct contact with 1,2-dichloroethane.

Table 5-7. Short-Term and Task-Length Inhalation Exposures for 1,2-Dichloroethane[a]

OES	SEG	Short-Term Samples					Task-Length Samples				
		Number of Samples	Number of Non-Detects[b]	Sample Duration (min)	Central Tendency (ppm)[c]	High-End (ppm)[c]	Number of Samples	Number of Non-Detects	Sample Duration (min)	Central Tendency (ppm)[c]	High-End (ppm)[c]
Manufacturing	Operator	52	3	8 to 34	0.26	96	38	2	14 to 352	0.18	12
	Laboratory Technician	22	0	15 to 17	0.40	3.1	16	0	23 to 174	0.27	4.3
	Logistics Technician	11	1	9 to 20	8.5E−02	4.4	2	0	145 to 146	7.7E−03	1.4E−02
	Maintenance Technician	24	1	10 to 18	0.14	20	21	0	13 to 103	4.5E−02	3.1
Manufacturing as an Unintentional Byproduct	Operator	7	0	0 to 19	0.51	6.3	2	0	15 to 40	3.5	3.5
	Laboratory Technician	17	0	12 to 79	3.5E−02	0.54	8	0	30 to 99	0.16	0.32
	Logistics Technician	13	1	0 to 20	2.7E−02	51	4	1	0 to 139	11	15
	Maintenance Technician	9	2	0 to 20	0.10	4.4	7	0	0 to 437	0.12	5.4
Processing as a Reactant	Operator	20	4	15 to 20	3.2	37	9	1	73 to 148	0.42	9.6
	Laboratory Technician	22	10	10 to 20	4.6E−03	2.7E−02	12	1	39 to 109	2.8E−03	0.56
	Logistics Technician	8	1	15	5.9	63	5	1	88 to 208	1.0	11
	Reaction Operator[d]	5	4	10 to 18	0.20	4.5	N/A	N/A	N/A	N/A	N/A

[a] Data source is (Stantec ChemRisk, 2024) unless otherwise noted.
[b] Non-detects were assessed at the LOD/2.
[c] Central tendency represent the 50th percentile results, and high end represent the 95th percentile results.
[d] Data source for reaction operator is (Dow Chemical, 2026).

Table 5-8. Summary of Occupational Inhalation Exposure Metrics

OES	Category	8-Hour TWA Exposures		Acute, Non-Cancer Exposures		Intermediate, Non-Cancer Exposures		Chronic, Non-Cancer Exposures		Chronic, Cancer Exposures – BLS Working Years		Chronic, Cancer Exposures – Vinyl Institute Working Years [a]	
		8-Hour TWA (ppm)		$AC_{8\text{-hr TWA}}$ (ppm)		$ADC_{8\text{-hr TWA}}$ (ppm)		$ADC_{8\text{-hr TWA}}$ (ppm)		$LADC_{8\text{-hr TWA}}$ (ppm)		$LADC_{8\text{-hr TWA}}$ (ppm)	
		CT	HE	CT	HE	CT	HE	CT	HE	CT	HE	CT	HE
Manufacturing	Operators	0.48	7.3	0.33	5.0	0.24	3.6	0.22	3.4	8.9E−02	1.7	2.5E−02	1.4
	Logistics technicians	1.7E−02	0.24	1.2E−02	0.16	8.5E−03	0.12	7.9E−03	0.11	3.1E−03	5.7E−02	9.0E−04	4.7E−02
Manufacturing (*continued*)	Maintenance technicians	4.9E−02	1.60	3.3E−02	1.1	2.4E−02	0.80	2.3E−02	0.75	9.1E−03	0.38	2.6E−03	0.32
	Laboratory technicians	4.7E−02	1.30	3.2E−02	0.88	2.2E−02	0.65	2.2E−02	0.61	8.7E−03	0.31	2.5E−03	0.26
	ONU [b]	1.4E−02	1.6	9.5E−03	1.1	7.0E−03	0.80	6.5E−03	0.75	2.6E−03	0.38	7.4E−04	0.32
Manufacturing as an Unintended Byproduct	Operators	7.4E−02	0.27	5.0E−02	0.18	3.7E−02	0.13	3.4E−02	0.13	1.4E−02	6.5E−02	4.7E−03	6.5E−02
	Logistics technicians	6.5E−02	1.70	4.4E−02	1.2	3.2E−02	0.85	3.0E−02	0.79	1.2E−02	0.41	4.1E−03	0.41
	Maintenance technicians	2.1E−02	0.36	1.4E−02	0.24	1.0E−02	0.18	9.8E−03	0.17	3.9E−03	8.6E−02	1.3E−03	8.6E−02
	Laboratory technicians	2.6E−02	7.6E−02	1.8E−02	5.2E−02	1.3E−02	3.8E−02	1.2E−02	3.5E−02	4.8E−03	1.8E−02	1.6E−03	1.8E−02
	ONU [b]	4.9E−03	0.16	3.3E−03	0.11	2.4E−03	8.0E−02	2.3E−03	7.5E−02	9.1E−04	3.8E−02	3.1E−04	3.8E−02
Repackaging (PBZ data)	Logistics technicians	5.0E−02	2.4	3.4E−02	1.6	2.5E−02	1.2	2.3E−02	1.1	9.2E−03	0.57	N/A	N/A
	ONU	5.0E−02	5.0E−02	3.4E−02	3.4E−02	2.5E−02	2.5E−02	2.3E−02	2.3E−02	9.2E−03	1.2E−03	N/A	N/A
Repackaging (modeled)	Worker	4.9	18	3.4	12	0.89	3.3	4.7E−02	0.16	1.8E−02	6.5E−02	N/A	N/A
	ONU	4.9	4.9	3.4	3.4	0.89	0.89	4.7E−02	4.7E−02	1.8E−02	1.8E−02	N/A	N/A
Processing as a Reactant	Operators	1.3E−03	4.8E−03	8.8E−04	3.3E−03	6.5E−04	2.4E−03	6.1E−04	2.2E−03	2.4E−04	1.1E−03	7.6E−05	9.5E−04
	Logistics technicians	0.17	2.3	0.12	1.6	8.5E−02	1.1	7.9E−04	1.1	3.1E−02	0.55	1.0E−02	0.45
	Maintenance technicians	3.2E−04	2.1E−03	2.2E−04	1.4E−03	1.6E−04	1.0E−03	1.5E−04	9.8E−04	5.9E−05	5.0E−04	1.9E−05	4.1E−04
	Laboratory technicians	6.9E−04	1.5E−03	4.7E−04	1.0E−03	3.4E−04	7.5E−04	3.2E−04	7.0E−04	1.3E−04	3.6E−04	4.0E−05	3.0E−04
	ONU [b]	2.1E−04	2.6E−04	1.4E−04	1.8E−04	1.0E−04	1.3E−04	9.8E−05	1.2E−04	3.9E−05	6.2E−05	1.2E−05	5.1E−05

OES	Category	8-Hour TWA Exposures		Acute, Non-Cancer Exposures		Intermediate, Non-Cancer Exposures		Chronic, Non-Cancer Exposures		Chronic, Cancer Exposures – BLS Working Years		Chronic, Cancer Exposures – Vinyl Institute Working Years [a]	
		8-Hour TWA (ppm)		$AC_{8\text{-hr TWA}}$ (ppm)		$ADC_{8\text{-hr TWA}}$ (ppm)		$ADC_{8\text{-hr TWA}}$ (ppm)		$LADC_{8\text{-hr TWA}}$ (ppm)		$LADC_{8\text{-hr TWA}}$ (ppm)	
		CT	HE	CT	HE	CT	HE	CT	HE	CT	HE	CT	HE
Processing into Formulation, Mixture, or Reaction Product	Worker	0.10	1.4	6.8E−02	0.94	5.0E−02	0.69	4.7E−02	0.64	1.9E−02	0.33	N/A	N/A
	ONU	0.10	0.11	6.8E−02	7.5E−02	5.0E−02	5.5E−02	4.7E−02	5.1E−02	1.9E−02	2.6E−02	N/A	N/A
												N/A	N/A
												N/A	N/A
Industrial Application of adhesives and Sealants	Worker	4.6	40	3.1	27	2.3	20	2.1	18	0.85	9.4	N/A	N/A
	ONU	0.90	1.0	0.61	0.68	0.45	0.50	0.42	0.47	0.17	0.24	N/A	N/A
Industrial Application of Lubricants and Greases	Worker	3.5	9.0	2.4	6.1	1.7	4.5	1.6	4.2	0.64	2.1	N/A	N/A
	ONU	2.3	7.4	1.6	5.0	1.2	3.7	1.1	3.5	0.43	1.8	N/A	N/A
Industrial and Commercial Non-Aerosol Cleaning/ Degreasing	Worker	14	78	9.4	53	6.9	39	6.4	36	2.6	19	N/A	N/A
	ONU	1.1	9.1	0.75	6.2	0.55	4.5	0.51	4.2	0.20	2.2	N/A	N/A
Commercial Aerosol Products (Aerosol Degreasing, Aerosol Lubricants)	Worker	46	112	31	76	23	56	21	52	8.4	27	N/A	N/A
	ONU	30	93	21	63	15	46	14	43	5.6	22	N/A	N/A
Laboratory Use	Laboratory technician	2.9E−02	1.4	2.0E−02	0.93	1.4E−02	0.68	1.3E−02	0.64	5.4E−03	0.33	N/A	N/A
	Herbicide manufacture	5.7E−02	5.8E−02	3.9E−02	3.9E−02	2.8E−02	2.9E−02	2.7E−02	2.7E−02	1.1E−02	1.4E−02	N/A	N/A
Laboratory Use (*continued*)	Academic laboratories	6.9E−02	0.76	4.7E−02	0.52	3.4E−02	0.38	3.2E−02	0.35	1.3E−02	0.18	N/A	N/A
	ONU	2.9E−02		2.0E−02	2.0E−02	1.4E−02	1.4E−02	1.3E−02	1.3E−02	5.4E−03	6.9E−03	N/A	N/A

OES	Category	8-Hour TWA Exposures		Acute, Non-Cancer Exposures		Intermediate, Non-Cancer Exposures		Chronic, Non-Cancer Exposures		Chronic, Cancer Exposures – BLS Working Years		Chronic, Cancer Exposures – Vinyl Institute Working Years [a]	
		8-Hour TWA (ppm)		$AC_{8\text{-hr TWA}}$ (ppm)		$ADC_{8\text{-hr TWA}}$ (ppm)		$ADC_{8\text{-hr TWA}}$ (ppm)		$LADC_{8\text{-hr TWA}}$ (ppm)		$LADC_{8\text{-hr TWA}}$ (ppm)	
		CT	HE	CT	HE	CT	HE	CT	HE	CT	HE	CT	HE
Waste Handling, Treatment, and Disposal (Landfill)	Worker	7.8E−04	7.8E−04	5.3E−04	1.9E−03	3.9E−04	1.4E−03	3.6E−04	1.3E−03	1.4E−04	6.6E−04	N/A	N/A
	ONU	8.9E−02	0.24	5.3E−04	5.3E−04	3.9E−04	3.9E−04	3.6E−04	3.6E−04	1.4E−04	1.9E−04	N/A	N/A
Waste Handling, Treatment and Disposal (POTW, Non-POTW, WWT)	Worker	0.14	0.72	9.8E−02	0.49	7.2E−02	0.36	6.7E−02	0.33	2.7E−02	0.17	N/A	N/A
	ONU	4.6E−02	0.13	3.1E−02	8.8E−02	2.3E−02	6.5E−−2	2.1E−02	6.1E−02	8.5E−03	3.1E−02	N/A	N/A

AC = acute concentration; ADC = average daily concentration; CT = central tendency; HE = high-end; LADC = lifetime average daily concentration; OES = occupational exposure scenario; ONU = occupational non-user; POTW = publicly owned treatment works; TWA = time-weighted average; WWT = wastewater treatment

[a] Estimates based on working year demographic data from the Vinyl Institute for manufacturing, manufacturing as a byproduct, and processing as a reactant (VI, 2026) (EPA-HQ-OPPT-2018-0427-0181).

[b] The high-end from the closed system ONU monitoring data is considered to be a representative and appropriate exposure estimate for a frequent, repeated inhalation exposure (*i.e.,* chronic) for the ONU exposure group.

Table 5-9. Summary of Occupational Dermal Exposure Metrics

OES	Category	Acute Absorbed Dose Rate		Acute Absorbed Dose		Intermediate Absorbed Dose, Non-Cancer		Chronic Absorbed Dose, Non-Cancer		Lifetime Chronic Absorbed Dose, Cancer – BLS Working Years		Lifetime Chronic Absorbed Dose, Cancer – Vinyl Institute Working Years	
		AADR (mg/day)		AAD (mg/kg-day)		IAD (mg/kg-day)		CAD (mg/kg-day)		LCAD (mg/kg-day)		LCAD (mg/kg-day)	
		CT	HE	CT	HE	CT	HE	CT	HE	CT	HE	CT	HE
Manufacturing	Operator	3.2	5.5	4.0E−02	6.9E−02	2.9E−02	5.0E−02	2.7E−02	NE [a]	1.0E−02	NE [a]	6.9E−03	NE [a]
	Logistic technician	3.2	5.5	4.0E−02	6.9E−02	2.9E−02	5.0E−02	2.7E−02	NE [a]	1.0E−02	NE [a]	6.9E−03	NE [a]
	Maintenance technician	3.2	5.5	4.0E−02	6.9E−02	2.9E−02	5.0E−02	2.7E−02	NE [a]	1.0E−02	NE [a]	6.9E−03	NE [a]
	Laboratory technician	3.2	5.5	4.0E−02	6.9E−02	2.9E−02	5.0E−02	2.7E−02	NE [a]	1.0E−02	NE [a]	6.9E−03	NE [a]
Manufacturing as an Unintended Byproduct	Operator	3.2	5.5	4.0E−02	6.9E−02	2.9E−02	5.0E−02	2.7E−02	NE [a]	1.0E−02	NE [a]	6.9E−03	NE [a]
	Logistics technician	3.2	5.5	4.0E−02	6.9E−02	2.9E−02	5.0E−02	2.7E−02	NE [a]	1.0E−02	NE [a]	6.9E−03	NE [a]
	Maintenance technician	3.2	5.5	4.0E−02	6.9E−02	2.9E−02	5.0E−02	2.7E−02	NE [a]	1.0E−02	NE [a]	6.9E−03	NE [a]
	Laboratory technician	3.2	5.5	4.0E−02	6.9E−02	2.9E−02	5.0E−02	2.7E−02	NE [a]	1.0E−02	NE [a]	6.9E−03	NE [a]
Repackaging	Worker	3.2	5.5	4.0E−02	6.9E−02	2.9E−02	5.0E−02	2.7E−02	4.4E−02	9.5E−03	1.9E−02	N/A	N/A
Processing as a Reactant	Operator	3.2	5.5	4.0E−02	6.9E−02	2.9E−02	5.0E−02	2.7E−02	NE [a]	1.0E−02	NE [a]	7.1E−03	NE [a]
	Logistics technician	3.2	5.5	4.0E−02	6.9E−02	2.9E−02	5.0E−02	2.7E−02	NE [a]	1.0E−02	NE [a]	7.1E−03	NE [a]
	Maintenance technician	3.2	5.5	4.0E−02	6.9E−02	2.9E−02	5.0E−02	2.7E−02	NE [a]	1.0E−02	NE [a]	7.1E−03	NE [a]
	Laboratory technician	3.2	5.5	4.0E−02	6.9E−02	2.9E−02	5.0E−02	2.7E−02	4.4E−02	9.5E−03	1.9E−02	7.1E−03	1.5E−02
	Worker – herbicide manufacture	3.2	5.5	4.0E−02	6.9E−02	2.9E−02	5.0E−02	2.7E−02	4.4E−02	9.5E−03	1.9E−02	7.1E−03	1.5E−02
Processing into Formulation, Mixture, or Reaction Product	Worker	2.0	4.9	2.5E−02	6.1E−02	1.9E−02	4.5E−02	1.7E−02	4.2E−02	6.4E−03	1.7E−02	N/A	N/A
Industrial Application of Adhesives and Sealants	Worker	3.2	5.7	4.0E−02	7.1E−02	2.9E−02	5.2E−02	2.0E−02	4.0E−02	7.3E−03	1.7E−02	N/A	N/A

OES	Category	Acute Absorbed Dose Rate		Acute Absorbed Dose		Intermediate Absorbed Dose, Non-Cancer		Chronic Absorbed Dose, Non-Cancer		Lifetime Chronic Absorbed Dose, Cancer – BLS Working Years		Lifetime Chronic Absorbed Dose, Cancer – Vinyl Institute Working Years	
		AADR (mg/day)		AAD (mg/kg-day)		IAD (mg/kg-day)		CAD (mg/kg-day)		LCAD (mg/kg-day)		LCAD (mg/kg-day)	
		CT	HE	CT	HE	CT	HE	CT	HE	CT	HE	CT	HE
Industrial Application of Lubricants and Greases	Worker	0.13	0.24	1.6E−03	3.1E−03	1.2E−03	2.2E−03	1.1E−03	2.1E−03	4.2E−04	8.8E−04	N/A	N/A
Industrial and Commercial Non-Aerosol Cleaning/Degreasing	Worker	3.2	5.5	4.0E−02	6.8E−02	2.9E−02	5.0E−02	2.7E−02	4.7E−02	1.0E−02	2.0E−02	N/A	N/A
Commercial Aerosol Products (Aerosol Degreasing, Aerosol Lubricants)	Worker	3.0	5.2	3.8E−02	6.5E−02	2.8E−02	4.8E−02	2.6E−02	4.5E−02	9.8E−03	1.9E−02	N/A	N/A
Laboratory Use	Worker	2.7	4.5	3.4E−02	5.3	2.5E−02	6.7E−02	2.2E−02	4.9E−02	8.1E−03	4.3E−02	N/A	N/A
Waste Handling, Treatment, and Disposal	Landfill	2.0	4.9	2.5E−02	6.1E−02	1.9E−02	4.5E−02	1.7E−02	4.2E−02	6.4E−03	1.7E−02	N/A	N/A
Waste Handling, Treatment, and Disposal	POTW and Non-POTW WWT	2.0	4.9	2.5E−02	6.1E−02	1.9E−02	4.5E−02	1.7E−02	4.2E−02	6.4E−03	1.7E−02	N/A	N/A

CT = central tendency; HE = high-end; OES = occupational exposure scenario; POTW = publicly owned treatment works; WWT = wastewater treatment; NE = not estimated; N/A = not applicable

BLS estimates based on working year demographic data from the Bureau of Labor Statistics (U.S. Census Bureau, 2019; U.S. BLS, 2014). Vinyl Institute estimates based on working year demographic data from the Vinyl Institute for manufacturing, manufacturing as a byproduct, and processing as a reactant (VI, 2026) (EPA-HQ-OPPT-2018-0427-0181).

[a] HE risk estimates for chronic non-cancer and cancer are available in the risk calculator file but are not reported here because the central tendency from the closed system monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated dermal exposure (*i.e.,* chronic) and is health protective for risk estimation for closed system processes, as high-end exposures from daily connecting/disconnecting of transfer lines and sampling is not realistic.

5.1.1.3 Summary of the 1,2-Dichloroethane Byproducts Inhalation and Dermal Exposure Assessment

EPA's approach to assessing the occupational exposures to the byproducts produced during the manufacture of 1,2-dichloroethane is described in detail in the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j). The Agency assessed exposures to workers via inhalation and dermal routes. For estimates based on inhalation monitoring data, the 50th percentile of the exposure data is used for the central tendency and the 95th percentile is used for the high-end estimate. For deterministic modeling, EPA selects values for the model input parameters for the central tendency and high-end exposure estimates. For probabilistic modeling, the Agency used EPA/OPPT models combined with Monte Carlo modeling to estimate inhalation exposures. The Monte Carlo simulation with 100,000 iterations used the range of input parameters to generate the distribution of potential exposures. The full inputs and results are presented in the *Byproducts Risk Calculator for 1,2-Dichloroethane* (U.S. EPA, 2026m).

Acute, intermediate, and chronic inhalation exposures were estimated using personal breathing zone inhalation monitoring data obtained through test orders.[10] For 1,1-dichloroethane, EPA used inhalation monitoring data submitted in response to a test order that measured 1,1-dichloroethane inhalation exposures during 1,2-dichloroethane manufacturing (Stantec ChemRisk, 2023). For the remaining assessed byproducts (trichloroethylene, perchloroethylene, methylene chloride, and carbon tetrachloride), the Agency used surrogate inhalation monitoring data submitted in response to the 1,2-dichloroethane test order, following the same methodology outlined in the *Risk Evaluation for 1,1-Dichloroethane* (U.S. EPA, 2025d). Low-end concentrations were estimated for each of these byproducts based on the weight percent of the byproduct in the unpurified 1,2-dichloroethane stream. High-end concentrations were estimated for each of these byproducts based on the maximum weight percent of the byproduct in light- and heavy-end liquid streams. These concentration estimates were provided by Vinyl Institute and are presented in Table 4-5 and 4-6 of the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j). Table 5-10 presents the results of the inhalation exposure assessment for each byproduct. For more information on inhalation exposure estimates see *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j) and *Byproducts Risk Calculator for 1,2-Dichloroethane* (U.S. EPA, 2026m).

When calculating cancer estimates, EPA utilized information on working years from both BLS (U.S. Census Bureau, 2019; U.S. BLS, 2014) and the Vinyl Institute (VI, 2026) (EPA-HQ-OPPT-2018-0427-0181). The central tendency and high-end estimates of working years from BLS represents an estimate of lifetime career working years and is not specific to the manufacturing of 1,2-dichloroethane. The working years provided by the Vinyl Institute is industry-provided data on length of service (years) for workers currently employed at the facilities in which the inhalation monitoring was performed. 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 (See Appendix B, Equations B-4 to B-5). As such, EPA has included one set of chronic, non-cancer values. For cancer effects, the exposure dose over the working years is averaged over the lifetime years, which includes the years with no exposure. EPA uses a default of 78 years for the lifetime years. For more information on

[10] TSCA section 4(a)(2)(A)(i) allows the EPA to impose testing requirements via "rule, order, or consent agreement" whenever new information "is necessary" in order to perform a risk evaluation (15 U.S.C. § 2603(a)(2)(A)(i)). EPA issued a test order for 1,2-dichloroethane on January 14, 2021; see https://www.epa.gov/sites/default/files/2021-01/documents/tsca_section_4a2_order_for_12-dichloroethane_on_ecotoxicity_and_occupational_exposure_0.pdf (accessed November 12, 2025) (Stantec ChemRisk, 2024). EPA also received inhalation monitoring data from the test order submission for 1,1-dichloroethane manufactured as a byproduct in the manufacture of 1,2-dichloroethane (Stantec ChemRisk, 2023).

the inhalation exposure estimates that incorporate the Vinyl Institute provided working years see *Byproducts Risk Calculator for 1,2-Dichloroethane,Adjusted Working Years.*

Dermal exposures were modeled using the Dermal Exposure to Volatile Liquids Model, consistent with the *Risk Evaluation for 1,1-Dichloroethane* (U.S. EPA, 2025d), based on values and assumptions from dermal test order data obtained for 1,2-dichloroethane (Labcorp Early Development, 2024) and from previously published chemical-specific risk evaluations (listed in Section 1.2 of the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j)). EPA assessed dermal occupational exposures to both unpurified 1,2-dichloroethane (considered a low-end exposure estimates), and light- and heavy-end liquid streams (considered a high-end exposure estimates). Low-end concentrations were estimated for each of the byproduct based on the weight percent of the byproduct in the unpurified 1,2-dichloroethane stream. High-end concentrations were estimated for each of the byproducts based on the maximum weight percent of the byproduct in light- and heavy-end liquid streams. These concentration estimates were provided by Vinyl Institute and are presented in Table 5-9 of the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j).

Table 5-11 summarizes the AADR, acute absorbed dose (AAD), intermediate absorbed dose (IAD), and chronic absorbed dose (CAD) for non-cancer, and Lifetime chronic absorbed dose (LCAD) for cancer for each of the byproducts. The high-ends are based on a higher loading rate of byproduct (2.1 mg/cm^2 per event) and a skin surface area equivalent to the area of two-hands (1,070 cm^2) that may occur during activities such as manual cleaning of the equipment. The central tendencies are based on a lower loading rate of 1,2-dichloroethane (1.4 mg/cm^2 per event) and a skin surface area equivalent to the area of one-hand (535 cm^2) that may occur while sampling the liquid stream. As with the inhalation exposure estimates, the dermal exposure cancer results were estimated using working year demographic data from BLS (U.S. Census Bureau, 2019; U.S. BLS, 2014) and data provided by the Vinyl Institute (VI, 2026) (EPA-HQ-OPPT-2018-0427-0181). See *Byproducts Risk Calculator for 1,2-Dichloroethane* (U.S. EPA, 2026m) for the calculations that lead to these results. For the cancer calculations that incorporate the Vinyl Institute working years data, please see the *Byproducts Risk Calculator for 1,2-Dichloroethane, Adjusted Working Years.*

Table 5-10. Summary of Occupational Inhalation Exposure Results to Byproducts During the Manufacturing of 1,2-Dichloroethane

Byproduct	Process Stream (wt % Fraction of Byproducts in the Process Stream)	Similar Exposure Group	8-Hour TWA Exposure Concentrations		Acute Exposure Concentrations (AC)		Intermediate Average Daily Concentration ($ADC_{intermediate}$)		Average Daily Concentration (ADC)		Lifetime Average Daily Concentration (LADC) – BLS Working Years		Lifetime Average Daily Concentration (LADC) – Vinyl Institute Working Years	
			Central Tendency (ppm) [a]	High-End (ppm) [b]	Central Tendency (ppm)	High-End (ppm)	Central Tendency (ppm)	High-End (ppm)	Central Tendency (ppm)	High-End (ppm)	Central Tendency (ppm)	High-End (ppm)	Central Tendency (ppm)	High-End (ppm)
1,1-Dichloroethane	N/A [c]	Operator/ Process Technician	1.6E−03	9.0E−03	1.1E−03	6.1E−03	7.8E−04	4.5E−03	7.3E−04	4.2E−03	2.9E−04	2.2E−03	8.3E−05	1.8E−03
		Maintenance Technician	2.3E−04	2.7E−03	1.6E−04	1.8E−03	1.1E−04	1.3E−03	1.1E−04	1.3E−03	4.3E−05	6.5E−04	1.2E−05	5.3E−04
		Logistics/ Distribution	6.7E−05	1.6E−03	4.6E−05	1.1E−03	3.3E−05	8.0E−04	3.1E−05	7.5E−04	1.2E−05	3.8E−04	3.6E−06	3.2E−04
		Laboratory Technician	1.6E−04	3.3E−03	1.1E−04	2.2E−03	8.0E−05	1.6E−03	7.5E−05	1.5E−03	3.0E−05	7.9E−05	8.5E−06	6.5E−04
		ONU [d]	6.9E−05	4.6E−03	4.7E−05	3.1E−03	3.5E−05	2.3E−03	3.2E−05	2.1E−03	1.3E−05	1.1E−03	3.7E−06	9.0E−04
Trichloroethylene [e]	Unpurified 1,2-Dichloroethane (0.0035%) to Light/Heavy Ends (0.23%) [f]	Operator/ Process Technician	1.9E−03	8.3E−03	1.3E−03	5.6E−03	9.7E−04	4.1E−03	9.0E−04	3.9E−03	1.8E−04	9.7E−04	1.0E−04	1.6E−03
		Laboratory Technician	5.4E−04	2.4E−03	3.6E−04	1.6E−03	2.7E−04	1.2E−03	2.5E−04	1.1E−03	4.9E−05	2.8E−04	2.8E−05	4.7E−04
		Logistics/ Distribution	6.0E−05	2.5E−04	4.1E−05	1.7E−04	3.0E−05	1.3E−04	2.8E−05	1.2E−04	5.4E−06	2.9E−05	3.2E−06	5.0E−05
		Maintenance Technician	5.2E−04	2.3E−03	3.5E−04	1.6E−03	2.6E−04	1.2E−03	2.4E−04	1.1E−03	4.7E−05	2.7E−04	2.8E−05	4.6E−04
		ONU [d]	3.6E−04	1.6E−03	2.4E−04	1.1E−03	1.8E−04	8.1E−04	1.7E−04	7.6E−04	3.2E−05	1.9E−04	1.9E−05	3.2E−04
Perchloroethylene	Unpurified 1,2-Dichloroethane (0.015%)	Worker	1.0E−05	1.5E−04	6.9E−06	1.1E−04	5.1E−06	7.7E−05	4.7E−06	7.2E−05	1.9E−06	3.7E−05	5.4E−07	3.1E−05
		ONU [d]	3.0E−07	3.4E−05	2.0E−07	2.3E−05	1.5E−07	1.7E−05	1.4E−07	7.7E−06	5.5E−08	8.1E−06	1.6E−08	6.7E−06
	Light/Heavy Ends (1,1%) [f]	Worker	9.5E−03	1.4E−02	6.5E−04	9.8E−03	4.7E−04	7.2E−03	4.4E−04	6.7E−03	1.8E−04	3.5E−03	5.1E−05	2.9E−03
		ONU [d]	2.8E−05	3.2E−03	1.9E−05	2.2E−03	1.4E−05	1.6E−03	1.3E−05	7.2E−04	5.1E−06	7.6E−04	1.5E−06	6.3E−04
Methylene chloride	Unpurified 1,2-Dichloroethane (0.0999%)	Worker	3.1E−03	4.7E−02	2.1E−03	3.2E−02	1.6E−03	2.4E−02	1.5E−03	2.2E−02	5.8E−04	1.1E−02	1.7E−04	9.3E−03
		ONU [d]	9.1E−05	1.0E−03	6.2E−05	7.1E−03	4.5E−05	5.2E−03	4.2E−05	4.8E−03	1.7E−05	2.5E−03	4.8E−06	2.0E−03
	Light/Heavy Ends (0.0999%) [f]	Worker	7.7E−03	0.12	5.3E−03	8.0E−02	3.9E−03	5.9E−02	3.6E−03	5.5E−02	1.4E−03	2.8E−02	4.1E−04	2.3E−02
		ONU [d]	2.3E−04	2.6E−02	1.5E−04	1.8E−02	1.1E−04	1.3E−02	1.1E−04	1.2E−02	4.2E−05	6.3E−03	1.2E−05	5.1E−03

Byproduct	Process Stream (wt % Fraction of Byproducts in the Process Stream)	Similar Exposure Group	8-Hour TWA Exposure Concentrations		Acute Exposure Concentrations (AC)		Intermediate Average Daily Concentration ($ADC_{intermediate}$)		Average Daily Concentration (ADC)		Lifetime Average Daily Concentration (LADC) – BLS Working Years		Lifetime Average Daily Concentration (LADC) – Vinyl Institute Working Years	
			Central Tendency (ppm) [a]	High-End (ppm) [b]	Central Tendency (ppm)	High-End (ppm)	Central Tendency (ppm)	High-End (ppm)	Central Tendency (ppm)	High-End (ppm)	Central Tendency (ppm)	High-End (ppm)	Central Tendency (ppm)	High-End (ppm)
Carbon tetrachloride [e]	Unpurified 1,2-Dichloroethane (0.15%) to Light/Heavy Ends (30%) [f]	Operator / Process Technician	0.33	1.4	0.23	0.98	0.17	0.72	0.15	0.67	6.1E−02	0.34	1.8E−02	0.28
		Laboratory Technician	9.1E−02	0.42	6.2E−02	0.28	4.5E−02	0.21	4.2E−02	0.19	1.7E−02	0.10	4.8E−03	8.2E−02
		Logistics/ Distribution	1.0E−02	4.4E−02	7.0E−03	3.0E−02	5.1E−03	2.2E−02	4.8E−03	2.0E−02	1.9E−03	1.0E−02	5.5E−04	8.6E−03
		Maintenance Technician	8.9E−02	0.40	6.1E−02	0.27	4.4E−02	0.20	4.2E−02	0.19	1.7E−03	9.6E−02	4.7E−03	7.9E−02
		ONU [d]	6.1E−02	0.28	4.2E−02	0.19	3.1E−02	0.14	2.9E−02	0.13	1.1E−02	6.7E−02	1.1E−02	6.7E−02

ONU = occupational non-user; SEG = similar exposure group

LADC calculated using working years from the Bureau of Labor Statistics (BLS) data (31 years central tendency, 40 years high end) (U.S. Census Bureau, 2019; U.S. BLS, 2014). LADC calculated using Vinyl Institute years of service for workers at manufacturing facilities (8.9 years central tendency, 33 years high end) (VI, 2026) (EPA-HQ-OPPT-2018-0427-0181).For chronic, non-cancer exposure estimates, exposure dose over the working years is averaged over the working years. Therefore, different values of working years do not affect these estimates, and EPA has presented one chronic, non-cancer estimate. For more information, including example calculations, please see Appendix B and C of the Occupational Exposure Assessment for 1,2-Dichloroethane.

[a] For 1,1-dichloroethane, the central tendency is the 50th percentile (median) of occupational exposures among all workers within a given similar exposure group (SEG), based on Vinyl Institute inhalation test order monitoring data (Stantec ChemRisk, 2023). For all other byproducts, the central tendency estimate is based on the 50th percentile exposure for 1,2-dichloroethane from the Vinyl Institute inhalation test order monitoring dataset (Stantec ChemRisk, 2024) adjusted for vapor pressure and mole fraction for the byproduct chemical using Equation 4-1 in the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j).

[b] For 1,1-dichloroethane, the high-end is the 95th percentile of occupational exposures among all workers within a given SEG, based on Vinyl Institute inhalation test order monitoring data (Stantec ChemRisk, 2023). For all other byproducts, the high-end estimate is based on the 95th percentile exposure for 1,2-dichloroethane from the Vinyl Institute inhalation test order monitoring dataset (Stantec ChemRisk, 2024) adjusted for vapor pressure and mole fraction for the byproduct chemical using Equation 4-1 in the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j).

[c] The unpurified 1,2-dichloroethane and light/heavy-ends exposure concentrations were not used for 1,1-dichloroethane because inhalation exposure estimates are based on 1,1-dichloroethane test order monitoring data collected at 1,2-dichloroethane manufacturing facilities (Stantec ChemRisk, 2023).

[d] The central tendency from the closed system monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated inhalation exposure (*i.e.,* chronic) for the ONU exposure group. As described in Section 4.1.1.1 of the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j), ONUs do not directly handle the chemical and are therefore expected to have lower inhalation exposures.

[e] High-end screening level exposures for trichloroethylene and carbon tetrachloride showed risk to workers; therefore, EPA further refined the analysis by performing Monte Carlo analysis to vary the byproduct concentration from the low-end to high-end exposures (equal distribution) as well as estimating the exposures by SEG.

[f] Light-ends liquid streams are the more volatile fractions in the mixture, typically derived from the initial stages of refining process, known for their lower boiling points. Heavy-ends liquid streams are the less volatile, higher boiling point fractions obtained towards the later stages of the refining process.

Information on respiratory protection used by the exposure groups at the facilities for 1,2-dichloroethane and byproducts is provided in the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j).

Table 5-11. Summary of Dermal Exposure Doses to Byproducts for an Average Adult Worker During the Manufacturing of 1,2-Dichloroethane[a]

Byproduct	Process Stream (% Fraction of Byproducts in the Process Stream)	Acute Absorbed Dose Rate (AADR) (mg/day)		Acute Absorbed Dose (AAD) (mg/kg-day)		Intermediate Absorbed Dose (IAD), Non-Cancer (mg/kg-day)		Chronic AbsorbedDose (CAD), Non-Cancer (mg/kg-day)		Lifetime Chronic Absorbed Dose (LCAD), Cancer (mg/kg-day) – BLS Working Years		Lifetime Chronic Absorbed Dose (LCD), Cancer (mg/kg-day) – Vinyl Institute Working Years	
		Central Tendency[b]	High-End[c]	Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End
1,1-Dichloroethane	Unpurified 1,2-Dichloroethane (0.29%)	6.5E−03	2.0E−02	8.2E−05	2.5E−04	6.0E−05	1.8E−04	5.6E−05	NE	2.2E−05	NE	6.4E−06	NE
	Light/Heavy Ends[e] (30%)	0.67	2.0	8.4E−03	2.5E−02	6.2E−03	1.9E−02	5.8E−03	NE	2.3E−03	NE	6.6E−04	NE
Trichloroethylene[f]	Unpurified 1,2-Dichloroethane (0.0035%) to Light/Heavy Ends[e] (0.23%)	9.0E−02	0.24	1.2E−03	3.1E−03	8.5E−04	2.2E−03	7.9E−04	NE	2.9E−04	NE	9.4E−05	NE
Perchloroethylene	Unpurified 1,2-Dichloroethane (0.015%)	1.5E−02	4.4E−02	1.8E−04	5.5E−04	1.3E−04	4.0E−04	1.3E−04	NE	5.0E−05	NE	1.4E−05	NE
Perchloroethylene (*continued*)	Light/Heavy Ends[e] (1.1%)	1.1	3.2	1.3E−02	4.0E−02	9.8E−03	2.9E−02	9.2E−02	NE	3.6E−03	NE	1.0E−03	NE
Methylene chloride	Unpurified 1,2-Dichloroethane; Light/Heavy Ends (0.0999%)[g]	6.0E−02	0.18	7.5E−04	2.2E−03	5.5E−04	1.6E−03	5.1E−04	NE	2.0E−04	NE	5.8E−05	NE
Carbon tetrachloride[f]	Unpurified 1,2-Dichloroethane (0.15%) to Light/Heavy Ends (30%)[e]	6.0	16	7.0E−02	0.20	0.05	0.15	5.0E−02	NE	0.02	NE	5.5E−03	NE

Byproduct	Process Stream (% Fraction of Byproducts in the Process Stream)	Acute Absorbed Dose Rate (AADR) (mg/day)		Acute Absorbed Dose (AAD) (mg/kg-day)		Intermediate Absorbed Dose (IAD), Non-Cancer (mg/kg-day)		Chronic AbsorbedDose (CAD), Non-Cancer (mg/kg-day)		Lifetime Chronic Absorbed Dose (LCAD), Cancer (mg/kg-day) – BLS Working Years		Lifetime Chronic Absorbed Dose (LCD), Cancer (mg/kg-day) – Vinyl Institute Working Years	
		Central Tendency[b]	High-End[c]	Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End
LCAD calculated using working years from the Bureau of Labor Statistics (BLS) data (31 years central tendency, 40 years high end) (U.S. Census Bureau, 2019; U.S. BLS, 2014). LADC calculated using Vinyl Institute years of service for workers at manufacturing facilities (8.9 years central tendency, 33 years high end) (VI, 2026) (EPA-HQ-OPPT-2018-0427-0181). For chronic, non-cancer exposure estimates, exposure dose over the working years is averaged over the working years. Therefore, different values of working years do not affect these estimates, and EPA has presented one chronic, non-cancer estimate. For more information, including example calculations, please see Appendix B and C of the Occupational Exposure Assessment for 1,2-Dichloroethane.													

[a] The test order provided information on PPE used at the facilities monitored which has been presented in the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j).

[b] Central tendency is based on a lower loading rate of 1,2-dichloroethane (1.4 mg per cm^2 per event) and one-hand contact.

[c] High-end is based on a higher loading rate of byproduct (2.1 mg per cm^2 per event) and two-hand contact.

[d] The central tendency from the closed system monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated dermal exposure (*i.e.,* chronic) and is health protective for risk estimation for closed system processes, as high-end exposures from daily connecting/disconnecting of transfer lines and sampling is not realistic. NE – not estimated.

[e] Light-ends liquid streams are the more volatile fractions in the mixture, typically derived from the initial stages of refining process, known for their lower boiling points. Heavy-ends liquid streams are the less volatile, higher boiling point fractions obtained towards the later stages of the refining process.

[f] High-end screening level exposures for trichloroethylene and carbon tetrachloride showed risk to workers; therefore, EPA further refined the analysis by performing Monte Carlo analysis to vary the concentration from the low-end to high-end exposures (equal distribution).

[g] Note that methylene chloride had the same concentration in the unpurified 1,2-dichloroethane stream and then light/heavy ends, and thus only has one row of results.

Information on protective gloves used by the exposure groups at the facilities for 1,2-dichloroethane and byproducts is provided in Table 4-1 and Table 4-2 of the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j).

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

An assessment objective is to estimate the number of workers and ONUs potentially exposed to 1,2-dichloroethane in the workplace. Normally, a primary difference between workers and ONUs is that workers may handle 1,2-dichloroethane and have direct contact with the chemical, while ONUs are working in the general vicinity of workers but do not handle 1,2-dichloroethane nor have direct contact with 1,2-dichloroethane. The size of the area that ONUs may work can vary across each OES and across facilities within the same OES and will depend on the facility configuration, building and room sizes, presence of vapor barrier, and worker activity pattern.

Methodology

Where available, EPA used CDR data to provide a basis to estimate the number of workers and ONUs. Data were available from the 2016 and 2020 CDR for manufacturing sites; however, the Agency determined this was not sufficient to determine the total number of workers for that OES. EPA supplemented the available CDR data using available market data; NAICS and Standard Industrial Classification (SIC) code data from TRI, DMR, and NEI sites identified for each COU; and analyzed U.S. Bureau of Labor Statistics (BLS) and U.S. Census data using the methodology described in the Environmental Releases and Occupational Exposure Assessment TSD. Where market penetration data and site-specific NAICS/SIC codes from TRI/DMR/NEI 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 *Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026aw). EPA also determined the number of days per year that workers are potentially exposed to 1,2-dichloroethane. 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.

Results

Table 5-12 provides a summary for the number of workers and ONUs potentially exposed to 1,2-dichloroethane per facility. The estimates are provided for a facility within each OES.

Table 5-12. Total Number of Workers and ONUs Potentially Exposed to 1,2-Dichloroethane for Each OES

OES[a]	Exposure Days Per Year	Potential Number of Sites	Potential Number of Workers per Site[b]	Potential Number of ONUs per Site[a]
Manufacturing	250	45	33	16
Processing as a Reactant	250	90	27	15
Processing into Formulation, Mixture, or Reaction Product	250	24	22	12
Processing – Repackaging	250	59	1	1
Processing – Repackaging (modeled)	24–119[c]	59	1	1
Industrial Application of Adhesives and Sealants	250	83	43	19
Industrial Application of Lubricants and Greases	250	4	75	22

OES[a]	Exposure Days Per Year	Potential Number of Sites	Potential Number of Workers per Site[b]	Potential Number of ONUs per Site[a]
Industrial Non-Aerosol Cleaning/Degreasing	250	4	76	22
Commercial Aerosol Products	250	30	12	5
Commercial Use as a Laboratory Chemical	250	14	6	10
Waste Handling, Treatment, and Disposal – Applicable to Incineration, Landfill, and Non-POTW WWT	250	39	14	12
Waste Handling, Treatment, and Disposal (POTW)	250	146	1	1
Waste Handling, Treatment, and Disposal (Remediation)	Not assessed			
CDR = Chemical Data Reporting; DMR = Discharge Monitoring Report; NEI = National Emissions Inventory; OES = occupational exposure scenario; ONU = occupational non-user; POTW = publicly owned treatment works; TRI = Toxics Release Inventory; WWT = wastewater treatment [a] The following OESs were qualitatively assessed: Distribution in Commerce, Industrial Heat Transferring Agent; Commercial Plastic and Rubber Products; and Commercial Fuels and Related Products. [b] Number of workers and ONUs estimates based on U.S. Census Bureau Data, U.S. BLS data, CDR, DMR, TRI, and NEI (U.S. BLS, 2023; U.S. Census Bureau, 2017). [c] Exposure days per year is based on the July 2022 Chemical Repackaging GS (U.S. EPA, 2022a).				

5.1.1.5 Weight of Scientific Evidence Conclusions for 1,2-Dichloroethane Occupational Exposure

EPA estimated occupational exposure using several sources of air monitoring data; however, the source used the most in this assessment was an inhalation exposure monitoring study submitted to the Agency by Vinyl Institute in response to a test order (Stantec ChemRisk, 2024). These data were determined to have overall data quality ratings of high through EPA's systematic review process. Other studies used had data quality ratings of high or medium.

In Table 5-13, EPA summarizes the weight of scientific evidence ratings for the occupational inhalation exposures for each OES. The Agency has the highest confidence (robust) in Manufacturing and processing as a reactant (where PBZ monitoring data obtained through test order submissions was used to estimate exposures). Other OESs have ratings of slight, slight-to-moderate, or moderate as they primarily used surrogate data or modeling. For more detail, see the *Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026aw).

Table 5-13. Summary of Assumptions, Uncertainty, and Overall Confidence in Occupational Exposure Estimates by OES

OES	Confidence Rating	Weight of Scientific Evidence Conclusion in Occupational Exposure Estimates
Manufacturing/ Manufacturing as an unintended byproduct	Robust	For this OES, EPA had inhalation monitoring data from manufacturing and processing facilities of 1,2-dichloroethane provided via a test order submission from Vinyl Institute. 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 8-hour TWA inhalation exposure estimates for the Manufacturing OES. 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 preferrable 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 Vinyl Institute were 1,2-dichloroethane-specific from multiple facilities that manufacture and process 1,2-dichloroethane; the data included 123 worker and 39 ONU full-shift (8–12 hour) PBZ samples across 5 manufacturing facilities for intentional production of 1,2-dichloroethane, and 53 worker and 6 ONU full-shift PBZ samples from 2 facilities for the unintentional production of 1,2-dichloroethane as a byproduct. All samples were above the limit of detection. EPA assumed 250 exposure days/year based on 1,2-dichloroethane exposure each working day for a typical worker schedule. There were data in the test order summary report that indicated that certain tasks are done on a daily basis, while others are done less frequently. Based on these strengths and limitations, EPA concluded that the weight of scientific evidence for this assessment provides a robust estimate of exposures.
Repackaging	Moderate (Bulk Repackaging) Slight to Moderate (Small Containers)	For this OES, EPA used analogous test order monitoring data for bulk repackaging and applied a modeling approach for repackaging into smaller containers for laboratory use. For bulk repackaging, EPA expects that workers who load and unload 1,2-dichloroethane at manufacturing and processing sites perform tasks similar to those carried out by workers at bulk repackaging sites. EPA identified 26 samples for logistics technicians; all samples were above the limit of detection. EPA assigns a confidence of moderate. For the modeling approach, EPA used assumptions and values from the July 2022 Chemical Repackaging GS (U.S. EPA, 2022a), having a high data quality rating from the systematic review process (OECD, 2009b). EPA also used EPA/OPPT models combined with Monte Carlo modeling to estimate inhalation exposures. A strength of the Monte Carlo modeling approach is that setting the range of model input values and conducting probabilistic modeling provides a full distribution of potential exposure values that are more likely than a discrete value to capture actual exposure at sites.

OES	Confidence Rating	Weight of Scientific Evidence Conclusion in Occupational Exposure Estimates
		The primary limitation is the uncertainty in the representativeness of values toward the true distribution of potential inhalation exposures. Also, EPA assumed that one import container is unloaded/day for repackaging, so the number of containers unloaded/year is equal to the number of exposure days/year. Based on these strengths and limitations, EPA concluded that the weight of scientific evidence for the repackaging assessment based on the inhalation monitoring data is moderate for the bulk repackaging scenario, and slight-to-moderate for the small container scenario. For ONUs, the Agency did not identify data or modeling approaches applicable to estimation of ONU exposure for repackaging and used a default assumption of the central tendency from modeled workers inhalation exposures to represent ONU inhalation exposures. EPA has lower confidence in the ONU estimate but still within the slight-to-moderate range.
Processing as Reactant	Robust	For this OES, EPA had inhalation data provided via a test order submission from Vinyl Institute, which includes manufacturers and processors of 1,2-dichloroethane. 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 8-hour TWA inhalation exposure estimates. The Agency used 1,2-dichloroethane test order inhalation data to assess inhalation exposures. The primary strength of these data is the use of personal and directly applicable data, and the number of samples available for workers and ONUs. EPA identified 48 worker and 14 ONU full-shift PBZ samples from 2 processing facilities from this dataset to estimate inhalation exposures; 6 worker and 8 ONU samples were below the limit of detection (<0.1 ppb). EPA also reviewed inhalation data provided via a test order submission, which was existing data generated during the manufacture of a herbicide used worldwide where the 1,2-dichloroethane is used as a processing solvent (BASF, 2021). This study contained 101 worker and 15 ONU personal full-shift samples; 66 worker and 15 ONU samples were below the LOD (range 0.1–2 ppm for workers and 0.1–0.3 ppm for ONUs). The range of data in this source was within the range of data from the 1,2-dichloroethane test order submission described above, however, EPA has greater uncertainty in these estimates due to the large number of samples below LOD (65% worker, 100% ONU) and the high LOD range (0.1 to 2 ppm). The primary limitation is that EPA assumed 250 exposure days/year based on 1,2-dichloroethane exposure each working day for a typical worker schedule; it is uncertain whether this captures actual worker schedules and exposures. Based on these strengths and limitations, EPA concluded that the weight of scientific evidence for this assessment provides a robust estimate of exposures.

OES	Confidence Rating	Weight of Scientific Evidence Conclusion in Occupational Exposure Estimates
Processing into Formulation, Mixture, or Reaction Product	Moderate	EPA used inhalation data provided via a test order submission, which was existing data generated during the manufacture of a herbicide used worldwide where the 1,2-dichloroethane is used as a processing solvent (BASF, 2021). This study contained 101 worker and 15 ONU personal full-shift samples; 66 worker and 15 ONU samples were below the LOD (range 0.1–2 ppm for workers and 0.1–0.3 ppm for ONUs). In this particular case, the ONU data was the same order of magnitude as the central tendency of worker 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 8-hour TWA inhalation exposure estimates. The primary strength of the test order submission is the use of personal and directly applicable data. The primary limitation of the data is that it is a single site and may not be representative of all processing sites. Additionally, there were a large number of non-detects in this dataset, and the limit of detection (0.1 to 2 ppm) was high in comparison to other datasets and to the benchmarks utilized in this risk evaluation. Particularly for ONUs, it should be noted that all the samples were below the limit of detection. EPA assessed non-detect values at the LOD/2. Additionally, for workers, the majority of samples were also below the limit of detection, and EPA also assessed these values at the LOD/2. As such, EPA has lower confidence in these estimates. Additionally, EPA assumed 250 exposure days/year based on 1,2-dichloroethane exposure each working day for a typical worker schedule; it is uncertain whether this captures actual worker schedules and exposures. Based on these strengths and limitations, EPA concluded that the weight of scientific evidence for this assessment provides a moderate estimate of exposures.
Application of Adhesives and Sealants	Moderate	For this OES, EPA did not identify inhalation exposure monitoring data related to the use of 1,2-dichloroethane in the application of adhesives and sealants. Based on available data, the Agency used surrogate data from trichloroethylene during Use of paints, coatings, adhesives, and sealants. The dataset, obtained from NIOSH Health Hazard Evaluation report (HHEs) as well as 3 OSHA facility inspections, contained 22 samples for workers and 2 samples for ONUs, and encompassed facilities using trichloroethylene in adhesive and coating applications. It had a medium data quality rating from the systematic review process. 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 8-hour TWA inhalation exposure estimates. The strength of these data includes that they are personal breathing zone and are expected to be applicable to 1,2-dichloroethane similar activities. Trichloroethylene and 1,2-dichloroethane also have similar vapor pressures (73.5 mm Hg vs. 78.9 mmHg for 1,2-dichloroethane), adding to the confidence that trichloroethylene is an appropriate surrogate for 1,2-dichloroethane. The primary limitation of this assessment is that it is based on data from a different chemical, which will cause

OES	Confidence Rating	Weight of Scientific Evidence Conclusion in Occupational Exposure Estimates
		inherent uncertainties due to differences in the chemical properties. Additionally, EPA assumed 250 exposure days/year based on exposure each working day for a typical worker schedule, and it is uncertain whether this estimate is representative of actual worker schedules and exposures. Although supported by several strengths, the assessment's reliance on surrogate data is the primary source of uncertainty. Based on these strengths and limitations, EPA concluded that the weight of scientific evidence for this assessment provides a moderate estimate of exposures.
Application of Lubricants and Greases	Slight to Moderate	For this OES, EPA did not identify relevant inhalation monitoring data and used modeling to estimate occupational exposures. EPA used EPA/OPPT models combined with Monte Carlo modeling to estimate inhalation exposures. The Monte Carlo simulation with 100,000 iterations was used to generate the full distribution of potential exposures based on the range for each input parameter. Various model parameters were derived from a CARB brake service study, having a high data quality rating from the systematic review process, and 1,2-dichloroethane concentration data from SDSs of various products. EPA considered the assessment approach, the quality of the data used in the model, and uncertainties in assessment results to determine a weight of scientific evidence conclusion for the 8-hour TWA inhalation air concentrations. A strength of the Monte Carlo modeling approach is that representing the range in model input values and the resulting distribution of potential exposure values is more likely than a discrete value to capture actual exposure at sites. Other strengths of this model include the use of parameters derived from applicable exposure scenarios such as the CARB brake service study, and the use of known 1,2-dichloroethane concentration data from products currently on the market. The primary limitations include the uncertainty of the representativeness of modeled air concentrations toward the true distribution of inhalation concentrations for the industries and sites covered by this scenario, as this scenario is based on the typical exposure and work patterns that occur for brake services. Also, the model references a CARB study on brake servicing to estimate use rate and application frequency of the degreasing product. The brake servicing scenario may not be representative of the use rates for the application of lubricants and greases containing 1,2-dichloroethane. Based on these strengths and limitations, EPA concluded that the weight of scientific evidence for this assessment provides a slight-to-moderate estimate of exposures.
Industrial and Commercial Non-Aerosol Cleaning/	Slight to Moderate	For this OES, EPA did not identify inhalation exposure monitoring data related to the use of 1,2-dichloroethane in non-aerosol degreasers. Based on available data, EPA uses surrogate data from trichloroethylene during batch open-top vapor degreasing. The dataset, obtained from NIOSH HHEs, contained 113 samples for workers and 10 samples for ONUs, and encompassed various industries. It had a high data quality rating from the systematic

OES	Confidence Rating	Weight of Scientific Evidence Conclusion in Occupational Exposure Estimates
Degreasing		review process. The strength of these data includes the number of samples, and the applicability to possible 1,2-dichloroethane activities. Trichloroethylene and 1,2-dichloroethane also have a similar vapor pressure (73.5 mm Hg vs. 78.9 mmHg for 1,2-dichloroethane), adding to the confidence that trichloroethylene is an appropriate surrogate. The primary limitations include: (1) the data are for a different chemical, which will cause inherent uncertainties due to differences in the chemical properties; and (2) EPA conservatively assesses vapor degreasing as the method of non-aerosol cleaning/degreasing with the highest exposure potential; however, EPA does not have evidence that 1,2-dichloroethane is used in vapor degreasing. Additionally, the Agency 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. Based on these strengths and limitations of the air concentrations, EPA concluded that the weight of scientific evidence for this assessment provides a slight-to-moderate estimate of exposures.
Industrial and Commercial Aerosol Products	Slight	For this OES, EPA did not identify relevant inhalation monitoring data and used modeling to estimate occupational exposures. Due to expected similarities in worker activity (both spray applications), the Agency used the same method used for the Application of lubricants and greases OES. EPA used EPA/OPPT models combined with Monte Carlo modeling to estimate inhalation exposures. The Monte Carlo simulation with 100,000 iterations used the range of input parameters to generate the distribution of potential exposures. Various model parameters were derived from a CARB brake service study, having a high data quality rating from the systematic review process, and 1,2-dichloroethane concentration data from SDSs of various products. EPA considered the assessment approach, the quality of the data used in the model, and uncertainties in assessment results to determine a weight of scientific evidence conclusion for the 8-hour TWA inhalation air concentrations. A strength of the Monte Carlo modeling approach is that capturing the range of model input values and the resulting distribution of potential exposure values is more likely than a discrete value to capture actual exposure at sites. Other strengths of this model include the use of parameters derived from applicable exposure scenarios such as the CARB brake service study, and the use of known 1,2-dichloroethane concentration data from products currently on the market. The primary limitations include the uncertainty of the representativeness of modeled air concentrations toward the true distribution of inhalation concentrations for the industries and sites covered by this scenario, as this scenario is based on the typical exposure and work patterns that occur for brake services. EPA had very limited information on the applications of 1,2-dichloroethane for this COU. The OES selected was to model 1,2-dichloroethane as an aerosol product applied in brake servicing.

OES	Confidence Rating	Weight of Scientific Evidence Conclusion in Occupational Exposure Estimates
		Due to the lack of monitoring data and the uncertainty in the OES modeled for this COU, EPA concluded that the weight of scientific evidence for this assessment provides an estimate of exposure of slight confidence.
Laboratory Use	Moderate to Robust	For this OES, EPA had inhalation data provided via a test order submission from Vinyl Institute, which included manufacturers and processors of 1,2-dichloroethane. Inhalation data from the worker description "laboratory technicians" were used as analogous in this assessment. These samples are representative of workers in QA/QC laboratories in manufacturing settings. All samples were above the limit of detection. EPA also reviewed additional inhalation data provided via a test order submission, which was existing data generated during the manufacture of a herbicide (BASF, 2021). This study contained 4 worker personal sample data points where metadata implied laboratory work. All samples were below the LOD (<0.1 ppm); non-detects were assessed at the LOD/2. The worker data is within the same order of magnitude as the data from the laboratory data from the Vinyl Institute test order. However, due to the large number of non-detects and the high limit of detection relative to benchmarks, there is greater uncertainty and reduced confidence in these exposure estimates. Other limitations include (1) the data are for laboratory technicians in a QA/QC laboratory manufacturing setting, rather than a commercial setting, and so the dataset may contain exposure from activities or environments that would not occur in a commercial laboratory setting; and (2) the lack of data for ONUs. To estimate exposure to 1,2-dichloroethane in academic laboratories, the Agency used methylene chloride data that was previously submitted to EPA by a public commentor (EPA-HQ-OPPT-2020-0465-0464). Summary statistics were provided based on a total of 80 samples. The primary limitation of this data are that it is for a different chemical, which will cause inherent uncertainties due to differences in the chemical properties such as vapor pressure (435 mmHg for methylene chloride and 78.9 mmHg for 1,2-dichloroethane). EPA did not identify laboratory data for other potential surrogate chemicals. Despite differences in vapor pressure, the results are on the same order of magnitude as results for workers in manufacturing/processing laboratories. Additionally, the discrete, underlying data were not provided thus EPA relied on summary statistics provided in the public comments, and as such there is greater uncertainty in the data. For example, EPA utilized the maximum value provided in the public comment as the HE, as the 95th percentile could not be calculated. The primary strength is that this information is specific to academic research labs, which are included in the Laboratory Use COU. 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 8-hour TWA inhalation exposure estimates. EPA used inhalation data to assess inhalation exposures. The primary strength of these data is that they are PBZ and capture many tasks that are expected to occur in a commercial laboratory setting. Additionally, EPA assumed 250 exposure days/year based on 1,2-dichloroethane exposure each working day for

OES	Confidence Rating	Weight of Scientific Evidence Conclusion in Occupational Exposure Estimates
		a typical worker schedule; it is uncertain whether this captures actual worker schedules and exposures. Based on these strengths and limitations, EPA concluded that the weight of scientific evidence for this assessment provides a moderate-to-robust estimate of exposures. For ONUs, the Agency did not identify data or modeling approaches applicable to estimation of ONU exposure for laboratory use and used a default assumption of the central tendency from the workers inhalation exposures to represent ONU inhalation exposures. Laboratory activities are expected to be performed under a fume hood which could lower the exposure potential to ONUs. EPA assigns a lower confidence of moderate for the ONU estimate.
Waste Handling, Treatment, and Disposal	Landfill: slight POTW, Non-POTW WWT: moderate	***Waste Handling, Treatment, and Disposal (Landfill) Inhalation Assessment*** For this OES, EPA had limited area data (12 samples) that was used in this assessment. 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 8-hour TWA inhalation exposure estimates. EPA used 1,2-dichloroethane inhalation data to assess inhalation exposures, having a medium data quality rating from systematic review. The primary strength of these data is that they are directly applicable concentration data that portray the concentration of 1,2-dichloroethane in the air at 3 locations around an active landfill. The primary limitations of these data are (1) the age of the data (samples taken in 1989 and 1990); (2) only area samples were available as opposed to PBZ air concentration data; (3) the data come from a non-U.S. facility (Greece), which may not be representative of U.S. facilities; and (4) the data are from a single landfill, which may not be representative of all landfills as pollutant concentrations surrounding a landfill can vary depending on the composition and structure of the landfill. Additionally, EPA assumed 250 exposure days/year based on 1,2-dichloroethane exposure each working day for a typical worker schedule; it is uncertain whether this captures actual worker schedules and exposures. Based on these strengths and limitations, EPA concluded that the weight of scientific evidence for this assessment provides a slight estimate of exposures. For ONUs, the Agency did not identify data or modeling approaches applicable to estimation of ONU exposure for disposal by landfill and used a default assumption of the central tendency from the workers inhalation exposures to represent ONU inhalation exposures. EPA also has slight confidence in the ONU estimate than the workers estimate. ***Waste Handling, Treatment, and Disposal (POTW, Non-POTW WWT) Inhalation Assessment*** For these OESs, EPA had discrete PBZ monitoring data that were used in this assessment. EPA used inhalation data provided via test order submission, as well as additional industrial hygiene monitoring data that was submitted as part of the public comments. Two samples relevant to this OES were provided in the test order, and these were collected from a maintenance supervisor and a wastewater operator. Both samples were above the

OES	Confidence Rating	Weight of Scientific Evidence Conclusion in Occupational Exposure Estimates
		limit of detection. As part of the public comments, EPA received samples collected from operators and ONUs who performed tasks relevant to wastewater treatment from Vinyl Institute EDC Consortium member companies. EPA utilized 70 worker and 3 ONU full-shift samples from both datasets combined; 37 of which were below the limit of detection (0.024 ppm to 0.28 ppm).[a] 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 8-hour TWA inhalation exposure estimates. The Agency used 1,2-dichloroethane inhalation data to assess inhalation exposures, having a high data quality rating from systematic review. The primary strength of these data is the use of directly applicable PBZ data obtained from workers at a wastewater treatment plant. The data represent exposure due to several processes that commonly occur at wastewater treatment plants. The primary limitation of this data is the high LOD (ranged up to 280 ppb) for many samples, and the large number of samples below the limit of detection. Additionally, EPA assumed 250 exposure days/year based on 1,2-dichloroethane exposure each working day for a typical worker schedule; it is uncertain whether this captures actual worker schedules and exposures. Based on these strengths and limitations, EPA concluded that the weight of scientific evidence for this assessment provides a moderate estimate of exposures. For ONUs, the Agency did not identify data or modeling approaches applicable to estimation of ONU exposure for disposal by wastewater treatment and used a default assumption of the central tendency from the workers inhalation exposures to represent ONU inhalation exposures. EPA assigns a lower confidence of slight-to-moderate for the ONU estimate.

OES	Confidence Rating	Weight of Scientific Evidence Conclusion in Occupational Exposure Estimates
Dermal Exposure	Moderate	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 acute absorbed dose. EPA used empirical Section 4 test order data on 1,2-dichloroethane for the fraction absorption parameter (Labcorp Early Development, 2024) and OES-specific data for the weight percent parameter in the model. The dermal loading parameter, *i.e.*, the amount of chemical on the skin resulting from the OES activity, is based on Cinnalli et al., study (U.S. EPA, 1992). Given that the study used oils to measure amount of liquid applied to the skin, instead of 1,2-dichloroethane or other solvents, there is some uncertainty in the data of 0.7 to 2.1 mg/cm^2 as used in the Monte Carlo model. A strength of the Monte Carlo modeling approach is that inclusion of the range of data-informed model input values resulting in a distribution of potential exposure values is more likely than a discrete value to capture actual exposure at sites. The primary limitation is the uncertainty in the representativeness of values toward the true distribution of potential dermal exposures. 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 the Agency does not expect ONUs to directly handle 1,2-dichloroethane 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.

COU = condition of use; CT = central tendency; HE = high end; LOD = limit of detection; OES = occupational exposure scenario; ONU = occupational non-user; POTW = publicly owned treatment works; WWT = wastewater treatment

[a] EPA assessed non-detects at LOD/2. Additionally, EPA reanalyzed the data for values below the LOD using maximum likelihood estimation (MLE) and the Kaplan–Meier estimator methods. Results were comparable across methods and did not materially change CT or HE risk estimates; therefore, no updates were made for this OES and the LOD/2 substitution method was utilized.

5.1.1.6 Weight of Scientific Evidence Conclusions for 1,2-Dichloroethane Byproducts Occupational Exposure

The primary strength of this assessment is the use of PBZ and directly applicable monitoring data, which are preferrable to other assessment approaches such as modeling or the use of occupational exposure limit (OELs). As stated in the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j), EPA had full shift worker inhalation monitoring data for both 1,2-dichloroethane, and 1,1-dichloroethane produced as a byproduct from the manufacture of 1,2-dichloroethane, provided via test order submissions from the Vinyl Institute.

For 1,1-dichloroethane, chemical-specific inhalation test order monitoring data were available from three sites that produce 1,1-dichloroethane as a byproduct during the manufacture of 1,2-dichloroethane (Stantec ChemRisk, 2023). This data was used to estimate 8-hour TWA exposure levels for 1,1-dichloroethane byproduct. A total of 98 full-shift samples were collected across five SEGs (including ONUs). Of the total samples collected, 39 samples were below the limit of detection. Worker SEGs include operators, maintenance technicians, logistics technicians, and laboratory technicians.

For the other byproducts, the Agency used the 1,2-dichloroethane surrogate inhalation test order monitoring data (Stantec ChemRisk, 2024) as surrogate data to estimate inhalation exposure to the other byproduct chemicals. For worker estimates, EPA used data from the operator SEG which included 53 full-shift samples. All samples were above the limit of detection. For ONUs, EPA used data from the ONU SEG which included 39 samples (all above the limit of detection). EPA applied a correction to the 8-hr TWAs to account for differences in vapor pressure and mole fraction. The mole fraction used in the screening approach is based on the maximum expected byproduct concentration in the light/heavy end streams in the 1,2-dichloroethane manufacturing process.

The number of samples available to assess inhalation exposures was a strength both for the 1,1-dichloroethane dataset, and the 1,2-dichloroethane dataset that was used as surrogate for the remaining four byproducts. The PBZ air concentration data used to assess inhalation exposures for the byproducts (both the 1,1-dichloroethane and 1,2-dichloroethane datasets) had a high data quality rating from the systematic review process.

EPA assumed 250 exposure days per year based on 1,2-dichloroethane exposure, each working day, for a typical worker schedule. There was data in the test order summary report that indicated that certain tasks are done daily while others are done less frequently. As demonstrated by the available inhalation monitoring data, exposure of an individual worker within an SEG varies. As EPA had SEG level specific monitoring data, it is unlikely that the reported high-end exposure would occur regularly to every employee within an SEG on a regular basis. Also, for the byproducts where 1,2-dichloroethane exposure is used as a surrogate, it was assumed that the concentration of 1,2-dichloroethane in the air can be adjusted to the concentration in the air of a given byproduct using only the byproduct's concentration in the liquid stream and the vapor pressure, which introduces uncertainty.

EPA also compared both the occupational eight-hour TWA inhalation exposure estimates and the dermal acute absorbed dose rates for each byproduct chemical produced during the manufacture of 1,2-dichloroethane to these same exposures estimated for the Manufacturing COU in previously published chemical-specific risk evaluations. This comparison is presented in Table 4-13 for the inhalation exposure and Table 4-14 for the dermal dose of the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j). These comparisons show that the estimates obtained in this assessment are reasonable. For carbon tetrachloride, the smaller difference reflects its high concentrations in the light and heavy end streams (Table 4-6 of the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j)).

5.1.2 General Population Exposures

General population exposures occur when 1,2-dichloroethane is released into the environment and the media is then a pathway for exposure. Figure 5-2 provides a graphic representation of where and in which media 1,2-dichloroethane is estimated to be found and the corresponding route of exposure. As described in Section 3.2, releases of 1,2-dichloroethane are expected in air, water, and disposal to landfills. Section 3.3 provides a summary of the monitoring, database, and modeled data on concentrations of 1,2-dichloroethane in the environment.

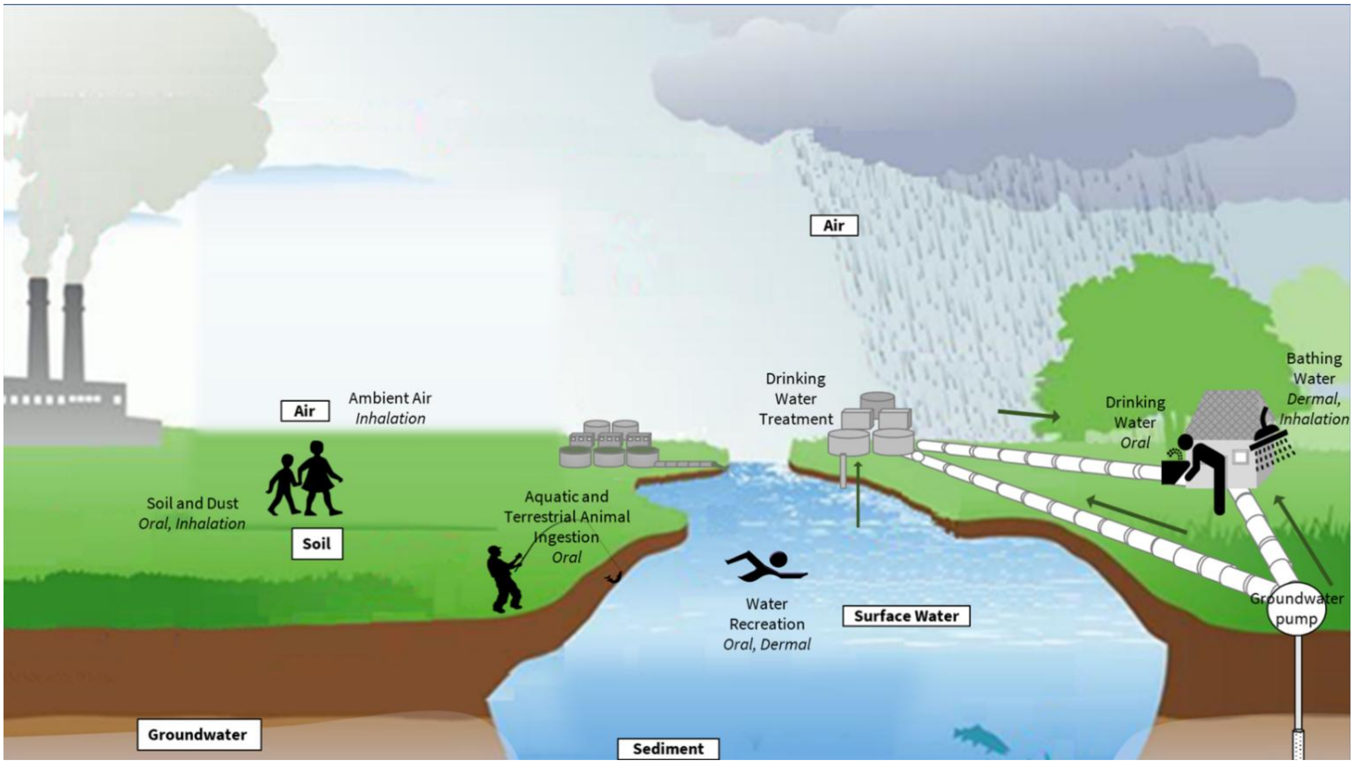

Figure 5-2. Potential Human Exposure Pathways to 1,2-Dichloroethane for the General Population

5.1.2.1 Summary of Inhalation Exposure Assessment

EPA estimated ambient air concentrations of 1,2-dichloroethane using AERMOD and HEM5.0. Based on the ambient air exposure analysis performed for the *Risk Evaluation for 1,1-Dichloroethane* (U.S. EPA, 2025d), the Agency did not perform a tiering analysis for 1,2-dichloroethane. For 1,1-dichloroethane, the tiering analysis performed resulted in EPA using the most refined approach available at the time because cancer risk estimates exceeding the benchmark were found in the lower-tier analyses. Because 1,1- and 1,2-dichloroethane use the same IUR and reported releases of 1,2-dichloroethane to ambient air are higher than those of 1,1-dichloroethane, EPA only performed the highest-tier of exposure analysis available. For this analysis, the Agency used a combination of AERMOD and HEM5.0 to estimate ambient air exposures to the general population as these two models are the highest-tier models currently used by EPA for estimating ambient air concentrations and exposures from industrial point and area sources.

HEM5.0 was used to estimate exposures using a releases from TRI reporting facilities (2015–2024) and NEI reporting facilities (2014, 2017, and 2020). AERMOD was used to estimate exposures for EPA estimated releases from generic facilities/sites.

HEM5.0 combines 2010 U.S. Census data with estimated ambient air concentrations to calculate maximum individual risks (MIR) and the number of people within each census block with a cancer risk estimate exceeding 1×10^{-6}, 1×10^{-5}, and 1×10^{-4}. Detailed descriptions of modeling using AERMOD and HEM are provided in the *Environmental Media Assessment for 1,2-Dichloroethane*(U.S. EPA, 2026ad) and the *General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ah). EPA also compared modeled data to monitored data reported to the AMTIC archive and did a case study focusing on a releasing facility in Calvert City, Kentucky, to ground truth modeling results (see *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad)).

Releases Used as Modeling Inputs for AERMOD and HEM5.0

For modeling, OESs fell into one of the following three categories:

- OESs for which there were only facility-reported releases (Manufacturing; Repackaging; Processing as a Reactant; Processing into Formulation, Mixture, or Reaction Product; and Industrial Application of Lubricants and Greases; and Waste Handling, Treatment, and Disposal);
- OESs for which there were only modeled releases from generic facilities/sites (Commercial Aerosol Products); and
- OESs for which there were both modeled releases from generic facilities/sites and reported releases (Industrial Application of Adhesives and Sealants; Non-Aerosol Cleaning and Degreasing; and Laboratory Use).

EPA considered TRI release data from the years 2015 to 2024 for this analysis. For each facility, EPA used the highest total emissions across the years of 2015 to 2024 as inputs to HEM5.0. TRI reporters may report either with a Form R or a Form A. To use Form A, reporters must release less than 500 lbs/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.

For NEI data, EPA used data reported in 2014, 2017, and 2020 for this analysis. In the draft risk evaluation, EPA modeled all available data for 2014 and 2017 using AERMOD (U.S. EPA, 2025a). For this evaluation, EPA modeled, using HEM5.0, each facility that showed a risk greater than 1×10^{-6} based on the 95th percentile concentration at 10 m from the release location based on the analysis performed in the draft risk evaluation. EPA also modeled any releases that were new to the 2020 NEI if they were greater than the lowest release from 2014 and 2017 that resulted in a risk greater than 1×10^{-6} based on the 95th percentile concentration at 10 m from the release location. If a facility reported in multiple years and had total releases greater than the threshold described above, then EPA used the maximum release across all years in this analysis.

Detailed descriptions of the modeling efforts using AERMOD and HEM with full model inputs are provided the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad) and the *General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ah).

Calculation of Exposures via Ambient Air Based on Results from AERMOD for EPA Estimated Releases from Generic Facilities/Sites

For all AERMOD modeling, the 10th, 50th, and 95th percentile daily and annual average concentrations were calculated for each facility. The AERMOD modeling methodology is described in full in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad) and the full exposure calculations are presented in the *General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ah). When calculating exposures to ambient air using results from AERMOD, 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 and 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) of people living near 1,2-dichloroethane-releasing facilities (see *General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ah) for more information). AERMOD was used to estimate exposures from EPA-modeled releases for generic facilities/sites.

Calculation of Exposures via Ambient Air Based on Results from HEM

HEM5.0 was used to estimate exposures and risks at centroids of census block up to 50,000 m from TRI-reporting facilities. When using HEM5.0 to estimate exposures to ambient air, EPA used the default chronic exposure scenario, which assumes that an individual breathes the ambient air at a given receptor site (*i.e.,* census block centroid) 24 hours per day over a 70-year lifetime (SC&A, 2023). Additionally, for 10th, 50th, and 95th percentile concentrations were calculated for the annual average concentrations at each radial distance. At each radial distance there were 16 modeled receptors (see Figure 3-1 in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad)). The 10th, 50th, and 95th percentiles for these 16 receptors at each modeled distance were calculated.

Results of Exposure Modeling

Lifetime average daily concentrations, which are equivalent to the annual average concentrations, modeled using HEM5.0 for TRI and NEI reporting facilities based on the 95th percentile of the annual average exposures across all facilities ranged from 0 to 7.1 $\mu g/m^3$ and 0 to 5.5 $\mu g/m^3$, respectively, at 1,000 m from the release location. Analysis using HEM5.0 showed that the nearest census block centroids to releasing facilities reporting to TRI ranged from 129 to 20,021 m, with a median of 976 m. For NEI release locations, the nearest populated census blocks were 13 to 19,931 m from the release location, with a median distance of 907 m. For generic facilities/sites that were modeled using EPA-estimated releases, lifetime average daily concentrations ranged 3.80×10^{-6} to 36 $\mu g/m^3$ at 1,000 m when using the meteorology station of Lake Charles, Louisiana. The seven orders of magnitude difference in these modeled concentrations is due to the differences in characteristics of the OESs modeled (Table 3-6). Additional exposures can be found in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad).

Comparison of Modeled Ambient Air Exposures Using AERMOD to Monitored Data

To support the modeled ambient air exposures, EPA extracted and summarized monitoring data for 1,2-dichloroethane from EPA's AMTIC database (U.S. EPA, 2002)—a collection of data from air monitoring networks located across the United States (U.S. EPA, 2026ad). EPA also identified and summarized measured data from peer-reviewed literature, gray literature, and databases that were included in EPA's systematic review process, as detailed in the *Systematic Review Protocol for 1,2-Dichloroethane* (U.S. EPA, 2026bi). As described in Section 3.3.1, EPA compared modeled to measured concentrations from monitoring as reported in the AMTIC archive (U.S. EPA, 2002) The comparison shows that annual average and 95th percentile daily modeled concentrations are within approximately an order of magnitude of the mean and 90th percentile monitored 1,2-dichloroethane concentrations at 10 monitoring stations with the highest modeled concentrations.

Additional monitoring was conducted October 2020 to December 2021 by EPA's Office of Air at three sampling locations near a facility in Calvert City, Kentucky (U.S. EPA, 2024b). The two other sampling sites were located approximately 1,900 and 2,500 m from the facility and had reported concentrations of 5.91×10^{-2} to 15.4 $\mu g/m^3$ (detection frequency of 93%) and 2.83×10^{-2} to 11.2 $\mu g/m^3$ (detection frequency of 96%). The modeled 95th percentile concentrations for this facility of 7.1 and 1.6 $\mu g/m^3$ at 1,000 and 2,500 m were on the same order of magnitude as the monitored concentrations at approximately the same distances. Based on the comparative analysis in this section, the 95th percentile ambient air concentrations are likely representative of actual concentrations near releasing facilities. Thus, EPA has robust confidence in the HEM5.0-modeled results from reported TRI and NEI releases of 1,2-dichloroethane.

5.1.2.2 Summary of Dermal Exposure Assessment

Dermal exposure of the general population to 1,2-dichloroethane may occur through swimming in surface water (streams and lakes) containing 1,2-dichloroethane due to facility releases of 1,2-dichloroethane to those surface waters. Dermal doses were calculated using the highest 1,2-dichloroethane surface water concentration for each OES resulting from the corresponding updated facility-specific discharges for 2015 to 2024. However, the highest 1,2-dichloroethane releases associated with each of the OESs are in highly industrialized areas and swimming in these areas such as in the Westlake, Louisiana, discharge location is not anticipated to occur on a chronic basis given contaminated waterways and published warnings and advisories against swimming.

The supplemental file, *Drinking Water Exposure Estimates for 1,2-Dichloroethane*, (U.S. EPA, 2026aa) presents the surface water concentrations used to estimate acute doses (ADR) from dermal exposure while swimming. Table 5-14 summarizes the derived acute doses (ADRs) resulting from dermal exposure while swimming for adults, youth, and children. Children younger than 6 years are not assumed to be swimming in receiving water bodies where facility releases occur. Of the OESs listed in Table 5-14, the highest dermal exposures are anticipated for adults from Waste handling, treatment, and disposal followed by Manufacturing OES releases.

Table 5-14. Acute Dermal (Swimming) Doses Across Life Stages

OES	1,2-Dichloroethane Surface Water Concentrations		Adult (21+ years)	Youth (11–15 years)	Child (6–10 years)
	30Q5 Conc. (µg/L)	Harmonic Mean Conc. (µg/L)	ADR_{POT} (mg/kg-day)	ADR_{POT} (mg/kg-day)	ADR_{POT} (mg/kg-day)
Manufacturing (LA0000761)	27	27	2.2E−05	1.7E−05	1.0E−05
Processing as a Reactant (IL0000141)	5	5	4.0E−06	3.1E−06	1.9E−06
Processing into Formulation, Mixture, or Reaction Product (NJ0002348)	1.5	1.1	1.2E−06	9.3E−07	5.7E−07
Laboratory Use (MI0001911)	5.7	2.0	4.5E−06	3.5E−06	2.1E−06
Repackaging (LA0056600)	0.17	0.17	1.3E−07	1.0E−07	6.2E−08

OES	1,2-Dichloroethane Surface Water Concentrations		Adult (21+ years)	Youth (11–15 years)	Child (6–10 years)
	30Q5 Conc. (µg/L)	Harmonic Mean Conc. (µg/L)	ADR_{POT} (mg/kg-day)	ADR_{POT} (mg/kg-day)	ADR_{POT} (mg/kg-day)
Industrial and Commercial Non-Aerosol Cleaning/ Degreasing (NJ0000019)	1.2E−02	8.2E−03	9.9E−09	7.6E−09	4.6E−09
Waste Handling, Treatment and Disposal (POTW), (CA0023671)	93	93	7.4E−05	5.7E−05	3.4E−05
Waste Handling, Treatment and Disposal (Non-POTW WWT), (PA0080594)	2,200	2,200	1.8E−03	1.3E−03	8.1E−04
Waste Handling, Treatment, and Disposal (Incinerator), (AR003780)	416	416	3.3E−04	2.5E−04	1.5E−04
Waste Handling, Treatment and Disposal (Landfill), (PA0043818)	2.7	3.5	2.1E−06	1.6E−06	9.9E−07
Waste Handling, Treatment and Disposal (Remediation), (NV0023621)	0.99	0.71	7.9E−07	6.0E−07	3.7E−07
30Q5 = 30 consecutive days of lowest flow over a 5-year period; ADR = acute dose rate; POT = potential; POTW = publicly owned treatment works; WWT = wastewater treatment					

5.1.2.3 Summary of Oral Exposures Assessment

Facilities reported 1,2-dichloroethane releases to surface waters from process wastewater discharges and to soil from biosolids application. 1,2-Dichloroethane concentrations in both surface water and soil can also be impacted by deposition from ambient air. Once in these media, the fate, physical and chemical, and transport properties (U.S. EPA, 2026n) indicate 1,2-dichloroethane can partition to each media, which in turn can lead to general population exposure to 1,2-dichloroethane via drinking water, incidental ingestion from swimming in receiving water bodies, and soil ingestion. However, the levels of exposure via the oral route are anticipated to be less than that via inhalation; thus, EPA conducted a screening analysis of the highest exposures resulting from facility-reported releases. The *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad) describes the methodology and results of estimation of surface water concentration from facility-specific releases.

As described in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad), 1,2-dichloroethane facility-specific releases are monitored and permitted via NPDES permits; therefore, EPA can estimate concentrations in the receiving water bodies at the point of discharge of facilities reporting releases of 1,2-dichloroethane. EPA uses the NHDPlus flow data of the receiving water body together with the amount of 1,2-dichlorethane reported in the effluent to estimate concentrations. Since flow metrics vary, EPA uses a low flow 7Q10 metric as a conservative metric for aquatic species assessment. For general population exposures from drinking water or incidental ingestion via swimming in the receiving water body as described in Sections 5.1.2.3.1 and 5.1.2.3.2 below, EPA uses the 30Q5 flow metric.

5.1.2.3.1 Drinking Water Exposure

In 1974, Congress passed the Safe Drinking Water Act. This law requires EPA to determine safe levels of chemicals in drinking water that do or may cause health problems. The Agency has set an enforceable standard called a Maximum Contaminant Level (MCL) for 1,2-dichloroethane at 5 parts per billion (ppb). All public water supplies must abide by these regulations. As noted above, 1,2-dichloroethane is reported by facilities as released to surface waters from COUs. EPA refined the drinking water estimates for those facilities that discharge to surface waters that are potential sources of drinking water. That is, the TSCA-reported releases are upstream of a drinking water intake location estimated the possible exposures resulting from these specific releases at the point of discharge. If EPA identified a downstream drinking water intake location from the release site, the Agency refined the exposure estimates by considering the amount of dilution occurring from the releasing facility discharge point to the drinking water intake location. Receiving water bodies with no downstream drinking water intakes were assumed not to be sources of drinking water, and the corresponding facility releases were not included in the drinking water analysis.

Modeling Approach

To model drinking water concentrations at the point of drinking water treatment facility intake locations, EPA started with the upstream TSCA facility surface water concentrations estimated at the facility's point of release. Modeled surface water concentrations estimation methodology and results are presented in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad). The receiving water bodies were reviewed if they were potential sources of drinking water through a downstream drinking water intake analysis. EPA searched for drinking water intake locations within 250 km downstream of releasing facilities and calculated the 1,2-dichloroethane diluted surface water concentration based on distance from release to the drinking water intake and the streamflow (see *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad) for details). If there were no downstream drinking water intake locations within the 250 km distance, EPA considered there were no drinking water exposures resulting from the facility releases. Therefore, the Agency focused the analysis on those facilities and corresponding COUs with potential drinking water exposures.

EPA presents in the *General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ah) acute and chronic exposure estimates for adults and bottle-fed infants. In including infant exposures estimates, EPA is considering PESS and protecting these sensitive subpopulations. Of 490 facilities reporting releases of 1,2-dichloroethane to surface waters, EPA identified 4 facility releases across 2 OES (Processing as a Reactant and Waste Handling, Treatment and Disposal [Incineration]) and 5 releases from facilities not mapped to an OES that were associated with possible downstream drinking water intakes. The Agency estimated highest exposures for each of the three OES , and Table 5-15 summarizes the drinking water doses for adults and infants from the facility with the highest downstream drinking water intake concentration per COU. The other six facilities had lower downstream concentrations and resulting lower doses and were therefore not summarized in the table. Detailed information regarding facility-specific releases associated with the downstream concentrations are not provided as the public water system intake locations and any information that could lead to ascertaining intake locations is considered national security information and is not disclosed to the public. All exposure estimates are provided in the *Drinking Water Exposure Estimates for 1,2-Dichloroethane* (U.S. EPA, 2026aa).

Table 5-15. Drinking Water Exposures to 1,2-Dichloroethane from Highest Concentration at a Drinking Water Intake per COU

OES	Number of Facilities with Downstream Drinking Water Intakes	Diluted 30Q5/Harmonic Mean Surface Water Concentrations (µg/L)	Adult (21+ years)			Infant (Birth to <1 year)		
			ADR_{POT} (mg/kg-day)	ADD (mg/kg-day)	LADD (mg/kg-day)	ADR_{POT} (mg/kg-day)	ADD (mg/kg-day)	LADD (mg/kg-day)
Processing as a Reactant	3	0.4/0.2	1.6E−05	2.1E−06	1.5E−06	5.6E−05	5.4E−06	3.9E−06
Waste Handling, Treatment, and Disposal (Incinerator)	1	0.1/0.1	4.0E−06	1.1E−06	7.7E−07	1.4E−05	2.7E−06	2.0E−06
Not mapped to OES	5	0.04/0.04	1.6E−06	4.2E−07	3.1E−07	5.6E−06	1.1E−06	7.9E−07

ADR = acute dose rate; ADD = average daily dose; COU = condition of use; LADD = lifetime average daily dose; OES = occupational exposure scenario; POT = potential
30Q5 and harmonic mean receiving water flow values used to calculated ADR and ADD.
Drinking water intake locations within 250 km of releasing facility were considered. Surface water concentrations at the intake location were calculated based on stream flow and distance from facility effluent release.

Monitoring Information

As presented in detail in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad), EPA searched peer-reviewed literature, gray literature, and databases of environmental monitoring data to obtain concentrations of 1,2-dichloroethane in drinking water. Drinking water quality data from 2011 through 2022 were obtained from the California Water Boards (2022) for 39 counties in that state. For the more than 200 active, inactive, or proposed water systems and facilities, 1,2-dichloroethane was detected above the MCL in a single sample (1 µg/L) out of 67,036 records. The highest level of 1,2-dichloroethane was detected in a 2022 sample from an active California Domestic Water Company well in Los Angeles.

Because 1,2-dichloroethane is a regulated chemical under the SDWA, EPA has collected results of U.S. public water system's finished water sampling data. Based on the national occurrence data listed in EPA's 2024 fourth Six-Year Review (SYR4) of National Primary Drinking Water Regulations (NPDWRs), 1,2-dichloroethane is rarely detected above the 1,2-dichloroethane Minimum Reporting Level (MRL) and even less above the Maximum Contaminant Level (MCL) of 5 parts per billion (U.S. EPA, 2024a). Across the public water systems, 0.57% detected 1,2-dichloroethane as reported in the SYR4. This frequency of detection of 1,2-dichloroethane in public drinking water systems has historically been low but has decreased over time with a 1.31% detection in the SYR1 in 2003 and 0.75% in SYR2 in 2010. In addition, the SYR4 reported that 0.05% systems detected 1,2-dichloroethane above the MCL. The SYR4 also presents data in terms of sample occurrence: that is, 0.44% of samples detected 1,2-dichloroethane and 0.01% were above the MCL.

Evidence Integration
Facilities report releases of 1,2-dichloroethane to surface water per permit requirements. The permits undergo public comment prior to finalization and are available publicly via the Pollutant Loading Tool (see *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad)). EPA's Office of Ground Water and Drinking Water has determined the 1,2-dichloroethane human health limit in drinking water as 5 µg/L (accessed November 12, 2025). In order to assess the impacts of COU activities and releases on drinking water sources, EPA conducted a facility-specific analysis of drinking water estimates downstream of facility releases. These estimates are considered conservative in that only dilution was considered in calculating the surface water concentration at the point of drinking water intakes. Processes such as volatilization within the receiving water flow as well as within the drinking water treatment facility were not quantified and would further decrease the concentrations of 1,2-dichloroethane in finished drinking water. EPA concludes that for all facilities releasing 1,2-dichloroethane upstream of drinking water intakes, the downstream surface water concentration is well below the drinking water limit.

5.1.2.3.2 Incidental Ingestion from Swimming

The general population may swim in surface waters (streams and lakes) that could contain 1,2-dichloroethane from facility releases under COUs. As a screening, the highest modeled surface water concentrations per OES included in the *Drinking Water Exposure Estimates for 1,2-Dichloroethane* (U.S. EPA, 2026aa) were used to estimate acute doses (ADR) resulting from incidental ingestion of 1,2-dichloroethane while swimming in the receiving water body. The highest 1,2-dichloroethane releases associated with each of the OESs are in highly industrialized areas and swimming in these areas such as in the Westlake, Louisiana, discharge location is not anticipated to occur on a chronic basis given contaminated waterways and published warnings and advisories against swimming.[11]

Table 5-16 summarizes the derived acute doses (ADRs) resulting from incidental oral exposure while swimming for adults, youth, and children. Children younger than six are not assumed to be swimming in receiving water bodies where facility releases occur. Oral doses were calculated using the highest 1,2-dichloroethane surface water concentration for each OES resulting from the corresponding facility-specific discharges. Of the OESs in Table 5-16, the highest oral exposures are anticipated for adults from Plastics and Rubber OES followed by Waste Handling, Treatment, and Disposal (Incinerator) releases.

Table 5-16. Acute Oral (Incidental Ingestion from Swimming) Doses Across Life Stages

OES	1,2-Dichloroethane Surface Water Concentrations		Adult (21+ years) ADR_{POT} (mg/kg-day)	Youth (11–15 years) ADR_{POT} (mg/kg-day)	Child (6–10 years) ADR_{POT} (mg/kg-day)
	30Q5 Conc. (µg/L)	Harmonic Mean Conc. (µg/L)			
Manufacturing (LA0000761)	27	27	9.5E−05	1.5E−04	8.2E−05
Processing as a Reactant (IL0000141)	5	5	1.7E−05	2.7E−05	1.5E−05
Processing into Formulation, Mixture, or Reaction Product (NJ0002348)	1.5	1.1	5.3E−06	8.2E−06	4.6E−06

[11] Louisiana swimming advisories can be found at: https://deq.louisiana.gov/page/fishing-consumption-and-swimming-advisories (accessed November 10, 2025).

OES	1,2-Dichloroethane Surface Water Concentrations		Adult (21+ years) ADR_{POT} (mg/kg-day)	Youth (11–15 years) ADR_{POT} (mg/kg-day)	Child (6–10 years) ADR_{POT} (mg/kg-day)
	30Q5 Conc. (µg/L)	Harmonic Mean Conc. (µg/L)			
Laboratory Use (MI0001911)	5.7	2.0	2.0E−05	3.0E−05	1.7E−05
Repackaging (LA0056600)	0.17	0.17	5.8E−07	9.0E−07	5.1E−07
Industrial and Commercial Non-Aerosol Cleaning/ Degreasing (NJ0000019)	1.2E−02	8.2E−03	4.3E−08	6.6E−08	3.7E−08
Waste Handling, Treatment and Disposal (POTW), (CA0023671)	93	93	3.2E−04	5.0E−04	2.8E−04
Waste Handling, Treatment and Disposal (Non-POTW WWT), (PA0080594)	2,200	2,200	7.6E−03	1.2E−02	6.6E−03
Waste Handling, Treatment, and Disposal (Incinerator), (AR003780)	416	416	1.4E−03	2.2E−03	1.3E−03
Waste Handling, Treatment and Disposal (Landfill), (PA0043818)	2.7	3.5	9.2E−06	1.4E−05	8.1E−06
Waste Handling, Treatment and Disposal (Remediation), (NV0023621)	0.99	0.71	3.4E−06	5.3E−06	3.0E−06
30Q5 = 30 consecutive days of lowest flow over a 5-year period; ADR = acute dose rate; POT = potential; POTW = publicly owned treatment works; WWT = wastewater treatment					

5.1.2.3.3 Incidental Ingestion from Soil (Biosolids and Air Deposition)

EPA considered incidental ingestion (soil pica) of soils contaminated with 1,2-dichloroethane via deposition from ambient air and land application of biosolids for 3- to 6-year-old children.

Concentrations of 1,2-dichloroethane in soils following application of biosolids on agricultural lands were estimated to be 0.63 mg/kg (U.S. EPA, 2026ad). A full description of the methods used to estimate concentrations of 1,2-dichloroethane in soils following application of biosolids is provided in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad).

Estimates of 1,2-dichloroethane air deposition to soil are discussed in detail in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad), which presents the range of calculated soil concentrations corresponding to the emission scenarios considered. The highest estimated soil concentration amongst all exposure scenarios was for the Manufacturing OES at 10 m from the releasing facility. The expected intake rate for children aged 3 to 6 years for soil pica (soil ingestion) is 1,000 mg/day (U.S. EPA, 2017). The exposure frequency and exposure duration were both assumed to be 1 year. Mean body weight (18.6 kg) for 3- to 6-year-olds was taken from EPA's *Exposure Factors Handbook* (U.S. EPA, 2011a). Detailed calculations are presented in the *General Population Exposure Assessment* (U.S. EPA, 2026o).

At the estimated 1,2-dichloroethane soil concentration of 0.63 mg/kg due to land application of biosolids, the ADD for a 3- to 6-year-old ingesting 1,000 mg/day of contaminated solids would be 3.39×10^{-5} mg/kg/day. Additionally, at the estimated 1,2-dichloroethane soil concentration of 1.4 mg/kg due to air deposition, the ADD for a 3- to 6-year-old ingesting 1,000 mg/day of contaminated solids would be 7.3×10^{-5} mg/kg/day. EPA acknowledges that the pica scenario is not highly likely among children; however, it is protective of a behavior that is not unusual among young children.

5.1.2.3.4 Fish Ingestion Exposure

General population exposures can occur from catching fish and ingesting fish tissue where 1,2-dichloroethane bioaccumulates from surface water impacted by facility releases of 1,2-dichloroethane. EPA based general population exposure estimates from this pathway of exposure on facility release data, the corresponding 1,2-dichloroethane surface water concentrations, fish tissue concentrations, and the consumption of the affected fish tissue. The Agency focused the analysis on the facility releases with the highest surface water concentrations per OES/COU as that correlates with the highest anticipated exposures (see the *General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ah)).

EPA estimated exposure from fish consumption using age-specific ingestion rates as well as ingestion rates associated with specific lifestyles such as subsistence or tribal fishing (U.S. EPA, 2011a). The acute dose (ADR) was calculated using the 90th percentile and central tendency IR, respectively. Cancer exposure (LADD, lifetime average daily dose) and risks were also characterized due to the carcinogenic potential of 1,2-dichloroethane (U.S. EPA, 2024c). The *General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ah) the calculations of fish ingestion doses for adults and toddlers. The inputs and chronic non-cancer estimates can be found in *Fish Ingestion Risk Calculator for 1,2-Dichloroethane* (U.S. EPA, 2026ag). The years within an age group (*i.e.,* 62 years for adults) was used for the exposure duration and averaging time to estimate non-cancer exposure. Table 5-17 presents the exposures to 1,2-dichloroethane from fish ingestion for adult subsistence fishers and for toddlers calculated using highest estimated 1,2-dichloroethane surface water concentrations per COU/OES resulting from the corresponding facility discharges, with modeled BCF of 4.4 L/kg.

Table 5-17. General Population Fish Ingestion Doses by Surface Water Concentration and OES[a]

OES Scenario	1,2-Dichloroethane Surface Water		Adult (21+ years)		Young Toddler (1–2 years)		Adult LADD (mg/kg-day)
	30Q5 Conc. (ug/L)	Harmonic Mean Conc. (µg/L)	ADR_{POT} (mg/kg-day)	ADD (mg/kg-day)	ADR_{POT} (mg/kg-day)	ADD (mg/kg-day)	
Manufacturing (LA0000761)	27	27	2.1E−04	2.1E−04	4.9E−05	6.4E−06	1.7E−04
Processing as a Reactant (IL0000141)	5	5	3.9E−05	3.9E−05	9.1E−06	1.2E−06	3.1E−05
Processing into Formulation, Mixture, or Reaction Product (NJ0002348)	1.5	1.1	1.2E−05	8.2E−06	2.8E−06	2.4E−07	6.5E−06
Laboratory Use (MI0001911)	5.7	2.0	4.5E−05	1.6E−05	1.0E−05	4.7E−07	1.3E−05

OES Scenario	1,2-Dichloroethane Surface Water		Adult (21+ years)		Young Toddler (1–2 years)		Adult LADD (mg/kg-day)
	30Q5 Conc. (ug/L)	Harmonic Mean Conc. (µg/L)	ADR_{POT} (mg/kg-day)	ADD (mg/kg-day)	ADR_{POT} (mg/kg-day)	ADD (mg/kg-day)	
Repackaging (LA0056600)	0.17	0.17	1.3E−06	1.3E−06	9.1E−06	1.2E−06	1.0E−06
Industrial and Commercial Non-Aerosol Cleaning/ Degreasing (NJ0000019)	1.2E−02	8.2E−03	9.7E−08	6.4E−08	2.2E−08	1.9E−09	5.1E−08
Waste Handling, Treatment and Disposal (POTW), (CA0023671)	93	93	7.3E−04	7.3E−04	1.7E−04	2.2E−05	5.8E−04
Waste Handling, Treatment and Disposal (Non-POTW WWT), (PA0080594)	2,200	2,200	1.7E−02	1.7E−02	4.0E−03	5.1E−04	1.4E−02
Waste Handling, Treatment, and Disposal (Incinerator), (AR003780)	416	416	3.3E−03	3.3E−03	7.5E−04	9.7E−05	2.6E−03
Waste Handling, Treatment and Disposal (Landfill), (PA0043818)	2.7	3.5	2.1E−05	2.7E−05	4.8E−06	8.1E−07	2.1E−05
Waste Handling, Treatment and Disposal (Remediation), (NV0023621)	0.99	0.71	7.7E−06	5.6E−06	1.8E−06	1.7E−07	4.4E−06

30Q5 = 30 consecutive days of lowest flow over a 5-year period; ADD = average daily dose; ADR = acute dose rate; LADD = lifetime average daily dose; POTW = publicly owned treatment works; WWT = wastewater treatment
[a] Fish consumption rate for adult subsistence fishers = 1.78 g/kg-day for both acute and chronic scenarios; differences in estimated dose for acute and chronic are due to differences in 30Q5 versus harmonic mean concentrations, respectively; young toddler consumption rate (1 to <2 years) = 0.412 g/kg-day (U.S. EPA, 2011a)

EPA also identified releases of 1,2-dichloroethane to Chinle Wash from the Chinle Wastewater Treatment Facility located on tribal lands and estimated possible doses of 1,2-dichloroethane from fish ingestion using tribal consumption rates (2.7 g/day) that are estimated as 10 times higher than the 95th percentile general population consumption rate. In response to public comments, EPA also included tribal children's consumption rates of 0.2469 g/kg-day for ages 3-5 and 0.3302 g/kg-day for ages 6-11 (see the *General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ah)). These children's ingestion rates are from the Minganie and Lower North Shorre tribal regions in Northern

Quebec, Canada (Dubeau et al., 2022). This subset of the general population may be considered representative of PESS.

Table 5-18. Tribal Fish Ingestion Doses from Releases on Tribal Lands[a]

OES	1,2-Dichloroethane Surface Water		Adult[a] (21+ years)	Youth[b] (6-11 years)	Child[b] (3–5 years)	LADD (mg/kg-day)
	30Q5 Conc. (ug/L)	Harmonic Mean Conc. (µg/L)	ADR_{POT} (mg/kg-day)	ADR_{POT} (mg/kg-day)	ADR_{POT} (mg/kg-day)	
Tribal POTW[c] (NN0020265 Chinle WWTF)	5.2	5.2	6.2E−05	7.5E−06	5.6E−06	4.9E−05

30Q5 = 30 consecutive days of lowest flow over a 5-year period; ADR = acute dose rate; NPDES = National Pollutant Discharge Elimination System; OES = occupational exposure scenario; POT = potential; POTW = publicly owned treatment works; WWTF = wastewater treatment facility
[a] Tribal fish consumption rates: adult only = 2.7 g/kg-day (U.S. EPA, 2011a)
[b] Tribal children's consumption rates of 0.2469g/kg-day for ages 3-5 and 0.3302 g/kg-day for ages 6-11 (Dubeau et al., 2022)
[c] NPDES permit NN0020265 represents highest concentration of 1,2-dichloroethane from discharges to surface water in tribal lands

5.1.2.4 Summary of Inhalation and Dermal Exposure Assessment to Byproducts

Inhalation Exposures to Byproducts in Ambient Air

EPA estimated acute, chronic non-cancer, and cancer risks from exposure to the byproducts for populations living in the vicinity of facilities manufacturing 1,2-dichloroethane via the ambient air pathway using HEM5.0. HEM5.0 provides estimates of risks and exposures at centroids of census blocks up to 50 km and discrete radial distances up to 50 km from releasing facilities. HEM5.0 calculates an aggregated exposure for each byproduct by accounting for the combined emissions across all modeled facilities in proximity to one another. The *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j) presents the highest cancer risk estimates and the lowest acute and chronic non-cancer risk estimates across all facilities for each byproduct at centroids of census blocks based on highest TRI-reported releases from each facility from 2015 to 2024. No cancer risk estimates exceeded 1 in a million. Additionally, none of the acute or chronic non-cancer risk estimates were below the benchmarks of 30.

EPA also compared the releases of each of the byproduct chemicals reported in previously published, chemical-specific risk evaluations as well as fenceline analyses provided in the estimated byproduct air releases section in the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j). That comparison showed lower exposures from the byproduct estimates vs. from the manufacture of chemical itself, which supports the reasonableness of the byproducts estimates.

Oral and Dermal Exposures to Byproducts in Surface Water

EPA compared the releases of each of the byproduct chemicals to surface waters reported in the previously published chemical-specific risk evaluations with release estimates from one facility (Eagle 2LLC) that reported releases of 1,2-dichloroethane. Releases of each byproduct chemical were based on the amounts of byproducts formed during 1,2-dichloroethane manufacturing and adjusted for the different removal rates applied during wastewater treatment. Based on the concentrations estimated from byproduct release, general population exposures were estimated as lower than those estimated in the fenceline memoranda for each chemical.

5.1.2.5 Weight of Scientific Evidence Conclusions for General Population Exposure

Ambient Air

The weight of scientific evidence for inhalation exposure estimates is determined by several different evidence streams, including evidence supporting the exposure scenarios (Section 5.1.2.1), release data used as model input data (U.S. EPA, 2026ad, e), and agreement between modeled and monitored ambient air concentrations (U.S. EPA, 2026ad). The Agency has higher confidence in exposures estimates that are based on facility-reported releases than those based on EPA-estimated releases of 1,2-dichloroethane from generic facilities/sites.

EPA has robust confidence in the applicability of HEM5.0 and AERMOD for the purposes of this risk evaluation. AERMOD is EPA's regulatory model that has been peer reviewed as part of the regulatory model process described in Appendix W to 40 CFR part 51, whereas HEM5.0 conducts dispersion modeling using AERMOD as a compiled executable program. EPA has higher confidence in the physical source specifications used as inputs for modeling of reported releases than those used for modeling of EPA-estimated releases from generic facilities/sites (U.S. EPA, 2026ad, e). There are additional uncertainties when using HEM5.0 to characterize populations living near manufacturing/ releasing facilities. HEM5.0 estimates exposures for the census block centroid, as defined by the U.S. Census Bureau. Values calculated for centroids are not representative of the range of values over the entire block and might not represent where most people reside within a census block. Therefore, estimated exposures using HEM5.0 can overestimate or underestimate actual exposures depending on the geographic population distribution within the block. Overall confidence in inhalation exposure estimates resulting from modeled ambient air concentrations are dependent on the OES and range from slight to robust. The OES with the highest overall predicted lifetime average daily concentrations were for Application of Adhesives and Sealants; however, the highest exposures for this OES were based on modeled releases, and EPA only has slight confidence in the estimated concentrations. The Agency also calculated exposures for the OES of Application of Adhesives and Sealants based on NEI-reported releases, which were several orders or magnitude lower than the exposures estimated using the EPA-modeled releases for generic facilities/sites. EPA has robust confidence in the exposures calculated using NEI-reported releases for the OES of Application of Adhesives and Sealants. Of the exposure estimates for which EPA has robust confidence, the OES of Manufacturing had the highest estimated lifetime average daily concentrations.

Surface Water Exposures

EPA considered physical and chemical properties to confirm presence in the water column, and facility-specific release data across nine years (2015 – 2024) and monitoring data as evidence to support the following exposure scenarios: oral and dermal exposure estimates from drinking water, incidental oral and dermal from swimming, and fish ingestion exposures.

1,2-Dichloroethane is soluble in water and if released to water will remain in water. NPDES discharge permits require monitoring data to be reported via their DMRs and provide evidence for releases to receiving water bodies. TRI also provides facility-specific water release data. The amount of 1,2-dichloroethane released, as well as receiving water body flow as calculated from EPA's National Hydrography Dataset Plus (NHDPlus) flow database at the point of release, are the principal factors affecting the concentration in the receiving water body and the corresponding levels of exposure.

For exposures via drinking water, releases were considered where they occurred upstream of a drinking water intake location. A dilution due to downstream transport was calculated between location of discharge and drinking water intake. EPA's Office of Ground Water and Drinking Water regulates levels of 1,2-dichloroethane in finished drinking water, and the estimated concentrations at drinking water intakes from releases prior to treatment are below EPA's regulatory limit.

Land Exposures

EPA investigated the soil ingestion pathway for two scenarios: land application of biosolids and deposition from ambient air. For the land application of biosolids scenario, EPA modeled soil concentrations by using the SimpleTreat 4.0 wastewater treatment plant model to estimate concentrations in biosolids and assuming annual applications of biosolids. For air deposition, EPA estimated concentrations in soils using deposition fluxes modeled using HEM5.0 for TRI-reported releases.

The pica scenario modeled for both land application of biosolids and air deposition is not highly likely among children in agricultural settings (for biosolids application); however, it is protective of a condition among young children. Therefore, overall, EPA has slight confidence in the accuracy of its exposure estimates for incidental ingestion of soils from biosolids and air deposition; however, the Agency has robust confidence that exposure scenarios modeled represent high-end scenarios that are health protective based on the conservative assumptions included in this assessment for the oral pathway.

5.1.3 Consumer Exposures

The following subsections describe EPA's approach for assessing consumer exposure and provides exposure assessment results for the single consumer COU, Use of plastic and rubber consumer objects. The *Consumer Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026o) provides additional details on the development of approaches and the exposure assessment results.

5.1.3.1 Summary of Consumer Exposure Scenarios

The three articles identified to emit 1,2-dichloroethane were the following: imported molded plastic Christmas ornaments, molded plastic lamp base, and squishy toys. Each of these articles are available to U.S. consumers as cited in the studies measuring 1,2-dichloroethane emissions and exposures from these articles. The molded plastic ornaments cited in (Doucette et al., 2010) consisted of five plastic ornaments imported from China, which contained and emitted 1,2-dichloroethane. The study did not identify how representative these ornaments are of imported Chinese ornaments available at large. However, the study described the ornaments as plastic figures that resembled toys and EPA therefore modeled Christmas ornaments exposures for children as toys. The molded plastic lamp base and squishy toys only consisted of imported articles. The distribution of these three articles across the United States is unknown, and though EPA cannot identify the number of impacted consumers who could be exposed to 1,2-dichloroethane through use of these articles, the Agency did evaluate these as general exposure scenarios.

EPA evaluated inhalation, dermal, and oral exposures for the consumer pathway. For each exposure route, exposures for acute (24 hours), intermediate (30 day) and chronic (1 year) doses were estimated. EPA estimated the emissions and the decay of emissions of 1,2-dichloroethane from each of the articles and since, after one year, the estimated remaining 1,2-dichloroethane in each of the articles is low, lifetime exposures are not expected and were not assessed. The Agency identified children as users of toys and specifically dermal and oral exposures via mouthing of toys whereas adults were exposed only via inhalation as bystanders. Table 5-19 summarizes the consumer COUs, exposure scenarios, and exposure routes for each of the three consumer articles identified above.

Table 5-19. Summary of Consumer COUs, Exposure Scenarios, and Exposure Routes

Consumer Use Category	Consumer Uses Sub-Category	Article	Exposure Scenario	Routes		
				Inhalation	Dermal	Oral (Mouthing)
Plastic and rubber products	Plastic and rubber products	Molded plastic Christmas ornaments	One or more ornaments are purchased and brought into a home	X	X	X
		Molded plastic lamp base	A new lamp is brought into the home	X		
		Squishy toys	A collection of toys is brought into a home	X	X	X

5.1.3.2 Summary of Inhalation Exposure Assessment

As described in the *Consumer Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026o), two approaches were used to evaluate inhalation exposure from the three articles evaluated (Christmas ornaments, lamp bases, and squishy toys) depending on the information available. For the Christmas ornaments and lamp bases, EPA utilized the Indoor Environmental Concentrations in Buildings with Conditioned and Unconditioned Zones (IECCU) Model Version 1.1 (EPA, 2019) to estimate exposures to 1,2-dichloroethane via the inhalation route. For squishy toys, chamber concentrations measured by the Danish EPA (Danish EPA, 2018) were found in the literature and used directly to estimate exposures to 1,2-dichloroethane via the inhalation route. For all three articles, air concentrations were estimated for the acute (24 hours), intermediate (30 days) and chronic (1-year) durations.

5.1.3.3 Summary of Dermal Exposure Assessment

Dermal exposure to 1,2-dichloroethane from Christmas ornaments and squishy toys were evaluated in the *Consumer Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026o). EPA modeled dermal exposures assuming transfer of emitted 1,2-dichloroethane directly to skin during contact. Key parameters for this exposure modeling approach include surface specific emission rate ($\mu g/cm^2$-h), contact time (h), contact surface area (cm^2), and contact frequency (day^{-1}, $year^{-1}$). Dermal exposures were assessed for the acute, intermediate and chronic durations only.

5.1.3.4 Summary of Oral Exposure Assessment

As described in the *Consumer Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026o), oral exposure to 1,2-dichloroethane due to mouthing from Christmas ornaments and squishy toys were evaluated in that assessment. Because the ornaments were identified in a study as emitting 1,2-dichloroethane and described as plastic figures that resembled toys, EPA modeled Christmas ornaments exposures for children as toys. The Agency modeled oral exposures assuming transfer of emitted 1,2-dichloroethane directly to the oral cavity during mouthing. Emissions were assumed to fully transfer to saliva and be ingested, in a closed mouth, mouthing scenario. Key parameters for this exposure modeling approach are surface specific emission rate ($\mu g/cm^2$-h), mouthing time (h), article area mouthed (cm^2), and mouthing frequency (day^{-1}, $year^{-1}$). Mouthing time is based on data in EPA's *Children's Exposure Factors Handbook* (U.S. EPA, 2008). Both Christmas ornaments and squishy toys were assumed to be mouthed once per day. Christmas ornaments were assumed to be mouthed 30 days per year (during play time) and squishy toys assumed to be mouthed 365 days per year (again during playtime). Exposures were therefore assessed for the acute, intermediate and chronic durations.

Table 5-20 presents a summary of exposures to 1,2-dichloroethane for all routes and exposure scenarios. In general, 1,2-dichloroethane doses were highest in the younger age groups (infants and toddlers) and lowest for adults. This is expected due to physical and behavioral differences between the age groups—specifically, infants and toddlers who are more likely to handle, play, and mouth these items for a longer duration than adults.

Table 5-20. Inhalation, Ingestion, and Dermal Doses of 1,2-Dichloroethane (µg/kg-day) for Chronic, Acute, and Intermediate Exposure Windows

Representative Article	Exposure Route	Infants	Toddlers	Pre-Schoolers	Middle Childhood	Young Teens	Teenagers	Adults
Chronic average daily dose (CADD) (µg/kg-day)								
Lamp base	Inhalation	0.59	0.56	0.45	0.32	0.22	0.19	0.15
Ornaments	Inhalation	0.12	0.11	9.0E−02	6.0E−02	5.0E−02	4.0E−02	3.0E−02
Ornaments	Dermal	0.31	0.27	0.23	0.19	0.15	–	–
Ornaments	Mouthing	0.64	0.37	0.24	–	–	–	–
Squishy toys	Inhalation	0.20	0.19	0.15	0.11	8.0E−02	6.0E−02	5.0E−02
Squishy toys	Dermal	7.0E−02	6.0E−02	5.0E−02	4.0E−02	3.0E−02	–	–
Squishy toys	Mouthing	0.11	3.0E−02	1.0E−02	–	–	–	–
Acute dose rate (ADR) (µg/kg-day)								
Lamp base	Inhalation	1.2	1.1	0.90	0.63	0.44	0.38	0.31
Ornaments	Inhalation	2.3	2.1	1.7	1.2	0.85	0.72	0.58
Ornaments	Dermal	3.8	3.3	2.8	2.3	1.8	–	–
Ornaments	Mouthing	7.8	4.5	2.9	–	–	–	–
Squishy toys	Inhalation	0.20	0.19	0.15	0.11	8.0E−02	6.0E−02	5.0E−02
Squishy toys	Dermal	7.0E−02	6.0E−02	5.0E−02	4.0E−02	3.0E−02	–	–
Squishy toys	Mouthing	0.11	3.0E−02	1.0E−02	–	–	–	–
Intermediate average daily dose ($ADD_{intermediate}$) (µg/kg-day)								
Lamp base	Inhalation	1.1	1.1	0.86	0.60	0.42	0.36	0.29
Ornaments	Inhalation	0.45	0.42	0.34	0.24	0.17	0.14	0.12
Ornaments	Dermal	3.8	3.3	2.8	2.3	1.8	–	–
Ornaments	Mouthing	7.8	4.5	2.9	–	–	–	–
Squishy toys	Inhalation	0.20	0.19	0.15	0.11	8.0E−02	6.0E−02	5.0E−02
Squishy toys	Dermal	7.0E−02	6.0E−02	5.0E−02	4.0E−02	3.0E−02	–	–
Squishy toys	Mouthing	0.11	3.0E−02	1.0E−02	–	–	–	–

5.1.3.5 Weight of Scientific Evidence Conclusions for Consumer Exposure

EPA used data extracted from peer-reviewed literature and a previous assessment on emissions of 1,2-dichloroethane from articles, specifically a lamp base, ornaments, and squishy toys. In estimating inhalation, dermal, and oral exposures, the Agency based exposures on 1,2-dichloroethane emission data from each of the articles and corresponding scenarios per life stage as found in EPA's *Exposure Factors Handbook* (also referred to as "the Handbook") (U.S. EPA, 2011a). The Agency characterized high-end exposures by choosing parameters such as duration and frequency of exposures to each of the three articles at the higher-end of the distribution presented in the Handbook. In presenting the higher-end exposures for adult inhalation and children's dermal, ingestion, and inhalation exposure scenarios, EPA has robust confidence that risk estimates will be protective of both children's and adults' exposures to articles containing 1,2-dichloroethane.

5.1.4 Aggregate and Sentinel Exposure

5.1.4.1 Aggregate 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 COUs were considered and the basis for their consideration. Furthermore, in the final RE framework rule, the Agency codified at 720.39(d)(8), a requirement that "EPA will consider aggregate exposures to the chemical substance, and, when supported by reasonably available information, consistent with the best available science and based on the weight of scientific evidence, include an aggregate exposure assessment in the risk evaluation, or will otherwise explain in the risk evaluation the basis for not including such an assessment."

In this risk evaluation, EPA quantitatively evaluated combined inhalation exposure and risk across multiple TRI facilities in proximity releasing 1,2-dichloroethane to ambient air using HEM (see Section 5.3.6.2). The Agency compared ambient air monitored data (Section 3.3.1), which includes all sources, to concentrations estimated using AERMOD, which does not include an aggregate analysis. The similarity of results ground truth the results of the modeling efforts and show that the primary contributors of ambient air concentrations of 1,2-dichloroethane are the facilities reporting releases of 1,2-dichloroethane in CDR.

In response to public comments, EPA conducted a screening analysis for aggregating oral and dermal exposures by selecting the facility/COU/OES with the highest exposures (Disposal COU; Waste Handling, Treatment and Disposal [Non-POTW WWT] OES) and summing the estimated adult acute doses across subsistence fish ingestion, incidental oral ingestion from swimming and incidental dermal from swimming (see Table 5-21. EPA could only aggregate the exposures associated with the acute duration because incidental exposures from swimming are not expected to occur on a chronic basis. EPA did not include drinking water exposures as there were no exposures downstream from this facility's release.

Acute inhalation exposures were not aggregated with the oral and dermal exposures as the effect associated with inhalation exposure is a portal of entry effect (degeneration of olfactory epithelium with necrosis), whereas both oral and dermal hazard effects are systemic effects (based on the route-to route extrapolation of the oral to dermal route; see Section 5.2).

EPA did not conduct the same analysis across other lifestages as the exposure associated with subsistence level of fish ingestion for the Disposal/Waste Handling, Treatment and Disposal (Non-POTW WWT) COU/OES is greater than that for children's exposures via fish ingestion.

Table 5-21. Oral and Dermal Aggregated Exposures for the OES with the Highest Exposures

OES	1,2-Dichloroethane Surface Water		Fish Ingestion[a]	Incidental Oral via Swimming[b]	Incidental Dermal via Swimming[c]	Aggregated Exposures
	30Q5 Conc. (ug/L)	Harmonic Mean Conc. (µg/L)	ADR_{POT} (mg/kg-day)	ADR_{POT} (mg/kg-day)	ADR_{POT} (mg/kg-day)	
Waste Handling, Treatment and Disposal (Non-POTW WWT), (PA0080594)	2,200	2,200	1.7E−02	7.6E−03	1.8E−03	2.6E−02

30Q5 = 30 consecutive days of lowest flow over a 5-year period; ADR = acute dose rate; OES = occupational exposure scenario; POT = potential; POTW = publicly owned treatment works; WWT = wastewater treatment
[a] See Table 5-17
[b] See Table 5-16
[c] See Table 5-14

5.1.4.2 Sentinel Exposure

EPA 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). In terms of this risk evaluation, EPA considered sentinel exposures by considering risks to human populations who may have upper-bound exposures; for example, workers and ONUs who perform activities with higher exposure potential or certain physical factors like body weight or skin surface area exposed. EPA characterized high-end exposures in evaluating exposure using both monitoring data and modeling approaches. Where statistical data are available, EPA typically uses the 95th percentile value of the available dataset to characterize high-end exposure for a given COU.

5.2 Summary of Human Health Hazard

This section briefly summarizes the human health hazards of 1,2-dichloroethane (see also the summary box on the following page). Additional information is provided in the *Human Health Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026an).

The *Human Health Hazard Assessment for 1,2-Dichloroethane* incorporates recommendations from the SACC and the public (U.S. EPA, 2025g) and reflects revisions received throughout the review process and during scientific deliberations. Additionally, based on recommendations by the SACC and public commenters, the Agency performed an updated human health literature search, which was completed in April 2025. A comparison of studies identified by this April 2025 literature update and studies provided during the November and January 2026 public comment period did not identify additional studies for consideration by EPA, thus EPA is confident this incorporation of literature represents the best available science for 1,2-dichloroethane. These studies were incorporated into the hazard identification and weight of scientific evidence for dose-response considerations.

These revisions include an updated intermediate/chronic POD for the oral exposure route and via route-to-route extrapolation for the dermal route. The draft relied on Munson (1982) and based the intermediate/chronic POD on immunosuppression and in the *Human Health Hazard Assessment for 1,2-Dichloroethane,* EPA is relying on the (NTP, 1991) oral gavage study that identified kidney effects due to 1,2-dichloroethane administration. The SACC also presented concerns on the NTP (1978) mouse study in its utility for cancer dose-response as proposed in the *Draft Human Health Hazard Assessment for 1,2-Dichloroethane* TSD (U.S. EPA, 2024c). These concerns included high mortality and occurrence of pneumonia in the treatment groups. Reconsiderations into the approach for the cancer dose-response were discussed by the Agency which resulted in the decision to derive an oral cancer slope factor based on route-to-route extrapolation from the inhalation cancer bioassay by Nagano (2006).

1,2-Dichloroethane – Human Health Hazards (Section 5.2): Key Points

EPA evaluated the reasonably available information for human health hazards, including the potential for increased susceptibility across PESS and acute, intermediate, chronic, and lifetime exposures to 1,2-dichloroethane. The most biologically relevant PODs for non-cancer human health hazards identified—along with the corresponding HED, HEC, and the total combined uncertainty factors (UF) for each route and exposure duration—are summarized below. Based on the identified PODs for each exposure duration, the listed HEDs and HECs were calculated to a daily, continuous exposure duration (24 h/day). Additionally, HECs and the IUR from animal studies assume an individual at resting breathing rate. The lack of adequate non-cancer data by the dermal route for 1,2-dichloroethane required route-to-route extrapolation from oral PODs. The most biologically relevant PODs for cancer effects for 1,2-dichloroethane from the human health hazards identified—along with the corresponding CSF, dermal slope factor, and IUR—are also summarized. The overall confidence in the selected POD for each exposure duration and route is summarized in Table 5-23 and Table 5-24.

Non-Cancer

PODs for the *acute oral/dermal exposure* routes are based on renal toxicity, specifically increased relative kidney weight ($BMDL_{10}$ = 153mg/kg-day) with the confidence in the acute oral and dermal PODs as robust and moderate, respectively. The POD for the *acute inhalation exposure* route is based on olfactory effects, specifically nasal necrosis ($BMCL_{10}$ = 48.9 mg/m^3). The confidence in the acute inhalation POD is robust.

- HED = 19.9 mg/kg-day
- HEC = 2.42 ppm
- Total UF = 30 for oral, inhalation, and dermal exposures

PODs for the *intermediate oral/dermal exposure routes* are based on renal toxicity, specifically increased relative kidney weight ($BMDL_{10}$ = 27 mg/kg-day), with the confidence in the intermediate oral POD and dermal PODs as robust and moderate, respectively. The POD for the *intermediate inhalation exposure route* is based on male reproductive effects, specifically decreased sperm concentration ($BMCL_5$ = 21.2 mg/m^3). The confidence in the intermediate inhalation POD is robust.

- HED = 6.5 mg/kg-day
- HEC = 5.2 ppm
- Total UF = 30 for oral, inhalation, and dermal exposures

The PODs for the *chronic oral/dermal exposure routes* are based on the oral/dermal intermediate PODs with the total UF of 100, which includes an additional subchronic-to-chronic duration extrapolation UF of 3 to account for the duration adjustment. The confidence in the chronic oral and dermal POD is moderate.

- HED = 6.5 mg/kg-day
- Total UF = 100 for oral and dermal exposures

The POD for the *chronic inhalation exposure route* is based on the inhalation intermediate POD with no additional duration adjustment to the total UF. Confidence in the chronic inhalation POD is moderate-to-robust.

- HEC = 5.2 ppm
- Total UF = 30 for inhalation exposue

Cancer

The IUR is based on a combined tumor model from Nagano (2006). The oral/dermal slope factors were derived by route-to-route extrapolation from the IUR of 7.1×10^{-6} per µg/m^3 to 0.039 per mg/kg-day. Confidence in the IUR is robust, moderate for the oral slope factor, and slight-to-moderate for dermal slope factor.

- IUR = 7.1×10^{-6} per µg/m^3 (2.9×10^{-2} per ppm)
- CSF (oral/dermal) = 0.039 per mg/kg-day

EPA evaluated the reasonably available information for human health hazards and identified hazard PODs for adverse effects following acute, intermediate, and chronic exposures. These PODs represent the potential for greater biological susceptibility across subpopulations. The most biologically relevant PODs for non-cancer for 1,2-dichloroethane from among the human health hazards identified—along with the corresponding human equivalent dose (HED), the human equivalent concentration (HEC), and the total combined UF for each route and exposure duration—are summarized below. The most biologically relevant PODs for cancer effects for 1,2-dichloroethane from among the human health hazards identified—along with the corresponding cancer slope factor (CSF), dermal slope factor, and IUR—are also summarized below.

EPA identified kidney toxicity, olfactory effects, and male reproductive (sperm) effects as the critical human health hazard non-cancer outcomes associated with 1,2-dichloroethane. In this risk evaluation, renal toxicity forms the basis of the POD used for oral acute, intermediate, and chronic exposure scenarios. Olfactory effects are the basis of the POD used for acute inhalation exposure and male reproductive (sperm) effects are the basis for intermediate and chronic inhalation exposure scenarios. Additionally, hazard identification and evidence integration of other toxicity outcomes are also outlined to emphasize the systematic review process applied to identify potential POD within the 1,2-dichloroethane database. The overall confidence summary for the human health hazard assessment summarized in Table 5-22 is based on considerations of the systematic review overall study qualtiy determination, benchmark dose modeling model fit, route-to-route extrapolation, and application of uncertainty factors for interspecies and intraspecies extrapolation. The overall confidence in the selected POD for each exposure duration and route is also included and summarized in Table 5-23 and Table 5-24.

Acute Oral Exposure Duration

EPA is using an acute POD of 153 mg/kg-day to estimate non-cancer risks from oral exposure to 1,2-dichloroethane for acute durations of exposure in this risk evaluation for 1,2-dichloroethane. The POD was derived based on benchmark dose modeling (BMD) of increased kidney weight in male mice after a single oral gavage and is the 95% lower confidence limit of the BMD associated with a benchmark response (BMR) of 10%. The Agency has performed ¾-body weight scaling to yield the HED of 19.9 mg/kg-day and is applying the animal to human extrapolation factor (*i.e.,* interspecies extrapolation; UF_A) of 3 and a within human variability extrapolation factor (*i.e.,* intraspecies extrapolation; UF_H) of 10. Thus, a total UF of 30× is applied for use as the benchmark margin of exposure (MOE). EPA has robust confidence in the acute oral POD and moderate confidence in the acute dermal POD since it was necessary to perform route-to-route extrapolation from the acute oral POD.

Acute Inhalation Exposure Duration

EPA is using a POD of 48.9 mg/m^3 to estimate non-cancer risks from inhalation to 1,2-dichloroethane for acute durations of exposure in the risk evaluation for 1,2-dichloroethane. The POD was derived based on BMD modeling of degeneration with necrosis of the olfactory (nasal) mucosa in male and female rats after an 8-hour exposure to 1,2-dichloroethane vapor and is the 95% lower confidence limit of the BMD associated with a BMR of 10 percent. The Agency, in accordance with (U.S. EPA, 1994) guidance, calculated the HEC of 9.78 mg/m^3 using the regional gas dose ratio for extrathoracic effects ($RGDR_{ET}$) of 0.2 for these nasal effects and is applying the animal to human extrapolation factor (UF_A) of 3 and a within human variability extrapolation factor (*i.e.,* UF_H) of 10. Thus, a total UF of 30 is applied for use as the benchmark MOE. EPA has robust confidence in the acute inhalation POD based on a high-quality acute inhalation study.

Intermediate/Chronic Oral Exposure Duration

EPA is using a POD of 27 mg/kg-day (HED of 6.5 mg/kg-day) from a subchronic 90-day gavage study in male rats based on increased relative kidney weight from the gavage study by NTP (1991) to estimate non-cancer risks from oral exposure to 1,2-dichloroethane for intermediate/chronic durations of exposure. The Agency has performed ¾-body weight scaling to yield the HED of 6.5 mg/kg-day and is applying the animal to human extrapolation factor (*i.e.,* interspecies extrapolation; UF_A) of 3 and a within human variability extrapolation factor (*i.e.,* intraspecies extrapolation; UF_H) of 10. In the *Draft Human Health Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2024c), a duration adjustment factor (*i.e.*, subchronic to long-term [chronic)]duration adjustment, UF_S) of 10 was applied for the chronic duration because a chronic oral study was not identified as suitable for dose-response and derivation of a chronic oral POD.

In the *Human Health Hazard Assessment for 1,2-Dichloroethane*, EPA refined the subchronic to long-term (chronic) duration adjustment (UF_S) to 3 based on toxicokinetic and data considerations. Toxicokinetic data suggest that absorption of 1,2-dichloroethane is rapid following oral exposure. In addition, qualitatively, the available chronic duration studies did not suggest an increase in sensitivity with longer exposure, suggesting exacerbation of effect(s) may not be observed with longer exposure durations. In contrast, health effects of oral exposure to 1,2-dichloroethane have been observed at lower concentrations in the subchronic studies relative to acute and short-term studies. Additionally, few data examining non-cancer endpoints following chronic exposure limits confidence that effects observed in shorter duration exposures would not demonstrate increased sensitivity following longer exposures. The increase in sensitivity observed in subchronic studies relative to shorter term duration exposures, as well as the limitation in the chronic oral exposure database introduce uncertainty into extrapolation from subchronic to chronic exposure. Based on these considerations, a total UF of 30 for use as the benchmark MOE for the intermediate duration and 100 for the chronic duration, respectively. EPA has robust overall confidence in the selected POD based on increased kidney weight for use in characterizing risk from exposure to 1,2-dichloroethane for intermediate oral exposure scenarios, however, EPA has moderate overall confidence in the selected POD based on increased kidney weight for use in characterizing risk from exposure to 1,2-dichloroethane for intermediate dermal exposure scenarios based on route-to-route extrapolation.

EPA has robust confidence in the intermediate oral POD and moderate confidence in the chronic oral POD because of the lack of a high-quality chronic oral study.

Intermediate/Chronic Inhalation Exposure Duration

EPA is using a POD of 21.2 mg/m^3 to estimate non-cancer risks from inhalation to 1,2-dichloroethane for intermediate/chronic durations of exposure in the risk evaluation for 1,2-dichloroethane. The POD was derived based on BMD modeling of decreased sperm concentration in male mice after a whole body, 4-week exposure to 1,2-dichloroethane vapor and is the 95% lower confidence limit of the BMD associated with a BMR of 5% due to a biological significance and relevance at this level in humans. In accordance with U.S. EPA (1994) guidance, as an RGDR for the systemic (sperm) effects of 1 was applied based on the animal blood:air partition coefficient exceeding the human blood:air partition coefficient, the Agency calculated HEC of 21.2 mg/m^3 and thus used this as the POD. Additionally, EPA is applying the animal to human extrapolation factor (UF_A) of 3× and a within human variability extrapolation factor (UF_H) of 10×. Although there are uncertainties in the dose-response analysis of chronic inhalation exposure to 1,2-dichloroethane, there is not sufficient evidence to support the application of an additional uncertainty factor of 10 to the intermediate duration for the inhalation route. Therefore, the uncertainty factor of 10 was removed for the inhalation route between the draft and this assessment of 1,2-dichloroethane. Thus, a total UF of 30× is applied for use as the benchmark MOE for both intermediate and chronic durations. EPA has robust confidence in the intermediate inhalation POD and moderate-robust in the chronic inhalation POD because of the lack of a high-quality chronic inhalation study.

Acute, Intermediate and Chronic Dermal Exposure Durations

No studies were identified from the updated (2025) human health literature search for dose-response for the dermal route that were suitable for deriving route-specific PODs. Studies in which 1,2-dichloroethane was administered via the dermal route showed evidence of systemic effects to the kidney and lung (Suguro et al., 2017) thus EPA used the acute, intermediate, and chronic oral PODs to evaluate risks from dermal exposure to 1,2-dichloroethane based on route-to-route extrapolation from the oral to dermal route. EPA has moderate confidence in the intermediate and chronic dermal PODs because they were derived from an oral study of the same corresponding duration via route-to-route extrapolation.

Cancer

Systematic review identified two 1,2-dichloroethane cancer studies for cancer dose-response. The oral cancer studies in mice performed by NTP (1978) on 1,2-dichloroethane resulted in tumor types or pre-cancerous lesions (*i.e.,* hepatocellular carcinomas, endometrial polyps, hemangiosarcomas, and mammary gland tumors). This study was, however, confounded by incidences of pneumonia in the high dose groups of the study. The 1,2-dichloroethane inhalation cancer study by Nagano (2006) is the basis for the IUR based on a combined tumor model (mammary gland adenomas, fibroadenomas, and adenocarcinomas and subcutaneous fibromas) in female rats and identified similar tumors as observed in the 1,2-dichloroethane oral cancer study. This oral NTP (1978) study, however, did also identify incidence of mortality and pneumonia in treated mice. Due to uncertainty associated with the oral 1,2-dichloroethane study, EPA is using a CSF of 0.039 per mg/kg-day for the oral/dermal exposure routes to 1,2-dichloroethane based on based on route-to-route extrapolation from the IUR of 7.1×10^{-6} per $\mu g/m^3$ from Nagano (2006) (derived from the lower confidence limit of the BMD [BMDL] for the 95% confidence level modeled data at BMR of 10% extra risk as per U.S EPA's *Benchmark Dose Technical Guidance* (U.S. EPA, 2012b)) for both continuous (*i.e.,* general population) and worker (occupational) scenarios. EPA has robust confidence in the inhalation IUR based on the critical study selected and the modeling approach used, moderate confidence in the oral CSF based on route-to-route extrapolation from the inhalation study, and slight-to-moderate confidence in the dermal CSF because of the additional route-to-route extrapolation that was necessary.

As discussed in the *Human Health Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026an), available *in vivo* and *in vitro* data indicate that 1,2-dichloroethane has the potential for genotoxicity but significant uncertainty exists surrounding a complete mode of action. Specifically, there are uncertainties regarding the source of reactive metabolites, DNA binding capabilities, and subsequent mutagenicity. This uncertainty can be attributed to the limited pharmacokinetic information that would inform enzymatic activity on 1,2-dichloroethane metabolism. The available evidence suggests that 1,2-dichloroethane exposure leads to DNA damage, but the uncertainties surrounding the relative contribution of each of the three potential DNA damaging pathways (DNA alkylation, CYP450-mediated ROS production, and glutathione-mediated episulfonium ion generation) prevents identification of the causal moiety. Without a mode of action (including molecular initiating event and subsequent key events leading to tumorigenesis), in accordance with the *Guidelines for Carcinogen Risk Assessment* (U.S. EPA, 2005b), EPA is using the default approach of linear low-dose extrapolation. EPA also reviewed the weight of evidence for the carcinogenicity of 1,2-dichloroethane and concluded that 1,2-dichloroethane is "*Likely to Be Carcinogenic to Humans*".

5.2.1 Weight of Scientific Evidence Conclusions for Human Health Hazards

EPA evaluated the confidence for human health hazard conclusions based on 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 6 of the *Human Health Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026an). The overall confidence summary for the human health hazard assessment, summarized in the in *Human Health Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026an), is also presented in Table 5-22 that considers additional factors when choosing studies for dose-response modeling and for each relevant exposure scenario (acute, intermediate, and chronic) and outlines the considerations of the systematic review overall study qualtiy determination, benchmark dose modeling model fit, route-to-route extrapolation, and application of uncertainty factors for interspecies and intraspecies extrapolation.

EPA has robust overall confidence for the evidence integration, study/endpoint selection, exposure scenario applicability, dose-response, and PESS sensitivity of the conclusions and PODs for kidney toxicity, respiratory (olfactory) effects, and male reproductive (sperm) effects, which are used for the risk estimates. These hazard outcome categories received moderate and robust evidence integration conclusions, and biologically relevant health effects were identified for these hazard outcomes. Additionally, EPA has robust overall confidence in the derived IUR based on a combined tumor model in female rats (mammary gland adenomas, fibroadenomas, and adenocarcinomas and subcutaneous fibromas), respectively. EPA, however, has moderate overall confidence in the derivation of the oral cancer slope factor and slight-to-moderate confidence due to the route-to-route extrapolation from inhalation to oral and further extrapolation to dermal applied for these derivations.

Table 5-22. Confidence Summary for Selection of the PODs for Human Health Hazard Assessment

Exposure Scenario	Acute			Intermediate			Chronic			Cancer		
	Oral	Inhalation	Dermal	Oral	Inhalation	Dermal	Oral	Inhalation	Dermal	Oral	Inhalation	Dermal
Study & OQD	Storer et al. (1984); High	Dow Chemical (2006); High	Storer et al. (1984); High	NTP (1991); High	Zhang et al. (2017); High	NTP (1991); High	NTP (1991); High	Zhang et al. (2017); High	NTP (1991); High	(Nagano et al., 2006); High	(Nagano et al., 2006); High	(Nagano et al., 2006); High
POD	BMDL$_{10}$ = 153 mg/kg-day Increased relative kidney weight Model selected provided adequate fit to the data	BMCL$_{10}$ = 48.9 mg/m^3 [12.1 ppm] Degeneration with necrosis of the olfactory mucosa Model selected provided adequate fit to the data	BMDL$_{10}$ = 153 mg/kg-day Increased relative kidney weight Model selected provided adequate fit to the data	BMDL$_{10}$ = 27 mg/kg-day Increased relative kidney weight Model selected provided adequate fit to the data	BMCL$_5$ = 21.2 mg/m^3 [5.2 ppm] Decreases in sperm conc. Model selected provided adequate fit to the data	BMDL$_{10}$ = 27 mg/kg-day Increased relative kidney weight Model selected provided adequate fit to the data	From intermediate duration	From intermediate duration	From intermediate duration	N/A	BMCL$_{10}$ = 14.17 mg/m^3 [3.5 ppm] Model selected provided adequate fit to the data	N/A
HED/HEC/ CSF/IUR	HED = 19.9 mg/kg-day	HEC = 9.78 mg/m^3 [2.42 ppm]	HED = 19.9 mg/kg-day	HED = 6.5 mg/kg-day	HEC = 21.2 mg/m^3 [5.2 ppm]	HED = 6.5 mg/kg-day	From intermediate duration	From intermediate duration	From intermediate duration	0.039 per mg/kg/day	7.1E−06 (per µg/m^3) 2.9E−02 (per ppm)	0.039 per mg/kg/day
Route-to-route extrap.	N/A	N/A	From acute oral	N/A	N/A	From intermediate duration	N/A	N/A	From intermediate duration	From inhalation	N/A	From inhalation
Interspecies consideration	Allometric ¾ BW scaling (PK = 1×, PD = 3×)	Dosimetrically adjusted (PK = 1×, PD = 3×)	Allometric ¾ BW scaling (PK = 1×, PD = 3×)	Allometric ¾ BW scaling (PK = 1×, PD = 3×)	Dosimetrically adjusted (PK = 1×, PD = 3×)	Allometric ¾ BW scaling (PK = 1×, PD = 3×)	Allometric ¾ BW scaling (PK = 1×, PD = 3×)	Dosimetrically adjusted (PK = 1×, PD = 3×)	Allometric ¾ BW scaling (PK = 1×, PD = 3×)	N/A	N/A	N/A
Intraspecies consideration	Default 10X factor	Default 10X factor	Default 10X factor	Default 10X factor	Default 10X factor	Default 10X factor	Default 10× factor	Default 10× factor	Default 10× factor	N/A	N/A	N/A
Other uncertainty factors	N/A	N/A	N/A	N/A	N/A	N/A	UFs = 3	N/A	UFs = 3	N/A	N/A	N/A
Overall confidence comment	Robust confidence in the duration- and route	Robust confidence in the duration- and route-	Moderate confidence in the POD from a study of high OQD	Robust confidence in the duration- and route specific POD	Robust confidence in the duration- and route-specific POD	Moderate confidence in the POD from a study of high OQD	Moderate confidence in the POD from a study of high OQD	Moderate-Robust confidence in the POD from a study	Moderate confidence in the POD from a study of high	Moderate confidence in the POD from a study of	Robust confidence in the duration-specific	Slight-to-Moderate confidence in the POD from a

Exposure Scenario	Acute			Intermediate			Chronic			Cancer		
	Oral	Inhalation	Dermal	Oral	Inhalation	Dermal	Oral	Inhalation	Dermal	Oral	Inhalation	Dermal
	specific POD from a study of high OQD using a default extrap. approach	specific POD from a study of high OQD using a default extrap. approach	using a default extrap. approach and applying route-to route extrap.	from a study of high OQD using a default extrap. approach	from a study of high OQD using a default extrap. approach	using a default extrap. approach and applying route-to route extrap.	using a default extrap. approach and applying a duration extrap.	of high OQD using a default extrap. approach	OQD using a default extrap. approach and applying a duration extrap.	high OQD using a default extrap. approach and applying route-to route extrap.	POD from a study of high OQD using a default extrap. approach	study of high OQD using a default extrap. approach and applying route-to route extrap. from inhalation POD

BMCL = lower confidence limit of the benchmark concentration; BMDL = lower confidence limit of the benchmark dose; CSF = cancer slope factor; HEC = human equivalent concentration; HED = human equivalent dose; IUR = inhalation unit risk; OQD = overall study quality determination; PD = pharmacodynamics; PK = pharmacokinetics; POD = point of departure; UFs = subchronic-to-chronic duration extrapolation

5.2.2 Human Health Hazard Values

Table 5-23 lists the non-cancer PODs and corresponding HECs, HEDs, and UFs that EPA used in this 1,2-dichloroethane risk evaluation to estimate risks following acute, intermediate, and chronic exposure, respectively. Table 5-24 provides the cancer PODs for evaluating lifetime exposure.

Table 5-23. Non-Cancer HECs and HEDs Used to Estimate Risks for 1,2-Dichloroethane

Exposure Scenario	Target Organ System	Species	Duration	POD	Effect	HEC [a] mg/m^3 [ppm]	HED [b] (mg/kg-day)	Benchmark MOE [c]	Reference	Overall Study Quality Determination	POD Selection Confidence [d]
Acute – Oral	Renal	Mice (male)	Single dose via oral gavage	$BMDL_{10}$ = 153 mg/kg-day	Increased relative kidney weight	N/A	19.9	UF_A = 3 UF_H = 10 ***Total UF = 30***	Storer et al. (1984)	High	Robust
Acute – Dermal	Renal	Mice (male)	Single dose via oral gavage	$BMDL_{10}$ = 153 mg/kg-day	Increased relative kidney weight	N/A	19.9	UF_A = 3 UF_H = 10 ***Total UF = 30***	Storer et al. (1984)	High	Moderate
Intermediate – Oral	Renal	Rats (male)	90-days via oral gavage	$BMDL_{10}$ = 27 mg/kg-day	Increased relative kidney weight	N/A	6.5	UF_A = 3 UF_H = 10 ***Total UF = 30***	NTP (1991)	High	Robust
Intermediate –Dermal	Renal	Rats (male)	90-days via oral gavage	$BMDL_{10}$ = 27 mg/kg-day	Increased relative kidney weight	N/A	6.5	UF_A = 3 UF_H = 10 ***Total UF = 30***	NTP (1991)	High	Moderate
Chronic – Oral	Renal	Rats (male)	90-days via oral gavage	$BMDL_{10}$ = 27 mg/kg-day	Increased relative kidney weight	N/A	6.5	UF_A = 3 UF_H = 10 UF_S = 3 ***Total UF = 100***	NTP (1991)	High	Moderate
Chronic – Dermal	Renal	Rats (male)	90-days via oral gavage	$BMDL_{10}$ = 27 mg/kg-day	Increased relative kidney weight	N/A	6.5	UF_A = 3 UF_H = 10 UF_S = 3 ***Total UF = 100***	NTP (1991)	High	Moderate
Acute – Inhalation	Respiratory (olfactory)	Rats (males and females combined)	8-hours (whole body to vapor)	$BMCL_{10}$ = 48.9 mg/m^3 [12.1 ppm]	Degeneration with necrosis of the olfactory mucosa	9.78 mg/m^3 [2.42 ppm]	N/A	UF_A = 3 UF_H = 10 ***Total UF = 30***	Dow Chemical (2006)	High	Robust
Intermediate – Inhalation	Reproductive (sperm effects)	Mice (male)	4-weeks (6 hours/day for 7 days/week whole body to vapor)	$BMCL_5$ = 21.2 mg/m^3 [5.2 ppm]	Decreases in sperm concentration	21.2 mg/m^3 [5.2 ppm]	N/A	UF_A = 3 UF_H = 10 ***Total UF = 30***	Zhang et al. (2017)	High	Robust
Chronic – Inhalation	Reproductive (sperm effects)	Mice (male)	4-weeks (6 hours/day for 7 days/week whole body to vapor)	$BMCL_5$ = 21.2 mg/m^3 [5.2 ppm]	Decreases in sperm concentration	21.2 mg/m^3 [5.2 ppm]	N/A	UF_A = 3 UF_H = 10 ***Total UF = 30***	Zhang et al. (2017)	High	Moderate - Robust

BMCL = lower confidence limit of the benchmark concentration; BMDL = lower confidence limit of the benchmark dose; HEC = human equivalent concentration; HED = human equivalent dose; MOE = margin of exposure; NOAEL = no-observed-adverse-effect level; POD = point of departure; UF = uncertainty factor

[a] In accordance with (U.S. EPA, 1994) guidance, the $BMCL_{10}$ of 48.9 mg/m^3 was dosimetrically adjusted to the HEC of 9.78 mg/m^3 using the regional gas dose ratio for extrathoracic effects ($RGDR_{ET}$) of 0.2 based on the combined value for male (0.25) and female (0.16) F344 rats for these nasal effects (U.S. EPA, 2012a). The $BMCL_5$ = 21.2 mg/m^3 was not further dosimetrically adjusted (no respiratory effects, RGDR = 1, therefore, the HEC is the same as the adjusted POD of 21.2 mg/m^3.

Exposure Scenario	Target Organ System	Species	Duration	POD	Effect	HEC [a] mg/m^3 [ppm]	HED [b] (mg/kg-day)	Benchmark MOE [c]	Reference	Overall Study Quality Determination	POD Selection Confidence [d]

[b] EPA used allometric body weight scaling to the three-quarters (¾) power to derive the HED. Consistent with EPA Guidance U.S. EPA (2011b), the UF_A was reduced from 10 to 3.
[c] UF = uncertainty factor; UF_A = extrapolation from animal to human (interspecies); UF_H = potential variation in sensitivity among members of the human population (intraspecies); UF_S = subchronic-to-chronic duration extrapolation
[d] POD Confidence Selection is 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, etc.). These considerations are summarized in Table 5-22.

Table 5-24. Cancer PODs for 1,2-Dichloroethane Lifetime Exposure Scenarios

Inhalation Unit Risk (IUR) [a]	Oral Slope Factor[b]	Dermal Slope Factor[c]	Extra Cancer Risk Benchmark	Reference	Overall Study Quality Determination	POD Selection Confidence [d]	
7.1E−06 (per µg/m^3) 2.9E−02 (per ppm)	0.039 per mg/kg/day	0.039 per mg/kg/day	1E−04 to 1E−06 (general population) 1E−04 (occupational)	(Nagano et al., 2006)	High	Inhalation	Robust
						Oral	Moderate
						Dermal	Slight-to-Moderate

[a] Cancer IUR for 1,2-dichloroethane based on a combined tumor model (mammary gland adenomas, fibroadenomas, and adenocarcinomas and subcutaneous fibromas in female rats) from Nagano et al. (2006) in female rats.
[b] Cancer slope factor (CSF) derived based on continuous (general population) exposure scenarios. Due to the exposure averaging time adjustments incorporated into lifetime exposure estimates, separate cancer hazard values for worker (occupational) scenarios are not required.
[c] Oral CSF for 1,2-dichloroethane was derived from the calculated IUR from Nagano et al. (2006) and extrapolated to the dermal route to derive the corresponding dermal slope factor.
[d] Point of departure (POD) Confidence Selection is based on an evaluation of the identified POD and the confidence in the alignment of this POD assigned to route and any uncertainties associated with the POD being used for risk estimates (*e.g.*, route-to-route extrapolation, duration adjustment, etc.). These considerations are summarized in Table 5-22.

5.3 Human Health Risk Characterization

5.3.1 Risk Characterization Approach

The exposure scenarios, populations of interest, and toxicological endpoints used for evaluating risks from acute, intermediate, and chronic/lifetime exposures are summarized in Table 5-25.

Table 5-25. Exposure Scenarios, Populations of Interest, and Hazard Values for 1,2-Dichloroethane

<table>
<tr><td rowspan="4">Population of Interest and Exposure Scenario</td><td>Workers
Male and female adolescents and adults (≥16 years) directly working with 1,2-dichloroethane under light activity (breathing rate of 1.25 m^3/hour) (for further details see Occupational Exposure Assessment for 1,2-Dichloroethane (U.S. EPA, 2026aw))
<u>Exposure Durations</u>
• Acute – 8 hours for a single workday (most OESs)
• Intermediate – 8 hours per workday for up to 22 working days
• Chronic – 8 hours per workday for up to 250 days per year for 31 or 40 working years
<u>Exposure Routes</u> – Inhalation and dermal</td></tr>
<tr><td>Occupational Non-Users
Male and female adolescents and adults (≥16 years) indirectly exposed to 1,2-dichloroethane within the same work area as workers (breathing rate of 1.25 m^3/hour) (for further details see Occupational Exposure Assessment for 1,2-Dichloroethane (U.S. EPA, 2026aw))
<u>Exposure Durations</u>
• Acute, Intermediate, and Chronic – Same as workers
<u>Exposure Route</u> – Inhalation</td></tr>
<tr><td>Consumers
Infants (<1 year), toddlers (1–2 years), children (3–5 years and 6–10 years), young teens (11–15 years), teenagers (16–20 years), and adults (21+ years) exposed to 1,2-dichloroethane through article use (for further details see Consumer Assessment for 1,2-Dichloroethane (U.S. EPA, 2026o))
<u>Exposure Durations</u>
• Acute – 1 day exposure
• Intermediate – 30 days per year
• Chronic – 365 days per year
<u>Exposure Routes</u> – Inhalation, dermal, and oral</td></tr>
<tr><td>General Population
Infants, children, and adults exposed to 1,2-dichloroethane through drinking water, ambient water, ambient air, soil, and fish ingestion (for further details see General Population Exposures for 1,2-Dichloroethane (U.S. EPA, 2026ah))
<u>Exposure Durations</u>
• Acute – Exposed to 1,2-dichloroethane continuously for a 24-hour period
• Chronic – Exposed to 1,2-dichloroethane continuously up to 78 years
<u>Exposure Routes</u> – Inhalation, dermal, and oral (depending on exposure scenario)</td></tr>
</table>

Health Effects, Concentration and Time Duration	**Non-Cancer** The **acute oral/dermal**[a] endpoint is increased relative kidney weight by 13% via a single oral gavage in male mice. • HED = 19.9 mg/kg • Acute uncertainty factors (benchmark MOE) = 30 for oral and dermal (UF_A = 3; UF_H = 10) [b] The **intermediate oral/dermal**[a] endpoint is increased relative kidney weight by 18% in male rats via daily oral gavage for 90 days. • HED = 6.5 mg/kg • Intermediate uncertainty factors (benchmark MOE) = 30 for oral and dermal (UF_A = 3; UF_H = 10) [b] The **chronic oral/dermal** [a] endpoint is based on and duration adjusted from the identified intermediate POD of increased relative kidney weight seen in male rats treated with 1,2-dichloroethane via daily oral gavage for 90 days. • HED = 6.5 mg/kg • Chronic uncertainty factors (benchmark MOE) = 100 for oral and dermal (UF_A = 3; UF_H = 10; UF_S = 3) [b] The **acute inhalation endpoint** is olfactory effects– degeneration with necrosis of the olfactory mucosa. • HEC = 9.78 mg/cm^3 or 2.42 ppm • Acute uncertainty factors (benchmark MOE) = 30 for inhalation (UF_A = 3; UF_H = 10) [c] The **intermediate inhalation endpoint** is decrease in sperm concentration. • HEC = 21.2 mg/cm^3 or 5.2 ppm • Intermediate uncertainty factors (benchmark MOE) = 30 (UF_A = 3; UF_H = 10) [b] The **chronic inhalation endpoint** is decrease in sperm concentration. • HEC = 21.2 mg/cm^3 or 5.2 ppm • Chronic uncertainty factors (benchmark MOE) = 30 (UF_A = 3; UF_H = 10) **Cancer** • Inhalation Unit Risk (IUR) = 7.1E−06 per µg/m^3 (2.9E−06 per ppm) • Oral/dermal cancer slope factor [c] = 0.039 per mg/kg/day

HEC = human equivalent concentration; HED = human equivalent dose; MOE = margin of exposure
[a] Dermal HED are extrapolated from the oral HED and are assumed to be equal.
[b] Uncertainty factors in the benchmark MOE (margin of exposure): UF_A = interspecies (animal to human); UF_H = intraspecies (human variability); UF_S = subchronic-to-chronic duration adjustment
[c] Oral/dermal cancer slope factor derived from the IUR.

5.3.1.1 Estimation of Non-Cancer Risks

EPA used a MOE approach to estimate non-cancer risks. The MOE is the ratio of the non-cancer hazard value divided by a human exposure dose. Acute and chronic MOEs for non-cancer inhalation and dermal risks were calculated using Equation 5-2:

Equation 5-2.

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

Where:

MOE	=	Margin of exposure for acute, intermediate, or chronic risk comparison (unitless)
$Non\text{-}cancer\ Hazard\ Value\ (POD)$	=	HEC (mg/m^3) or HED (mg/kg-day)
$Human\ Exposure$	=	Exposure estimate (mg/m^3 or mg/kg-day)

MOE risk estimates may be interpreted in relation to benchmark MOEs. Benchmark MOEs are typically the total UF for each non-cancer hazard value. The MOE estimate is interpreted as a human health risk of concern if the MOE estimate is less than the benchmark MOE (*i.e.,* the total UF). On the other hand, if the MOE estimate is equal to or exceeds the benchmark MOE, risk is not considered to be of concern and mitigation is not needed. Typically, the larger the MOE, the more unlikely it is that a non-cancer adverse effect occurs relative to the benchmark. When determining if 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 to consider other risk-related factors in addition to risks identified in risk characterization.

5.3.1.2 Estimation of Cancer Risks

Extra cancer risks for repeated exposures to a chemical were estimated using Equation 5-3 or Equation 5-4:

Equation 5-3.

$$Inhalation\ Cancer\ Risk = Human\ Exposure \times IUR$$

Equation 5-4.

$$\boldsymbol{Dermal\ or\ Oral\ Cancer\ Risk = Human\ Exposure \times CSF}$$

Where:

Risk	=	Extra lifetime cancer risk (unitless)
Human Exposure	=	Exposure estimate (LADC in ppm)
IUR	=	Inhalation unit risk (risk per mg/m^3)
CSF	=	Cancer slope factor (risk per mg/kg-day)

Estimates of extra cancer risks are interpreted as the incremental probability of an individual developing cancer over a lifetime following exposure (*i.e.,* incremental or extra individual lifetime cancer risk).

5.3.2 Risk Characterization for Potentially Exposed or Susceptible Subpopulations

EPA considered PESS throughout the exposure assessment, hazard identification, and dose-response analysis. In general, the Agency evaluates several factors that may contribute to a group having increased exposure or biological susceptibility. Examples of these factors include life stage, preexisting disease, occupational and certain consumer exposures, nutrition, and lifestyle activities.

For the 1,2-dichloroethane risk evaluation, EPA accounted for the following PESS groups: workers, infants exposed to drinking water during formula bottle feeding, subsistence and tribal fishers, men of reproductive age, individuals with preexisting conditions such as chronic kidney disease, people with the CYP2E1 and aldehyde dehydrogenase-2 polymorphisms, lifestyle factors such as smoking cigarettes or secondhand smoke, and communities who live near facilities that emit 1,2-dichloroethane. Table 5-26 summarizes how PESS were incorporated into the risk evaluation and the remaining sources of uncertainty related to consideration of PESS.

Additional information on other factors that could possibly impact greater biological susceptibility following exposure to 1,2-dichloroethane—such as more comprehensive information on preexisting diseases in humans, lifestyle activities, nutritional status, or other chemical co-exposures and non-chemical stressors—was not reasonably available.

Table 5-26. Summary of PESS Categories in the Risk Evaluation and Remaining Sources of Uncertainty

PESS Categories	Potential Increased Exposures Incorporated into Exposure Assessment	Potential Sources of Biological Susceptibility Incorporated into Hazard Assessment
Life stage	Life stage-specific exposure scenarios included infants exposed to drinking water during formula bottle feeding. Other scenarios of children swimming or playing in soil may be considered for dermal and oral exposure. It is unclear how relevant dermal and ingestion estimates from soil exposure are as 1,2-dichloroethane is expected to either volatilize or migrate from surface soils to groundwater. Other factors by age may be relevant.	Direct evidence of a sperm effect was the basis for the chronic inhalation POD used for risk estimation. The inhalation POD selected is considered to be protective and data were incorporated in the weight of scientific evidence. 1,2-Dichloroethane partitions in the milk of women exposed dermally in toxicokinetic considerations (ATSDR, 2024; Urusova, 1953). Children in households that smoke cigarettes, receiving secondhand smoke, may be exposed to higher levels of 1,2-dichloroethane (ATSDR, 2024; Wang et al., 2012). Smokers as well as those exposed to passive smoke may be more susceptible to lung emphysema following repeated exposure to 1,2-dichloroethane (ATSDR, 2024; Ansari et al., 1988). The increase in susceptibility due to secondhand smoke is not known and is a source of uncertainty in part reliant on proximity to the smoker, space ventilation, and frequency of smoking/number of cigarettes smoked. Evidence also from mice showed changes in sperm parameters in decreases in sperm count following short-term exposures to 1,2-dichloroethane. Potential susceptibility of older adults due to toxicokinetic differences was addressed through a 10× UF_H for human variability.
Preexisting disease	Not applicable	Application of a 10× UF_H to account for human variability. Especially susceptible individuals, such as those with chronic kidney disease, may not be accounted for by standard approaches. The increase in susceptibility due to preexisting disease is not known and is a source of uncertainty.
Lifestyle activities	EPA evaluated exposures resulting for subsistence and tribal fishers and considered increased intake of fish in these populations. People that smoke cigarettes may be exposed to higher levels of 1,2-dichloroethane. Emissions from smoking cigarettes can contain between 53 and 200 µg 1,2-dichloroethane/cigarette (Wang et al., 2012).	EPA considered alcohol consumption and smoking as factors accounted for in the applied 10× UF_H for human variability. Smokers as well as those exposed to passive smoke may be more susceptible to lung emphysema following repeated exposure to 1,2-dichloroethane (ATSDR, 2024; Ansari et al., 1988). The increase in susceptibility due to secondhand smoke is not known and is a source of uncertainty in part reliant on proximity to the smoker, space ventilation, and frequency of smoking/number of cigarettes smoked.

PESS Categories	Potential Increased Exposures Incorporated into Exposure Assessment	Potential Sources of Biological Susceptibility Incorporated into Hazard Assessment
Occupational exposures	EPA considered increased exposure specific to worker activities.	Not applicable.
Sociodemographic	EPA evaluated exposure differences between groups, including women of reproductive age based on location of exposures to 1,2-dichloroethane in ambient air.	EPA utilized the most sensitive sex from rodent assays cancer modeling. EPA quantified sociodemographic differences based on sex alone.
Geography and site-specific	EPA assessed exposure concentrations to which residential communities proximal to releasing facilities may be exposed.	Not applicable.
Nutrition	Not applicable.	EPA did not identify nutritional factors that influence susceptibility.
Genetics/ epigenetics	Not applicable.	Genetic variants may increase susceptibility of the target organ was addressed through a 10× UF_H for human variability. A known metabolite of 1,2-dichloroethane is the reactive 2-chloroacetaldehyde supporting that a PESS group are people with the CYP2E1 and aldehyde dehydrogenase-2 polymorphisms that may have a higher risk for several diseases affecting multiple organ systems including cancer, heart disease, and osteoporosis. Individuals with genetically reduced plasma alpha-1-proteinase inhibitor and predisposed to emphysema may be at increased risk (Ansari et al., 1988). Hazard values are based on wild-type rodents and a broad occupational population and may underestimate risks for populations with sensitizing mutations.
Other Unique Activities	EPA did not identify unique activities that influence exposure.	EPA did not identify unique activities that influence susceptibility.
Aggregate Exposures	EPA assessed aggregate exposures to the general populations to the combined ambient air concentrations from several adjacent facility air releases. EPA did not aggregate routes of exposure as the endpoints are different and dependent on the corresponding route of exposure.	Not applicable.

PESS Categories	Potential Increased Exposures Incorporated into Exposure Assessment	Potential Sources of Biological Susceptibility Incorporated into Hazard Assessment
Other Chemical and Non-Chemical Stressors	EPA did not identify other chemical and non-chemical factors influencing exposure.	EPA did not identify other chemical and non-chemical stressors that influence susceptibility.
EPA = U.S. Environmental Protection Agency; PESS = potential exposed or susceptible subpopulation; POD = point of departure; UF = uncertainty factor		

5.3.3 Risk Estimates for Workers

5.3.3.1 Occupational Inhalation Exposure Risk Characterization

This section provides a summary table of inhalation risk estimates (Table 5-27), as well as a discussion of the risk characterization per OES. Table 5-27 provides occupational inhalation MOEs with and without PPE, as well as the minimum APF needed (depending on the expected workplace activity, represented in the risk evaluation by the various SEGs) for an MOE above the non-cancer benchmark or below the cancer benchmark, for the OES and worker categories assessed for 1,2-dichloroethane. It should be noted that 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. General information on PPE and respiratory protection is available in Appendix K, and more specific information is included in each OES specific sub-section.

Table 5-27. Occupational Inhalation Risk Summary Table

COU		OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)		Intermediate Non-Cancer (Benchmark MOE = 30)		Chronic Non-Cancer (Benchmark MOE = 30)[h]		Cancer – BLS Working Years (Benchmark = 1E−04)		Cancer - Vinyl Institute Working Years (Benchmark = 1E−04)	
Life Cycle Stage	Category / Subcategory				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	No PPE [a]	APF [b]	No PPE [a]	APF [b]
Manufacturing	Domestic manufacture / Domestic Manufacture	Manufacturing	Operator [c]	CT	**7.4**	74 (APF 10)	**22**	217 (APF 10)	**23**	233 (APF 10)	**2.6E−03**	5.2 E−05 (APF 50)	**7.4E−04**	7.4E−05 (APF 10)
				HE	**0.49**	487 (APF 1,000)	**1.4**	36 (APF 25)	**1.5**	38 (APF 25)	**5.1E−02**	5.1E−05 (APF 1,000)	**4.2E−02**	4.2E−05 (APF 1,000)
			Logistics technician [d]	CT	209	–	613	–	656	–	9.1E−05	–	2.6E−05	–
				HE	**15**	148 (APF 10)	43	–	47	–	**1.7E−03**	6.7E−05 (APF 25)	**1.4E−03**	5.5E−05 (APF 25)
			Maintenance technician [e]	CT	73	–	213	–	228	–	**2.6E−04**	2.6E−05 (APF 10)	7.6E−05	–
				HE	**2.2**	56 (APF 25)	**6.5**	65 (APF 10)	**7.0**	70 (APF 10)	**1.1E−02**	1.1E−05 (APF 1,000)	**9.1E−03**	9.2E−06 (APF 1,000)
			Laboratory technician [f]	CT	76	–	222	–	237	–	**2.5E−04**	2.5E−05 (APF 10)	7.2E−05	–
				HE	**2.7**	68 (APF 25)	**8.0**	80 (APF 10)	**8.6**	86 (APF 10)	**9.0E−03**	9.0E−06 (APF 1,000)	**7.4E−03**	7.4E−06
			ONU [g] [h]	CT	254	–	745	–	797	–	7.5E−05	–	2.2E−05	–
				HE	**2.2**	56 (APF 56)	**6.5**	65 (APF 10)	**7.0**	70(APF 10)	**1.1E−02**	1.1E−05 (APF 1,000)	**9.1E−03**	9.2E−06 (APF 1,000)
Manufacturing	Domestic manufacture / Domestic Manufacture	Manufacturing – As an Unintended Byproduct	Operator [c]	CT	48	–	141	–	151	–	**4.0E−04**	4.0E−05 (APF 10)	**1.4E−04**	1.4E−05 (APF 10)
				HE	**13**	132 (APF 10)	39	–	41	–	**1.9E−03**	7.5E−05 (APF 25)	**1.9E−03**	7.5E−05 (APF 25)

COU		OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)		Intermediate Non-Cancer (Benchmark MOE = 30)		Chronic Non-Cancer (Benchmark MOE = 30)[h]		Cancer – BLS Working Years (Benchmark = 1E−04)		Cancer - Vinyl Institute Working Years (Benchmark = 1E−04)	
Life Cycle Stage	**Category / Subcategory**				**MOE – No PPE [a]**	**MOE – APF [b]**	**MOE – No PPE [a]**	**MOE – APF [b]**	**MOE – No PPE [a]**	**MOE – APF [b]**	**No PPE [a]**	**APF [b]**	**No PPE [a]**	**APF [b]**
Manufacturing (*continued*)	Domestic manufacture / Domestic Manufacture (*continued*)	Manufacturing – As an Unintended Byproduct (*continued*)	Logistics technician [d]	CT	55	–	160	–	172	–	**3.5E−04**	3.5E−05 (APF 10)	**1.2E−04**	1.2E−05 (APF 10)
				HE	**2.1**	52 (APF 25)	**6.1**	61 (APF 10)	**6.6**	66 (APF 10)	**1.2E−02**	1.2E−05 (APF 1,000)	**1.2E−02**	1.2E−05 (APF 1,000)
			Maintenance technician [e]	CT	169	–	496	–	531	–	**1.1E−04**	1.1E−05 (APF 10)	3.9E−05	–
				HE	**9.9**	99 (APF 10)	**29**	290 (APF 10)	31	–	**2.5E−03**	1.0E−06 (APF 25)	**2.5E−03**	1.0E−04 (APF 25)
			Laboratory technician [f]	CT	137	–	401	–	429	–	**1.4E−04**	1.4E−05 (APF 10)	4.8E−05	–
				HE	47	–	137	–	147	–	**5.3E−04**	5.3E−05 (APF 10)	**5.3E−04**	5.3E−05 (APF 10)
			ONU [g, h]	CT	726	–	2,127	–	2,278	–	2.6E−05	–	9.0E−06	–
				HE	**22**	222 (APF 10)	65	–	70	–	**1.1E−03**	4.4E−05 (APF 25)	**1.1E−03**	4.4E−05 (APF 25)
Manufacturing	Import / Import	Repackaging (PBZ)	Worker	CT	71	–	209	–	223	–	**2.7E−04**	2.7E−05 (APF 10)	N/A	N/A
				HE	**1.5**	37 (APF 25)	**4.3**	43 (APF 10)	**4.7**	47(APF 10)	**1.7E−02**	1.7E−05 (APF 1,000)	N/A	N/A
Processing	Repackaging / Repackaging		ONU	CT	71 [i]	–	209 [i]	–	223 [j]	–	2.7E−04	2.5E−05 (APF 10)	N/A	N/A
				HE							**3.5E−04**	3.5E−05 (APF 10)	N/A	N/A

COU		OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)		Intermediate Non-Cancer (Benchmark MOE = 30)		Chronic Non-Cancer (Benchmark MOE = 30)[h]		Cancer – BLS Working Years (Benchmark = 1E−04)		Cancer - Vinyl Institute Working Years (Benchmark = 1E−04)	
Life Cycle Stage	**Category / Subcategory**				**MOE – No PPE [a]**	**MOE – APF [b]**	**MOE – No PPE [a]**	**MOE – APF [b]**	**MOE – No PPE [a]**	**MOE – APF [b]**	**No PPE [a]**	**APF [b]**	**No PPE [a]**	**APF [b]**
Manufacturing	Import / Import	Repackaging (modeled)	Worker	CT	**0.72**	36 (APF 50)	**5.8**	58 (APF 10)	110	–	**5.2E−04**	5.2E−05 (APF 10)	N/A	N/A
				HE	**0.19**	194 (APF 1,000)	**1.6**	39 (APF 25)	32	–	**1.9E−03**	7.6E−05 (APF 25)	N/A	N/A
Processing	Repackaging / Repackaging		ONU	CT	**0.72** [i]	36 (APF 50)	**5.8** [i]	58 (APF 10)	110	–	**5.2E−04**	5.2E−05 (APF 10)	N/A	N/A
				HE									N/A	N/A
Processing	Processing – As a reactant / Intermediate in: Petrochemical manufacturing; Plastic material and resin manufacturing; All other basic organic chemical manufacturing; All other basic inorganic chemical manufacturing	Processing as a Reactant	Operator [c]	CT	2,736	–	8,018	–	8,585	–	7.0E−06	–	2.2E−06	–
				HE	741	–	2,172	–	2,325	–	3.3E−05	–	2.7E−05	–
			Logistics technician [d]	CT	**21**	209 (APF 10)	61	–	66	–	**9.1E−04**	9.1E−05 (APF 10)	**2.9E−04**	2.9E−05
				HE	**1.5**	39 (APF 25)	**4.5**	45 (APF 10)	**4.9**	49 (APF 10)	**1.6E−02**	1.6E−05 (APF 1,000)	**1.3E−02**	1.3E−05 (APF 1,000)
			Maintenance technician [e]	CT	1.1E04	–	3.3E04	–	3.5E04	–	1.7E−06	–	5.4E−07	–
				HE	1,694	–	4,964	–	5,314	–	1.5E−05	–	1.2E−05	–
			Laboratory technician [f]	CT	5,156	–	1.5E04	–	1.6E04	–	3.7E−06	–	1.2E−06	–
Processing	Recycling / Recycling			HE	2,372	–	6,949	–	7,440	–	1.0E−05	–	8.6E−06	–
Industrial use	Process regulator / *e.g.,* Catalyst moderator; Oxidation inhibitor		Worker – herbicide manufacture	CT	36	–	104	–	112	–	**5.4E−04**	5.4E−05 (APF 10)	**1.7E−04**	1.7E−05 (APF 10)
				HE	**2.6**	64 (APF 25)	**7.6**	76 (APF 10)	**8.1**	81 (APF 10)	**9.6E−03**	1.0E−05 (APF 1,000)	**7.9E−03**	8.2E−06 (APF 1,000)
			ONU [g]	CT	1.7E04	–	5.0E04	–	5.3E04	–	1.1E−06	–	3.9E−07	–
				HE	1.4E04	–	4.0E04	–	4.3E04	–	1.8E−06	–	1.5E−06	–

COU: Life Cycle Stage	COU: Category / Subcategory	OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30): MOE – No PPE [a]	Acute Non-Cancer (Benchmark MOE = 30): MOE – APF [b]	Intermediate Non-Cancer (Benchmark MOE = 30): MOE – No PPE [a]	Intermediate Non-Cancer (Benchmark MOE = 30): MOE – APF [b]	Chronic Non-Cancer (Benchmark MOE = 30)[h]: MOE – No PPE [a]	Chronic Non-Cancer (Benchmark MOE = 30)[h]: MOE – APF [b]	Cancer – BLS Working Years (Benchmark = 1E−04): No PPE [a]	Cancer – BLS Working Years (Benchmark = 1E−04): APF [b]	Cancer - Vinyl Institute Working Years (Benchmark = 1E−04): No PPE [a]	Cancer - Vinyl Institute Working Years (Benchmark = 1E−04): APF [b]
Processing	Processing – Incorporated into formulation, mixture, or reaction product / Fuels and fuel additives: All other petroleum and coal products manufacturing / Processing aids: Specific to petroleum production / Adhesives and sealants; Lubricants and greases; Process regulators; degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing	Processing into Formulation, Mixture, or Reaction Product	Worker	CT	36	–	104	–	112	–	**5.4E−04**	5.4E−05 (APF 10)	N/A	N/A
				HE	**2.6**	64 (APF 25)	**7.6**	76 (APF 10)	**8.1**	81 (APF 10)	**9.6E−03**	1.0E−05 (APF 1,000)	N/A	N/A
			ONU	CT	36	--	104	–	112	–	**5.4E−04**	5.4E−05 (APF 10)	N/A	N/A
Industrial use	Other use / Process solvent			HE	32	--	95	–	101	–	**7.6E−04**	7.6E−05 (APF 10)	N/A	N/A
Industrial use	Adhesives and sealants / Adhesives and sealants	Industrial Application of Adhesives and Sealants (Surrogate)	Worker	CT	**0.77**	39 (APF 50)	**2.3**	57 (APF 25)	**2.4**	61 (APF 25)	**2.5E−02**	2.5E−05 (APF 1,000)	N/A	N/A
				HE	**9.0E−02**	90 (APF 1,000)	**0.26**	264 (APF 1,000)	**0.28**	283 (APF 1,000)	**0.27**	2.7E−05 (APF 10,000)	N/A	N/A
			ONU	CT	**4.0**	40 (APF 10)	**12**	116 (APF 10)	**12**	124 (APF 10)	**4.8E−03**	9.7E−05 (APF 50)	N/A	N/A

COU		OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)		Intermediate Non-Cancer (Benchmark MOE = 30)		Chronic Non-Cancer (Benchmark MOE = 30)[h]		Cancer – BLS Working Years (Benchmark = 1E−04)		Cancer - Vinyl Institute Working Years (Benchmark = 1E−04)	
Life Cycle Stage	**Category / Subcategory**				**MOE – No PPE [a]**	**MOE – APF [b]**	**MOE – No PPE [a]**	**MOE – APF [b]**	**MOE – No PPE [a]**	**MOE – APF [b]**	**No PPE [a]**	**APF [b]**	**No PPE [a]**	**APF [b]**
Industrial use (*continued*)	Adhesives and sealants / Adhesives and sealants (*continued*)	Industrial Application of Adhesives and Sealants (Surrogate) (*continued*)	ONU (*continued*)	HE	**3.6**	36 (APF 10)	**10**	104 (APF 10)	**11**	112 (APF 10)	**6.9E−03**	6.9E−06 (APF 1,000)	N/A	N/A
Industrial use	Lubricants and greases / Solid film lubricants and greases	Industrial Application of Lubricants and Greases (Modeled)	Worker	CT	**1.0**	51 (APF 50)	**3.0**	30 (APF 10)	**3.2**	32 (APF 10)	**1.9E−02**	1.9E−05 (APF 1,000)	N/A	N/A
				HE	**0.40**	397 (APF 1,000)	**1.2**	58 (APF 50)	**1.2**	31 (APF 25)	**6.2E−02**	6.2E−05 (APF 1,000)	N/A	N/A
			ONU	CT	**1.5**	38 (APF 25)	**4.5**	45 (APF 10)	**4.8**	48 (APF 10)	**1.2E−02**	1.2E−05 (APF 1,000)	N/A	N/A
				HE	**0.48**	479 (APF 1,000)	**1.4**	35 (APF 25)	**1.5**	38 (APF 25)	**5.1E−02**	5.1E−05 (APF 1,000)	N/A	N/A
Industrial use	Solvents (For cleaning and degreasing) / Degreasing and cleaning solvents	Industrial and Commercial Non-Aerosol Cleaning/ Degreasing	Worker	CT	**0.26**	258 (APF 1,000)	**0.76**	38 (APF 50)	**0.81**	809 (APF 1,000)	**7.4E−02**	7.4E−05 (APF 1,000)	N/A	N/A
				HE	**4.6E−02**	46 (APF 1,000)	**0.13**	134 (APF 1,000)	**0.14**	1,434 (APF 10,000)	**0.54**	5.4E−05 (APF 10,000)	N/A	N/A
			ONU	CT	**3.2**	32 (APF 10)	**9.5**	95 (APF 10)	**10**	101 (APF 10)	**5.9E−03**	5.9E−06 (APF 1,000)	N/A	N/A
				HE	**0.39**	391 (APF 1,000)	**1.1**	57 (APF 50)	**1.2**	31 (APF 25)	**6.3E−02**	6.3E−05 (APF 1,000)	N/A	N/A
		Commercial Aerosol Products (Aerosol Degreasing, Aerosol Lubricants)	Worker	CT	**7.8E−02**	78 (APF 1,000)	**0.23**	229 (APF 1,000)	**0.25**	245 (APF 1,000)	**0.24**	2.5E−05 (APF 10,000)	N/A	N/A
				HE	**3.2E−02**	32 (APF 1,000)	**9.3E−02**	93 (APF 1,000)	**9.9E−02**	99 (APF 1,000)	**0.78**	7.8E−05 (APF 10,000)	N/A	N/A

COU		OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)		Intermediate Non-Cancer (Benchmark MOE = 30)		Chronic Non-Cancer (Benchmark MOE = 30)[h]		Cancer – BLS Working Years (Benchmark = 1E−04)		Cancer - Vinyl Institute Working Years (Benchmark = 1E−04)	
Life Cycle Stage	Category / Subcategory				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	No PPE [a]	APF [b]	No PPE [a]	APF [b]
Industrial use (*continued)*	Solvents (For cleaning and degreasing) / Degreasing and cleaning solvents (*continued*)	Commercial Aerosol Products (Aerosol Degreasing, Aerosol Lubricants) (*continued*)	ONU	CT	**0.12**	118 (APF 1,000)	**0.34**	344 (APF 1,000)	**0.37**	369 (APF 1,000)	**0.16**	1.6E−05 (APF 10,000)	N/A	N/A
				HE	**3.8E−02**	38 (APF 1,000)	**0.11**	112 (APF 1,000)	**0.12**	120 (APF 1,000)	**0.64**	6.4E−05 (APF 10,000)	N/A	N/A
Commercial use	Other use / Laboratory chemical	Laboratory Use	Worker	CT	123	–	360	–	386	–	**1.6E−04**	1.6E−05 (APF 10)	N/A	N/A
				HE	**2.6**	65 (APF 25)	**7.6**	76 (APF 10)	**8.1**	81 (APF 10)	**9.5E−03**	9.5E−06 (APF 1,000)	N/A	N/A
			Worker – herbicide manufacture	CT	62	–	183	–	196	–	**3.1E−04**	3.1E−05 (APF 10)	N/A	N/A
				HE	61	–	180	–	192	–	**4.0E−04**	4.0E−05 (APF 10)	N/A	N/A
			Worker – academic laboratory	CT	52	–	151	–	162	–	**3.7E−04**	3.7E−05 (APF 10)	N/A	N/A
				HE	**4.7**	47 (APF 10)	**14**	137 (APF 10)	**15**	147 (APF 10)	**5.3E−03**	5.3E−06 (APF 1,000)	N/A	N/A
			ONU	CT	123 [i]	–	360 [i]	–	386 [j]	–	**1.6E−04**	1.6E−05 (APF 10)	N/A	N/A
				HE		–		–		–	**2.0E−04**	2.0E−05 (APF 10)	N/A	N/A
Disposal	Disposal / Disposal	Waste Handling, Treatment, and Disposal (Landfill)	Worker	CT	4,571	–	1.3E04	–	1.4E04	–	4.2E−06	–	N/A	N/A
				HE	1,280	–	3,750	–	4,015	–	1.9E−05	–	N/A	N/A
			ONU	CT	4,571 [i]	–	1.3E04 [i]	–	1.4E04 [j]	–	4.2E−06	–	N/A	N/A
				HE		–		–		–	5.4E−06	–	N/A	N/A

COU		OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)		Intermediate Non-Cancer (Benchmark MOE = 30)		Chronic Non-Cancer (Benchmark MOE = 30)[h]		Cancer – BLS Working Years (Benchmark = 1E−04)		Cancer - Vinyl Institute Working Years (Benchmark = 1E−04)	
Life Cycle Stage	Category / Subcategory				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	No PPE [a]	APF [b]	No PPE [a]	APF [b]
Disposal (*continued*)	Disposal / Disposal (*continued*)	Waste Handling, Treatment, and Disposal (POTW and Non-POTW WWT)	Worker	CT	**25**	247 (APF 10)	72	–	78	–	**7.7E−04**	7.7E−05 (APF 10)	N/A	N/A
				HE	**5.0**	50 (APF 10)	**15**	145 (APF 145)	**16**	156 (APF 10)	**5.0E−03**	1.0E−04 (APF 50)	N/A	N/A
			ONU	CT	78	–	227	–	243	–	**2.5E−04**	2.5E−05 (APF 10)	N/A	N/A
				HE	**27**	274 (APF 10)	80	–	86	–	**9.0E−04**	9.0E−04 (APF 10)	N/A	N/A

APF = assigned protection factor; COU = condition of use; CT = central tendency; HE = high-end; MOE = margin of exposure; OES = occupational exposure scenario; POTW = publicly owned treatment works; PPE = personal protective equipment; WWT = wastewater treatment
"–" = inhalation APF not needed
BLS estimates based on working year data from the Bureau of Labor Statistics (U.S. Census Bureau, 2019; U.S. BLS, 2014). Vinyl Institute estimates based on working year demographic data from the Vinyl Institute manufacturing, manufacturing as a byproduct, and processing as a reactant (VI, 2026) (EPA-HQ-OPPT-2018-0427-0181).
[a] Risk estimates that exceed the benchmark (*i.e.,* non-cancer risks less than the risk benchmark and cancer risks exceeding the cancer risk benchmark) are bolded and shaded.
[b] APF listed in parentheses is the minimum level of protection needed for estimated MOEs to be above benchmark.
[c] Test order data indicate that operators wore respirators with APFs ranging from 10–1,000 while performing certain tasks.
[d] Test order data indicate that logistics technicians wore respirators with APFs ranging from 10–50 during loading or offloading tasks.
[e] Test order data indicate that maintenance technicians wore full-face airline respirators of APF 1,000 during major maintenance tasks.
[f] Test order data indicate that laboratory technicians wore respirators with APFs ranging from 10–1,000 while performing certain tasks.
[g] The high-end from the closed system ONU monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated inhalation exposure (*i.e.,* chronic) for the ONU exposure group.
[h] For chronic, non-cancer exposure estimates, exposure dose over the working years is averaged over the working years. Therefore, different values of working years do not affect these estimates, and EPA has presented one chronic, non-cancer estimate. For more information, including example calculations, please see Appendix B and C of the Occupational Exposure Assessment for 1,2-Dichloroethane.

5.3.3.1.1 OES for Manufacture of 1,2-Dichloroethane (Intentional)

As described in Section 5.1.1.1, EPA estimated inhalation exposure based on monitoring data from 1,2-dichloroethane manufacturing facilities provided via a test order submission from Vinyl Institute. Empirical inhalation monitoring data for 1,2-dichloroethane during its manufacture as an intentional product were collected via a TSCA section 4 test order (EPA-HQ-OPPT-2018-0427-0050) from five manufacturing facilities that followed an EPA-approved study plan. Workers were categorized into exposure groups of operators, logistics technicians, maintenance technicians, laboratory technicians and ONUs. Within an exposure group, workers perform similar tasks. More details on the exposure groups are provided in Table 5-2. A total of 162 full-shift (8-12 hour) samples were collected among the 5 exposure groups (53 for operators; 9 for logistic technicians, 32 for maintenance technicians, 29 for laboratory technicians and 39 for ONUs). There were no full-shift samples below the limit of detection. EPA used the monitoring data to estimate the 50th percentile as central tendency and the 95th percentile as the high-end exposures for each exposure group including ONUs. A summary of the full-shift occupational inhalation exposure estimates is provided in Table 5-6.

EPA rated the weight of scientific evidence as robust for this OES. The primary strengths include the use of personal breathing zone samples directly applicable to this OES, which are preferrable to other assessment approaches 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 Vinyl Institute were 1,2-dichloroethane specific across 5 manufacturing facilities for intentional production of 1,2-dichloroethane, and data were collected recently. Additionally, monitoring data was received for multiple SEGs.

EPA assumed up to 250 days/yr of exposure for each SEG based on test order data which indicated that each of the SEGs had tasks that could be performed “daily” combined with assumptions of 50 weeks per year and 5 days per week. The actual maximum number of exposures days for an individual worker within an SEG may be less than 250 days, and there is evidence from the inhalation monitoring study that not all tasks with high exposure potential are performed with a daily frequency during the working year.

In calculating cancer risks, EPA utilized estimates of working years provided by BLS (central tendency value of 31 years and high-end value of 40 years). For this OES, EPA also calculated cancer risks utilizing industry provided data on length of service (years) for workers at the facilities monitored as part of the test order (central tendency of 8.9 years and high-end of 33 years.

For this OES, generally EPA considers that high-end exposure and risk estimates are most appropriate for consideration of shorter duration exposures (acute, intermediate), while central tendency values are more representative for chronic exposures, without consideration of existing respiratory protections. EPA has lower-confidence that high-end inhalation exposures are representative for chronic non-cancer and cancer inhalation exposure estimates, because it is unlikely that a worker would experience the high-end concentration repeatedly across days and years. Inhalation monitoring data was available for each SEG and indicate that workers in an exposure group experience a range of potential exposure concentrations, and that not all high exposure tasks are performed on a daily basis during the working year.

As described below (see "Reported Use of Respiratory Protection by SEG"), it should be noted that proper use of respiratory protection during high-exposure tasks will likely reduce the overall full-shift exposures. Given the available information on respiratory PPE used during high exposure tasks for certain SEGs within this OES (operators, logistics technicians, maintenance technicians), high-end estimates are likely to over-estimate risk where respiratory PPE is worn properly during high-exposure tasks performed by workers in these SEGs. For certain SEGs, EPA considered reasonably available information on PPE, which influenced EPA's reliance on high-end exposure estimates in the risk determination (see Section 6.2.1).

Estimates of occupational inhalation risks are presented in Table 5-27. Where the estimated MOE is below the benchmark value, an indication of the respirator APF needed to mitigate risk is also provided. In the case of test orders, there is information available on the use of respiratory protection worn by workers during the inhalation monitoring study. Additional discussion of the consideration of respiratory protection usage is provided below:

Reported Use of Respiratory Protection by SEG

Data were available in the test order summary report on respiratory protection used at the monitored facilities, as described in Section 5.3.3. As previously noted, respirator use (as documented in Appendix N- Raw Sample Results of the Final Study Report (Stantec ChemRisk, 2024)), varied by SEG. Where risks were indicated relative to benchmarks, EPA has considered how information on reported use of respiratory protection may inform interpretation of risk estimates:

- Operator SEG

Information provided in the test order report on the use of PPE indicated that 28 of 53 of the sampled operators in the Manufacturing OES wore task-specific respiratory protection for some portion of their full-shift (Stantec ChemRisk, 2024). Specifically, use of respiratory protection was noted for workers with the 11 highest full-shift samples concentrations. Additionally, respirator use was documented during collection of 77% of the full-shift samples (n= 20 out of 26) that were above the central tendency worker inhalation estimate (0.48 ppm, Table 5-7); use of respiratory protection was also indicated for the short-term and task-based samples collected concurrently with these full-shift samples. Use of respiratory protection is documented with less frequency for workers with full-shift exposures near the central tendency worker inhalation estimate (0.48 ppm, Table 5-7). Specifically, use of respiratory protection was documented for 27% (n=7) of the full-shift samples below the central tendency (n=26). Use of respiratory protection was documented for the full-shift sample at the central tendency (0.48 ppm); however, it was only documented for 3 out of 5 of the next highest full-shift samples (0.55 to 0.89 ppm) and only one out of 5 of the next lowest full-shift samples (0.23 to 0.44 ppm).

Based on the available information, operators monitored in the test order inhalation monitoring study wear respiratory protection during high-end exposures. There is variation in use of respiratory protection associated with central tendency exposures, and respiratory protection is not worn during all tasks with exposures representative of the central tendency risk estimates.

As there is evidence that operators wear respiratory protection during high-end exposures but not during central-tendency exposures, EPA believes that the central tendency risk estimates likely do not overestimate operator exposures and that high-end risk estimates, although they are informed by real world data and therefore reasonably expected to occur, are likely an over-estimate of actual worker risk when PPE is worn during high exposure tasks. Furthermore, reasonably available data, from the test order, tells us that PPE is worn during these high-exposure tasks. Use of respiratory protection during high-intensity tasks may significantly reduce overall full-shift exposure if these tasks contribute to a large percentage of the potential exposure during a shift. However, EPA is not able to quantify the exposure reduction of the reported respirator use, as it is not used during the full-shift. Additionally, it is unclear if the respirators utilized by workers in this SEG provide the minimum APF (1,000 at the high-end acute exposures) to mitigate exposures so that they do not exceed applicable benchmarks. According to the available information, workers in this SEG wear respirators that correspond to an APF of 10 to 1,000 APF, when utilized properly. Potential risks relative to applicable benchmarks were identified for non-cancer acute, intermediate and chronic and cancer inhalation exposures at the central tendency and high end (Table 5-27).

- Logistics Technicians

EPA reviewed seven full-shift samples collected on logistics technicians in manufacturing facilities that were described in Appendix N (Raw Samples Results) of the final study report for the inhalation monitoring test order (Stantec ChemRisk, 2024). Use of task-specific respiratory protection during some portion of the full-shift sampling was documented for six of seven samples (85%). For the full-shift samples where respiratory protection was not noted, an associated short-term sample was collected and use of respiratory protection was documented for this sample. Based on the available information, workers in this SEG wear respirators, and as such, actual inhalation exposures are likely to be lower than measured concentrations, and risk estimates at the central tendency and high-end are likely to over-estimate worker exposure when respirators are worn during tasks with high-exposure potential.

Per Table 5-27, for high-end acute exposure estimates a minimum APF of 25 was indicated for estimated MOEs to exceed applicable benchmarks. Logistics technicians were generally described as wearing half-face or full-face respirators during loading or offloading tasks which required connecting and disconnecting process lines to railcars, tanks, and trucks (APF 10 to 50). Use of respiratory protection may significantly reduce overall full-shift exposure if worn during tasks that contribute a large proportion of potential shift exposures. Potential risks relative to applicable benchmarks were not indicated for exposures at the central tendency.

- Maintenance Technicians

Task based respiratory protection was noted for 19 out of 32 (60%) full-shift maintenance technician workers monitored in the inhalation monitoring test order (Stantec ChemRisk, 2024), including the workers with the 10 highest full-shift exposures and the associated short-term and task-based samples. Based on the available information, maintenance technicians wear respiratory protection during high-end exposures but not consistently during central-tendency exposures. As such, EPA believes that the risk estimates associated with central tendency exposure estimates likely do not overestimate maintenance technician inhalation exposures, and that high-end risk estimates likely over-estimate actual worker exposures due to known use of respiratory protection. EPA is not able to quantify task-based reduction from the task based usage of respiratory protection. Per Table 5-31, a minimum APF of 10 or 25 was indicated to mitigate acute or intermediate high-end exposures. Maintenance technicians were described as wearing full-face airline respirators during major maintenance tasks (*e.g.,* line breaks and other equipment openings) (APF 1,000). Use of proper respiratory protection during high-intensity tasks may significantly reduce overall full-shift exposure if these tasks contribute to a large percentage of the potential exposure during a shift.

- Laboratory Technicians

Certain laboratory personnel were described as wearing full-face air purifying respirators during disposal of hazardous wastes from fume hoods (APF 10 to 1,000). Upon review of the full-shift sampling information (Appendix N of the final study report), use of task-specific respiratory protection was noted for one of 29 full-shift samples (concentration 0.3 ppm) (Stantec ChemRisk, 2024). Use of a respirator was noted for the short-term sample collected on this worker. As such, there is limited evidence that workers in this SEG wore respirators during the inhalation monitoring that was performed, at central-tendency or high-end exposures estimates.

- ONUs

ONUs were not reported to wear respiratory protection during any routine daily tasks aside from one case where a supervisor donned a full-face respirator to observe 1,2-dichloroethane loading activities from approximately 20 feet away. Upon review of Appendix N of the test order report, respirator use was documented for nine (23%, total n = 30) of ONUs during full-shift sampling, and use did not correspond to the highest measured concentrations (Stantec ChemRisk, 2024). No task or short-term samples were collected to indicate specific tasks for which respirators were worn. As such, there is limited evidence that workers in this SEG wore respirators during the inhalation monitoring that was performed, at central-tendency or high-end exposures.

5.3.3.1.2 OES for Manufacture of 1,2-Dichloroethane (as Unintentional Byproduct)

As described in Section 5.1.1.1, EPA estimated inhalation exposure based on monitoring data from manufacturing and processing facilities of 1,2-dichloroethane provided via a test order submission from Vinyl Institute. Empirical inhalation monitoring data for 1,2-dichloroethane during its manufacture as an unintentional byproduct were collected via a TSCA section 4 test order from two facilities that manufacture 1,2-dichloroethane as an unintentional byproduct following an EPA-approved study plan. Workers were categorized into exposure groups of operators, logistics technicians, maintenance technicians, laboratory technicians and ONUs. Within an exposure group, workers perform similar tasks. More details on the exposure groups are provided in Table 5-2. A total of 53 samples were collected among the 5 exposure groups (12 for operators; 12 for logistic technicians, 14 for maintenance technicians, 9 for laboratory technicians and 6 for ONUs). All samples were above the limit of detection. EPA used monitoring data to estimate the 50th percentile as central tendency and the 95th percentile as the high-end exposures for each exposure group including ONUs. A summary of the full-shift occupational inhalation exposures is provided in Table 5-6.

EPA rated the weight of scientific evidence as robust for this OES. The primary strengths include the use of personal breathing zone samples directly applicable to this OES, which are preferrable to other assessment approaches. The Vinyl Institute Consortium identified only 2 facilities that manufacture 1,2-dichloroethane only as a byproduct. Sampling was performed at both facilities. Most of the SEGs had 9 to 14 full-shift samples. The test order summary report included key metadata. EPA used the 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 Vinyl Institute were specific to 1,2-dichloroethane and captured across 2 manufacturing facilities for production of 1,2-dichloroethane as an unintended byproduct. Additionally, monitoring data were received for multiple SEGs.

An uncertainty in evaluating this OES is that the 1,2-dichloroethane inhalation monitoring data from the test order represented a narrow range of 1,2-dichloroethane concentration in the byproduct stream (95-100%) at the facilities where the inhalation monitoring was performed. EPA received public comments that other facilities may produce 1,2-dichloroethane as a byproduct at a lower weight percentage (as low as 1%). In response to this public comment, EPA evaluated a scenario where the concentration of 1,2-dichloroethane in the byproduct stream would be as low as 1%. This resulted in lower inhalation exposures and associated risk estimates for this low weight percent scenario (1% weight) by two orders of magnitude compared to the test order inhalation monitoring data. The results of this analysis are presented in the *Risk Calculator for Occupational Exposure for 1,2-Dichloroethane* (U.S. EPA, 2026ba). EPA acknowledges that there is uncertainty associated with adjusting the inhalation data from 95% to 1%.

EPA assumed up to 250 days/yr of exposure for each SEG based on test order data that indicated each of the SEGs had tasks that could be performed daily and assumptions of 50 weeks per year and 5 days per week. The actual maximum number of exposures days for an individual worker within an SEG for this OES may be less than 250, and there is evidence from the inhalation monitoring study that not all tasks with high exposure potential are performed with a daily frequency during the working year.

In calculating cancer risks, EPA utilized estimates of working years provided by BLS (central tendency value of 31 years and high-end value of 40 years). For this OES, EPA also calculated cancer risks utilizing industry provided data on length of service (years) for workers at the facilities monitored as part of the test order (central tendency of 10.6 years and high-end of 40 years).

For this OES, generally EPA considers high-end exposure and risk estimates to be most appropriate for consideration of shorter duration exposures (acute, intermediate), while central tendency values are more representative for chronic and lifetime exposures, without consideration of existing respiratory protections. EPA has lower-confidence that high-end inhalation exposures are representative for chronic non-cancer and cancer inhalation exposure estimates, because it is unlikely that a worker would experience the high-end concentration repeatedly across days and years. Additionally, inhalation monitoring data were available for each SEG and indicate that workers in an exposure group experience a range of potential exposure concentrations, and that not all high exposure tasks are performed on a daily basis during a working year.

Additionally, as described below (see "Reported Use of Respiratory Protection by SEG "), it should be noted that proper use of respiratory protection during high-exposure tasks will likely reduce the overall full-shift exposures. Given the available information on respiratory PPE used during high exposure tasks for a select SEG within this OES (logistics technicians), high-end estimates are likely to over-estimate risk where respiratory PPE is worn properly during high-exposure tasks performed by workers in this SEGs. For certain SEGs, EPA considered reasonably available information on PPE, which influenced EPA's reliance on high-end exposure estimates in the risk determination (see Section 6.2.1).

Estimates of occupational inhalation risks are presented in Table 5-27. Where the estimated MOE is below the benchmark value, an indication of the respirator APF needed to mitigate risk is also provided. In the case of test orders, there is data available on the use of respiratory protection. Additional discussion of the consideration of respiratory protection usage is provided below:

Reported Use of Respiratory Protection by SEG

Data were available in the test order summary report on PPE used at the monitored facilities as summarized in Section 5.3.3. As previously noted, respirator use (as documented in Appendix N- Raw

Sample Results of the final study report), varied by SEG (Stantec ChemRisk, 2024). EPA has considered how information on reported use of respiratory protection may inform or refine the risk estimates used in the risk determination.

Upon review of the raw sample results (Appendix N of the final study report) from the inhalation monitoring study, there was no documented use of respiratory protection during the full-shift, task-length, or short-term sample collection for any workers in the following SEGS: laboratory technicians, maintenance technicians, and ONUs. For the operator SEG, use of a respirator was documented for one of 12 full shift samples, as well as the associated short term and task-based samples collected on this worker. Due to the lack of reported use of respirators for these three SEGs, EPA has confidence that the inhalation exposure estimates for these SEGs are reflective of worker exposures without the consideration of potential effects of respirator usage. While workers in these SEGs were generally described as wearing respirators during certain tasks, this was not documented in association with the airborne inhalation monitoring that was performed.

For logistics technicians, task-specific respirator use was documented on five of 12 full-shift samples, which included the three highest full-shift sample results (range: 0.45–2.7 ppm full-shift exposure). The range of exposures in which use of a respirator is reported is consistent with the high-end worker inhalation estimate (1.7 ppm, see Table 5-6). Use of a respirator was documented for the seven highest short-term or task length samples collected on logistics technicians in this OES. However, respiratory use was not documented for the remaining full-shift samples (n=3, range: 0.092 to 0.28 ppm) above the central tendency worker inhalation estimate (0.065 ppm, Table 5-6).

As there is evidence that logistics technicians wear respiratory protection during high-end exposure exposures but not during central-tendency exposures, EPA believes that the central tendency exposures and risk estimates likely do not overestimate worker inhalation exposures, and that high-end estimates are likely to overestimate worker exposures when PPE is worn during high exposure tasks. It should be noted that the high-end estimates are informed by real world data and therefore reasonably expected to occur, and that reasonably available data, from the test order, tells us that PPE is worn during these high-exposure tasks. Per Table 5-31, a minimum APF of 10 to 25 was indicated to mitigate risks at the acute or intermediate high-end exposure (no risk indicated at central tendency), and a minimum APF of 10 was indicated to mitigate chronic non-cancer and cancer risks at the central-tendency estimates). Logistics technicians were generally described as wearing half-face or full-face respirators during loading or offloading tasks which required connecting and disconnecting process lines to railcars, tanks, and trucks (APF 10 to 50). Use of respiratory protection during high-intensity tasks may significantly reduce overall full-shift exposure if these tasks contribute to a large percentage of the potential exposure during a shift.

5.3.3.1.3 OES for Repackaging

Repackaging involves the transfer of chemicals from larger containers into smaller containers. EPA assessed both large container (bulk) and small container repackaging scenarios.

1. Bulk repackaging scenario

EPA estimated inhalation exposures for bulk repackaging scenarios into large containers utilizing analogous monitoring data (same chemical, similar OES) from manufacturing and processing facilities of 1,2-dichloroethane provided via a test order submission from Vinyl Institute. The SEG for logistic technicians at the manufacturing facilities includes the tasks of unloading from bulk shipments into reactors or storage vessels as described in Table 5-2. EPA identified 26 samples for logistics technicians;

all samples were above the limit of detection. EPA used the monitoring data to estimate the 50th percentile as central tendency and the 95th percentile as the high-end exposure. EPA did not identify data to estimate inhalation exposure to ONUs for bulk repackaging and used the central tendency exposure of the logistics technician data to estimate the ONU inhalation exposure. A summary of the full-shift occupational inhalation exposures is provided in Table 5-6.

EPA rated the weight of scientific evidence as moderate. The estimates are based on PBZ data on 1,2-dichloroethane exposures for an analogous scenario of logistics technicians performing similar tasks at 1,2-dichloroethane manufacturing and processing facilities. However, there is uncertainty in the representativeness of this data set to exposures at other facilities where bulk repackaging may be done and whether the impact of administrative and engineering controls on exposure levels at these facilities would be similar.

EPA assumed up to 250 days/yr of exposure for each SEG based on test order data that indicated logistics technicians had tasks that were performed on a daily basis and assumptions of 50 weeks per year and 5 days per week. The actual maximum number of exposures days may be less than 250. For working years, EPA used central tendency and high-end values based on BLS data of 31 yr and 40 yrs respectively.

Due to the strength of having chemical-specific PBZ monitoring data for workers performing similar activities, both the central tendency and high-end estimates are suitable for use in the risk determination. For this OES, EPA considers high-end exposure and risk estimates to be most appropriate for consideration of shorter duration exposures (acute, intermediate), while central tendency values are more representative for chronic and lifetime exposures.

Estimates of occupational inhalation risks are presented in Table 5-27. Where the estimated MOE is below the benchmark value, an indication of the respirator APF needed is also provided. In the case of test orders, there is data available on the use of respiratory protection. This data was provided for each SEG and also at the task level for the tasks performed by the SEGs. Additional discussion of the consideration of PPE usage is provided below:

2. Small container repackaging scenario

The lifecycle of 1,2-dichloroethane also consists of commercial use as a laboratory chemical and other uses that may involve repackaging into smaller size containers of 1 gallon or less. Lacking suitable inhalation monitoring data—including analogous data, such as from logistics technicians—for small-container repackaging, EPA estimated inhalation exposures using a modeling approach. The basis for the modeling approach is an EPA Generic Scenario on Repackaging which includes a process description where sources and activities with a potential for release and exposure are identified. The generic scenario provides an estimation approach for each source and recommends default parameters for each model parameter if specific data is not available.

For estimating inhalation exposure, the model estimates the vapor generation rate of the chemical being emitted from a source, such as a container loading and unloading activity. The model then estimates the airborne concentration in proximity of the emission source that results from the emission. EPA uses this value to approximate the exposure concentration to a worker who performs the tasks. Generally, the models recommended in the generic scenario to estimate air releases and exposure concentrations are the standard EPA/OPPT models used in ChemSTEER.

EPA used a probabilistic modeling approach with Monte Carlo. EPA defined a range of values and distribution types for the release and exposure parameters in the model. The model was executed with 100,000 iterations with each iteration representing a different combination of values. The number of iterations was set at 100,000 as a sufficient number for the model results to converge on the values for the exposure distribution. EPA's practice is to use the 50th percentile results to represent the central tendency and the 95th percentile to represent the high-end exposure.

EPA assessed exposure for this scenario for the generic SEGs of workers and ONUs. Worker activities for these SEGs are described in Table 5-2. The model estimates the exposures to the workers but does not estimate exposure to ONUs. Therefore, EPA assumed ONU exposure is equal to the workers central tendency to estimate the ONU inhalation exposure.

For this modeling approach, the facility throughput in kg/site-yr is a key determinant in the level of exposure. The throughput impacts the amount of chemical repackaged each day, the number of containers repackaged, and as a result the amount of time that it takes to repackage. Throughput also impacts the number of exposure days. In the absence of data on the repackaging of 1,2-dichloroethane into smaller containers such as for laboratory chemical use, EPA made conservative assumptions to estimate the facility throughput.

The model estimates the exposure and time duration for a single worker activity. EPA may combine the results from several worker activities in estimating the workers 8-hr TWA exposure, assuming that the same worker can perform more than one task with a potential for exposure in a given day. EPA assumes that the exposure for the remaining part of the worker's day is zero. For this scenario, EPA combined the exposures for the worker activities of drum emptying, container filling, and drum cleaning. In this particular case, the total exposure time estimated by the model time was up to 0.43 hr/day with the remaining time as zero exposure.

EPA rates the weight of scientific evidence as slight-to-moderate for this scenario. The strengths are in the use of the generic scenario as the foundation of the model and the use of EPA/OPPT Exposure models with Monte Carlo modeling. As with any exposure modeling approach, a key exposure determinant is the facility throughput and there is uncertainty in the value selected for this parameter and its applicability to 1,2-dichloroethane repackaging into smaller containers. Overall, EPA considers the CT results as suitable for risk determination. Use of the high-end estimate in consideration of the uncertain and conservative assumption of throughput may be overly conservative for this purpose.

The model does consider a range of values for general building ventilation but does not consider more specific engineering controls that may be used around an emission source such as local exhaust ventilation. Also, consistent with monitoring data, the model estimates the exposure concentrations near the worker's breathing zone and does not consider exposure reduction that results from the use of respiratory protection. The inhalation exposure results from the modeling are provided in Table 5-7.

Estimation of chronic non-cancer and cancer risks include values for exposure frequency and working years. For this scenario, exposure frequency was estimated in the model using the site throughput and container volume resulting in an exposure frequency ranging from 24 days/year to 119 days/year. EPA used data from the U.S. Bureau of Labor Statistics (BLS) and U.S. Census as a basis for the working years. In modeling inhalation exposures using a Monte Carlo simulation, EPA applies a triangular distribution for working years based on the BLS data with a lower bound of 10.4 years, an upper bound of 44 years, with a mode of 36 years. The occupational inhalation risk estimates are provided in Table 5-28.

Reported Use of Respiratory Protection
Some information on PPE was available from the Chemical Repackaging GS, indicating potential use of safety glasses, face shields, aprons, and gloves (see Table 5-28). There was no information on potential use of respiratory protection in the Chemical Repackaging GS.

As previously described, detailed information on the respiratory protection used by logistics technicians was provided as part of the test order inhalation monitoring study. As detailed in the final study report (Stantec ChemRisk, 2024) and associated documentation (*e.g.,* Appendix N- Raw Sample Results), logistics technicians in manufacturing and processing settings wore respiratory PPE during high-exposures but not for all central-tendency exposures (for detailed discussion of this information, please refer to the risk characterization of the OESs for Manufacture (Intentional, Unintentional Byproduct) and Processing as a Reactant).

As there is evidence that logistics technicians in the test order monitoring study wore respiratory protection during high-end exposure exposures but not during central-tendency exposures, EPA believes that the central tendency exposures estimates likely do not overestimate worker exposures, and that high-end risk estimates likely overestimate actual worker exposures. However, there is less certainty as to if this described usage of PPE in facilities monitored as part of the test order would apply to other repackaging sites.

5.3.3.1.4 OES for Processing as a Reactant
As described in Section 5.1.1.1, EPA estimated inhalation exposure based on monitoring data from manufacturing and processing facilities of 1,2-dichloroethane provided via a test order submission from Vinyl Institute. Empirical inhalation monitoring data for 1,2-dichloroethane during its processing as a reactant were collected via a TSCA section 4 test order from two facilities that process 1,2-dichloroethane following an EPA-approved study plan. Workers were categorized into exposure groups of operators, logistics technicians, maintenance technicians, laboratory technicians and ONUs. Within an exposure group, workers perform similar tasks. More details on the exposure groups are provided in Table 5-2. A total of 62 samples were collected among the 5 exposure groups (18 for operators; 6 for logistic technicians, 10 for maintenance technicians, 14 for laboratory technicians and 14 for ONUs); 6 worker and 8 ONU samples were below the limit of detection (<0.1 ppb). EPA used the monitoring data to estimate the 50th percentile as central tendency and the 95th percentile as the high-end exposures for each exposure group including ONUs. A summary of the full-shift occupational inhalation exposures is provided in Table 5-6.

EPA rated the weight of scientific evidence as robust for this OES. The primary strengths include the use of personal breathing zone samples directly applicable to this OES, which are preferrable to other assessment approaches. The Vinyl Institute Consortium identified only 2 facilities that process 1,2-dichloroethane. Sampling was performed at both facilities. Three SEGs had over 6 full-shift samples. The test order summary report included key metadata. EPA used the 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 Vinyl Institute were 1,2-dichloroethane specific across two processors of 1,2-dichloroethane. Additionally, monitoring data was received for multiple SEGs.

EPA assumed up to 250 days/yr of exposure for each SEG based on test order data which indicated that each of the SEGs had tasks that could be performed "daily" combined with assumptions of 50 weeks per year and 5 days per week. The actual maximum number of exposures days for an individual worker within an SEG may be less than 250 days, and there is evidence from the inhalation monitoring study that not all tasks with high exposure potential are performed with a daily frequency during the working year.

In calculating cancer risks, EPA utilized estimates of working years provided by BLS (central tendency value of 31 years and high-end value of 40 years). For this OES, EPA also calculated chronic cancer risks utilizing industry provided data on length of service (years) for workers at the facilities monitored as part of the test order (central tendency of 9.8 years and high-end of 33 years).

For this OES, generally, EPA considers that high-end exposure and risk estimates are most appropriate for consideration of shorter duration exposures (acute, intermediate), while central tendency values are more representative for chronic exposures, without consideration of existing respiratory protections. EPA has lower-confidence that high-end inhalation exposures are representative for chronic non-cancer and cancer inhalation exposure estimates, because it is unlikely that a worker would experience the high-end concentration repeatedly across days and years. Additionally, inhalation monitoring data was available for each SEG and indicate that workers in an exposure group experience a range of potential exposure concentrations, and that not all high exposure tasks are performed on a daily basis during a working year.

Additionally, as described below (see "Reported Use of Respiratory Protection by SEG "), it should be noted that proper use of respiratory protection during high-exposure tasks will likely reduce the overall full-shift exposures. Given the available information on respiratory PPE used during high exposure tasks for a select SEG within this OES (logistics technicians), high-end estimates are likely to over-estimate risk where respiratory PPE is worn properly during high-exposure tasks performed by workers in this SEG. For certain SEGs, EPA considered reasonably available information on PPE, which influenced EPA's reliance on high-end exposure estimates in the risk determination (see Section 6.2.1).

Estimates of occupational inhalation risks are presented in Table 5-27. Where the estimated MOE is below the benchmark value, an indication of the respirator APF needed to mitigate risk is also provided. In the case of test orders, there is data available on the use of respiratory protection. Additional discussion of the consideration of respiratory protection usage is provided below:

Reported Use of Respiratory Protection by SEG

Data was available in the test order summary report on respiratory PPE used at the monitored facilities, as described in Section 5.3.3. As previously noted, respirator use (as documented in Appendix N - Raw Sample Results of the Final Study Report), varied by SEG (Stantec ChemRisk, 2024). EPA has considered how information on reported use of respiratory protection may inform or refine the risk estimates used in the risk determination.

For the Processing as a Reactant OES, potential risks relative to benchmarks were not indicated for high-end (or central-tendency) acute, intermediate, or chronic inhalation for the following SEGs: operators, maintenance technicians, laboratory technicians, and ONUs (Table 5-27). EPA has not performed a review of respiratory protection reportedly worn by workers in these SEGs, but EPA acknowledges that if respiratory protection is worn by such workers, actual inhalation exposures to workers may be lower than monitored concentrations.

Use of respiratory protection varied within the logistics technician SEG, and not all logistics technicians sampled during the full-shift inhalation monitoring study were noted as wearing respirators (per Appendix N – Raw Sample Results of the final study report; (Stantec ChemRisk, 2024)). Respiratory protection was indicated for the eight highest full-shift samples in this SEG (8-hour TWA range: 0.32 to

2.4 ppm). Short-term and/or task-based samples were collected in parallel with six of these samples, and use of respiratory protection was documented during collection of these samples as well. No respiratory use was documented for the remaining nine full-shift samples reviewed, including the sample associated with the central tendency worker inhalation estimate (0.17 ppm, Table 5-6).

Additionally, Dow described that full face respirators (supplied air or air purifying respirators) are required to be worn during tote-changeout tasks that occur during the use of 1,2-dichloroethane as a catalyst moderator to synthesize ethylene oxide (Dow Chemical, 2026). This information is consistent with the information provided by the Vinyl Institute, which documented use of full-face respirators worn by operators during changeout of catalyst totes (see Table 16 of the Stantec ChemRisk report).

As there is evidence that logistics technicians wear respiratory protection during high-end exposure exposures but not during central-tendency exposures, EPA believes that the central tendency risk estimates likely do not overestimate operator exposures, and that high-end estimates are likely to over-estimate actual worker exposures due to known use of PPE. Per Table 5-26, a minimum APF of 10 was indicated to mitigate risks at the central tendency (acute, cancer), and an APF of 10 for intermediate and 25 for acute was indicated to mitigate risks at the high-end. Logistics technicians were generally described as wearing half-face or full-face respirators during loading or offloading tasks which required connecting and disconnecting process lines to railcars, tanks, and trucks (APF 10 to 50). Use of respiratory protection during high-intensity tasks may significantly reduce overall full-shift exposure if these tasks contribute to a large percentage of the potential exposure during a shift.

5.3.3.1.5 OES for Processing into Formulation, Mixture or Reaction Product

As described in Section 5.1.1.1, EPA estimated inhalation exposure for this OES based on monitoring data provided via a test order submission. Specifically, this was existing inhalation monitoring data generated during the manufacture of a herbicide used worldwide where 1,2-dichloroethane is used as a processing solvent (BASF, 2021). Inhalation monitoring data was provided for ONUs. A general description of worker activities for this OES is provided in Table 5-2.

This study contained 101 worker and 15 ONU personal full-shift samples; 66 worker and 15 ONU samples were below the LOD (range 0.1–2 ppm for workers and 0.1–0.3 ppm for ONUs). EPA calculated the 50th and 95th percentile 8-hr TWA concentrations to represent a central tendency and high-end estimate of potential occupational inhalation exposures, respectively, for this scenario. Non-detects were assessed at the LOD/2. The estimates of inhalation exposure are provided in Table 5-6.

EPA rated the weight of scientific evidence as moderate for this OES. The strengths included the high number of chemical and OES specific inhalation monitoring data. A primary limitation of the data is that it is a single site and may not be representative of all processing sites. Additionally, there were a large number of non-detects in this dataset, and the limit of detection (0.1 to 2 ppm) was high in comparison to other datasets and to the benchmarks utilized in this risk evaluation. Particularly for ONUs, it should be noted that all the samples were below the limit of detection. EPA assessed non-detect values at the LOD/2. Additionally, for workers, the majority of samples were also below the limit of detection, and EPA also assessed these values at the LOD/2. EPA was unable to pursue other statistical analysis methods due to confidentiality claims on the underlying dataset, which EPA would not be able to protect from disclosure by masking the statistical analysis. As such, EPA has lower confidence in these estimates. EPA believes it is reasonable to use both the central tendency and high-end values for use in risk determination due to the large amount of data used to determine these values.

EPA then estimated the doses for evaluation of acute, intermediate, chronic non-cancer and cancer effects. The parameters of exposure days and working years impact the estimates of the doses for chronic non-cancer and cancer effects. EPA assumed up to 250 days/yr 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 actual maximum number of exposures days for an individual worker within an SEG for this OES may be less than 250. For working years, EPA used central tendency and high-end values based on BLS data of 31 yr and 40 yrs respectively.

Estimates of occupational inhalation risks are presented in Table 5-27. Where the estimated MOE is below the benchmark value, an indication of the respirator APF needed to mitigate risk is also provided. EPA did not identify any information on respiratory protection usage for this OES. Some information on PPE was available from the ESD on Adhesive Formulation, indicating potential use of gloves and safety glasses with side shields or goggles; there was no information on respiratory PPE in the ESD (see Table 5-28). Due to a lack of information, EPA is unable to further refine these risk estimates. If proper respiratory protection is utilized, worker exposures will be reduced.

5.3.3.1.6 OES for Industrial Application of Adhesives and Sealants

As described in Section 5.1.1.1, EPA estimated inhalation exposure based on surrogate monitoring data. EPA did not identify any 1,2-dichloroethane inhalation monitoring data for this OES. Empirical data on inhalation exposure was available for trichloroethylene for this OES. Trichloroethylene has a vapor pressure similar to 1,2-dichloroethane and the data was included in the published risk evaluation for trichloroethylene. The trichloroethylene monitoring data were obtained from a NIOSH Health Hazard Evaluation report (HHEs) and three OSHA facility inspections (OSHA, 2017; Chrostek, 1981). EPA assessed exposures for the exposure groups of workers and ONUs. A general description of worker activities for this OES is provided in Table 5-2.

The inhalation exposure monitoring data encompass exposures from facilities using trichloroethylene in adhesive and coating applications. The data includes 22 samples for workers and 2 samples for ONUs. There were no samples below the limit of detection. EPA used the monitoring data to estimate the 50th percentile as central tendency and the 95th percentile as the high-end exposures for workers and ONUs. For data sets with two data points, EPA uses the average of the two data points for the central tendency and the highest data point for the high-end exposure. The estimates of inhalation exposure are provided in Table 5-7.

EPA rated the weight of scientific evidence as moderate for this OES. The strengths included the use of PBZ inhalation monitoring data, similar OES and similarity in vapor pressure of the surrogate data chemical to 1,2-dichloroethane (73.5 mm Hg for trichloroethylene vs. 78.9 mm Hg for 1,2-dichloroethane). The limitations include the use of surrogate data as a less preferred approach for estimating inhalation exposure (as described in Table 5-1). Additionally, this is a broad condition of use and the number of samples available is not considered large enough to support a higher confidence rating.

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. For working years, EPA used central tendency and high-end values based on BLS data of 31 years and 40 years respectively.

The data and confidence support the use of the central tendency and high-end exposures for assessment of non-cancer acute and intermediate risk and the central tendency for the assessment of chronic and cancer risks. EPA considers that high-end exposure and risk estimates are most appropriate for consideration of shorter duration exposures (acute, intermediate). Chronic non-cancer and cancer effects involved repeated exposures over a high exposure frequency and high number exposure days. Use of the high-end estimate in combination with these other conservative default values may result in an overly conservative estimate of chronic risk for this OES.

Estimates of occupational inhalation risks are presented in Table 5-27. Where the estimated MOE is below the benchmark value, an indication of the respirator APF needed to mitigate risk is also provided. Some information on PPE was available from the ESD on the Use of Adhesives, indicating potential use of gloves and safety glasses or goggles, and sometimes respirators (see Table 5-28). Due to a lack of specific information (*e.g.,* respirator type utilized during specific tasks), it is uncertain how usage of respiratory protection may influence the exposures estimated for this OES, and EPA is unable to further refine these risk estimates. Where proper respiratory protection is utilized, worker exposures will be reduced.

5.3.3.1.7 OES for Industrial Application of Lubricants

The Agency did not identify any empirical inhalation monitoring data that could be used for this OES (See Section 5.1.1.1). Therefore, EPA used a modeling approach to estimate inhalation exposures. Specifically, EPA used a near-field/far-field modeling approach to estimate inhalation exposures. EPA has developed a specific application of the near-field/far-field, the EPA/OPPT Brake Servicing Model, which has been used in previous EPA risk evaluations. The model estimates exposures from the application of lubricants during reservicing of brakes. For this OES, EPA assessed exposure for the generic exposure groups of workers and ONUs. A description of the worker activities are provided in Table 5-2.

The model uses inputs of the amount of lubricant applied and then estimates the exposure concentrations in the near-field to the workers applying the lubricant, and also the exposure concentrations in the far-field for ONUs. The amount of lubricant applied is a key determinant in the estimates of exposure. EPA's estimate was based on site data from automotive maintenance and repair shops obtained by the California Air Resources Board (CARB, 2000) along with data from SDS on the weight% of 1,2-dichloroethane in these products.

EPA executed the model using a probabilistic modeling approach with Monte Carlo. EPA defines a range of values and distribution types for the release and exposure parameters in the model. The model is executed with 100,000 iterations with each iteration representing a different combination of values. The number of iterations was set at 100,000 as a sufficient number for the model results to converge on the values for the exposure distribution. EPA's practice is to use the 50th percentile results to represent the central tendency and the 95th percentile to represent the high-end exposure. The outputs of the model are estimates of inhalation exposure as an 8-hr TWA and are presented in Table 5-6.

The model includes a parameter for air exchange rate. Higher air exchange rates where the lubricant is applied would lead to lower exposures. EPA used a triangular distribution for this parameter consisting of lower bound, mode and upper bound values. The model results take this parameter into account.

EPA assumed up to 250 days/yr of exposure based on assumptions that each exposure group could have tasks that needed to be performed on a daily basis 5 days per week and 50 weeks per year. For working years, EPA used central tendency and high-end values based on BLS data of 31 year and 40 years respectively. The actual maximum number of exposures days and years may be less than these estimates.

EPA rates the weight of scientific evidence as slight-to-moderate for this scenario. The strengths are in the basis and source for the estimates of the amount of 1,2-dichloroethane applied based on the CARB data and data on weight percent. The limitations are in the uncertainty of the representative of this OES for this COU for 1,2-dichloroethane. Applications of lubricants containing 1,2-dichloroethane may involve smaller quantities under more controlled conditions than was modeled for this OES, which would lead to lower exposure levels. Overall, EPA considers the central tendency results as suitable for risk determination for all risk estimates. Due to the uncertainties described above, use of the high-end estimate is likely to be overly conservative.

Estimates of occupational inhalation risks are presented in Table 5-27. Where the estimated MOE is below the benchmark value, an indication of the respirator APF needed to mitigate risk is also provided. Consistent with monitoring data, the model estimates the exposure concentrations near the worker's breathing zone and does not consider exposure reduction that results from the use of respiratory protection. No information on respirators was found in the EPA GS/Emission Scenario Documents and NIOSH HHEs for this OES. Due to a lack of information, EPA is unable to further refine these exposure and risk estimates. Where proper respiratory protection is utilized, worker exposures will be reduced.

5.3.3.1.8 OES for Industrial and Commercial Non-Aerosol Cleaning and Degreasing

As described in Section 5.1.1.1, EPA estimated inhalation exposure based on surrogate monitoring data. EPA did not identify any inhalation monitoring data related to the use of 1,2-dichloroethane in non-aerosol degreasers. Empirical data on inhalation exposure was available for trichloroethylene for this OES. Trichloroethylene has a vapor pressure similar to 1,2-dichloroethane and the data was included in the published risk evaluation for trichloroethylene. The trichloroethylene monitoring data were obtained from NIOSH Health Hazard Evaluation report (HHEs). EPA assessed exposures for the generic exposure groups of workers and ONUs. A general description of worker activities for this OES is provided in Table 5-2.

The data encompasses exposures from various industries such as metal tube production, valve manufacturing, jet and rocket engine manufacturing, air conditioning preparation and assembly and air conditioning motor parts. EPA used data on trichloroethylene exposures from open-top vapor degreasing based on the availability of surrogate monitoring data and because this process presents a conservative estimate of exposure due to its higher exposure potential. Trichloroethylene also has a robust dataset with 113 samples for workers and 10 samples for ONUs. All samples were above the limit of detection. EPA used the monitoring data to estimate the 50th percentile as central tendency and the 95th percentile as the high-end exposures for workers and ONUs. All samples were above the limit of detection. The estimates of inhalation exposure are provided in Table 5-6.

EPA rated the weight of scientific evidence as slight-to-moderate for this OES. The strengths included the use of large dataset of PBZ inhalation monitoring data for a similar chemical. The limitations include the uncertainty in whether the vapor degreasing scenario assessed is representative of 1,2-dichloroethane for this COU.

EPA assumed up to 250 days/yr 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 actual maximum number of exposures days for an individual worker within an SEG for this OES may be less than 250. For working years, EPA used central tendency and high-end values based on BLS data of 31 yr and 40 yrs respectively.

The data and confidence support the use of the central tendency exposures for assessment of risks and use in risk determination. Due to the uncertainty in the exposure estimates (as described above), use of the high-end estimates may result in an overly conservative estimate of risk.

Estimates of occupational inhalation risks are presented in Table 5-27. Where the estimated MOE is below the benchmark value, an indication of the respirator APF needed to mitigate risk is also provided. Some information on PPE was available from the ESD on the Use of Vapor Degreasers and various NIOSH HHEs, indicating potential use of gloves and/or respirators – see Table 5-28. Due to a lack of specific information (*e.g.,* specific type of respirator used during specific tasks), it is uncertain how usage of respiratory protection may influence the exposures estimated for this OES, and EPA is unable to further refine these risk estimates. Where proper respiratory protection is utilized, worker exposures will be reduced.

5.3.3.1.9 OES for Industrial and Commercial Aerosol Product

The Agency did not identify any empirical inhalation monitoring data that could be used for this OES. Therefore, EPA used a modeling approach to estimate inhalation exposures (See Section 5.1.1.1).

EPA had limited evidence available to model this OES. As mentioned previously in discussion of modeling approaches, daily throughput of the chemical used at the site and the air emission rate from sources of air release are key exposure determinants. EPA did not find evidence for 1,2-dichloroethane from either the sources investigated as part of this risk evaluation or from comments on the draft risk evaluation to use as a basis for estimating these parameters for this OES. EPA did have data from two SDS to use as the basis for estimating the weight percent of 1,2-dichloroethane in the aerosol product which were both greater than 90%. EPA considered its existing modeling approaches and selected the near-field/far-field, EPA/OPPT Brake Servicing Model as the closest available model to assess this OES. For this OES, EPA assessed exposure for the generic similar exposure groups of workers and ONUs. A description of the worker activities in provided in Table 5-2.

The exposure model uses a near-field/far-field approach (AIHA, 2009), where an aerosol application located inside the near-field generates a mist of droplets, and indoor air movements lead to the convection of the droplets between the near-field and far-field. Workers are assumed to be exposed to droplet concentrations in the near-field, while ONUs are exposed at concentrations in the far-field. EPA's estimate was based on site data from automotive maintenance and repair shops obtained by the California Air Resources Board (CARB, 2000) along with data from the SDS mentioned above on the weight percent of 1,2-dichloroethane in these products.

EPA executed the model using a probabilistic modeling approach with Monte Carlo. EPA defines a range of values and distribution types for the release and exposure parameters in the model. The model is executed with 100,000 iterations with each iteration representing a different combination of values. The number of iterations was set at 100,000 as a sufficient number for the model results to converge on the values for the exposure distribution. EPA's practice is to use the 50th percentile results to represent the central tendency and the 95th percentile to represent the high-end exposure. The outputs of the model are estimates of inhalation exposure as an 8-hour TWA and are presented in Table 5-6.

The model does include a parameter for air exchange rate. Higher air exchange rates where the aerosol product is applied would lead to lower exposures. EPA used a triangular distribution for this parameter consisting of lower bound, mode and upper bound values. The model results take this parameter into account.

EPA assumed up to 250 days/yr of exposure based on assumptions that each exposure group could have tasks that needed to be performed on a daily basis 5 days per week and 50 weeks per year. The actual maximum number of exposures days for an individual worker within this OES may be less than 250. For working years, EPA used central tendency and high-end values based on BLS data of 31 yr and 40 yrs respectively. The actual maximum number of exposures days and years may be less than these estimates.

Due to the lack of monitoring data and the uncertainty in the OES modeled for this COU, EPA concluded that the weight of scientific evidence for this assessment provides an estimate of exposure of slight confidence. Overall, EPA considers the central tendency results for acute and intermediate risks as suitable for risk determination. Use of the central tendency results for assessment of chronic risks and use of the high-end estimate may be overly conservative due to uncertainty and the slight confidence rating. Consistent with monitoring data, the model estimates the exposure concentrations near the worker's breathing zone and does not consider exposure reduction that result from the use of respiratory protection.

Estimates of occupational inhalation risks are presented in Table 5-27. Where the estimated MOE is below the benchmark value, an indication of the respirator APF needed to mitigate risk is also provided. Estimation of chronic non-cancer and cancer risks include values for exposure frequency and working years. EPA assumed up to 250 days/yr 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 actual maximum number of exposures days for an individual worker within an SEG for this OES may be less than 250. For working years, EPA used central tendency and high-end values based on BLS data of 31 yr and 40 yrs respectively. The occupational inhalation risk estimates are provided in Table 5-27. No information from EPA GS/Emission Scenario Documents and NIOSH HHEs on Inhalation PPE was found for this OES. No information on respirators was found in the EPA GS/Emission Scenario Documents and NIOSH HHEs for this OES. Due to a lack of information, EPA is unable to further refine these risk estimates. Where proper respiratory protection is utilized, worker exposures will be reduced.

5.3.3.1.10 OES for Laboratory Use

Empirical data on inhalation exposure for 1,2-dichloroethane were provided via a test order submission from Vinyl Institute, which includes manufacturers and processors of 1,2-dichloroethane. The sampling was done following an EPA-approved study plan. Inhalation data from the worker description laboratory technicians were used as analogous in the assessment of this OES. Within this dataset EPA identified 48 worker full-shift PBZ samples for laboratory technicians, which included 29 samples for manufacturing (0 below the LOD), 9 from manufacturing as a byproduct (0 below the LOD), and 10 from processors (2 below the LOD, <0.1 ppb). These laboratory technicians conducted routine daily tasks such as preparing samples for analysis, preparing chemical solutions or standards, cleaning laboratory equipment and glassware, and data input, interpretation, and analysis. Disposal of gas chromatography (GC) waste was reported to occur on a weekly basis, and sample analyses varied in frequency (daily, weekly, monthly, or as needed).

EPA also reviewed additional inhalation data provided via a test order submission, which was existing data generated during the manufacture of an herbicide (BASF, 2021). This study contained four worker personal sample data points where metadata implied laboratory work; all samples were below the LOD (<0.1 ppm). Non-detects were assessed at the LOD/2. The worker data is within the same order of magnitude as the data from the laboratory data from the Vinyl Institute test order. However, due to the large number of non-detects and the high limit of detection relative to benchmarks, there is greater uncertainty and reduced confidence in these exposure estimates.

In addition, EPA reviewed methylene chloride data previously submitted to EPA for academic laboratories (EPA-HQ-OPPT-2020-0465-0464). The commentor provided mean 8-hour TWAs for three data sets: limited engineering controls (41 samples), engineering controls (39 samples), and total (80 samples). EPA used the mean of the total samples for the central tendency and the maximum value as the high-end result. The results are presented in Table 5-6.

EPA used the monitoring data to estimate the 50th percentile as central tendency and the 95th percentile as the high-end exposures for workers. EPA did not identify any ONU PBZ samples; while ONUs were sampled as part of the inhalation monitoring study submitted by Vinyl Institute, these ONUs were not specifically associated with laboratories. Therefore, the Agency used the central tendency from workers to represent ONU exposures.

EPA rated the weight of scientific evidence as moderate-to-robust for this OES. Strengths include the use of PBZ data, the amount of data, and multiple data sources and settings represented. These data capture many of the tasks that are expected to occur in a laboratory setting. However, there is uncertainty with applying data from specific laboratory settings, such as QA/QC laboratories in manufacturing settings, to other laboratory settings. EPA considered data from academic laboratories to fill in potential data gaps on other laboratory settings where manufacturing/processing does not occur, however, this was surrogate data for another chemical. The use of analogous or surrogate data is a less preferred approach for estimating inhalation exposure compared to the use of inhalation monitoring data that is specific to the chemical and OES (as described in Table 5-1).

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. For working years, EPA used central tendency and high-end values based on BLS data of 31 years and 40 years respectively.

The data and confidence support the use of the central tendency and high-end exposures for assessment of non-cancer acute and intermediate risk and the central tendency for the assessment of chronic and cancer risks. EPA considers that high-end exposure and risk estimates are most appropriate for consideration of shorter duration exposures (acute, intermediate). Chronic non-cancer and cancer effects involved repeated exposures over a high exposure frequency and high number exposure days. Use of the high-end estimate in combination with these other conservative default values may result in an overly conservative estimate of chronic risk for this OES.

Estimates of occupational inhalation risks are presented in Table 5-27. Where the estimated MOE is below the benchmark value, an indication of the respirator APF needed to mitigate risk is also provided. While the test order submission from Vinyl Institute included information on respiratory protection worn by laboratory technicians in the manufacturing and processing facilities where inhalation monitoring was sampled, EPA has uncertainty as to if these data are representative of PPE use in other laboratory settings (those not associated with manufacturing/processing settings). As previously described, use of a respirator was indicated for one of 29 full-shift samples collected on laboratory technicians in the manufacturing setting. More generally, the test order documentation described that certain laboratory personnel wore full-face, air purifying respirators during disposal of hazardous wastes from fume hoods. However, this information was specific to manufacturing and processing facilities, and there is a lack of certainty as to if this PPE usage applies to workers in commercial laboratories. Additionally, some information on PPE was available from the Use of Laboratory Chemicals GS, indicating potential use of gloves, face shields, goggles, and respirators (see Table 5-28). Where proper respiratory protection is utilized, worker exposures will be reduced.

5.3.3.1.11 OES for Waste Handling, Treatment, and Disposal – Landfill

EPA did not identify any personal breathing zone monitoring data but did identify area monitoring data for 1,2-dichloroethane from a landfill study in Greece, which included a total of 12 samples. The landfill receives both municipal and industrial waste. Samples were collected at three locations at the landfill facility, two locations (8 samples total) were in the landfill area itself, and one location (4 samples) was near the landfill boundaries. There were no non-detect samples. Area monitoring can be used for estimating inhalation exposures by making assumptions on the duration that workers may be near where the area monitor is located (See Table 5-1). EPA assumed up to 8 hours in estimating 8-hr TWAs from the area monitoring data. EPA assessed exposure for the generic exposure groups of workers and ONU. Worker activity information is provided in Table 5-2.

From these monitoring data, EPA calculated the 50th and 95th percentile 8-hour TWA concentrations to estimate a central tendency and high-end estimate of potential occupational inhalation exposures, respectively, for landfill sites. Results are presented in Table 5-6.

EPA rated the weight of scientific evidence as slight for this OES for assessment of inhalation exposure. The primary strength of these data is that they are directly applicable concentration data that portray the concentration of 1,2-dichloroethane in the air at 3 locations around an active landfill. The primary limitations of these data are (1) the age of the data (samples taken in 1989 and 1990); (2) only area samples were available as opposed to personal breathing zone air concentration data; (3) the data come from a non-U.S. facility (Greece), which may not be representative of U.S. facilities; and (4) the data are from a single landfill, which may not be representative of all landfills as pollutant concentrations surrounding a landfill can vary depending on the composition and structure of the landfill.

EPA assumed up to 250 days/yr 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 assuming 50 weeks per year and 5 days per week. The actual maximum number of exposures days for an individual worker within an SEG for this OES may be less than 250. For working years, EPA used central tendency and high-end values based on BLS data of 31 yr and 40 yrs respectively.

The data and confidence support the use of both the central tendency and high-end exposure estimates for assessment of acute, intermediate, chronic non-cancer and cancer risks. Normally, the slight confidence would preclude the use of the high-end estimate for the assessment of chronic risks. In this case the combination of using area monitoring data with incomplete metadata may result in an underestimate of the high-end exposure.

Estimates of occupational inhalation risks are presented in Table 5-27. Where the estimated MOE is below the benchmark value, an indication of the respirator APF needed is also provided.
No information from EPA Generic Scenarios/Emission Scenario Documents and NIOSH HHEs on Inhalation PPE was found for this OES. Due to a lack of information, EPA is unable to further refine these risk estimates. Where proper respiratory protection is utilized, worker exposures will be reduced.

5.3.3.1.12 OES for Waste Handling, Treatment, and Disposal – POTW and Non-POTW WWT

For these OESs, EPA had discrete personal breathing zone monitoring data that were used in this assessment. EPA used inhalation data provided via test order submission, as well as additional industrial hygiene monitoring data that was submitted as part of the public comments. Two samples relevant to this OES were provided in the test order, and these were collected from a maintenance supervisor and a wastewater operator. Both samples were above the limit of detection (provided in Table 5-26). As part of the public comments, EPA received samples collected from operators (69) and ONUs (2) across seven facilities from Vinyl Institute EDC Consortium member companies. Out of the 71 total samples, 37 were below the limit of detection (LOD). The LOD for all non-detect samples ranged from 0.024 ppm to 0.28 ppm.[12]

EPA rated the weight of scientific evidence as moderate for this OES. The Agency used 1,2-dichloroethane inhalation data to assess inhalation exposures, having a high data quality rating from systematic review. The primary strength of these data is the use of directly applicable personal breathing zone data obtained from workers at a wastewater treatment plant. The data represent exposure due to several processes that commonly occur at wastewater treatment plants. The primary limitations of these data are that there is limited metadata or information about how the data was collected, and the high LOD for many samples.

EPA assumed up to 250 days/yr 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 assuming 50 weeks per year and 5 days per week. The actual maximum number of exposures days for an individual worker within an SEG for this OES may be less than 250. For working years, EPA used central tendency and high-end values based on BLS data of 31 yr and 40 yrs respectively.

The data and confidence support the use of both the central tendency (50th percentile and high-end (95th percentile) exposure estimates for assessment of acute and intermediate risks and the use of CT estimate in the assessment of chronic non-cancer and cancer risks. The uncertainties of the high-end assessment in combination of repeated exposures at this level for assessment of chronic risks may be overly conservative.

Estimates of occupational inhalation risks are presented in Table 5-27. Where the estimated MOE is below the benchmark value, an indication of the respirator APF needed to mitigate risk is also provided. No information from EPA Generic Scenarios/Emission Scenario Documents and NIOSH HHEs on respiratory PPE was found for this OES. EPA reviewed the two personal breathing zone samples collected as part of the test order that were relevant to this OES; use of respiratory protection was not documented for either worker. EPA identified information on respiratory protection worn by workers in biological wastewater treatment areas and facilities associated with 1,2-dichloroethane manufacturing and processing facilities (VI March 2026). Specifically, certain operators were described as wearing half-face APR respirators. Other workers were not described as wearing respiratory protection. Where proper respiratory protection is utilized, worker exposures will be reduced.

5.3.3.2 Occupational Dermal Exposure Risk Characterization

This section provides summary tables and dermal risks Table 5-28, as well as a discussion of the risk characterization for dermal exposures. Table 5-28 provides occupational dermal MOEs for the OES and worker categories assessed for 1,2-dichloroethane. Working years is a parameter that impacts the estimates of chronic cancer risks. EPA had OES specific data for several of these OES. The table provides both estimates based on the OES specific data for working years as well as the working years based on BLS data. The risk characterization in these cases is based on the results using the OES

[12] EPA reanalyzed the data for values below the LOD using three methods: LOD/2 substitution, maximum likelihood estimation (MLE), and the Kaplan–Meier estimator. Results were comparable across methods and did not materially change CT or HE risk estimates; therefore, no updates were made for this OES.

specific data. General information on PPE, including dermal protection is available in Appendix K, and more specific information is included in this subsection.

Table 5-28. Occupational Dermal Risk Summary Table

COU		OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 100)[c]	Cancer – BLS Working Years (Benchmark = 1.0E−04)	Cancer – Vinyl Institute Working Years (Benchmark = 1.0E−04)
Life Cycle Stage	Category / Subcategory				MOE – No Gloves [a]	MOE – No Gloves [a]	MOE – No Gloves [a]	No Gloves [a]	No Gloves [a]
Manufacturing	Domestic manufacture / Domestic manufacture	Manufacturing [b]	Operator	CT	497	221	237	**4.0E−04**	**2.7E−04**
				HE	290	129	NE	NE	NE
			Logistic technician	CT	497	221	237	**4.0E−04**	**2.7E−04**
				HE	287	128	NE	NE	NE
Manufacturing	Domestic manufacture / Domestic manufacture	Manufacturing [b]	Maintenance technician	CT	497	221	237	**4.0E−04**	**2.7E−04**
				HE	290	129	NE	NE	NE
			Laboratory technician	CT	497	221	237	**4.0E−04**	**2.7E−04**
				HE	290	129	NE	NE	NE
		Manufacturing as an Unintended Byproduct [b]	Operator	CT	497	221	237	**4.0E−04**	**2.7E−04**
				HE	290	129	NE	NE	NE
			Logistics technician	CT	497	221	237	**4.0E−04**	**2.7E−04**
				HE	290	129	NE	NE	NE
			Maintenance technician	CT	497	221	237	**4.0E−04**	**2.7E−04**
				HE	290	129	NE	NE	NE
			Laboratory technician	CT	497	221	237	**4.0E−04**	**2.7E−04**
				HE	290	129	NE	NE	NE
Manufacturing	Import / Import	Repackaging	PBZ	CT	497	221	258	**3.7E−04**	N/A
Processing	Repackaging / Repackaging			HE	290	129	147	**7.3E−04**	N/A

COU		OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 100)[c]	Cancer – BLS Working Years (Benchmark = 1.0E−04)	Cancer – Vinyl Institute Working Years (Benchmark = 1.0E−04)
Life Cycle Stage	Category / Subcategory				MOE – No Gloves [a]	MOE – No Gloves [a]	MOE – No Gloves [a]	No Gloves [a]	No Gloves [a]
Processing	Processing – as a reactant / Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing	Processing as a Reactant [b]	Operator	CT	497	221	237	**4.0E−04**	**2.8E−04**
				HE	290	129	NE	NE	NE
			Logistics technician	CT	497	221	237	**4.0E−04**	**2.8E−04**
				HE	290	129	NE	NE	NE
			Maintenance technician	CT	497	221	237	**4.0E−04**	**2.8E−04**
				HE	290	129	NE	NE	NE
			Laboratory technician	CT	497	221	237	**4.0E−04**	**2.8E−04**
				HE	290	129	138	**7.8E−04**	**5.9E−04**
Processing	Recycling / Recycling		Herbicide manufacture	CT	497	221	237	**4.0E−04**	**2.7E−04**
Industrial Use	Process regulator / *e.g.,* Catalyst moderator; oxidation inhibitor			HE	290	129	138	**7.8E−04**	**5.9E−04**

COU		OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 100)[c]	Cancer – BLS Working Years (Benchmark = 1.0E−04)	Cancer – Vinyl Institute Working Years (Benchmark = 1.0E−04)
Life Cycle Stage	Category / Subcategory				MOE – No Gloves [a]	MOE – No Gloves [a]	MOE – No Gloves [a]	No Gloves [a]	No Gloves [a]
Processing	Processing – incorporated into formulation, mixture, or reaction product / Fuels and fuel additives: all other petroleum and coal products manufacturing / Processing aids: specific to petroleum production / Adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing	Processing into Formulation, Mixture, or Reaction product	Worker	CT	784	349	374	**2.5E−04**	N/A
Industrial Use	Other use / Process solvent			HE	324	144	155	**6.7E−04**	N/A
Industrial Use	Adhesives and sealants / Adhesives and sealants	Industrial Application of Adhesives and Sealants	Worker	CT	498	222	333	**2.9E−04**	N/A
				HE	281	125	164	**6.5E−04**	N/A

COU		OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 100)[c]	Cancer – BLS Working Years (Benchmark = 1.0E−04)	Cancer – Vinyl Institute Working Years (Benchmark = 1.0E−04)
Life Cycle Stage	Category / Subcategory				MOE – No Gloves [a]	MOE – No Gloves [a]	MOE – No Gloves [a]	No Gloves [a]	No Gloves [a]
Industrial Use	Lubricants and greases / Solid film lubricants and greases	Industrial Application of Lubricants and Greases	Worker	CT	1.2E04	5,492	5,880	1.6E−05	N/A
				HE	6,512	2,901	3,106	3.4E−05	N/A
Industrial Use	Solvents (for cleaning and degreasing) / Degreasing and cleaning solvents	Industrial and Commercial non-Aerosol Cleaning/ Degreasing	Worker	CT	500	223	238	**4.0E−04**	N/A
				HE	292	130	139	**7.8E−04**	N/A
		Commercial Aerosol Products (Aerosol Degreasing, Aerosol Lubricants)	Worker	CT	523	233	250	**3.8E−04**	N/A
				HE	305	136	146	**7.4E−04**	N/A
Commercial Use	Other use / Laboratory chemical	Laboratory Use	Worker	CT	580	258	301	**3.2E−04**	N/A
				HE	**3.7**	97.5	133	**1.7E−04**	N/A
Disposal	Disposal / Disposal	Waste Handling, Treatment, and Disposal (Landfill)	Worker	CT	784	349	374	**2.5E−04**	N/A
				HE	324	144	154	**6.8E−04**	N/A
		Waste Handling, Treatment, and Disposal (POTW and Non-POTW WWT)	Worker	CT	784	349	374	**2.5E−04**	N/A
				HE	324	144	154	**6.8E−04**	N/A

COU = condition of use; CT = central tendency; HE = high end; MOE = margin of exposure; NE = not evaluated; OES = occupational exposure scenario; POTW = publicly owned treatment works; PPE = personal protective equipment; WWT = wastewater treatment

BLS estimates based on working year demographic data from the Bureau of Labor Statistics (U.S. Census Bureau, 2019; U.S. BLS, 2014). Vinyl Institute estimates based on working year demographic data from provided for manufacturing, manufacturing as a byproduct, and processing as a reactant (VI, 2026) (EPA-HQ-OPPT-2018-0427-0181). Vinyl Institute estimates only applicable to certain OES.

[a] Risk estimates that exceed the benchmark (*i.e.,* non-cancer risks less than the risk benchmark and cancer risks exceeding the cancer risk benchmark) are bolded and shaded.

[b] The central tendency from DEVL model is considered a more representative and appropriate exposure estimate for a frequent, repeated dermal exposure (*i.e.,* chronic) for closed system processes.

[c] For chronic, non-cancer exposure estimates, exposure dose over the working years is averaged over the working years. Therefore, different values of working years do not affect these estimates, and EPA has presented one chronic, non-cancer estimate. For more information, including example calculations, please see Appendix B and C of the Occupational Exposure Assessment for 1,2-Dichloroethane.

The dermal exposure assessment used the DEVL Model to estimate dermal exposures. A key strength of the approach used was the use of data on fractional absorption that was developed from a TSCA section 4 test order for 1,2-dichloroethane requesting the guideline OECD 428 *in vitro* dermal absorption study utilizing human skin relevant to the risk evaluation. Because 1,2-dichloroethane is a highly volatile chemical, any estimate of dermal exposure must take volatility into account which was quantified by the vapor trap in the study. The tests were conducted using 100% (neat), 50%, 10%, and 1% concentrations of 1,2-dichloroethane. Due to its volatility, the study results had high variability within individual test concentrations as well as across the test concentrations. To address this uncertainty and variability, EPA statistically adjusted the mean absorption values for each test concentration of 1,2-dichloroethane (for detailed calculations, see (U.S. EPA, 2026ap)). Furthermore, EPA has assumed that the 0.3% fraction absorbed for the various test fractions of 1,2-dichloroethane are fully absorbed through the skin and dermal exposures are equal to the systemic dose. This is based on the test order data where the amount in the receptor fluid (representing blood tissue) is at steady state and thus represents the actual systemic dose. For the neat chemical (100% 1,2-dichloroethane) the adjusted fraction absorbed is 0.3%.

This approach of adjusting for variability and lost mass enabled EPA to generate a more accurate estimate of dose (Labcorp Early Development, 2024). A prior *in vitro* dermal absorption study (DuPont Haskell Lab, 2005) was submitted under a TSCA test rule, "In Vitro Dermal Absorption Rate Testing of Certain Chemicals of Interest to the Occupational Health and Safety Administration" (69 FR 22402 [April 26, 2004]), for derivation of a permeability coefficient (Kp) and short-term absorption rates at 10 and 60 minutes the values derived from this study were not applied in the DEVL model. This 2004 study only tested the neat chemical for short durations and not the full COUs under TSCA with respect to vehicles, concentrations and exposure durations. The rationale for the issuance of the TSCA section 4 test order for 1,2-dichlorethane was to allow for test preparations of various 1,2-dichloroethene concentrations that were more representative to COU/OES exposure scenarios for workers. Furthermore, the concentration of 1,2-dichloroethane in the test compartments was measured up to 24 hours following an 8-hour exposure period to monitor 1,2-dichlorethane absorption throughout the work shift and after to monitor 1,2-dichloroethane translocation even after cessation of exposure. Additionally, the availability of multiple fraction absorption values for 1,2-dichloroethane based on the various concentrations (1, 10, 50%, and neat) tested in the test order allows for application and alignment of the corresponding COU/OES to the most representative absorption value to mimic occupational exposures.

The dermal loading values (mg/cm^2) used for the DEVL Model are based on experimental studies and EPA is applying these loading values for exposure scenarios that are encountered in the industrial and commercial settings for the COU/OES identified for 1,2-dichloroethane. The experimental study used oils as substances to measure the applied amount on skin as opposed to solvents which are less viscous. The modeling approach includes a weight fraction parameter that accounts for differences in the weight fraction of 1,2-dichloroethane between OESs. However, it does not account for other differences that may exist among the OESs that impact dermal exposure such as differences in dermal loading, skin surface area exposed, and frequency of contact. The weight of scientific evidence was rated as moderate for the dermal modeling method used to assess dermal exposure for the COU/OES of 1,2-dichloroethane.

In executing the DEVL Model, EPA used a probabilistic modeling approach with Monte Carlo to incorporate variability in the values for model parameters. This calculation included variation in fraction absorbed for different weight percents of 1,2-dichloroethane among the various OES. The model estimates the acute absorbed dose rate. There is limited data available on dermal exposure in industrial and commercial settings to for comparison of the model results.

For dermal exposure for all OES, generally EPA considers that high-end exposure and risk estimates are most appropriate for consideration of shorter duration exposures (acute, intermediate), while central tendency values are appropriate for consideration for chronic exposures, without consideration of existing glove protection. EPA has lower-confidence that high-end dermal exposures are representative for chronic non-cancer and cancer dermal exposure estimates, because it is unlikely that a worker would experience the high-end concentration for dermal contact repeatedly across operating days and working years.

Discussion of Reported Use of Dermal PPE

The DEVL model estimates the acute absorbed dose rate and does not take into account the protection provided by gloves when workers perform their tasks. For the OES where EPA received detailed information on the use of gloves by workers, EPA has further reviewed this information to understand how this may affect the risk estimates.

- Manufacturing and Processing OES

EPA has reviewed the information on glove use provided in the Vinyl Institute test order final study report and associated documentation (*e.g.,* Appendix N - Raw Sample Results) (Stantec ChemRisk, 2024)). Data were available from the test order summary report for the manufacturing and processing facilities monitored that indicated standard dermal PPE for production process areas included neoprene gloves and leather or cut-resistant gloves, while task-specific PPE in this area may include nitrile gloves or viton/butyl gloves. For logistic work areas, neoprene gloves were standard and task-specific PPE may include heavy duty nitrile gloves. Nitrile gloves were described as standard PPE for laboratory work areas.

Documented use of gloves varied by SEG and OES (Stantec ChemRisk report; Appendix N-Raw Sample Results). For manufacturing, use of gloves were documented for 85 of 162 full-shift samples (52%), 75 of 109 short-term samples (69%), and 45 of 77 task-length samples (58%). For manufacturing as a byproduct, use of gloves was documented for 36 of 53 full-shift samples (68%), 32 of 46 short-term samples (69%), and 15 of 21 task-length samples (71%). For processing as a reactant, use of gloves was documented for 22 of 53 full-shift samples (42%), 46 of 47 short-term samples (98%), and 21 of 25 task-length samples (84%). According to the final study report, workers in these facilities wear dermal PPE (such as chemical resistant gloves) during specific tasks that were more likely to result in chemical exposure. Chemical-resistant gloves were noted as minimum PPE requirements for closed and open-loop sample processing, for example (Appendix C, Stantec ChemRisk). Additionally, Dow described that chemical resistant gloves and suit utilized as PPE during operations that use 1,2-dichloroethane as a catalyst moderator to synthesize ethylene oxide (EPA-HQ-OPPT-2018-0427-0162).

Based on the available information, workers in manufacturing and processing settings were documented as wearing gloves when the inhalation monitoring was performed, including during specific tasks where exposures were reported to occur. As there are no dermal exposure measurements available, EPA is unable to evaluate the reported usage of gloves in the context of specific exposure measurements or concentrations. Additionally, as previously noted, there are no established quantitative protection factors for gloves. Nonetheless, the occupational risk estimates, which do not include or assume the use of gloves, may be an over-estimate of dermal exposures.

- Other OESs

There is limited information on use of dermal PPE for other OESs. While EPA recognizes that workers in these OES may wear PPE, there is a lack of specific information available to further refine or discuss how the potential use of such PPE may inform interpretation of the risk estimates.

5.3.4 Risk Estimates for Workers from Byproducts Formed from 1,2-Dichloroethane Manufacturing

The *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j) contains details of the risk estimates of the byproducts produced during the manufacture of 1,2-dichloroethane. Risk estimates for exposure to the light-/heavy-end streams (high-end exposures) are presented in Table 5-29. Risk estimates for exposure to the unpurified 1,2-dichloroethane stream (low-end exposures) are presented in Table 5-30. High-end, screening-level exposures for trichloroethylene and carbon tetrachloride showed risk to workers; therefore, EPA further refined these analyses by performing Monte Carlo analysis to vary the concentration from the low- to high-end exposures (equal distribution) as well as separating the exposures by SEG. These results are presented in Table 5-31.

As previously described, when calculating chronic cancer estimates, EPA utilized information on working years from both BLS (U.S. Census Bureau, 2019; U.S. BLS, 2014) and the Vinyl Institute (VI, 2026) (EPA-HQ-OPPT-2018-0427-0181). The central tendency and high-end estimates of working years from BLS represents an estimate of lifetime career working years and is not specific to the manufacturing of 1,2-dichloroethane. The demographic data provided by the Vinyl Institute is industry provided data on length of service (years) for workers currently employed at the facilities in which the inhalation monitoring was performed. Therefore, the working years data provided by Vinyl Institute does not represent lifetime working years. 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 (see Appendix B, Equations B-4 to B-5). As such, EPA has included one set of chronic, non-cancer values.

For both the high- and low-end exposure results, there is no inhalation or dermal risk estimates exceeding Agency benchmarks for 1,1-dichloroethane, perchloroethylene, or methylene chloride. Trichloroethylene presents chronic non-cancer inhalation risk for operators and laboratory technicians at high-end exposures. Carbon tetrachloride presents both chronic non-cancer and cancer inhalation risk for operators (both central tendency and high-end), maintenance technicians (high-end), laboratory technicians (high-end), and ONUs (high-end). Carbon tetrachloride also presents cancer risks for maintenance technicians (central tendency), logistics technicians (high-end), laboratory technicians (central tendency), and ONUs (central tendency). For dermal exposures, carbon tetrachloride presents cancer risk for workers at central tendency exposures. For additional details on these estimates, refer to *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j).

In cases where there is estimated risk exceeding Agency benchmarks, Table 5-29 also provides the minimum level of PPE that would be needed for estimated MOEs to meet the indicated benchmark, which is indicated using an Assigned Protection Factor (APF) in the case of inhalation exposure. APF value indicates the level of protection provided by a respirator. Again, OSHA has not established protection factors for gloves. Where no risk is estimated, no APF is provided. The test order submission from the Vinyl Institute provided data on the use of respiratory protection (Stantec ChemRisk, 2024). Such information is discussed in the risk characterization.

Although these risk estimates are presented under the Manufacturing COU, they represent independent risk from each assessed byproduct based on chemical-specific human health hazards. EPA acknowledges that workers are co-exposed to 1,2-dichloroethane and assessed byproducts at the same time and via the same route and pathway of exposure; however, combined risks are not quantified. There are uncertainties around the degree to which risk can be combined across chemicals due to the differences in health endpoints. A cumulative risk assessment across all byproducts would result in higher worker exposures and potentially higher risks compared to the exposures and risks associated with the individual byproducts.

Table 5-29. Occupational Risk Summary Table for High-End Exposures (Light-/Heavy-End Streams) and PPE Level Needed to Exceed Benchmark in Cases of Risk for 1,1-Dichloroethane, Perchloroethylene, and Methylene Chloride

Chemical	Similar Exposure Group	Exposure Route and Duration	Exposure Level	Acute Non-Cancer		Intermediate Non-Cancer		Chronic Non-Cancer[e]		Cancer – BLS Working Years		Cancer – Vinyl Institute Working Years	
				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	No PPE [a]	APF [b]	No PPE[a]	APF [b]
Benchmarks for 1,1-Dichloroethane				**30**		**30**		**300**		**1.0E−04 (only for inhalation)**		**1.0E−04 (only for inhalation)**	
1,1-Dichloroethane	Worker (Operators)	Inhalation 8-hour TWA	Central tendency	2,279	–	2.8E04	–	7,214	–	8.3E−06	–	2.4E−06	–
1,1-Dichloroethane	Worker (Operators)	Inhalation 8-hour TWA	High-end	394	–	4,895	–	1,248	–	6.2E−05	–	5.1E−05	–
1,1-Dichloroethane	Worker (Maintenance Technicians)	Inhalation 8-hour TWA	Central tendency	1.5E04	–	1.9E05	–	4.9E04	–	1.2E−06	–	3.5E−07	–
1,1-Dichloroethane	Worker (Maintenance Technicians)	Inhalation 8-hour TWA	High-end	1,316	–	1.6E04	–	4,164	–	1.9E−05	–	1.5E−05	–
1,1-Dichloroethane	Worker (Logistics Technicians)	Inhalation 8-hour TWA	Central tendency	5.3E04	–	6.6E05	–	1.7E05	–	3.6E−07	–	1.0E−07	–
1,1-Dichloroethane	Worker (Logistics Technicians)	Inhalation 8-hour TWA	High-end	2,220	–	2.8E04	–	7,026	–	1.1E−05	–	9.1E−06	–
1,1-Dichloroethane	Worker (Laboratory Technicians)	Inhalation 8-hour TWA	Central tendency	2.2E04	–	2.8E05	–	7.0E04	–	8.5E−07	–	2.4E−07	–
1,1-Dichloroethane	Worker (Laboratory Technicians)	Inhalation 8-hour TWA	High-end	1,076	–	1.3E04	–	3,407	–	2.3E−05	–	1.9E−05	–
1,1-Dichloroethane	ONU	Inhalation 8-hour TWA	Central tendency	5.1E04	–	6.4E05	–	1.6E05	–	3.7E−07	–	3.7E−07	–
1,1-Dichloroethane	ONU [c]	Inhalation 8-hour TWA	High-end	778	–	9,658	–	2,462	–	3.1E−05	–	3.1E−05	–
1,1-Dichloroethane	All Worker SEGs	Dermal	Central tendency	2,362	–	1,052	–	1,126	–	N/A	–	N/A	–
1,1-Dichloroethane	All Worker SEGs	Dermal	High-end	787	–	351	–	NE [d]	–	NE [d]	–	NE [d]	–
Benchmarks for Perchloroethylene				**10**		**N/A**		**10**		**1.0E−04**		**1.0E−04**	

Chemical	Similar Exposure Group	Exposure Route and Duration	Exposure Level	Acute Non-Cancer		Intermediate Non-Cancer		Chronic Non-Cancer[e]		Cancer – BLS Working Years		Cancer – Vinyl Institute Working Years	
				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	No PPE [a]	APF [b]	No PPE[a]	APF [b]
Perchloroethylene	Worker	Inhalation 8-hour TWA	Central tendency	2,620	–	N/A	–	2.4E04	–	3.6E−07	–	1.0E−07	–
Perchloroethylene	Worker	Inhalation 8-hour TWA	High-end	172	–	N/A	–	1,576	–	7.0E−06	–	5.8E−06	–
Perchloroethylene	ONU	Inhalation 8-hour TWA	Central tendency	9.0E04	–	N/A	–	8.2E05	–	1.0E−08	–	3.0E−09	–
Perchloroethylene	ONU [c]	Inhalation 8-hour TWA	High-end	786	–	N/A	–	7,190	–	1.5E−06	–	1.3E−06	–
Perchloroethylene	Worker	Dermal	Central tendency	157	–	N/A	–	676	–	7.3E−06	–	2.1E−06	–
Perchloroethylene	Worker	Dermal	High-end	52	–	N/A	–	NE [d]	–	NE [d]	–	NE [d]	–
Benchmarks for Methylene Chloride				**30**		**N/A**		**10**		**1.0E−04**		**1.0E−04**	
Methylene chloride	Worker	Inhalation 8-hour TWA	Central tendency	9,514	–	N/A	–	1,373	–	2.9E−08	–	8.3E−09	–
Methylene chloride	Worker	Inhalation 8-hour TWA	High-end	626	–	N/A	–	90	–	5.7E−07	–	4.7E−07	–
Methylene chloride	ONU	Inhalation 8-hour TWA	Central tendency	3.3E05	–	N/A	–	4.7E04	–	8.4E−10	–	2.4E−10	–
Methylene chloride	ONU [c]	Inhalation 8-hour TWA	High-end	2,854	–	N/A	–	412	–	1.2E−07	–	1.0E−07	–
Methylene chloride	Worker	Dermal	Central tendency	4.3E04	–	N/A	–	5,854	–	6.5E−09	–	1.9E−09	–
Methylene chloride	Worker	Dermal	High-end	1.4E04	–	N/A	–	NE [d]	–	NE [d]	–	NE [d]	–

APF = assigned protection factor; MOE = margin of exposure; NE = not estimated; PPE = personal protective equipment; TWA = time-weighted average
"–"= Inhalation APF not needed
BLS estimates based on working year demographic data from the Bureau of Labor Statistics (U.S. Census Bureau, 2019; U.S. BLS, 2014). Vinyl Institute estimates based on working year demographic data provided for manufacturing (VI, 2026)(EPA-HQ-OPPT-2018-0427-0181).
[a] Risk estimates that exceed the benchmark (*i.e.,* a non-cancer MOE less than the benchmark or a cancer MOE exceeding the benchmark) are bolded and shaded.
[b] APF listed in parentheses is the level of protection needed for estimated MOEs to be above benchmark.

Chemical	Similar Exposure Group	Exposure Route and Duration	Exposure Level	Acute Non-Cancer		Intermediate Non-Cancer		Chronic Non-Cancer[e]		Cancer – BLS Working Years		Cancer – Vinyl Institute Working Years	
				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	No PPE [a]	APF [b]	No PPE[a]	APF [b]

[c] The central tendency from the closed system monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated inhalation exposure (*i.e.,* chronic) for the ONU exposure group. ONUs do not directly handle the chemical and are therefore expected to have lower inhalation exposures and are not expected to have dermal exposures through contact with liquids or solids.
[d] The central tendency from the closed system monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated dermal exposure (*i.e.,* chronic) and is health protective for risk estimation for closed system processes, as high-end exposures from daily connecting/disconnecting of transfer lines and sampling is not realistic.
[d] For chronic, non-cancer exposure estimates, exposure dose over the working years is averaged over the working years. Therefore, different values of working years do not affect these estimates, and EPA has presented one chronic, non-cancer estimate. For more information, including example calculations, please see Appendix B and C of the Occupational Exposure Assessment for 1,2-Dichloroethane.

Table 5-30. Occupational Risk Summary Table for Low-End Exposures (Unpurified 1,2-Dichloroethane Stream) and PPE Level Needed to Exceed Benchmark in Cases of Risk for 1,1-Dichloroethane, Perchloroethylene, and Methylene Chloride

Chemical	Similar Exposure Group	Exposure Route and Duration	Exposure Level	Acute Non-Cancer		Intermediate Non-Cancer		Chronic Non-Cancer[e]		Cancer – BLS Working Years		Cancer – Vinyl Institute Working Years	
				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	No PPE [a]	APF [b]	No PPE [a]	APF [b]
Benchmarks for 1,1-Dichloroethane				**30**		**30**		**300**		**1.0E−04 (only for inhalation)**		**1.0E−04 (only for inhalation)**	
1,1-Dichloroethane	Worker (Operators)	Inhalation 8-hour TWA	Central tendency	2,279	–	2.8E04	–	7,214	–	8.3E−06	–	2.6E−05	–
1,1-Dichloroethane	Worker (Operators)	Inhalation 8-hour TWA	High-end	394	–	4,895	–	1,248	–	6.2E−05	–	5.1E−05	–
1,1-Dichloroethane	Worker (Maintenance Technicians)	Inhalation 8-hour TWA	Central tendency	1.5E04	–	1.9E05	–	4.9E04	–	1.2E−06	–	3.5E−07	–
1,1-Dichloroethane	Worker (Maintenance Technicians)	Inhalation 8-hour TWA	High-end	1,316	–	1.6E04	–	4,164	–	1.9E−05	–	1.5E−05	–
1,1-Dichloroethane	Worker (Logistics Technicians)	Inhalation 8-hour TWA	Central tendency	5.3E04	–	6.6E05	–	1.7E05	–	3.6E−07	–	1.0E−07	–

Chemical	Similar Exposure Group	Exposure Route and Duration	Exposure Level	Acute Non-Cancer		Intermediate Non-Cancer		Chronic Non-Cancer[e]		Cancer – BLS Working Years		Cancer – Vinyl Institute Working Years	
				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	No PPE [a]	APF [b]	No PPE [a]	APF [b]
1,1-Dichloroethane	Worker (Logistics Technicians)	Inhalation 8-hour TWA	High-end	1,076	–	2.8E04	–	7,026	–	1.1E−05	–	9.1E−06	–
1,1-Dichloroethane	Worker (Laboratory Technicians)	Inhalation 8-hour TWA	Central tendency	2.2E04	–	2.8E05	–	7.0E04	–	8.5E−07	–	2.4E−07	–
1,1-Dichloroethane	Worker (Laboratory Technicians)	Inhalation 8-hour TWA	High-end	4,523	–	1.3E04	–	3,407	–	2.3E−05	–	1.9E−05	–
1,1-Dichloroethane	ONU	Inhalation 8-hour TWA	Central tendency	5.1E04	–	6.4E05	–	1.6E05	–	3.7E−07	–	1.1E−07	–
1,1-Dichloroethane	ONU [c]	Inhalation 8-hour TWA	High-end	778	–	9,658	–	2,462	–	3.1E−05	–	2.6E−05	–
1,1-Dichloroethane	All Worker SEGs	Dermal	Central tendency	2.4E05	–	1.1E05	–	1.2E05	–	N/A	–	N/A	–
1,1-Dichloroethane	All Worker SEGs	Dermal	High-end	8.1E04	–	3.6E04	–	NE [d]	–	NE [d]	–	NE [d]	–
Benchmarks for Perchloroethylene				**10**		**N/A**		**10**		**1.0E−04**		**1.0E−04**	
Perchloroethylene	Worker	Inhalation 8-hour TWA	Central tendency	2.4E05	–	N/A	–	2.2E06	–	3.8E−09	–	1.1E−09	–
Perchloroethylene	Worker	Inhalation 8-hour TWA	High-end	1.6E04	–	N/A	–	1.5E05	–	7.5E−08	–	6.2E−08	–
Perchloroethylene	ONU	Inhalation 8-hour TWA	Central tendency	8.4E06	–	N/A	–	7.7E07	–	1.1E−10	–	3.2E−11	–
Perchloroethylene	ONU [c]	Inhalation 8-hour TWA	High-end	7.3E04	–	N/A	–	6.7E05	–	1.7E−08	–	1.4E−08	–
Perchloroethylene	Worker	Dermal	Central tendency	1.2E04	–	N/A	–	5.0E04	–	9.9E−08	–	2.9E−08	–
Perchloroethylene	Worker	Dermal	High-end	3,834	–	N/A	–	NE [d]	–	NE [d]	–	NE [d]	–
Benchmarks for Methylene Chloride				**30**		**N/A**		**10**		**1.0E−04**		**1.0E−04**	
Methylene chloride	Worker	Inhalation 8-hour TWA	Central tendency	2.4E04	–	N/A	–	3,413	–	1.2E−08	–	3.3E−09	–

Chemical	Similar Exposure Group	Exposure Route and Duration	Exposure Level	Acute Non-Cancer		Intermediate Non-Cancer		Chronic Non-Cancer[e]		Cancer – BLS Working Years		Cancer – Vinyl Institute Working Years	
				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	No PPE [a]	APF [b]	No PPE [a]	APF [b]
Methylene chloride	Worker	Inhalation 8-hour TWA	High-end	1,555	–	N/A	–	224	–	2.3E−07	–	1.9E−07	–
Methylene chloride	ONU	Inhalation 8-hour TWA	Central tendency	8.1E05	–	N/A	–	1.2E05	–	3.4E−10	–	9.7E−11	–
Methylene chloride	ONU [c]	Inhalation 8-hour TWA	High-end	7,095	–	N/A	–	1,024	–	5.0E−08	–	4.1E−08	–
Methylene chloride	Worker	Dermal	Central tendency	4.3E04	–	N/A	–	5,854	–	6.5E−09	–	1.9E−09	–
Methylene chloride	Worker	Dermal	High-end	1.4E04	–	N/A	–	NE [d]	–	NE [d]	–	NE [d]	–

"–"= Inhalation APF not needed; APF = assigned protection factor; MOE = margin of exposure; NE = not estimated; PPE = personal protective equipment; TWA = time-weighted average

BLS estimates based on working year demographic data from the Bureau of Labor Statistics (U.S. Census Bureau, 2019; U.S. BLS, 2014). Vinyl Institute estimates based on working year demographic data provided for manufacturing (VI, 2026) (EPA-HQ-OPPT-2018-0427-0181).

[a] Risk estimates that exceed the benchmark (*i.e.,* a non-cancer MOE less than the benchmark or cancer MOE exceeding the benchmark) are bolded and shaded.

[b] APF listed in parentheses is the level of protection needed for estimated MOEs to be above benchmark.

[c] The central tendency from the closed system monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated inhalation exposure (*i.e.,* chronic) for the ONU exposure group. ONUs do not directly handle the chemical and are therefore expected to have lower inhalation exposures and are not expected to have dermal exposures through contact with liquids or solids.

[d] The central tendency from the closed system monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated dermal exposure (*i.e.,* chronic) and is health protective for risk estimation for closed system processes, as high-end exposures from daily connecting/disconnecting of transfer lines and sampling is not realistic.

[e] For chronic, non-cancer exposure estimates, exposure dose over the working years is averaged over the working years. Therefore, different values of working years do not affect these estimates, and EPA has presented one chronic, non-cancer estimate. For more information, including example calculations, please see Appendix B and C of the Occupational Exposure Assessment for 1,2-Dichloroethane.

Table 5-31. Occupational Risk Summary Table and PPE Level Needed to Exceed Benchmark in Cases of Risk for Trichloroethylene and Carbon Tetrachloride Using Monte Carlo Simulation

Chemical	Similar Exposure Group	Exposure Route and Duration	Exposure Level	Acute Non-Cancer		Intermediate Non-Cancer		Chronic Non-Cancer[j]		Cancer – BLS Working Years		Cancer – Vinyl Institute Working Years	
				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	No PPE [a]	APF [b]	No PPE [a]	APF [b]
Benchmarks for Trichloroethylene				**10**		**N/A**		**30**		**1.0E−04**		**1.0E−04**	
Trichloroethylene	Worker (Operators)	Inhalation 8-hour TWA	Central tendency	733	–	N/A	–	36	–	3.9E−06	–	2.3E−06	–
Trichloroethylene	Worker (Operators)	Inhalation 8-hour TWA	High-end	171	–	N/A	–	**8.5**	85 (APF 10) [e]	2.1E−05	–	3.6E−05	–
Trichloroethylene	Worker (Maintenance Technicians)	Inhalation 8-hour TWA	Central tendency	2,740	–	N/A	–	136	–	1.0E−06	–	6.1E−07	–
Trichloroethylene	Worker (Maintenance Technicians)	Inhalation 8-hour TWA	High-end	614	–	N/A	–	31	–	6.0E−06	–	1.0E−05	–
Trichloroethylene	Worker (Logistics Technicians)	Inhalation 8-hour TWA	Central tendency	2.4E04	–	N/A	–	1,179	–	1.2E−07	–	7.0E−08	–
Trichloroethylene	Worker (Logistics Technicians)	Inhalation 8-hour TWA	High-end	5,662	–	N/A	–	281	–	6.5E−07	–	1.1E−06	–
Trichloroethylene	Worker (Laboratory Technicians)	Inhalation 8-hour TWA	Central tendency	2,658	–	N/A	–	132	–	1.1E−06	–	6.3E−07	–
Trichloroethylene	Worker (Laboratory Technicians)	Inhalation 8-hour TWA	High-end	593	–	N/A	–	**29**	295 (APF 10) [f]	6.2E−06	–	1.0E−05	–
Trichloroethylene	ONU	Inhalation 8-hour TWA	Central tendency	3,983	–	N/A	–	198	–	7.1E−08	–	6.3E−07	–
Trichloroethylene	ONU [c]	Inhalation 8-hour TWA	High-end	877	–	N/A	–	44	–	4.2E−06	–	1.0E−05	–
Benchmarks for Trichloroethylene (Dermal)				**10**		**N/A**		**30**		**1.0E−04**		**1.0E−04**	

Chemical	Similar Exposure Group	Exposure Route and Duration	Exposure Level	Acute Non-Cancer		Intermediate Non-Cancer		Chronic Non-Cancer[j]		Cancer – BLS Working Years		Cancer – Vinyl Institute Working Years	
				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	No PPE [a]	APF [b]	No PPE [a]	APF [b]
Trichloroethylene	Worker	Dermal	Central tendency	1,117	–	N/A	–	61	–	1.4E−05	–	1.5E−05	–
Trichloroethylene	Worker	Dermal	High-end	432	–	N/A	–	NE [d]	–	NE [d]	–	NE [d]	–
Benchmarks for Carbon Tetrachloride (Inhalation)				**10**		**N/A**		**30**		**1.0E−04**		**1.0E−04**	
Carbon tetrachloride	Worker (Operators)	Inhalation 8-hour TWA	Central tendency	165	–	N/A	–	**15**	147 (APF 10) [e]	**2.3E−03**	9.3E−05 (APF 25) [e]	**6.6E−04**	6.6E−05 (APF 25) [e]
Carbon tetrachloride	Worker (Operators)	Inhalation 8-hour TWA	High-end	38	–	N/A	–	**3.4**	34 (APF 10) [e]	**1.3E−02**	1.3E−05 (APF 1,000) [e]	**1.1E−02**	1.1E−05 (APF 1,000) [e]
Carbon tetrachloride	Worker (Maintenance Technicians)	Inhalation 8-hour TWA	Central tendency	613	–	N/A	–	55	–	**6.2E−04**	6.2E−05 (APF 10) [g]	**1.8E−04**	1.8E−05 (APF 10) [g]
Carbon tetrachloride	Worker (Maintenance Technicians)	Inhalation 8-hour TWA	High-end	136	–	N/A	–	**12**	122 (APF 10) [g]	**3.6E−03**	7.2E−05 (APF 50) [g]	**3.0E−03**	6.0E−05 (APF 50) [g]
Carbon tetrachloride	Worker (Logistics Technicians)	Inhalation 8-hour TWA	Central tendency	5,333	–	N/A	–	476	–	7.2E−05	–	2.1E−05	–
Carbon tetrachloride	Worker (Logistics Technicians)	Inhalation 8-hour TWA	High-end	1,255	–	N/A	–	112	–	**3.9E−04**	3.9E−05 (APF 10) [h]	**3.1E−03**	6.2E−05 (APF 50) [h]
Carbon tetrachloride	Worker (Laboratory Technicians)	Inhalation 8-hour TWA	Central tendency	601	–	N/A	–	54	–	**6.4E−04**	6.4E−05 (APF 10) [f]	**1.8E−04**	1.8E−05 (APF 10) [f]
Carbon tetrachloride	Worker (Laboratory Technicians)	Inhalation 8-hour TWA	High-end	131	–	N/A	–	**12**	117 (APF 10) [f]	**3.8E−03**	7.5E−05 (APF 50) [f]	**3.8E−03**	7.5E−05 (APF 50) [f]
Carbon tetrachloride	ONU	Inhalation 8-hour TWA	Central tendency	892	–	N/A	–	80	–	**4.3E−04**	4.3E−05 (APF 10) [i]	**4.3E−04**	4.3E−05 (APF 10) [i]

Chemical	Similar Exposure Group	Exposure Route and Duration	Exposure Level	Acute Non-Cancer		Intermediate Non-Cancer		Chronic Non-Cancer[j]		Cancer – BLS Working Years		Cancer – Vinyl Institute Working Years	
				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	No PPE [a]	APF [b]	No PPE [a]	APF [b]
Carbon tetrachloride	ONU [c]	Inhalation 8-hour TWA	High-end	195	–	N/A	–	**17**	174 (APF 10) [i]	**2.5E−03**	5.1E−05 (APF 50) [i]	**2.5E−03**	5.1E−05 (APF 50) [i]
Benchmarks for Carbon Tetrachloride (Dermal)				**30**		**N/A**		**30**		**1.0E−04**		**1.0E−04**	
Carbon tetrachloride	Worker	Dermal	Central tendency	243	–	N/A	–	34	–	**1.0E−03**	–	**9.5E−04**	9.5E−05 (PF 10)
Carbon tetrachloride	Worker	Dermal	High-end	85	–	N/A	–	NE [d]	–	NE [d]	–	NE [d]	–

APF = assigned protection factor; MOE = margin of exposure; NE = not estimated; PPE = personal protective equipment; "–"= Inhalation APF not needed;
BLS estimates based on working year demographic data from the Bureau of Labor Statistics (U.S. Census Bureau, 2019; U.S. BLS, 2014). Vinyl Institute estimates based on working year demographic data provided for manufacturing (VI, 2026) (EPA-HQ-OPPT-2018-0427-0181).

[a] Risk estimates that exceed the benchmark (*i.e.,* a non-cancer MOE less than the benchmark or a cancer MOE exceeding the benchmark) are bolded and shaded.

[b] APF listed in parentheses is the level of protection needed for estimated MOEs to be above benchmark.

[c] The central tendency from the closed system monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated inhalation exposure (*i.e.,* chronic) for the ONU exposure group. ONUs do not directly handle the chemical and are therefore expected to have lower inhalation exposures and are not expected to have dermal exposures through contact with liquids or solids.

[d] The central tendency from the closed system monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated dermal exposure (*i.e.,* chronic) and is health protective for risk estimation for closed system processes, as high-end exposures from daily connecting/disconnecting of transfer lines and sampling is not realistic.

[e] Test order data described operators as wearing respirators with APFs ranging from 10–1,000 while performing various tasks.

[f] Test order data described laboratory technicians as wearing respirators with APFs ranging from 10–1,000 while performing various tasks.

[g] Test order data described maintenance technicians as wearing full-face airline respirators of APF 1,000 during major maintenance tasks.

[h] Test order data described logistics technicians as wearing respirators with APFs ranging from 10–50 during loading or offloading tasks.

[i] Test order data described ONUs as not wearing respiratory protection during routine daily tasks, although 1 supervisor was described as wearing a full-face respirator (APF 50) while observing loading activities from 20 feet away.

[j] For chronic, non-cancer exposure estimates, exposure dose over the working years is averaged over those years. Therefore, different values of working years do not affect these estimates, and EPA has presented a single chronic, non-cancer estimate. For more information, including example calculations, please see Appendix B and C of the *Occupational Exposure Assessment for 1,2-Dichloroethane*.

5.3.4.1 Occupational Inhalation Exposure Risk Characterization

EPA assessed occupational exposures to 1,1-dichloroethane, trichloroethylene, perchloroethylene, methylene chloride (CASRN 75-09-2), and carbon tetrachloride (CASRN 56-23-5) produced as byproducts during the manufacture of 1,2-dichloroethane. To evaluate occupational exposures, EPA used inhalation monitoring data—either directly applicable data or surrogate data obtained through test orders—to evaluate acute, intermediate, and chronic exposures to workers for each chlorinated solvent byproduct. EPA first used a screening-level approach to estimate inhalation exposures and risks. Where risks were identified, EPA then used a refined approach.

For 1,1-dichloroethane, EPA had test order data from facilities where 1,1-dichloroethane is manufactured as a byproduct. A total of 98 full-shift samples were collected across 5 SEGs (including ONUs). Of the total samples collected, 39 were below the limit of detection. Worker SEGs include operators, maintenance technicians, logistics technicians, and laboratory technicians.

For the remaining byproducts, EPA used surrogate data from the 1,2-dichloroethane test order. For worker estimates, the Agency used data from the operator SEG that included 53 full-shift samples. All samples exceeded the limit of detection. For ONUs, EPA used data from the ONU SEG that included 39 samples (all above the limit of detection). The Agency applied a correction to the 8-hour TWAs to account for differences in vapor pressure and mole fraction. The mole fraction used in the screening approach is based on the maximum expected byproduct concentration in the light/heavy end streams in the 1,2-dichloroethane manufacturing process.

No risks were identified for exposure to 1,1-dichloroethane, perchloroethylene and methylene chloride when produced as a byproduct based on this screening approach.

Using the screening approach, EPA identified risks from exposure to the chemicals trichloroethylene and carbon tetrachloride when produced as a byproduct. For these two chemicals EPA refined the inhalation exposure estimates by using a Monte Carlo modeling approach to apply variability in weight percent for trichloroethylene and methylene chloride. EPA then applied a uniform distribution using the expected byproduct concentrations in the nonpurified product stream and the light/heavy end streams. In addition, the Agency developed estimates for all five SEGs (including ONUs) from the 1,2-dichloroethane test order submission.

EPA estimates the number of potential days of worker exposure as up to 250 days/year. The Agency had demographic data on working years from the Vinyl Institute and estimates of cancer risk using both the Vinyl Institute working years and working years based on BLS data are provided. For the estimates based on the Vinyl Institute data, EPA used 8.9 years for central tendency and 33 years for high-end exposure. For the BLS estimates, the Agency used 31 years for central tendency and 40 years for high-end exposure.

The weight of scientific evidence was rated as robust for assessment of inhalation exposure. Due to this high confidence, central tendency and high-end exposures are applicable for assessment of non-cancer (*i.e.,* acute, intermediate and chronic) and cancer risks for workers and ONUs. ONUs do not directly handle the chemical and are therefore expected to have lower inhalation exposures in the workplace. They are also not expected to have dermal exposures due to limited contact with liquids or solids.

The high-end estimates combined both highest exposures and highest byproduct weight percent and may be overly conservative for assessment of chronic risks for both workers and ONUs. The method and confidence support the use of high-end exposures for assessment of non-cancer acute and intermediate risks and the central tendency for the assessment of non-cancer chronic and cancer risks for the other four byproduct chemicals. Again, ONUs do not directly handle chemicals and are therefore expected to have lower inhalation exposures.

The estimates of inhalation exposure are based on monitoring data from samplers attached to worker and do not reflect the exposure reduction that results from the use of respiratory protection, which is discussed below.

Discussion of Reported Use of Respiratory Protection
Data were available in the test order final study report on PPE (Stantec ChemRisk, 2024) used at the monitored facilities, as described in Section 5.3.3. As previously noted, respirator use (as documented in Appendix N - Raw Sample Results of the final study report), varied by SEG (Stantec ChemRisk, 2024). Where risk relative to applicable benchmark was observed, EPA considered how available information on respiratory protection worn by workers may further refine these risk estimates. For carbon tetrachloride, chronic non-cancer and/or cancer risks relative to applicable benchmark MOEs were observed at the central tendency for operators, maintenance workers, laboratory technicians, and ONUs—in several cases, potential risks were observed for high-end exposures as well.

A detailed analysis of the respiratory protection used by workers in each SEGs in the Manufacture of 1,2-Dichloroethane (Intentional) OES is provided in Section 5.3.3.1.1. As previously described, based on the information provided as part of the test order submission, there is evidence that operators and maintenance technicians wear respiratory protection during high exposure tasks, but not consistently during central tendency exposures. There was limited evidence that laboratory technicians wore respiratory protection (1 of 29 full-shift samples documented the use of respiratory protection). Use of respiratory protection was documented for 23% of ONUs sampled, but the use did not correspond to the highest measured full-shift concentrations. Because EPA has evidence that respiratory protection usage associated with central tendency exposures is limited, the Agency has determined that the central tendency exposure estimates appropriately account for the lack of or limited use of respiratory protection and cannot be further refined. Where respirators are used during high-end exposures, use of respiratory protection during high-intensity tasks may significantly reduce overall full-shift exposure if these tasks contribute to a large percentage of the potential exposure during a shift.

5.3.5 Risk Estimates for Consumers

Table 5-32 summarizes the dermal, inhalation, and ingestion MOEs based on 1,2-dichloroethane-specific hazards (Section 5.2). It also characterizes non-cancer risk for acute, intermediate, and chronic exposure to 1,2-dichloroethane and presents these values for all life stages for the consumer articles scenarios within the Consumer plastic and rubber products COU. Since the estimated 1,2-dichloroethane emissions decay from articles resulting in anticipated very low 1,2-dichloroethane emissions after one year, lifetime exposures are not anticipated and cancer risks from lifetime exposures were not assessed. Based on published, peer-reviewed data of 1,2-dichloroethane emissions from three articles scenario, EPA conducted a screening-level assessment for consumers that both considers high-intensity exposure scenario risk estimates and relies on conservative assumptions to assess exposures that would be expected to be on the high-end of the expected exposure distribution. EPA also evaluated peer-reviewed data to inform the decay (*i.e.,* decreases over time) in 1,2-dichloroethane emissions from these articles and found that, as a conservative scenario, 1,2-dichloroethane emissions could occur for over 1 year. Although chronic exposures for consumers were assessed; cancer was not as the decay of 1,2-dichloroethane emissions from these articles would not result in lifetime exposures.

Table 5-32. Consumer Risk Summary Table

Life Cycle Stage: COU: Subcategory	Product or Article	Duration	Exposure Route (Benchmark MOE)	Life Stage (years) MOE						
				Infants (<1 year)	Toddlers (1–2 years)	Pre-Schoolers (3–5 years)	Middle Childhood (6–10 years)	Young Teens (11–15 years)	Teenagers (16–20 years)	Adults (21+ years)
Consumer uses: Plastic and rubber products	Ornaments	Acute	Inhalation (30)	3,080						
			Dermal (30)	5,200	6,100	7,100	8,800	11,000	N/A	N/A
			Ingestion (mouthing) (30)	2,600	4,400	6,900	N/A	N/A	N/A	N/A
		Intermediate	Inhalation (30)	33,500						
			Dermal (30)	1,700	2,000	2,300	2,900	3,600	N/A	N/A
			Ingestion (30)	830	1400	2,200	N/A	N/A	N/A	N/A
		Chronic	Inhalation (30)	123,000						
			Dermal (100)	21,000	24,000	28,000	35,000	44,000	N/A	N/A
			Ingestion (100)	10,000	17,000	27,000	N/A	N/A	N/A	N/A
	Squishy toys	Acute	Inhalation (30)	34,500						
			Dermal (30)	290,000	340,000	390,000	480,000	610,000	N/A	N/A
			Ingestion (Mouthing) (30)	180,000	670,000	130,000	N/A	N/A	N/A	N/A
		Intermediate	Inhalation (30)	74,800						
			Dermal (30)	94,000	110,000	130,000	160,000	200,000	N/A	N/A
			Ingestion (30)	58,000	220,000	440,000	N/A	N/A	N/A	N/A
		Chronic	Inhalation (30)	74,800						
			Dermal (100)	94,000	110,000	130,000	160,000	200,000	N/A	N/A
			Ingestion (100)	58,000	220,000	440,000	N/A	N/A	N/A	N/A
	Lamp base	Acute	Inhalation (30)	5,860						
			Dermal (30)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Ingestion (30)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Intermediate	Inhalation (30)	13,400						
			Dermal (30)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Ingestion (30)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Chronic	Inhalation (30)	25,300						
			Dermal (100)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Ingestion (100)	N/A	N/A	N/A	N/A	N/A	N/A	N/A

N/A = not assessed; MOE = margin of exposure
Exposures and risks via the inhalation route were assessed for all age groups. Mouthing was assessed for age groups <6 and dermal was assessed for children <16.

5.3.6 Risk Estimates for General Population

As detailed in Section 5.1.2, EPA conducted a quantitative exposure assessment for the air, land, and water pathways to evaluate non-cancer and cancer risks for the general population based on the 1,2-dichloroethane-specific hazard values (Section 5.2). The following sections summarize the risk estimates and conclusions for inhalation, dermal, and oral exposures for all general population exposure scenarios.

5.3.6.1 General Population Inhalation Risks via Ambient Air Methods

EPA estimated risks of general population exposures to 1,2-dichloroethane released to air, with a focus on exposures to general populations residing near 1,2-dichloroethane emitting facilities. Risks were evaluated for air releases from industrial and commercial COUs based on exposure estimated from reported and estimated ambient air releases (Section 3.2) and human health hazard values (selected PODs) for chronic and acute inhalation exposures (Section 5.1.2.1). EPA estimated risks using modeling results from AERMOD and HEM.

HEM5.0 was used to estimate exposures using releases from TRI reporting facilities (2015–2024) and NEI reporting facilities (2014, 2017, and 2020). AERMOD as a standalone program was used to estimate exposures for EPA estimated releases from generic facilities/sites.

For analysis using HEM5.0, EPA estimated inhalation risk for polar grid receptors and centroids of census block up to 50,000 m from the release location. Where available, EPA used facility releases reported to TRI and NEI and the associated site-specific data. EPA estimated cancer and non-cancer inhalation risks for discrete polar-grid receptors at distances up to 10,000 m using AERMOD.

AERMOD was run for EPA-estimated releases for generic facilities/sites. To simplify presentation of results, the Agency is presenting general population inhalation risks from generic facilities/sites at distances of 100 to 1,000, 1,000, and 2,500 m in this risk evaluation (additional distances are available in the *Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2026bd)).

HEM5.0 was run for NEI and TRI facility-reported releases. HEM5.0 was used to characterize populations living near 1,2-dichloroethane-releasing facilities and estimate inhalation risk up to 50,000 m from releasing facilities at polar receptors and census block centroids. HEM5.0 combines 2010 U.S. Census data with estimated ambient air concentrations to calculate MIR and the number of people within each census block with a cancer risk estimate between 1×10^{-6} and 1×10^{-4}.

5.3.6.2 General Population Cancer Inhalation Risks

In Sections 5.3.6.2.2 through 5.3.6.2.3, EPA is presenting cancer risk estimates compared to the range of 1×10^{-6} to 1×10^{-4} for the general population, including fenceline communities.[13] Risks are based on the 1,2-dichloroethane specific cancer Section 5.2.

[13] Consistent with CERCLA, for TSCA risk evaluations, EPA has generally used 1×10^{-6} to 1×10^{-4} as an acceptable cancer risk range for general population exposures. While a handful of TSCA risk evaluations relied solely on 1×10^{-6}, EPA generally believes that the use of a range is more appropriate. These values provide a range for evaluating risk but do not constitute a "bright-line."

5.3.6.2.1 General Population Analysis Using HEM5.0

TRI Reporting Facilities

The HEM5.0 modeling of TRI reported releases predicted that an estimated 81,000 people across all OESs represented in TRI would have an inhalation cancer risk exceeding 1 in 1,000,000 (1×10^{-6}), 628 people would have an inhalation cancer risk exceeding 1 in 100,000 (1×10^{-5}), and 0 people would have an inhalation cancer risk exceeding 1 in 10,000 (1×10^{-4}) (Table 5-33) due to inhalation of 1,2-dichloroethane by the general population. Detailed descriptions of HEM modeling are provided in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad). The Manufacturing OES was the largest risk contributor, with 13 facilities being the primary contributors to 77,376 people having an inhalation cancer risk estimate exceeding 1 in 1,000,000 and 3 facilities being the primary contributors to 628 people having an inhalation cancer risk estimate exceeding 1 in 100,000. For the 77,376 people associated with the Manufacturing OES with an estimated cancer risk at or above 1 in 1,000,000 (1×10^{-6}) but less than the 1 in 10,000 (1×10^{-4}) there would be an additional 0.077 to less than 7.7 additional lifetime cancer cases if the population is exposed daily (for 24 hours each day) over a lifetime of 70 years. Four facilities within the Processing into Formulation, Mixture, or Reaction Product OES are the primary contributors to 4,249 people having a risk above the 1 in 1,000,000. For those 4,253 people with an estimated cancer risk at or above 1 in 1 million (1×10^{-6}) but less than the 1 in 10,000 (1×10^{-5}) there would be an additional 4.3×10^{-3} to less than 0.043 additional lifetime cancer cases if the population is exposed daily (for 24 hours each day) over a lifetime of 70 years. One facility within the Processing as a Reactant OES was the primary contributor to 3 people having a risk above 1 in 1,000,000. For those 3 people with an estimated cancer risk at or above 1 in 1 million (1×10^{-6}) but less than the 1 in 100,000 (1×10^{-5}) there would be an additional 3.0×10^{-6} to less than 3.0×10^{-5} additional lifetime cancer cases if the population is exposed daily (for 24 hours each day) over a lifetime of 70 years. The facilities primarily contributing to risk greater than 1×10^{-6} across all OESs are located in South Carolina, Kentucky, Louisiana, Texas, Wisconsin, North Carolina, Illinois, and Arkansas.

None of the three other OESs with TRI data had facilities contributing to risks exceeding 1 in 1,000,000 based on the HEM5.0 modeling. Census block-based results are aggregated across all facilities modeled using HEM5.0; that is, if a census block is within proximity to more than one TRI reporting facility, then the estimated concentrations, and in turn, the estimated cancer risks, from each facility release are added together for that census block. Therefore, cancer risks estimated at a census block centroid might be attributable to multiple facilities that each have different COUs.

Table 5-33. Total Inhalation Cancer Risk Population Count Across All Census Blocks Based on HEM5.0 Modeling Results for TRI Release Data[a b]

Life Cycle Stage	Category	Subcategory	OES	Facility Count (N) [c]	Max. Cancer Risk [b] Across all Facilities for All Census Blocks Within 50 km	Number of People Exposed to ≥1 in 1,000,000 Risk (1E−06)	Number of Facilities Contributing to Risk >1E−06 [c]	Number of People Exposed to Risk ≥1 1E−05	Number of Facilities Contributing to Risk >1E−05 [d]	Number of People Exposed to Risk ≥E−04	Number of Facilities Contributing to Risk >1E−04
Manufact-uring	Domestic manufacture	Manufacturing	Manufact-uring	24	2.93E−05	77,376	13	628	3	0	0
Import/ Repackaging	Import/ Repackaging	Repackaging	Repackaging	4	1.00E−08	0	0	0	0	0	0
Processing/ Industrial use	Processing – as a reactant/ Recycling/ Process regulator	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; All other basic organic chemical manufacturing/Recycling/ *e.g.* Catalyst moderator; oxidation inhibitor	Processing as a Reactant	13	1.25E−06	3	1	0	0	0	0
Processing/ Industrial use	Processing – incorporated into formulation, mixture, or reaction product/Other use	Fuels and fuel additives: All other petroleum and coal products manufacturing/ Processing aids: specific to petroleum production/ Adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing/ Process solvent	Processing into Formulation, Mixture, or Reaction Product	11	9.80E−06	4,249	4	0	0	0	0
Industrial use	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Non-Aerosol Cleaning and Degreasing	1	2.37−9	0	0	0	0	0	0

Life Cycle Stage	Category	Subcategory	OES	Facility Count (N) [c]	Max. Cancer Risk [b] Across all Facilities for All Census Blocks Within 50 km	Number of People Exposed to ≥1 in 1,000,000 Risk (1E−06)	Number of Facilities Contributing to Risk >1E−06 [c]	Number of People Exposed to Risk ≥1 1E−05	Number of Facilities Contributing to Risk >1E−05 [d]	Number of People Exposed to Risk ≥E−04	Number of Facilities Contributing to Risk >1E−04
Disposal	Disposal	Disposal	Waste Handling, Treatment, and Disposal (Incinerator)	23	2.12E−07	0	0	0	0	0	0

[a] For each OES, EPA modeled the highest total (fugitive + stack) annual TRI-reported release for each facility from 2015–2024. Additionally, this table only includes facilities reporting to TRI using Form R.

[b] HEM5.0 calculates a maximum individual risk, which is equivalent to the highest cancer risk for any populated receptor modeled. When calculating cancer risk, HEM assumes that an individual breathes the ambient air at a given receptor site 24 hours per day over a 70-year lifetime.

[c] The number of facilities in this column is the number of facilities that individually contribute to an estimated inhalation cancer risk exceeding 1×10^{-6}.

[d] The number of facilities in this column is the number of facilities that individually contribute to an estimated inhalation cancer risk exceeding 1×10^{-5}.

Table 5-34 shows the distance from the modeled release location to the census block centroid showing risk using HEM5.0 for facilities that are the primary contributors to cancer risk exceeding 1×10^{-6}. The results show that only facilities in OESs of Manufacturing; Processing into Formulation, Mixture, or Reaction Product; and Processing as a Reactant have people living near enough to the facilities to be exposed to ambient air concentrations that would result in an inhalation cancer risk exceeding 1×10^{-6}. For the OES of Manufacturing, distances from the release location to the nearest populated census block centroid range from 641 to 4,525 m. Distances from the release location to the nearest census block range from 641 to 727 m for the OES of Processing into Formulation, Mixture, or Reaction Product. For the OES of Processing as a Reactant, the census block with the highest risk as 151 m from the release location. Additionally, across all facilities analyzed using HEM5.0, the nearest census block centroid to a releasing facility, regardless of the risk, was approximately 129 m from the modeled release point.

Based on the populations of the census blocks showing the highest risk for the facilities modeled using HEM5.0 (, the additional cancer cases per million people if exposed daily (24 hours a day for 70 years) over a lifetime would range from 3.76×10^{-6} to 2.64×10^{-4} resulting from inhalation of 1,2-dichloroethane by the general population for the people living at the census block nearest to facilities that contribute to a cancer risk greater than 1×10^{-6}. Table 5-34 also presents the number of individuals exposed to the maximum cancer risk estimate at each centroid and the total population associated with each facility that is the primary contributor to risk greater 1×10^{-6}.

Table 5-34. Distance from Release to Nearest Census Block Showing Cancer Risk Estimates Exceeding 1×10^{-6} for Facilities Modeled using HEM 5.0 using TRI Data from 2015 to 2024

Toxics Release Inventory (TRI) ID [a]	OES	Maximum Cancer Risk Estimates at a Census Block Centroid [b]	Population of Census Block Showing Highest Risk [c]	Distance from Modeled Release Location to Centroid of Census Block Showing Highest Risk (m) [d]	Total Population with Risk Greater than 1×10^{-6} [e]	Distance (m) to Farthest Census Block Centroid Showing Risk Greater than 1×10^{-6} [f]	Distance (m) to Farthest Census Block Centroid Showing Risk Greater than 1×10^{-5} [g]	Total Population with Risk Greater than 1×10^{-5}
2814WKZNBL485CE	Processing into Formulation, Mixture, or Reaction Product	4.1E−06	18	631	2,759	1,573	NA	0
29415LBRGH2151K	Manufacturing	6.7E−06	10	712	3,483	2,578	NA	0
42029WSTLK2468I	Manufacturing	2.1E−05	3	1,302	5,246	12,159	2,480	86
53704BLLLB3699K	Processing into Formulation, Mixture, or Reaction Product	1.9E−06	5	610	5	610	NA	0
54143SPCLT2STAN	Processing as a Reactant	1.3E−06	3	151	3	151	NA	0
60901HNKLCSKENS	Processing into Formulation, Mixture, or Reaction Product	9.8E−06	4	727	1,390	2,825	NA	0
70669GRGGL1600V	Manufacturing	1.7E−05	8	1,422	11,295	9,011	1,422	83
70669PPGNDCOLUM	Manufacturing	2.9E−05	9	1,393	33,263	12,428	2,654	457
70723CCDNTHIGHW	Manufacturing	1.9E−06	6	1,035	12	1,035	NA	0
70734BRDNCLOUIS	Manufacturing	7.2E−06	6	1,647	938	15,688	NA	0
70734VLCNMASHLA	Manufacturing	3.5E−06	78	3,746	881	11,240	NA	0
70764LLMNXHWY40	Manufacturing	5.5E−06	26	976	6,240	9,834	NA	0

Toxics Release Inventory (TRI) ID [a]	OES	Maximum Cancer Risk Estimates at a Census Block Centroid [b]	Population of Census Block Showing Highest Risk [c]	Distance from Modeled Release Location to Centroid of Census Block Showing Highest Risk (m) [d]	Total Population with Risk Greater than 1×10^{-6} [e]	Distance (m) to Farthest Census Block Centroid Showing Risk Greater than 1×10^{-6} [f]	Distance (m) to Farthest Census Block Centroid Showing Risk Greater than 1×10^{-5} [g]	Total Population with Risk Greater than 1×10^{-5}
70765GRGGLHIGHW	Manufacturing	2.21E−06	5	4,526	2,282	10,698	NA	0
7076WBLCBP21255	Manufacturing	5.10E−06	18	641	3,910	4,756	NA	0
70805FRMSPGULFS	Manufacturing	7.05E−06	29	1,102	8,603	7,690	NA	0
71730GRRSN181CO	Processing into Formulation, Mixture, or Reaction Product	1.80E−06	30	6,029	95	1,816	NA	0
7754WBLCBP231NB	Manufacturing	2.40E−06	10	2,068	611	5,591	NA	0
77978FRMSPPOBOX	Manufacturing	3.35E−06	39	2,247	612	3,214	NA	0

HEM = Human Exposure Model Version 5; OES = Occupation exposure scenario; TRI = Toxics Release Inventory;

[a] Additional facilities beyond those show in the table were modeled in HEM5.0. This table only shows facilities that were primary contributors to a cancer risk estimate exceeding 1 in a million at a census block centroid within 50 km of the modeled release location.

[b] HEM5.0 calculates a maximum individual risk (MIR), which is equivalent to the highest cancer risk estimate for any populated receptor modeled and is shown here as the maximum cancer risk. When estimating cancer risk, HEM assumes that an individual breathes the ambient air at a given receptor site 24 hours per day over a 70-year lifetime. The MIRs in this table show the aggregated risks and they might be associated with multiple facilities. The facility associated with each MIR is the largest contributor to risk at a given census block.

[c] This population is only the population of the census block with the highest cancer risk estimated at the centroid and not the total number of people with listed estimated cancer risk resulting from a given facility's emissions.

[d] This is the distance from the emission release point to the centroid of the census block that shows the highest estimated cancer risk.

[e] Total population of all census blocks with a cancer risk greater than 1×10^{-6} for which the associated facility was the primary contributor to risk.

[f] Distance to farthest census block centroid with an estimated cancer risk greater than 1×10^{-6} for the associated facility. Risk at the census block is aggregated across all facilities, but the facilities shown in the table are the greatest contributors to the risk at the associated census blocks.

[g] Distance to farthest census block centroid with an estimated cancer risk greater than 1×10^{-5} for the associated facility. Risk at the census block is aggregated across all facilities, but the facilities shown in the table are the greatest contributors to the risk at the associated census blocks.

NEI Releasing Facilities

The HEM5.0 modeling of NEI reported releases predicted that an estimated 37,439 people across all OESs represented in TRI would have an inhalation cancer risk exceeding 1 in 1,000,000 (1×10^{-6}), 14 people would have an inhalation cancer risk exceeding 1 in 100,000 (1×10^{-5}), and 0 people would have an inhalation cancer risk exceeding 1 in 10,000 (1×10^{-4}) (Table 5-35) due to inhalation of 1,2-dichloroethane by the general population. Detailed descriptions of HEM5.0 modeling are provided in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad).

The Manufacturing OES had the most facilities that were the largest risk contributors at census blocks, with 12 facilities being the primary contributors to 30,375 people having an inhalation cancer risk estimate exceeding 1 in 1,000,000. For the 30,375 people associated with the Manufacturing OES with an estimated cancer risk at or above 1 in 1 million (1×10^{-6}) but less than the 1 in 10,000 (1×10^{-4}) there would be an additional 0.03 to less than 3.0 additional lifetime cancer cases if the population is exposed daily (for 24 hours each day) over a lifetime of 70 years. Three facilities within the Processing as a Reactant OES are the primary contributors to 4,580 people having a risk above 1 in 1,000,000. For those 4,580 people with an estimated cancer risk at or above 1 in 1,000,000 (1×10^{-6}) but less than the 1 in 100,000 (1×10^{-5}) there would be an additional 0.0046 to less than 0.46 additional lifetime cancer cases if the population is exposed daily (for 24 hours each day) over a lifetime of 70 years. An additional three facilities within the Processing into Formulation, Mixture, or Reaction Product OES are primary contributors to 14 people having a risk above 1 in 1,000,000 but less than 1 in 100,000. Two facilities within the OES of Waste Handling, Disposal, and Treatment (POTW) are primary contributors to 980 people having a risk above 1 in 1,000,000 but less than 1 in 100,000. Additionally, one facility in the OESs of Repackaging; Industrial Application of Adhesives and Sealants; and Waste Handling, Disposal, and Treatment (Non-POTW WWT) are primary contributors to 1,036, 167, and 273 people having a risk above 1 in 1,000,000 but below 1 in 100,000. Overall, the cancer incidence for the 47,439 people with a cancer risk above 1 in 1,000,000 would be at least 0.037 if the population is exposed daily (for 24 hours each day) over a lifetime.

None of the other OESs with NEI data had facilities that were primary contributor to risks exceeding 1 in 1,000,000 based on the HEM5.0 modeling. Census block-based results are aggregated across all facilities modeled using HEM5.0; that is, if a census block is within proximity to more than one NEI reporting facility, then the estimated concentrations, and in turn, the estimated cancer risks, from each facility release are added together for that census block. Therefore, cancer risks estimated at a census block centroid might be attributable to multiple facilities that each have different COUs.

Table 5-35. Total Inhalation Cancer Risk Population Count Across All Census Blocks Based on HEM5.0 Modeling Results for NEI Release Data[a b]

Life Cycle Stage	Category	Subcategory	OES	Facility Count (N) [c]	Max. Cancer Risk [b] Across all Facilities for All Census Blocks Within 50 km	Number of People Exposed to ≥1 in 1,000,000 Risk (1E−06)	Number of Facilities Contributing to Risk >1E−06 [d]	Number of People Exposed to Risk ≥1 1E−05	Number of Facilities Contributing to Risk >1E−05 [e]	Number of People Exposed to Risk ≥E−04	Number of Facilities Contributing to Risk >1E−04
Manufacturing	Domestic manufacture	Domestic manufacture	Manufacturing	20	1.30E−05	30,375	8	14	1	0	0
Manufacturing/Processing	Import/ Repackaging	Repackaging	Repackaging	7	7.73E−06	1,036	1	0	0	0	0
Processing/ Industrial use	Processing – as a reactant/ Recycling/ Process regulator	Intermediate in: Petrochemical manufacturing; Plastic material and resin manufacturing; All other basic organic chemical manufacturing/Recycling/ *e.g.,* Catalyst moderator; Axidation inhibitor	Processing as a Reactant	19	6.54E−06	4,580	7	0	0	0	0
Processing/ Industrial use	Processing – Incorporated into formulation, mixture, or reaction product/ Other use	Fuels and fuel additives: All other petroleum and coal products manufacturing/ Processing aids: Specific to petroleum production/Adhesives and sealants; Lubricants and greases; Process regulators; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing/Process solvent	Processing into Formulation, Mixture, or Reaction Product	9	2.41E−06	14	2	0	0	0	0

Life Cycle Stage	Category	Subcategory	OES	Facility Count (N) [c]	Max. Cancer Risk [b] Across all Facilities for All Census Blocks Within 50 km	Number of People Exposed to ≥1 in 1,000,000 Risk (1E−06)	Number of Facilities Contributing to Risk >1E−06 [d]	Number of People Exposed to Risk ≥1 1E−05	Number of Facilities Contributing to Risk >1E−05 [e]	Number of People Exposed to Risk ≥E−04	Number of Facilities Contributing to Risk >1E−04
Industrial use	Adhesives and sealants	Adhesives and sealants	Industrial Application Adhesives and Sealants	27	1.93E−06	167	1	0	0	0	0
Industrial use	Lubricants and greases	Solid film lubricants and greases	Industrial Application of Lubricants and Greases	1	4.00E−07	0	0	0	0	0	0
Industrial use	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Non-Aerosol Cleaning and Degreasing	10	3.12E−07	0	0	0	0	0	0
Commercial use	Other use	Laboratory chemical	Laboratory Use	3	3.73E−08	0	0	0	0	0	0
Disposal	Disposal	Disposal	Waste Handling, Treatment, and Disposal (Incinerator)	12	9.24E−07	0	0	0	0	0	0
Disposal	Disposal	Disposal	Waste Handling, Treatment, and Disposal (Landfill)	431	3.30E−07	0	0	0	0	0	0
Disposal	Disposal	Disposal	Waste Handling, Treatment, and Disposal (Non-POTW WWT)	6	3.52E−06	273	1	0	0	0	0
Disposal	Disposal	Disposal	Waste Handling, Treatment, and Disposal (POTW)	25	3.80E−06	980	2	0	0	0	0

Life Cycle Stage	Category	Subcategory	OES	Facility Count (N) [c]	Max. Cancer Risk [b] Across all Facilities for All Census Blocks Within 50 km	Number of People Exposed to ≥1 in 1,000,000 Risk (1E−06)	Number of Facilities Contributing to Risk >1E−06 [d]	Number of People Exposed to Risk ≥1 1E−05	Number of Facilities Contributing to Risk >1E−05 [e]	Number of People Exposed to Risk ≥E−04	Number of Facilities Contributing to Risk >1E−04
Disposal	Disposal	Disposal	Waste Handling Treatment, and Disposal (Remediation)	18	1.36E−07	0	0	0	0	0	0
N/A	N/A	N/A	Facilities not Mapped to an OES [f]	2	1.82E−06	0	0	0	0	0	0

HEM5.0 = Human Exposure Model Version 5; NEI = National Emissions Inventory; OES = Occupational exposure scenario; POTW = publicly owned treatment works; WWT = wastewater treatment;

[a] For NEI data, EPA used data reported 2014, 2017, and 2020 in this analysis. In the draft risk evaluation, EPA modeled all available data for 2014 and 2017 using AERMOD (U.S. EPA, 2025a). For this evaluation, EPA modeled, in HEM5.0, each facility that showed a risk greater than 1×10^{-6} based on the 95th percentile concentration at 10 m from the release location based on the analysis performed in the draft risk evaluation. EPA also modeled any releases that were new to the 2020 NEI if they were greater than the lowest release from 2014 and 2017 that resulted in a risk greater than 1×10^{-6} based on the 95th percentile concentration at 10 m from the release location. If a facility reported in multiple years and had total releases greater than the threshold described above, then EPA used the maximum release across all years in this analysis. The risks in this table are aggregated across all facilities and releases that impact each census block.

[b] HEM5.0 calculates a maximum individual risk, which is equivalent to the highest cancer risk for any populated receptor modeled. When calculating cancer risk, HEM assumes that an individual breathes the ambient air at a given receptor site 24 hours per day over a 70-year lifetime. The max cancer risk is aggregated across all facilities and releases that might be assigned different OESs. The risk at each facility was assigned to an OES based on the facility that contributed the most risk to each census block.

[c] The number of facilities in this column is the total number of facilities assessed for each OES.

[d] The number of facilities in this column is the number of facilities that individually contribute to an estimated inhalation cancer risk exceeding 1×10^{-6}. Risks were rounded to two decimal places, so this represents risks greater than 9.95×10^{-7}.

[e] The number of facilities in this column is the number of facilities that individually contribute to an estimated inhalation cancer risk exceeding 1×10^{-5}. Risks were rounded to two decimal places, so this represents risks greater than 9.95×10^{-8}.

[f] Facilities were not mapped to an OES in cases where information on the 1,2-dichloroethane use at the site was not available.

Table 5-36 shows the distance from the modeled release location to the census block centroid showing risk the highest estimated cancer risk using HEM5.0 for facilities that are the primary contributors to cancer risk exceeding 1×10^{-6} and the farthest distances to census block centroids that are showing estimated cancer risks greater than 1×10^{-6} and 1×10^{-5}. Table 5-36 also presents the number of individuals exposed to the maximum cancer risk estimate at each centroid and the total population associated with each facility that is the primary contributor to risk greater 1×10^{-6} and 1×10^{-5}. The results show that facilities in OESs of Manufacturing; Repackaging; Processing into Formulation, Mixture, or Reaction Product; Processing as a Reactant; Industrial Application of Adhesives and Sealants; Waste Handling, Disposal, and Treatment (Non-POTW WWT); and Waste Handling, Disposal and Treatment (POTW) have people living near enough to the facilities to be exposed to ambient air concentrations that would result in an inhalation cancer risk exceeding 1×10^{-6}. Across all OESs, distances from the release location to the nearest populated census block centroid range from 34 to 3,227 m. Additionally, across all facilities analyzed using HEM5.0, the nearest census block centroid to a releasing facility, regardless of the risk, was approximately 13 m from the modeled release point. Due to uncertainties in NEI reporting and population distribution within a census block, the minimum distances reported in this paragraph might not be representative of actual exposures for all facilities and in some cases could be on the facility property.

Across all OESs, based on the populations of the census blocks closest to the releasing facilities that are primary contributors to risk greater than 1×10^{-6} and the highest risk for the facilities modeled using HEM5.0, the additional cancer cases per million people per facility if exposed daily (24 hours a day, every day for 70 years) over a lifetime would range from 1.82×10^{-6} to 8.17×10^{-4} for the general population . These cancer incidences were calculated by multiplying the third column in Table 5-36 by the fourth column.

Table 5-36. Distance from Release to Nearest Census Block Showing Cancer Risk Estimates Exceeding 1×10^{-6} for Facilities Modeled Using HEM5.0 using NEI Data from 2014, 2017, and 2020

Emissions Inventory System (EIS) ID [a]	OES	Maximum Cancer Risk Estimates at a Populated Census Block Centroid [b]	Population of Census Block Showing Highest Risk [c]	Distance from Modeled Release Location to Centroid of Census Block Showing Highest Risk (m) [d]	Total Population with Risk Greater than 1×10^{-6} [e]	Distance (m) to Farthest Census Block Centroid Showing Risk Greater than 1×10^{-6} [f]	Distance (m) to Farthest Census Block Centroid Showing Risk Greater than 1×10^{-5} [g]	Total Population with Risk Greater than 1×10^{-5}
12807511	Processing into Formulation, Mixture, or Reaction Product	2.4E−06	5	531	5	531	NA	0
13610611	Manufacturing	9.6E−06	26	1,004	436	5,238	NA	0
17640911	Manufacturing	1.4E−06	34	2,874	2,249	5,006	NA	0
17735411	Manufacturing	2.4E−06	9	1,641	45	3120	NA	0
3333611	Waste Handling, Treatment, and Disposal (POTW)	1.7E−06	396	174	742	236	NA	0
3965211	Manufacturing	3.8E−06	18	679	2,569	2,077	NA	0
4103311	Waste Handling, Treatment, and Disposal (POTW)	3.8E−06	91	35	238	61	NA	0
4193911	Industrial Application of Adhesives and Sealants	1.9E−06	11	379	167	663	NA	0
4778211	Processing as a Reactant	2.2E−06	41	849	761	1,543	NA	0
5632711	Processing as a Reactant	1.9E−06	18	2,873	3,812	4,846	NA	0
5633411	Manufacturing	1.8E−06	1	783	1	783	NA	0
5929411	Manufacturing	1.3E−05	1	1,156	4,124	10,117	1,156	14

Emissions Inventory System (EIS) ID [a]	OES	Maximum Cancer Risk Estimates at a Populated Census Block Centroid [b]	Population of Census Block Showing Highest Risk [c]	Distance from Modeled Release Location to Centroid of Census Block Showing Highest Risk (m) [d]	Total Population with Risk Greater than 1×10^{-6} [e]	Distance (m) to Farthest Census Block Centroid Showing Risk Greater than 1×10^{-6} [f]	Distance (m) to Farthest Census Block Centroid Showing Risk Greater than 1×10^{-5} [g]	Total Population with Risk Greater than 1×10^{-5}
7227011	Manufacturing	1.6E−06	25	3,146	77	4,287	NA	0
7354711	Manufacturing	6.5E−06	29	1,406	13,951	7,968	NA	0
7354911	Manufacturing	4.3E−06	9	1,605	3,524	4,474	NA	0
7445711	Manufacturing	2.2E−06	78	3,724	99	4,743	NA	0
7469811	Processing into Formulation, Mixture, or Reaction Product	1.8E−06	5	127	5	127	NA	0
7792011	Processing into Formulation, Mixture, or Reaction Product	1.1E−06	4	725	4	725	NA	0
7915011	Manufacturing	6.6E−06	6	2,005	349	9,001	NA	0
7915211	Repackaging	7.7E−06	41	634	1,036	1,451	NA	0
8018911	Waste Handling, Treatment, and Disposal (Non-POTW WWT)	3.5E−06	232	509	273	711	NA	0
8467311	Manufacturing	7.4E−06	18	922	2,965	3,700	NA	0
993411	Processing as a Reactant	3.3E−06	7	363	7	363	NA	0

HEM5.0 = Human Exposure Model Version 5; EIS = Emissions Inventory System; NEI = National Emissions Inventory; OES = Occupational exposure scenario; POTW = publicly owned treatment works; WWT = wastewater treatment

[a] Additional facilities beyond those shown in the table were modeled in HEM5.0. This table only shows facilities that were primary contributors to a cancer risk estimate exceeding 1 in a million at a census block centroid within 50 km of the modeled release location.

[b] HEM5.0 calculates a maximum individual risk (MIR), which is equivalent to the highest cancer risk estimate for any populated receptor modeled and is shown here as the maximum cancer risk. When estimating cancer risk, HEM5.0 assumes that an individual breathes the ambient air at a given receptor site 24 hours per

Emissions Inventory System (EIS) ID [a]	OES	Maximum Cancer Risk Estimates at a Populated Census Block Centroid [b]	Population of Census Block Showing Highest Risk [c]	Distance from Modeled Release Location to Centroid of Census Block Showing Highest Risk (m) [d]	Total Population with Risk Greater than 1×10^{-6} [e]	Distance (m) to Farthest Census Block Centroid Showing Risk Greater than 1×10^{-6} [f]	Distance (m) to Farthest Census Block Centroid Showing Risk Greater than 1×10^{-5} [g]	Total Population with Risk Greater than 1×10^{-5}

day over a 70-year lifetime. The MIRs in this table show the aggregated risks and they might be associated with multiple facilities. The facility associated with each MIR is the largest contributor to risk at a given census block.

[c] This population is only the population of the census block with the highest cancer risk estimated at the centroid and not the total number of people with listed estimated cancer risk resulting from a given facility's emissions. Table 5-35 provides the total number of people with an estimated cancer risk exceeding a given benchmark.

[d] This is the distance from the emission release point to the centroid of the census block that shows the highest estimated cancer risk for which the given facility is the highest contributor of risk. For facilities with multiple release points, this is the distance from the census block to the nearest release point associated with the associated facility. Unique facilities were determined by unique EIS IDs.

[e] Total population of all census blocks with a cancer risk greater than 1×10^{-6} for which the associated facility was the primary contributor to risk.

[f] Distance to farthest census block centroid with an estimated cancer risk greater than 1×10^{-6}. Risk at the census block is aggregated across all facilities, but the facilities shown in the table are the greatest contributors to the risk at the associated census blocks.

[g] Distance to farthest census block centroid with an estimated cancer risk greater than 1×10^{-5}. Risk at the census block is aggregated across all facilities, but the facilities shown in the table are the greatest contributors to the risk at the associated census blocks.

[h] Facilities were not mapped to an OES in cases where information on the 1,2-dichloroethane use at the site was not available.

Comparison of Cancer Risk based on TRI and NEI Release Data

A comparison of cancer risks at each modeled census block based on TRI and NEI release data showed that risks based on TRI data generally, but not exclusively, resulted in higher risk than risks based on NEI data (Figure 5-3). For example, the highest risk at a populated census block based on TRI data was 2.98×10^{-5}, while the risk based on NEI for the same census block was 4.33×10^{-6}, which is a factor of approximately 6.9 less risk. The census data point with the highest TRI census is emphasized in the left pane of Figure 5-3. This risk is associated with the facility with the TRI ID of 70669PPGNDCOLUM and EIS ID of 7354911. All census blocks associated with this facility that present risk greater than 4.33×10^{-6} are also emphasized in blue-green (cyan). The difference in risk estimates between use of TRI and NEI is likely due to the difference in releases reported to each database. The TRI releases for this facility were 92,000 lbs for the year 2024, while the NEI releases were 26,432 lbs for the year 2020, which is a factor of approximately 3.5 less in reported release. The right pane of Figure 5-3 shows that TRI releases are consistently higher than NEI releases for facilities that report to both databases. The releases associated with the facility with the TRI ID of 70669PPGNDCOLUM and EIS ID of 7354911 are highlighted in blue-green (cyan) for emphasis. Additional differences in risk would result from differences in modeling. TRI reports emissions on a facility-wide basis and therefore does not include information on stack parameters and does not provide locations of process level emissions for facilities that have multiple emission points. In this assessment, EPA assumed stack parameters (*e.g.*, stack height, stack temperature, plume velocity) that generally result in high-end estimated concentrations when stack parameters were not reported by the facility. EPA also assumed TRI releases occur at one location, which could result in higher or lower risk estimates depending on the specific locations of the releases, size of the facility, and population distribution around the facility. Overall, the data indicate that the higher reported TRI emissions compared to the NEI emissions are driving the higher estimated risks.

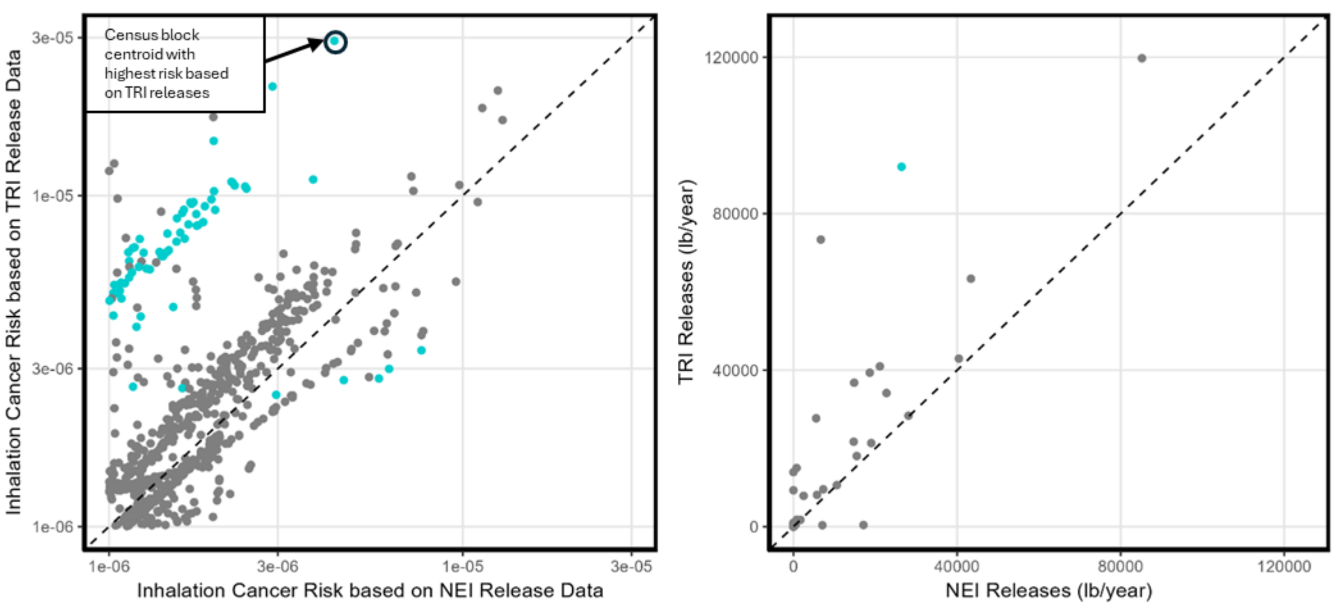

Figure 5-3. Left: Comparison of Inhalation Risks at Each Census Block Modeled in HEM5.0 Based on TRI Releases to Risks Based on NEI Releases on a Log-Log Scale; Right: Comparison of TRI Releases to NEI Releases Used in this Evaluation

Risks and emissions from the facility with highest risk (TRI ID 70669PPGNDCOLUM/EIS ID 7354911) based on TRI releases are shown in (blue-green) cyan for emphasis. Diagonal line is a one-to-one line for comparison.

5.3.6.2.2 Estimated General Population Cancer Risks via Ambient Air Using HEM5.0 at Radial Distances

In this section, EPA is focusing on inhalation cancer risk estimates at discrete distances of 100 and 1,000 m. Risks at all modeled distances using TRI and NEI data are shown in Table_Apx G-1 and Table_Apx G-2. HEM5.0-calculated risk estimates for TRI-releasing facilities indicated that only the OESs of Manufacturing and Processing into Formulation, Mixture, or Reaction Product exceeded 1×10^{-4} at a of 100 m when considering the maximum 95th annual average percentile concentrations at 100 m. Risks for both of these OESs decreased below 1×10^{-4} at distances 1,000 m and beyond. No other OES showed risk estimates above 1×10^{-4} at distances above 100 m. Relative to 1×10^{-6}, five OESs (Manufacturing; Processing as a Reactant; Processing into Formulation, Mixture, or Reaction Product; Repackaging; and Waste Handling, Treatment, and Disposal (Incinerator) had risks that exceeded 1×10^{-6} at the distance of 100 m based on the maximum of the 95th percentile annual average concentrations at 100 m. Only the OESs of Manufacturing and Processing into Formulation, Mixture, or Reaction Product had estimated risk estimates that exceeded 1×10^{-6} at distances greater than or equal to 1,000 m.

HEM5.0-calculated risk estimates for NEI-releasing facilities indicated that only the OESs of Manufacturing; Processing as a Reactant; and Processing into Formulation, Mixture, or Reaction Product exceeded 1×10^{-4} at a of 100 m when considering the maximum 95th annual average percentile concentrations at 100 m. Risks for these three OESs decreased below 1×10^{-4} at distances 1,000 m and beyond. No other OES showed risk estimates above 1×10^{-4} at distances above 100 m. Relative to 1×10^{-6}, all OES, except Waste Handling, Disposal, and Treatment (Non-POTW WWT), had risks that exceeded 1×10^{-6} at the distance of 100 m based on the maximum of the 95th percentile annual average concentrations at 100 m. Only the OESs of Manufacturing and Repackaging had estimated risk estimates that exceeded 1×10^{-6} at distances greater than or equal to 1,000 m. Note that these risks at radial distances for NEI releases were calculated individually for each release point are not aggregated across other releases at the same facility or across facilities.

5.3.6.2.3 Estimated General Population Cancer Risks from EPA-Estimated Releases for Generic Facilities/Sites

For OESs where EPA used estimated releases from generic facilities/site, the maximum cancer inhalation risks across all OESs resulting from the 95th percentile modeled concentrations ranged from 1.02×10^{-10} to 2.58×10^{-4} at 1,000 m. Because generic facilities/sites do not have actual physical locations, releases from these facilities were modeled for multiple scenarios that are meant to represent a range of release conditions. Table 5-37 shows risk estimates for modeling using the Lake Charles, Louisiana, meteorology station, which has previously been found to provide high-end estimates relative to other meteorology stations available in AERMOD (see the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026o) for more information). The OES with the highest estimated inhalation cancer risk was Application of adhesives and sealants, with risk estimates above 1×10^{-6} up to the highest modeled distance of 10,000 m and risks estimates above 1×10^{-4} at distances up to 1,000 m. No other OES had risk estimates above 1×10^{-4} at a distance exceeding 100 m. The OES of Commercial Non-Aerosol Cleaning/Degreasing had risk estimates above 1×10^{-6} for distances up to 1,000 m. None of the other OESs modeled using EPA-estimated releases from generic facilities/sites showed cancer inhalation risk estimates above 1×10^{-6} at distances above 100 m. The distances presented in Table 5-37 are consistent with those presented in previous sections and are likely to represent the general population; however, since these are generic facilities/sites, there are no location data and EPA cannot fully characterize the populations that might be living near these facilities/sites. Summary tables for acute risks for OESs using modeled releases based on the 10th, 50th, and 95th percentile modeled concentrations up to 10,000 m are presented in Table 5-37 and *Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2026bd).

Table 5-37. Maximum 95th Percentile Cancer Risks Estimated Within 100–2,500 m of Generic Facilities/Sites for OESs with EPA-Estimated Releases Based on Modeled Ambient Air Concentrations Using AERMOD[a b c d]

OES [e]	Meteorology [f]	Land Use	100–1,000 m	1,000 m	2,500 m	Overall Confidence [g]
Industrial Application of Adhesives and Sealants	Lake Charles, LA	Rural	1.17E−03	2.58E−04	6.41E−05	Slight
	Lake Charles, LA	Urban	3.97E−04	6.04E−05	1.32E−05	
Commercial Aerosol Products	Lake Charles, LA	Rural	8.09E−07	1.62E−07	3.41E−08	Slight
	Lake Charles, LA	Urban	5.21E−07	8.59E−08	1.61E−08	
Non-Aerosol Cleaning and Degreasing	Lake Charles, LA	Rural	3.81E−05	3.40E−06	5.58E−07	Slight
	Lake Charles, LA	Urban	3.66E−05	3.23E−06	4.65E−07	
Laboratory Use	Lake Charles, LA	Rural	1.12E−08	1.18E−09	2.04E−10	Moderate
	Lake Charles, LA	Urban	1.11E−08	1.11E−09	1.84E−10	

AERMOD = American Meteorological Society (AMS)/EPA Regulatory Model; OES = occupational exposure scenario

[a] See *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae) for discussion of EPA-modeled releases for generic facilities/sites.

[b] Lifetime cancer risk estimates are based on 78 years of continuous inhalation exposure averaged of a 78-year lifetime.

[c] Cancer risks were estimated at additional distances from 10–10,000 m from all facilities and can be found in *Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2026bd).

[d] This table shows risks estimates for all OESs that are represented by EPA-estimated releases for generic facilities/sites regardless of how the risk compares to the benchmark.

[e] See Table 5-35 for OES to COU mapping for the OESs of Industrial Application of Adhesives and Sealants; Non-Aerosol Cleaning and Degreasing; and Laboratory Use. For the OES of Commercial Aerosol Products, the life cycle stage is Industrial Use, the category is Solvents (for cleaning and degreasing), and the subcategory is Degreasing and cleaning solvents.

[f] For OESs with estimated releases from generic facilities/sites, EPA assumed meteorology stations for modeling of ambient air concentrations. EPA is presenting results when using the Lake Charles, LA, station in this table. Previous work has shown that the Lake Charles, LA, station tends to produce higher air concentrations relative to other meteorology stations available in AERMOD. EPA also modeled estimated releases from generic facilities/sites using the Sioux Falls, SD, meteorology station, which tends to produce central-tendency air concentrations relative to other stations. The results using the Sioux Falls, SD, station are presented in *Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2026bd).

[g] The rationale for the overall confidences can be found in *General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ah).

5.3.6.3 Acute Inhalation Risks by Discrete Distance Modeled with HEM5.0

For this analysis, acute concentrations were only calculated based on the 95th percentile concentrations at each receptor. Daily average concentrations were calculated for each receptor, resulting in 365 daily concentrations. In this evaluation, the 18th highest of the 365 daily averages were output by HEM5.0, which equates to approximately the 95th percentile. Table 5-38 shows the acute inhalation MOEs closest to the benchmark of 30 for each OES based on acute concentrations at census block centroids using both NEI and TRI release data. The OES of Manufacturing showed the highest risks, with MOEs of 477 and 715 based on TRI and NEI releases, respectively. The analysis did not find any populated census blocks with acute inhalation risk below the benchmark. Acute risks at polar receptors up to 50,000 m from the release locations were also calculated. Summary tables for acute risks for TRI- and NEI-reporting facilities are presented in Table_Apx H-1 and Table_Apx H-2.

Table 5-38. Acute Inhalation Risk MOEs at Census Block Showing most Risk based on TRI[a] and NEI[b] Releases[c] Using HEM5.0

OES	Acute Inhalation Risk MOEs based on TRI Releases (Benchmark = 30)	Acute Inhalation Risk MOEs based on NEI Releases (Benchmark = 30)
Manufacturing	477	715
Repackaging	977,173	3,821
Processing as a Reactant	11,428	3,411
Processing into Formulation, Mixture, or Reaction Product	1,361	4,412
Industrial Application of Adhesives and Sealants	NA	6,276
Industrial Application of Lubricants and Greases	NA	29,127
Non-Aerosol Cleaning and Degreasing	4,251,348	60,244
Laboratory Use	NA	507,532
Waste Handling, Treatment, and Disposal (Incinerator)	7,147	57,837
Waste Handling, Treatment, and Disposal (Landfill)	NA	40,218
Waste Handling, Treatment, and Disposal (Non-POTW WWT)	NA	4,002
Waste Handling, Treatment, and Disposal (POTW)	NA	3,920
Waste Handling, Treatment, and Disposal (Remediation)	NA	126,483
Facilities not Mapped to an OES[d]	NA	469,412

HEM5.0 = Human Exposure Model Version 5; NEI = National Emissions Inventory; ; OES = occupational exposure scenario; POTW = publicly owned treatment works; TRI = Toxics Release Inventory; WWT = wastewater treatment

[a] For each OES, EPA modeled the highest total (fugitive + stack) annual TRI-reported release for each facility from 2015–2024. Additionally, this table only includes facilities reporting to TRI using Form R.

[b] For NEI data, EPA used data reported 2014, 2017, and 2020 in this analysis. In the draft risk evaluation, EPA modeled all available data for 2014 and 2017 using AERMOD (U.S. EPA, 2025a). For this evaluation, EPA modeled, in HEM5.0, each facility that showed a risk greater than 1×10^{-6} based on the 95th percentile concentration at 10 m from the release location based on the analysis performed in the draft risk evaluation. EPA also modeled any releases that were new to the 2020 NEI if they were greater than the lowest release from 2014 and 2017 that resulted in a risk greater than 1×10^{-6} based on the 95th percentile concentration at 10 m from the release location. If a facility reported in multiple years and had total releases greater than the threshold described above, then EPA used the maximum release across all years in this analysis. The risks in this table are aggregated across all facilities and releases that impact each census block.

OES	Acute Inhalation Risk MOEs based on TRI Releases (Benchmark = 30)	Acute Inhalation Risk MOEs based on NEI Releases (Benchmark = 30)
[c] Average daily concentrations were calculated at each census block for all 365 days in a year. For this assessment, the 18th highest concentration was output by HEM5.0, which equates to approximately the 95th percentile. The acute risks in this table were calculated using the highest 95th percentile concentration across all census blocks modeled and facilities within the associated OES. [d] Facilities were not mapped to an OES in cases where information on the 1,2-dichloroethane use at the site was not available.		

For OESs where EPA used estimated releases from generic facilities/site, the maximum acute inhalation risks across all OESs resulting from the 95th percentile modeled concentrations ranged from 71 to 3.66×10^9 for 1,000 m. The maximum risk was for the OES of Application of adhesives and sealants and was modeled using the Lake Charles, Louisiana, meteorological station (an urban land use scenario), and a 95th percentile release scenario (as described in *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae)). The Industrial application of adhesives and sealants and Non-aerosol cleaning and degreasing OESs had acute inhalation risk estimates below the benchmark of 300 at a distance of 100 m, and 60 m, respectively. None of the other OESs relying on EPA-estimated releases showed acute inhalation risk at any modeled distance. Summary tables for acute risks for OESs using EPA-estimated releases based on the 10th, 50th, and 95th percentile modeled concentrations up to 10,000 m are presented in Table_Apx H-3 and *Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2026bd).

5.3.6.4 Chronic Non-Cancer Inhalation Risks by Discrete Distance Modeled by HEM5.0

For this analysis, chronic, non-cancer inhalation risks were calculated using annual average concentrations for each receptor. Table 5-38 shows the chronic, non-cancer inhalation MOEs closest to the benchmark of 30 for each OES based on acute concentrations at census block centroids using both NEI and TRI release data. The OES of Manufacturing had the lowest MOEs, with values of 5.09×10^3 and 1.15×10^5 based on TRI and NEI data respectively. The analysis did not identify any populated census blocks with chronic non-cancer risk estimates below the benchmark.

Table 5-39. Chronic Non-Cancer Inhalation Risk MOEs at Census Block Showing most Risk based on TRI[a] and NEI[b] Releases as Modeled by HEM5.0

OES	Chronic Non-Cancer Inhalation Risk MOE based on TRI Releases (Benchmark = 30)[c, d]	Chronic Non-Cancer Inhalation Risk MOE based on NEI Releases (Benchmark = 30)[c]
Manufacturing	5,091	11,532
Repackaging	14,873,818	19,345
Processing as a Reactant	119,187	45,602
Processing into Formulation, Mixture, or Reaction Product	15,254	61,938
Industrial Application of Adhesives and Sealants	NA	77,506
Industrial Application of Lubricants and Greases	NA	377,604
Non-Aerosol Cleaning and Degreasing	62,992,628	478,756
Laboratory Use	NA	4,079,842
Waste Handling, Treatment, and Disposal (Incinerator)	83,044	667,650

OES	Chronic Non-Cancer Inhalation Risk MOE based on TRI Releases (Benchmark = 30)[c, d]	Chronic Non-Cancer Inhalation Risk MOE based on NEI Releases (Benchmark = 30) [c]
Waste Handling, Treatment, and Disposal (Landfill)	NA	453,069
Waste Handling, Treatment, and Disposal (Non-POTW WWT)	NA	42,473
Waste Handling, Treatment, and Disposal (POTW)	NA	39,326
Waste Handling, Treatment, and Disposal (Remediation)	NA	1,128,146
Facilities not Mapped to an OES[d]	NA	4,520,978

HEM5.0 = Human Exposure Model Version 5; NEI = National emissions inventory; OES = Occupational exposure scenario; TRI = Toxic release inventory

[a] For each OES, EPA modeled the highest total (fugitive + stack) annual TRI-reported release for each facility from 2015–2024. Additionally, this table only includes facilities reporting to TRI using Form R.

[b] For NEI data, EPA used data reported 2014, 2017, and 2020 in this analysis. In the draft risk evaluation, EPA modeled all available data for 2014 and 2017 using AERMOD (U.S. EPA, 2025a). For this evaluation, EPA modeled, in HEM5.0, each facility that showed a risk greater than 1×10^{-6} based on the 95th percentile concentration at 10 m from the release location based on the analysis performed in the draft risk evaluation. EPA also modeled any releases that were new to the 2020 NEI if they were greater than the lowest release from 2014 and 2017 that resulted in a risk greater than 1×10^{-6} based on the 95th percentile concentration at 10 m from the release location. If a facility reported in multiple years and had total releases greater than the threshold described above, then EPA used the maximum release across all years in this analysis The risks in this table are aggregated across all facilities and releases that impact each census block.

[c] Risks are shown for the census block within each OES that had the risk closest to the benchmark. Risk is indicated when the estimated is below the benchmark. The risks are based on the annual average concentration each block.

[d] Facilities were not mapped to an OES in cases where information on the 1,2-dichloroethane use at the site was not available.

For OESs where EPA used estimated releases from generic facilities/site, the maximum acute inhalation risks across all OESs resulting from the 95th percentile modeled concentrations ranged from 579 to 1.06×10^{10} for a distance of 1,000 m. The maximum risk was for the OES of Application of Adhesives and Sealants and was modeled using the Lake Charles, Louisiana, meteorological station (an urban land use scenario) and a 95th percentile release scenario (as described in *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae)). The Application of Adhesives and Sealants and Industrial and Commercial Non-Aerosol Cleaning/Degreasing OESs had risk estimates below the benchmark of 300 at an area distance of 100 to 1,000 m, and 60 m, respectively. None of the other OESs relying on EPA-estimated releases showed chronic non-cancer inhalation risk at any modeled distance. Summary tables for chronic, non-cancer inhalation risks for OESs using EPA-estimated releases based on the 10th, 50th, and 95th percentile modeled concentrations up to 10,000 m are presented in Table_Apx I-3 and *Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2026bd).

5.3.6.5 General Population Risk Estimates from Oral Exposures

EPA estimated exposures to 1,2-dichloroethane via the oral route from several sources, including drinking water exposures, fish ingestion exposures, incidental ingestion from swimming in receiving water bodies, and soil ingestion from soil treated with biosolids containing 1,2-dichloroethane. Ingestion of 1,2-dichloroethane via surface water or soil is based on reported releases from facilities as found in the TRI and DMR. Summaries of these exposures are provided in Section 5.1.2.3. EPA summarized the highest exposures per COU/OES to quantify the highest potential risks associated with these exposures. The full exposure and risks are presented in supplemental files *Fish Ingestion Risk Calculator for 1,2-*

Dichloroethane (U.S. EPA, 2026ag) and *Drinking Water Exposure Estimates for 1,2-Dichloroethane* (U.S. EPA, 2026aa).

EPA evaluated oral exposures to 1,2-dichloroethane via drinking water ingestion. A refined analysis was conducted to consider the concentration of 1,2-dichloroethane downstream of those releasing facilities within each COU/OES at the point of drinking water treatment facility intakes (see Table 5-15). The highest drinking water exposures were acute exposures to infants (5.6×10^{-5} mg/kg/day) from the Processing as a Reactant OES releases. The corresponding acute risk for infants from this exposure is 352,358, which is above the benchmark MOE of 30. Both adult and infant risk estimates from drinking water exposures are presented below in Table 5-40.EPA has robust confidence in the general population risk estimates for drinking water ingestion.

Table 5-40. Summary of General Population Risk Estimates from Oral Exposures via Drinking Water Ingestion

Lifestage	Category	Subcategory	OES	Adult Lifetime Cancer Risk[a]	Adult (21+ years)		Infant (Birth to <1 year)	
					Acute non-Cancer MOE[b]	Chronic non-Cancer MOE[c]	Acute non-Cancer MOE[b]	Chronic non-Cancer MOE[c]
Processing	Processing as a reactant	Intermediate in: Petrochemical manufacturing; Plastic material and resin manufacturing; All other basic organic chemical manufacturing; All other basic inorganic chemical manufacturing	Processing as a Reactant	6.2E−08	1.2E06	3.1E06	3.5E05	1.2E06
Disposal	Disposal	Disposal	Waste Handling, Treatment, and Disposal (Incinerator)	3.1E−08	4.9E06	6.2E06	1.4E06	2.4E06
Not mapped to OES	Not mapped to OES	Not mapped to OES	Not Mapped to OES	1.2E−08	1.2E07	1.5E07	3.5E06	6.0E06

MOE = margin of exposure; OES = occupational exposure scenario
[a] Cancer benchmark = 1×10^{-4} to 1×10^{-6}; no drinking water risk estimates above benchmark
[b] Acute oral non-cancer benchmark = 30; no drinking water risk estimates below benchmark
[c] Chronic oral non-cancer benchmark = 100; no drinking water risk estimates below benchmark

EPA conducted a screening level assessment for fish ingestion by estimating the highest surface water concentrations of 1,2-dichloroethane, and thus, highest fish tissue concentration per OES. The OES with the highest fish ingestion acute exposures was Waste Handling, Treatment, and Disposal (Non-POTW WWT) OES for adult subsistence fishers at 1.7×10^{-2} mg/kg/day (see Table 5-17). The corresponding acute risk for adults was 1,155, which is well above the acute benchmark MOE of 30 (see Table 5-41). For chronic exposures via fish ingestion associated with Waste Handling, Treatment, and Disposal

(Non-POTW WWT) OES releases was also 1.7×10^{-2} mg/kg/day. The corresponding risks were 377, which is above the chronic benchmark MOE of 300. EPA has robust confidence in (1) the risk estimates for fish ingestion, and (2) that other releases with lower surface water concentrations would likewise have lower fish ingestion exposures and even lower acute and chronic risk estimates.

Table 5-41. Summary of General Population Risk Estimates from Oral Exposures from Fish Ingestion

Life Cycle Stage	Category	Subcategory	OES	Adult (+21)[a]		Young Toddler (1 to <2)[b]	
				Acute Non-Cancer MOE (BM=30)	Chronic Non-Cancer MOE (BM=100)	Acute Non-Cancer MOE (BM=30)	Chronic Non-Cancer MOE (BM=100)
Manufacturing	Domestic manufacture	Manufacturing	Manufacturing (LA0000761)	9.3E04	3.0E04	4.0E05	1.0E06
Import/ Repackaging	Import/ Repackaging	Repackaging	Repackaging (LA0056600)	1.5E07	4.9E06	2.2E06	5.6E06
Processing	Processing – as a reactant	Intermediate in: Petrochemical manufacturing; Plastic material and resin manufacturing; All other basic organic chemical manufacturing; All other basic inorganic chemical manufacturing	Processing as a Reactant (IL0000141)	5.1E05	1.7E05	2.2E06	5.6E06
	Processing – incorporated into formulation, mixture, or reaction product	Adhesives and sealants; Lubricants and greases; Process regulators; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing	Processing into Formulation, Mixture, or Reaction Product (NJ0002348)	1.7E06	7.9E05	7.2E06	2.6E07
Industrial use	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Industrial and Commercial Non-Aerosol Cleaning/ Degreasing (NJ0000019)	2.1E08	1.0E08	8.85E08	3.4E09
Commercial use	Other use	Laboratory chemical	Laboratory Use (MI0001911)	4.5E05	4.1E05	1.9E06	1.4E07
Disposal	Disposal	Disposal	Waste Handling, Treatment and Disposal (POTW), (CA0023671)	2.7E04	8.9E03	1.2E05	3.0E05

Life Cycle Stage	Category	Subcategory	OES	Adult (+21)[a]		Young Toddler (1 to <2)[b]	
				Acute Non-Cancer MOE (BM=30)	**Chronic Non-Cancer MOE (BM=100)**	**Acute Non-Cancer MOE (BM=30)**	**Chronic Non-Cancer MOE (BM=100)**
Disposal	Disposal	Disposal	Waste Handling, Treatment and Disposal (Non-POTW), (PA0080594)	1.1E03	377	5.0E03	1.3E04
			Waste Handling, Treatment, and Disposal (Incinerator), (AR003780)	6.1E03	2.0E03	2.6E04	6.7E04
			Waste Handling, Treatment and Disposal (Landfill), (PA0043818)	9.5E05	2.4E05	4.1E06	8.1E06
			Waste Handling, Treatment and Disposal (Remediation), (NV0023621)	2.6E06	1.2E06	1.1E07	3.9E07

[a] Adult oral risk based on fish consumption rate for adult subsistence fishers of 1.78 g/kg-day for both acute and chronic scenarios.
[b] Young toddler (1 to <2 years) oral risk based on fish consumption rate of 0.412 g/kg-day (U.S. EPA, 2011a).

EPA also evaluated fish ingestion exposures and associated risks from releases on tribal lands in Arizona as these populations have 10 times higher fish ingestion rates (2.7 g/kg-day) than the general population (0.277 g/kg-day). The releases of 1,2-dichloroethane were low and the concentration of 1,2-dichloroethane in the receiving water body (Chinle Wash in Chinle, Arizona) was also relatively low (5.2 µg/L). The highest exposures were acute tribal fish ingestion exposures and were estimated as 6.18×10^{-5} mg/kg/day. The associated risk with the acute fish ingestion exposure was 322,006—well above the acute benchmark MOE of 30 (see Table 5-42). In response to public comments, EPA also considered possible risks to tribal children from 1,2-dichloroethane via fish ingestion. For children 3 to 5 years old the acute exposures were estimated at 5.6×10^{-6} mg/kg-day with the corresponding risk of 3,522,702 and for children 6 to 11 years old the acute exposures were 7.55×10^{-6} mg/kg-day and the corresponding risk estimate was 2,634,025 – both risk estimates above the acute benchmark MOE of 30.

Table 5-42. Summary of Tribal Risk Estimates from Oral Exposures to 1,2-Dichloroethane from Fish Ingestion

Life Cycle Stage	Category	Subcategory	Scenario	Adult (+21)[a]		Child (3 to 5 yrs)		Child (6 to 11 yrs)	
				Acute Non-Cancer MOE (BM=30)	Chronic Non-Cancer MOE (BM=100)	Acute Non-Cancer MOE (BM=30)	Chronic Non-Cancer MOE (BM=100)	Acute Non-Cancer MOE (BM=30)	Chronic Non-Cancer MOE (BM=100)
Disposal	Disposal	Disposal	Waste Handling, Treatment and Disposal (POTW), (NN0020265)	3.2E05	1.0E05	3.5E06	1.1E06	2.6E06	8.6E05

MOE = margin of exposure
[a] Adult tribal risk based on tribal fish consumption rates: adult only = 2.7 g/kg-day (U.S. EPA, 2011a)
[b] Tribal children's risk based on tribal children's consumption rates of 0.2469 g/kg-day for ages 3 to 5 and 0.3302 g/kg-day for ages 6 to 11 (Dubeau et al., 2022)
[c] NPDES permit NN0020265 represents highest concentration of 1,2-dichloroethane from discharges to surface water in tribal lands.

For incidental ingestion, EPA conducted screening assessment and as presented in Table 5-43 assessed the highest exposures per COUs/OESs releasing to surface water. The highest exposures across all COUs were from releases associated with the Disposal/Waste Handling, Treatment, and Disposal (Non-POTW WWT) and the COU/OES for youths (ages 11–15 years) with acute exposures of 0.012 mg/kg-day (see Table 5-16). The corresponding MOEs were 1,690, which is above the benchmarks of 30 for acute. Risk estimates associated with all other surface water releases and the resultant oral exposures from incidental ingestion associated with other OESs are less than those presented in the Table 5-16 and would also be above benchmarks.

Table 5-43. Summary of Oral Risk Estimates from Exposures via Incidental Ingestion from Swimming

Life Cycle Stage	Category	Subcategory	OES	Acute MOE (Benchmark=30)		
				Adult (21+ years)	Youth (11–15 years)	Child (6–10 years)
Manufacturing	Domestic manufacture	Manufacturing	Manufacturing (LA0000761)	2.1E05	1.4E05	2.4E05

Life Cycle Stage	Category	Subcategory	OES	Acute MOE (Benchmark=30)		
				Adult (21+ years)	Youth (11–15 years)	Child (6–10 years)
Import/ Repackaging	Import/ Repackaging	Repackaging	Repackaging (LA0056600)	3.4E07	2.2E07	3.9E07
Processing	Processing – As a reactant	Intermediate in: Petrochemical manufacturing; Plastic material and resin manufacturing; All other basic organic chemical manufacturing; All other basic inorganic chemical manufacturing	Processing/ Processing as a Reactant (IL0000141)	1.2E06	7.4E05	1.3E06
	Processing – Incorporated into formulation, mixture, or reaction product	Adhesives and sealants; Lubricants and greases; Process regulators; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing	Processing into Formulation, Mixture, or Reaction Product (NJ0002348)	3.8E06	2.4E06	4.3E06
Industrial use	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Industrial and Commercial non-Aerosol Cleaning/ Degreasing (NJ0000019)	4.7E08	3.0E08	5.3E08
Commercial use	Other use	Laboratory chemical	Laboratory Use (MI0001911)	1.0E06	6.5E05	1.2E06
Disposal	Disposal	Disposal	Waste Handling, Treatment and Disposal (POTW), (CA0023671)	6.2E04	4.0E04	7.1E04
			Waste Handling, Treatment and Disposal (Non-POTW WWT), (PA0080594)	2.6E03	1.7E03	3.0E03
			Waste Handling, Treatment, and Disposal (Incinerator), (AR003780)	1.4E04	8.9E03	1.6E04

Life Cycle Stage	Category	Subcategory	OES	Acute MOE (Benchmark=30)		
				Adult (21+ years)	Youth (11–15 years)	Child (6–10 years)
Disposal	Disposal	Disposal	Waste Handling, Treatment and Disposal (Landfill), (PA0043818)	2.2E06	1.4E06	2.5E06
			Waste Handling, Treatment, and Disposal (Remediation), (NV0023621)	5.8E06	3.8E06	6.7E06

EPA conducted a screening analysis of exposures from ingestion of soil and estimated high-end exposures from the Manufacturing OES releases as 3.39×10^{-5} mg/kg/day (see Section 5.1.2.3). EPA uses the MOE to estimate risk and acute and chronic risks are 587,021 and 191,740, respectively—which are well above the acute and chronic benchmark MOEs of 30 and 100, respectively. The Agency therefore has robust confidence that there is low risk to 1,2-dichloroethane from oral exposures through soil ingestion. EPA did not evaluate further risks from other oral exposures from soil ingestion associated with other OESs.

5.3.6.6 General Population Risk Estimates from Dermal Exposures

EPA assessed possible risk from dermal exposures via swimming in surface waters receiving facility discharges from COUs/OESs. Across all OESs, the highest dermal exposure is from Waste Handling, Treatment, and Disposal OES releases for adults. The adult acute dermal exposures are 2.1×10^{-3} mg/kg/day. The corresponding associated risks are 9,566 for acute, which are above the benchmark MOEs of 30. Because dermal exposures were lower for the other remaining OESs, EPA did not further quantitatively assess risk as they would be lower than those for Waste handling, treatment, and disposal and would not be below the benchmark MOEs. EPA has robust confidence that there are no dermal risks for non-cancer below benchmark.

Table 5-44. Summary of Dermal Risk Estimates from General Population Exposures via Swimming

Life Cycle Stage	Category	Subcategory	OES	Acute MOE (Benchmark=30)		
				Adult (21+ years)	Youth (11–15 years)	Child (6–10 years)
Manufacturing	Domestic manufacture	Domestic manufacture	Manufacturing (LA0000761)	9.1E05	1.2E06	2.0E06
Import/ Repackaging	Import/ Repackaging	Repackaging	Repackaging (LA0056600)	1.5E08	1.9E08	3.2E08

Life Cycle Stage	Category	Subcategory	OES	Acute MOE (Benchmark=30)		
				Adult (21+ years)	Youth (11–15 years)	Child (6–10 years)
Processing	Processing – as a reactant	Intermediate in: Petrochemical manufacturing; Plastic material and resin manufacturing; All other basic organic chemical manufacturing; All other basic inorganic chemical manufacturing	Processing as a Reactant (IL0000141)	5.0E06	6.5E06	1.1E07
	Processing – incorporated into formulation, mixture, or reaction product	Adhesives and sealants; Lubricants and greases; Process regulators; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing	Processing into Formulation, Mixture, or Reaction Product (NJ0002348)	1.6E07	2.1E07	3.5E07
Industrial use	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Industrial and Commercial Non-Aerosol Cleaning/ Degreasing (NJ0000019)	2.0E09	2.6E09	4.3E09
Commercial use	Other use	Laboratory chemical	Laboratory Use (MI0001911)	4.4E06	5.7E06	9.4E06
Disposal	Disposal	Disposal	Waste Handling, Treatment and Disposal (POTW), (CA0023671)	2.7E05	3.5E05	5.8E05
			Waste Handling, Treatment and Disposal (Non-POTW WWT), (PA0080594)	1.1E04	1.5E04	2.4E04
			Waste Handling, Treatment, and Disposal (Incinerator), (AR003780)	6.0E04	7.8E04	1.3E05
			Waste Handling, Treatment and Disposal (Landfill), (PA0043818)	9.4E06	1.2E07	2.0E07

Life Cycle Stage	Category	Subcategory	OES	Acute MOE (Benchmark=30)		
				Adult (21+ years)	Youth (11–15 years)	Child (6–10 years)
Disposal	Disposal	Disposal	Waste Handling, Treatment and Disposal (Remediation), (NV0023621)	2.5E07	3.3E07	5.4E07
OES = occupational exposure scenario; POTW = publicly owned treatment works; WWT = wastewater treatment						

5.3.6.7 General Population Risk Estimates from Byproducts

EPA did not find acute or chronic non-cancer or cancer inhalation risks for the general population that exceeded a benchmark for any of the byproducts based on an analysis using HEM5.0. The estimated inhalation risks to the general population from the assessed byproducts are expected to be high-end estimates for the following reasons (1) EPA used TRI-reported releases of 1,2-dichloroethane from the year of release for each facility from 2015 to 2024; (2) Each facility's highest annual release of 1,2-dichloroethane was used to calculate releases of each byproduct using percentages provided by industry presented in Table 3-2 that represent high-end estimates of the typical composition of each byproduct (a comparison to the releases used in the fenceline analyses and *Risk Evaluation for 1,1-Dichloroethane* (U.S. EPA, 2025d) indicates that the releases modeled in this assessment are unlikely to be overestimated); and (3) the exposure scenarios assume continuous exposure (1 day for acute risk, 1 year for chronic non-cancer risks, and 70 years for cancer risks). The risks calculated using the percentages of each byproduct in the non-purified product stream are likely to represent high-end estimates.

Based on the data presented in the *1,2-Dichloroethane Byproducts Assessment* TSD (U.S. EPA, 2026j), EPA concludes there are no anticipated cancer risks nor risks below benchmark for acute or chronic non-cancer exposures to the general population from byproduct exposures released to surface waters. This conclusion is based primarily on the lower releases and corresponding lower concentrations of each of the byproduct chemicals than those presented in the fenceline analyses for the analogs perchloroethylene, trichloroethylene, and methylene chloride. Likewise, the 1,1-dichloroethane risk evaluation estimated greater surface water releases of 1,1-dichloroethane to the same receiving water body yet did not result in general population non-cancer or cancer risks. And lastly, for carbon tetrachloride, a screening analysis estimating receiving water concentrations from byproduct release anticipated no associated cancer or non-cancer risks to general population exposures.

5.3.6.8 Characterization and Summary of Risk Estimates for General Population

Table 5-45 below presents a summary of the risk estimates for the three main exposure scenarios associated with facility releases: ambient air inhalation, drinking water ingestion (via surface water), and fish ingestion. Risk estimates presented below are based on the 1,2-dichloroethane-specific hazards described in Section 5.2.

5.3.6.8.1 Characterization and Summary of Risk via Inhalation of Ambient Air for General Population

For the ambient air pathway, Table 5-45 compiles data from Sections 5.3.6.2 through 5.3.6.4. This section provides an overview of the factors used to estimate the cancer and non-cancer risks to the general population, with each major factor being described in its own subsection.

Releases

For modeling, OESs fell into one of the following three categories:

- OESs for which there were only facility-reported releases (Manufacturing; Repackaging; Processing as a Reactant; Processing into Formulation, Mixture, or Reaction Product; and Industrial Application of Lubricants and Greases; and Waste Handling, Treatment, and Disposal);
- OESs for which there were only modeled releases from generic facilities/sites (Commercial Aerosol Products); and
- OESs for which there were both modeled releases from generic facilities/sites and reported releases (Industrial Application of Adhesives and Sealants; Non-Aerosol Cleaning and Degreasing; and Laboratory Use).

Table 5-46 presents the data sources that were available for each OES and the notes associated with the OES column in Table 5-45 show which data source was used in development of the presented risk estimates.

EPA modeled ambient air concentrations using the release data from the TRI and NEI datasets as described in the *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae) and summarized below.

EPA considered TRI release data from the years 2015 to 2024 for this analysis. For each facility, EPA used the highest total emissions across the years of 2015 to 2024 as inputs to HEM5.0. TRI releases to air were categorized into six OESs. Concentrations were modeled for both fugitive and stack emissions. TRI data are reported on a total facility basis. That is, for each facility reports one emission rate is reported even if there are multiple emissions locations (stack or fugitive) at the facility. For facilities reporting both stack and fugitive emissions, modeled concentrations from both types of emissions were added together to determine a total concentration of 1,2-dichloroethane in the ambient air at the distances evaluated specific to TSCA OESs. TRI reporters may report either with a Form R or a Form A. To use Form A, reporters must release less than 500 lbs/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.

For NEI data, EPA used data reported 2014, 2017, and 2020 in this analysis. In the draft risk evaluation, EPA modeled all available data for 2014 and 2017 using AERMOD (U.S. EPA, 2025a). For this evaluation, EPA modeled, in HEM5.0, each facility that showed a risk greater than 1×10^{-6} based on the 95th percentile concentration at 10 m from the release location based on the analysis performed in the draft risk evaluation. EPA also modeled any releases that were new to the 2020 NEI if they were greater than the lowest release from 2014 and 2017 that resulted in a risk greater than 1×10^{-6} based on the 95th percentile concentration at 10 m from the release location. If a facility reported in multiple years and had total releases greater than the threshold described above, then EPA used the maximum release across all years in this analysis. NEI release data are process level data and therefore there can be multiple capture releases from one facility. This is in contrast to TRI release data, which aggregates all releases at a facility to a single release location. NEI also includes source-specific parameter values used in modeling like stack parameters (*e.g.*, stack height, stack temperature, plume velocity). EPA modeled all individual releases separately. In this document, for the NEI analysis, EPA relied on concentrations resulting from individual release points for this assessment and not the combined releases. NEI releases were categorized into 14 OESs. Concentrations and risks reported at the census block level in this risk evaluation are aggregated across release points.

For OESs where release data were either not available or limited, EPA used alternative release estimates, as described in the *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae), to model ambient air concentrations around a generic facility under a generic exposure scenario.

Modeling Methodologies

EPA used two modeling approaches to estimate ambient air concentrations resulting from facility releases of 1,2-dichloroethane: (1) AERMOD to model concentrations at user-defined distances (discrete and area distances) from releasing facilities with EPA-estimated releases from generic facilities/sites, and (2) HEM5.0 to model concentrations at the centroid of each census blocks and polar receptors with 50,000 m of each release. HEM5.0 has two components: (1) an atmospheric dispersion model, AERMOD,[14] with included meteorological data; and (2) U.S. Census Bureau population data at the block level. The HEM5.0 version uses 2020 Census data—including all 50 states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands.[15] AERMOD has been peer reviewed as part of the regulatory model process described in Appendix W to 40 CFR part 51. HEM5.0 was developed by EPA's Office of Air and Radiation (OAR) and runs AERMOD as a compiled executable program to model ambient air concentrations. Both HEM5.0 and AERMOD are used in a fit for purpose manner for this 1,2-dichloroethane risk evaluation. Furthermore, the AERMOD has undergone testing and validation in comparing predicted and measured air concentrations and has been externally peer reviewed (Cimorelli et al., 2018).

Release Site Physical Characteristics Input Data

For 14 of the OESs evaluated in this assessment, EPA had site-specific, facility-reported releases available for use as direct inputs to HEM5.0. Availability of facility-reported data allows for use of site-specific information—such as facility location, stack height, meteorological data, and land cover—as model inputs. However, some model inputs, such as release days and stack parameters, are not consistently available for all facilities across all databases and assumptions were made for these characteristics based on information from the EPA National-scale Air Toxics Assessment and the source classification code of the facility, as described in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad). For instance, stack information is not available in TRI As an example, for the Manufacturing OES, 93% of releases reported stack height, 90% reported exit temperature, 75% reported stack diameters, 79% reported exit gas velocity, and 83 reported exit gas flow rate. Other parameters when not reported in NEI, such as release days, were developed on an OES basis in the evaluation and are described in Section 3.1. The assumed stack parameters generally, but not necessarily always, represent a slow-moving, low-to-the-ground plume with limited dispersion that results in a more conservative estimate of concentrations at the distances evaluated. Additionally, HEM5.0 modeling used the meteorological station closest to each facility for all facility-reported releases, which means that estimated ambient air concentrations account for local meteorological conditions such as temperature, precipitation, and wind direction. For the one OES where there was no facility-specific release data (Commercial aerosol products), assumptions from the generic scenario (see Section 3.1) were used to estimate releases.

Exposure Scenarios and Exposure Factors

For the analysis using AERMOD, EPA assumed a 78-year lifespan and a constant exposure over an entire lifetime. The 78-year lifespan is the average life expectancy of the general population (U.S. EPA,

[14] Page for AERMOD (American Meteorological Society/Environmental Protection Agency Regulatory Model): https://www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models#aermod.

[15] The HEM census file for the U.S. Virgin Islands has 0 people in each location. Block-level population data may not be currently available from the 2020 census.

2011a). An exposure duration of 78 years was assumed to be protective of PESS groups and communities that are located near 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 lifetime. It is also consistent with previous recommendations from the Science Advisory Committee on Chemicals (SACC; accessed August 13, 2025) (U.S. EPA, 2023b). The default exposure scenario in HEM5.0 assumes an exposure duration of 70 years and a lifetime of 70 years. For both the HEM5.0 and AERMOD 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 a constant exposure over a lifetime of either 70 or 78 years is a conservative assumption that will result in high-end risk estimates. Additionally, for the purposes of this risk evaluation, EPA is assuming that indoor air concentrations are equal to the 1,2-dichloroethane ambient air concentrations from releasing facilities.

Hazard Values Used for Risk Calculations

The POD of 48.9 mg/m^3 is based on BMD modeling of degeneration with necrosis of the olfactory (nasal) mucosa in male and female mice after an 8-hour exposure to 1,2-dichloroethane vapor for acute non-cancer inhalation exposure. The Agency, in accordance with (U.S. EPA, 1994) guidance, calculated the HEC of 9.78 mg/m^3 using the regional gas dose ratio for extrathoracic effects ($RGDR_{ET}$) of 0.2 for these nasal effects and is applying the animal to human extrapolation factor (*i.e.,* interspecies extrapolation; UF_A) of 3× and a within human variability extrapolation factor (*i.e.,* intraspecies extrapolation; UF_H) of 10×. Thus, for the acute duration, a total UF of 30× is applied for use as the benchmark MOE.

The POD of 21.2 mg/m^3 is based on BMD modeling of decreased sperm concentration in male mice after a whole body, 6 hour/day, 7 day/week, 4-week exposure to 1,2-dichloroethane vapor to estimate non-cancer risks from inhalation to 1,2-dichloroethane for the intermediate/chronic durations of exposure. The Agency, in accordance with (U.S. EPA, 1994) guidance, calculated the HEC of 21.2 mg/m^3, which is equal to the POD by using the default regional gas dose ratio (RGDR) for the systemic (sperm) effects of 1. Additionally, EPA is applying the animal to human extrapolation factor (UF_A) of 3× and a within human variability extrapolation factor (UF_H) of 10×. Thus, a total UF of 30× is applied for use as the benchmark MOE for the intermediate and chronic duration .

The 1,2-dichloroethane inhalation cancer study by Nagano (2006) is the basis for the IUR of 7.1×10^{-6} per µg/m^3 derived from the lower confidence limit of the BMD (BMDL) for the 95% confidence level modeled data at a benchmark response (BMR) of 10% extra risk to estimate cancer risks from inhalation to 1,2-dichloroethane based on a combined tumor model (mammary gland adenomas, fibroadenomas, and adenocarcinomas and subcutaneous fibromas) in female rats.

Comparison of Modeled and Monitored Data

EPA used monitoring stations from the AMTIC archive as user added receptors in the modeling of TRI facilities to compare directly modeled and monitored data near releasing facilities. The comparison shows that annual average and 95th percentile daily modeled concentrations are within approximately an order of magnitude of the mean and 90th percentile monitored 1,2-dichloroethane concentrations at 10 monitoring stations with the highest modeled concentrations. See *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad) for more details.

Population Characterization and Cancer Risk Estimates Using HEM5.0

HEM5.0 was used to characterize the general population living near facilities releasing 1,2-dichloroethane. For risks calculated at census block centroids, which is a single discrete location, the risk is calculated using the annual average concentrations (daily averages of hourly estimated concentrations averaged across 365 days) that account for the conditions of that specific location such as prevailing winds. The census block-level analysis using HEM5.0 provides total population with cancer risk estimates above 1×10^{-4}, 1×10^{-5}, and 1×10^{-6} (Table 5-33, Table 5-35). Table 5-36 and Table 5-38 show the distance from the releasing facility to the nearest census block centroid for facilities contributing to cancer risk estimates above 1×10^{-6}. The results of the HEM modeling show that the nearest populated census block centroid showing risk above 1×10^{-6} is 633 m from a release location. The results of the HEM modeling did not identify any census block centroids for populated census blocks that would result in inhalation cancer risk estimates above 1×10^{-4} when assuming the location of the census block centroid is an appropriate estimation for the location of all people living within a census block. The analysis identified an estimated 628 people with an estimated cancer risk greater than 1×10^{-5} based on TRI releases and 14 people based on NEI releases though none exceeded 1×10^{-4} cancer risk estimate. The analysis also identified 81,628 people with an estimated risk cancer risk above 1×10^{-6} based on TRI releases and 37,425 people based on NEI releases. Table 5-46 shows the highest cancer risk calculated at a census block centroid for each OES and the associated population with risk above 1×10^{-6} based on both TRI and NEI release data. The population analysis represents a highly refined approach, but EPA acknowledges that these risks are based on census block centroids and that the population distribution within an census block is unknown; therefore, these population estimates would be overestimated if most people live farther from the release point than the centroid.

Cancer Risk Estimates at Radial Distances

For each release point modeled, HEM5.0 calculated an annual average concentration for each modeled receptor location. From the resulting distribution of annual average concentrations for each receptor at a given radial distance (16 for discrete radial distances), select statistics (*e.g.,* mean, median, and maximum of the 95th percentile) were calculated. Table_Apx G-1 and Table_Apx G-2 present the resulting maximum of the 95th percentile annual average concentrations across all facilities within an OES. The 95th percentile of the annual average concentrations at each distance tend to reflect levels typical of locations predominantly downwind of releasing facilities.

For this analysis, EPA is focusing on inhalation cancer risk estimates at discrete distances of 100 and 1,000 m. HEM5.0-calculated risk estimates for TRI-releasing facilities indicated that only the OESs of Manufacturing and Processing into Formulation, Mixture, or Reaction Product exceeded 1×10^{-4} at 100 m when considering the maximum 95th annual average percentile concentrations. Risks for both of these OESs decreased below 1×10^{-4} at distances 1,000 m and beyond. No other OES showed risk estimates above 1×10^{-4} at distances above 100 m. Relative to 1×10^{-6}, five OESs (Manufacturing; Processing as a Reactant; Processing into Formulation, Mixture, or Reaction Product; Repackaging; and Waste Handling, Treatment, and Disposal (Incinerator) had risks that exceeded 1×10^{-6} at the distance of 100 m based on the maximum of the 95th percentile annual average concentrations at 100 m. Only the OESs of Manufacturing and Processing into Formulation, Mixture, or Reaction Product had estimated risk estimates that exceeded 1×10^{-6} at distances greater than or equal to 1,000 m.

HEM5.0-calculated risk estimates for NEI-releasing facilities indicated that only the OESs of Manufacturing; Processing as a Reactant; and Processing into Formulation, Mixture, or Reaction Product exceeded 1×10^{-4} at a of 100 m when considering the maximum 95th annual average percentile concentrations at 100 m. Risks for these three OESs decreased below 1×10^{-4} at distances 1,000 m and beyond. No other OES showed risk estimates above 1×10^{-4} at distances above 100 m. Relative to 1×10^{-6}, all OES, except Waste Handling, Disposal, and Treatment (Non-POTW WWT), had risks that exceeded 1×10^{-6} at the distance of 100 m based on the maximum of the 95th percentile annual average concentrations at 100 m. Only the OESs of Manufacturing and Repackaging had estimated risk estimates that exceeded 1×10^{-6} at distances greater than or equal to 1,000 m. Note that these risks at radial distances for NEI releases were calculated individually for each release point are not aggregated.

Estimated Cancer Incidence Due to Ambient Air Inhalation of 1,2-Dichloroethane by the General Population

EPA also calculated additional cancer incidence rates based on the HEM5.0 results by multiplying population numbers by either the estimated cancer risks at specific census blocks or risk thresholds (Section 5.3.6.2). Based on TRI reported releases, Table 5-33 shows an estimated 81,000 people would have an estimated cancer risk between 1×10^{-6} to 1×10^{-5}, which would result in 0.081 to 0.81 additional lifetime cancer cases across all OESs. Another way to characterize these increased cancer incidences is that there would be an estimated additional 1.16×10^{-3} to 1.16×10^{-2} excess cases per year when assuming a 70-year lifetime for the 81,000 people when considering releases reported to TRI. Additionally, based on TRI reported releases, there were 628 people with risk between 1×10^{-5} and 1×10^{-4}, which would result in 6.28×10^{-3} to 6.28×10^{-2} additional lifetime cancer cases or 8.97×10^{-5} to 8.97×10^{-4} annual cancer cases when assuming a 70-year lifetime. The facilities contributing the largest amount of risk to the 628 people were three facilities associated with the OES of Manufacturing. For the census block with the highest cancer risk estimate (2.93×10^{-5}), there would be a 2.68×10^{-4} additional lifetime cancer cases (3.83×10^{-6} additional cases annually based on a 70-year lifetime) based on the population of nine people.

When considering NEI releases (Table 5-35), there are an estimated 37,411 people with an estimated inhalation cancer risk between 1×10^{-6} to 1×10^{-5}, which would result in 0.037 to 0.37 additional lifetime cancer cases across all OESs. Another way to characterize these increased cancer incidences is that there would be an estimated additional 5.34×10^{-4} to 5.34×10^{-3} excess cases per year when assuming a 70-year lifetime for the 37,411 people. Additionally, based on NEI reported releases, there were 14 people with risk between 1×10^{-5} and 1×10^{-4}, which would result in 1.4×10^{-4} to 1.4×10^{-3} additional lifetime cancer cases or 2.0×10^{-6} to 2.0×10^{-5} annual cancer cases when assuming a 70-year lifetime. For the census block with the highest cancer risk estimate (1.3×10^{-5}), there would be a 1.3×10^{-5} additional lifetime cancer cases (2.14×10^{-7} additional cases annually based on a 70-year lifetime) based on the population of one person.

Acute and Chronic Non-Cancer Ambient Air Inhalation Risks

For estimated acute and chronic non-cancer risks, EPA did not identify any populated census blocks with risk estimates below the benchmark MOEs of 30.

5.3.6.8.2 Characterization and Summary of Risk via Exposure to Surface Water for General Population

No MOE estimates below the chronic non-cancer benchmark and above the cancer benchmark were identified for drinking water or fish ingestion. Acute oral or dermal exposures do not result in MOE estimates below the non-cancer benchmark in the swimming scenario. When considering the byproducts associated with the Manufacturing OES, no individual byproduct showed either cancer or non-cancer risk to the general population via dermal and oral exposures.

Table 5-45. General Population Risk Summary for Exposures via Ambient Air Inhalation, Drinking Water Ingestion, and Fish Ingestion for Facility-Reported Releases and EPA-Estimated Releases for Generic Facilities/Sites for all OESs

Life Cycle Stage/Category	Subcategory	OES	Exposure Route [a g h]	Exposure Level [b]	Risk Estimates for Each Exposure Scenario [c]		
					Maximum Acute Non-Cancer Risk based on TRI Releases/NEI Releases (Benchmark MOE: Oral = 30; Inhalation = 30)	Maximum Chronic Non-Cancer Risk (Benchmark MOE: Oral = 100; Inhalation = 30)	Maximum Cancer Risk based on TRI Releases/NEI Releases for Inhalation and DMR for Drinking Water Ingestion (Benchmark = 1E−06 to 1E−04)
Manufacturing/ Domestic manufacture	Domestic manufacture	Manufacturing [d e]	Ambient Air Inhalation	Annual average for cancer and chronic non-cancer; 95th percentile of daily averages for acute	477/715	5.09E03/1.15E04	2.93E−05 (77,376)/1.30E−05 (30,375)
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	4.0E05	1.0E06	N/A
				High-end	9.3E04	3.0E04	N/A
Manufacturing/ Import and Processing/ Repackaging	Import and packaging	Repackaging [d e]	Ambient Air Inhalation	Annual average for cancer and chronic non-cancer; 95th percentile of daily averages for acute	9.77E05/3.82E03	1.49E07/1.93E04	1.00E−08/7.73E−06 (1,036)
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	2.2E06	5.6E06	N/A
				High-end	1.5E07N/A	4.9E06	N/A

Life Cycle Stage/Category	Subcategory	OES	Exposure Route [a g h]	Exposure Level [b]	Risk Estimates for Each Exposure Scenario [c] Maximum Acute Non-Cancer Risk based on TRI Releases/NEI Releases (Benchmark MOE: Oral = 30; Inhalation = 30)	Maximum Chronic Non-Cancer Risk (Benchmark MOE: Oral = 100; Inhalation = 30)	Maximum Cancer Risk based on TRI Releases/NEI Releases for Inhalation and DMR for Drinking Water Ingestion (Benchmark = 1E−06 to 1E−04)
Processing/ Processing – as a reactant; Processing/ Recycling; and Industrial use/Process regulator	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing/ Recycling/ *e.g.,* Catalyst moderator; oxidation inhibitor	Processing as a Reactant [d e]	Ambient Air Inhalation	Annual average for cancer and chronic non-cancer; 95th percentile of daily averages for acute	1.14E04/3.41E03	1.19E05/4.56E04	1.25E−06 (3)/3.28E−06 (4,580)
			Drinking Water Ingestion	Central tendency	1.2E06	3.1E06	2E−08
				High-end	3.5E05	1.2E06	
			Fish Ingestion	Central tendency	2.2E06	5.6E06	N/A
				High-end	5.5E05	1.7E05	N/A
Processing/ Processing – incorporated into formulation, mixture, or reaction product and Industrial use/Other use	Fuels and fuel additives: all other petroleum and coal products manufacturing/ Processing aids: specific to petroleum production/Adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticides, fertilizer, and other agricultural chemical manufacturing/ Process solvent	Processing into Formulation, Mixture, or Reaction Product [d e]	Ambient Air Inhalation	Annual average for cancer and chronic non-cancer; 95th percentile of daily averages for acute	1.36E03/4.41E03	1.53E04/6.19E04	9.80E−06 (4,249)/ 2.41E−06 (14)
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	7.2E06	2.6E07	N/A
				High-end	1.7E06	7.9E05	N/A

Life Cycle Stage/Category	Subcategory	OES	Exposure Route [a g h]	Exposure Level [b]	Risk Estimates for Each Exposure Scenario [c]: Maximum Acute Non-Cancer Risk based on TRI Releases/NEI Releases (Benchmark MOE: Oral = 30; Inhalation = 30)	Maximum Chronic Non-Cancer Risk (Benchmark MOE: Oral = 100; Inhalation = 30)	Maximum Cancer Risk based on TRI Releases/NEI Releases for Inhalation and DMR for Drinking Water Ingestion (Benchmark = 1E−06 to 1E−04)
Industrial use/ Adhesives and sealants	Adhesives and sealants	Industrial Application of Adhesives and Sealants [e]	Ambient Air Inhalation	Annual average for cancer and chronic non-cancer; 95th percentile of daily averages for acute	N/A / 6.28E03	N/A / 7.75E04	N/A / 1.93E−06 (167)
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
Industrial use/ Lubricants and greases	Solid film lubricants and greases	Industrial Application of Lubricants and Greases [e]	Ambient Air Inhalation	Annual average for cancer and chronic non-cancer; 95th percentile of daily averages for acute	N/A / 2.91E04	N/A / 3.78E05	N/A / 4.00E−07
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
Industrial use/Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Commercial Aerosol Products [f]	Ambient Air Inhalation	Central tendency	N/A	2.29E07	1.35E−07
				High-end	8.59E04	5.64E06	8.09E−07
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A

Life Cycle Stage/Category	Subcategory	OES	Exposure Route [a g h]	Exposure Level [b]	Risk Estimates for Each Exposure Scenario [c]		
					Maximum Acute Non-Cancer Risk based on TRI Releases/NEI Releases (Benchmark MOE: Oral = 30; Inhalation = 30)	**Maximum Chronic Non-Cancer Risk (Benchmark MOE: Oral = 100; Inhalation = 30)**	**Maximum Cancer Risk based on TRI Releases/NEI Releases for Inhalation and DMR for Drinking Water Ingestion (Benchmark = 1E−06 to 1E−04)**
Industrial use/Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Non-Aerosol Cleaning and Degreasing [d e]	Ambient Air Inhalation	Annual average for cancer and chronic non-cancer; 95th percentile of daily averages for acute	4.25E06/ 6.02E04	6.30E07/ 4.79E05	2.37E−09/ 3.12E−07
Industrial use/Solvents (for cleaning and degreasing) (continued)	Degreasing and cleaning solvents (continued)	Non-Aerosol Cleaning and Degreasing [e] (continued)	Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	8.8E08	3.4E09	N/A
				High-end	2.1E08	1.0E08	N/A
Commercial use/Other use	Laboratory chemical	Laboratory Use [e]	Ambient Air Inhalation	Annual average for cancer and chronic non-cancer; 95th percentile of daily averages for acute	N/A / 5.08E05	N/A / 4.08E06	N/A / 3.73E−08
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	1.9E06	1.4E07	N/A
				High-end	4.5E05	4.1E05	N/A

Life Cycle Stage/Category	Subcategory	OES	Exposure Route [a g h]	Exposure Level [b]	Risk Estimates for Each Exposure Scenario [c] Maximum Acute Non-Cancer Risk based on TRI Releases/NEI Releases (Benchmark MOE: Oral = 30; Inhalation = 30)	Maximum Chronic Non-Cancer Risk (Benchmark MOE: Oral = 100; Inhalation = 30)	Maximum Cancer Risk based on TRI Releases/NEI Releases for Inhalation and DMR for Drinking Water Ingestion (Benchmark = 1E−06 to 1E−04)
Disposal/Disposal	Disposal	Waste Handling, Treatment, and Disposal (Incinerator) [d e]	Ambient Air Inhalation	Annual average for cancer and chronic non-cancer; 95th percentile of daily averages for acute	7.15E03/ 5.78E04	8.30E04/ 6.68E05	2.12E−07/ 9.24E−07
			Drinking Water Ingestion	Central tendency	4.9E06	6.2E06	3.1E−08
				High-end	1.4E06	2.4E06	
			Fish Ingestion	Central tendency	2.6E04	6.7E04	N/A
				High-end	6.1E03	2.0E03	N/A
Disposal/Disposal	Disposal	Waste Handling, Treatment, and Disposal (Landfill) [e]	Ambient Air Inhalation	Annual average for cancer and chronic non-cancer; 95th percentile of daily averages for acute	N/A / 4.02E04	N/A / 4.53E05	N/A / 3.30E−07
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	4.6E06	8.1E06	N/A
				High-end	9.5E05	2.4E05	N/A

Life Cycle Stage/Category	Subcategory	OES	Exposure Route [a g h]	Exposure Level [b]	Risk Estimates for Each Exposure Scenario [c] Maximum Acute Non-Cancer Risk based on TRI Releases/NEI Releases (Benchmark MOE: Oral = 30; Inhalation = 30)	Maximum Chronic Non-Cancer Risk (Benchmark MOE: Oral = 100; Inhalation = 30)	Maximum Cancer Risk based on TRI Releases/NEI Releases for Inhalation and DMR for Drinking Water Ingestion (Benchmark = 1E−06 to 1E−04)
Disposal/Disposal	Disposal	Waste Handling, Treatment, and Disposal (Non-POTW WWT) [e]	Ambient Air Inhalation	Annual average for cancer and chronic non-cancer; 95th percentile of daily averages for acute	N/A/4.00E03	N/A/4.25E04	N/A/3.52E−06 (273)
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	5.0E03	1.3E04	N/A
				High-end	1.1E03	377	N/A
Disposal/Disposal	Disposal	Waste Handling, Treatment, and Disposal (POTW) [e]	Ambient Air Inhalation	Annual average for cancer and chronic non-cancer; 95th percentile of daily averages for acute	N/A/3.92E03	N/A/3.93E04	N/A/3.80E−06 (980)
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	1.2E05	3.0E05	N/A
				High-end	2.7E04	8.9E03	N/A

Life Cycle Stage/Category	Subcategory	OES	Exposure Route [a g h]	Exposure Level [b]	Risk Estimates for Each Exposure Scenario [c]		
					Maximum Acute Non-Cancer Risk based on TRI Releases/NEI Releases (Benchmark MOE: Oral = 30; Inhalation = 30)	**Maximum Chronic Non-Cancer Risk (Benchmark MOE: Oral = 100; Inhalation = 30)**	**Maximum Cancer Risk based on TRI Releases/NEI Releases for Inhalation and DMR for Drinking Water Ingestion (Benchmark = 1E−06 to 1E−04)**
Disposal/Disposal	Disposal	Waste Handling, Treatment, and Disposal (Remediation) [e]	Ambient Air Inhalation	Annual average for cancer and chronic non-cancer; 95th percentile of daily averages for acute	N/A / 1.26E05	N/A / 1.13E06	N/A / 1.36E−07
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	1.1E07	3.9E07	N/A
				High-end	2.6E06	1.2E06	N/A
N/A	N/A	Facilities not mapped to an OES [e]	Ambient Air Inhalation	Annual average for cancer and chronic non-cancer; 95th percentile of daily averages for acute	N/A / 4.69E05	N/A / 4.52E06	N/A / 3.97E−08
			Drinking Water Ingestion	Central tendency	1.2E07	1.5E07	1.2E−08
				High-end	3.5E06	6.0E06	
			Fish Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A

TRI = Toxics Release Inventory; NEI = National Emissions Inventory; HEM5.0 = Human Exposure Model Version 5; OES = occupational exposure scenario; POTW = publicly owned treatment works; WWT = wastewater treatment

[a] The risk estimates shown in this table for ambient air inhalation are based on modeling of TRI and NEI release data using HEM5.0For OESs for which there were no TRI-reported releases, risk estimates calculated based on modeling of only NEI release data using HEM5.0. For the OES of Commercial Aerosol Products, there were no release data and the risks presented are based on EPA-estimated releases for generic facilities/sites using AERMOD.

[b] Cancer and chronic non-cancer risks shown in this table are based on highest annual average concentrations across all facilities within each OES, as estimated using HEM5.0. Acute risks are calculated using the maximum of the 18 highest of the 365 daily averages across all facilities within each OES, as estimated using HEM5.0.

[c] The number in parentheses is the total population for which the associated OES is the major contributor to risk greater than 1×10^{-6}.

[d] The risk estimates shown in for this OES are based on reported TRI release data.

[e] The risk estimates shown in for this OES are based on reported NEI release data.

[f] The risk estimates shown in for this OES are based on EPA-estimated releases for generic facilities/sites.

Life Cycle Stage/Category	Subcategory	OES	Exposure Route [a] [g] [h]	Exposure Level [b]	Risk Estimates for Each Exposure Scenario [c]		
					Maximum Acute Non-Cancer Risk based on TRI Releases/NEI Releases (Benchmark MOE: Oral = 30; Inhalation = 30)	**Maximum Chronic Non-Cancer Risk (Benchmark MOE: Oral = 100; Inhalation = 30)**	**Maximum Cancer Risk based on TRI Releases/NEI Releases for Inhalation and DMR for Drinking Water Ingestion (Benchmark = 1E−06 to 1E−04)**

[g] Risk estimates for drinking water exposures are reflected as central tendency = adult exposures and high-end = infant exposures
[h] Risk estimates for fish ingestion are reflected as central tendency = 1 to 2 year old exposures and high-end = adult subsistence fisher's exposures. For POTWs high-end risk is reflected in exposures from releases on tribal lands and tribal ingestion rates of fish.
[i] See Section 5 for a population analysis.
[j] For this OES, risks were based on exposures using AERMOD. Central tendency refers to the 50th percentile of the period average at a given distance from the release location. High-end refers to the 95th percentile of the period average at a given distance from the release location.
N/A= not assessed. For drinking water: only facilities and corresponding COUs that were upstream of a drinking water intake location were assessed for drinking water exposures. For fish ingestion: COUs with the largest releases and highest surface water concentrations were included in a screening assessment. Ingestion of fish from these surface waters did not result in risk below benchmark. Therefore, other facilities with discharges resulting in lower surface water concentrations were also presumed to have estimated fish ingestion exposures that would not result in risk below benchmark. For ambient air: a concentration of 0 was calculated and therefore a risk could not be estimated.

5.3.7 Risk Characterization of Aggregate and Sentinel Exposures

As stated in Section 5.1.3, EPA considered sentinel exposures by considering risks to populations who may have upper bound exposures; for example, workers who perform activities with higher exposure potential, or certain physical factors like body weight or skin surface area exposed. The Agency characterized high-end exposures in evaluating exposure using both monitoring data and modeling approaches. Where statistical data are reasonably available, EPA typically uses the 95th percentile value of the reasonably available dataset to characterize high-end exposure for a given COU. In cases where sentinel exposures result in MOEs exceeding the benchmark or cancer risk lower than the benchmark (*i.e.,* risks were not identified), EPA did no further analysis because sentinel exposures represent the worst-case scenario.

EPA aggregated ambient air concentrations to estimate inhalation risks from co-located facilities (see Sections 5.1.3). The Agency did not consider aggregate inhalation exposures to people who both work at and live near facilities releasing 1,2-dichloroethane because EPA does not have data showing that this is a likely exposure scenario.

EPA conducted a screening analysis of aggregating general population exposures to 1,2-dichloroethane for dermal and oral exposures (see Section 5.1.4.1). The risk associated with the aggregated exposure is estimated with an MOE of 765 well above the acute benchmark of 30 and represents an upper bound estimated risk for aggregated dermal and oral exposures across the COUs and relevant pathways (fish ingestion, incidental oral exposures via swimming and incidental dermal exposures via swimming).

5.3.8 Overall Confidence and Remaining Uncertainties in Human Health Risk Characterization

5.3.8.1 Human Health Hazard Values

Non-Cancer Oral/Dermal PODs

Based on the above factors, EPA has robust overall confidence for the evidence integration, study/endpoint selection, exposure scenario applicability, dose-response, PESS sensitivity of the conclusions and oral acute and intermediate PODs for renal toxicity based on the most biologically relevant endpoint of increased relative kidney weight. The non-cancer acute oral POD for kidney effects utilizes the most robust acute study and the endpoint of increased relative kidney weight, which is supported by the weight of scientific evidence. The non-cancer intermediate PODs for kidney toxicity utilizes a robust intermediate study and biologically relevant endpoint of increased relative kidney weight, which is supported by the weight of scientific evidence. EPA has moderate confidence for the evidence integration, study/endpoint selection, exposure scenario applicability, dose-response, PESS sensitivity of the conclusions and oral POD for renal toxicity for the chronic duration based on the biologically relevant endpoint of increased relative kidney weight derived from the identified intermediate study due to duration adjustment applied for derivation of the chronic POD. EPA has moderate confidence for the evidence integration, study/endpoint selection, exposure scenario applicability, dose-response, PESS sensitivity of the conclusions and dermal POD for all exposure durations for renal toxicity due to route-to-route extrapolation from the corresponding oral POD.

Non-Cancer Inhalation PODs

Based on the above factors, EPA has robust overall confidence for the evidence integration, study/endpoint selection, exposure scenario applicability, dose-response, PESS sensitivity of the conclusions for 1,2-dichloroethane acute and intermediate inhalation PODs and moderate-to-robust confidence in the chronic inhalation POD. The non-cancer acute inhalation POD for respiratory effects utilizes a robust acute study and biologically relevant endpoint of necrosis of the olfactory mucosa, which is supported by the weight of scientific evidence. The non-cancer intermediate and chronic inhalation PODs for male reproductive toxicity utilizes a high-quality study and biologically relevant endpoint of decreased sperm concentration, which is supported by the weight of scientific evidence.

Cancer

EPA has high confidence in the identified cancer study for 1,2-dichloroethane in deriving the inhalation unit risk. This study used to assess the cancer risk estimate was rated high in systematic review based on experimental design, data reporting, statistical analysis and dose-responsiveness. Based on the above factors, EPA has robust overall confidence for the evidence integration, study/endpoint selection, exposure scenario applicability, dose-response, PESS sensitivity of the conclusions, of mammary gland and subcutaneous tumors associated with 1,2-dichloroethane inhalation exposures. EPA has moderate overall confidence for the evidence integration, study/endpoint selection, exposure scenario applicability, dose-response, PESS sensitivity of the conclusions, of mammary gland and subcutaneous tumors associated with 1,2-dichloroethane oral exposure scenarios and slight-to-moderate confidence for dermal exposure scenarios.

EPA reviewed the proposed metabolic data for 1,2-dichloroethane that suggests the potential for biotransformation of 1,2-dichloroethane and the available data indicate a complex role for metabolism in the production of reactive metabolic products. EPA, however, did not identify a clear association among routes of exposure across *in vivo* model systems and positivity for genotoxic or mutagenic endpoints within the database for 1,2-dichloroethane. As a potential for the induction of DNA damage through DNA alkylation, the production of direct-acting reactive metabolites (episulfonium ion), and reactive oxidative species is indicated in the available database, a more complete understanding of the relative contribution of metabolic processing in the generation of these events is needed to understand their overall contribution to genomic mutation. There also is uncertainty surrounding the mode of action for 1,2-dichloroethane and its potential for genotoxicity or mutagenicity. The available evidence suggests that 1,2-dichloroethane exposure leads to DNA damage, but the uncertainties surrounding the relative contribution of each of the three potential DNA damaging pathways (DNA alkylation, CYP450-mediated ROS production, and glutathione-mediated episulfonium ion generation) prevents identification of the causal moiety. Without mode of action information (including molecular initiating event and subsequent key events leading to tumorigenesis), in accordance with the Guidelines for Carcinogen Risk Assessment (U.S. EPA, 2005b), EPA used the default approach of linear low-dose extrapolation. If EPA had additional information on the mode of action, a non-linear mode of action could have been considered.

5.3.8.2 Occupational Exposure Risk Estimates

This section provides a discussion of the confidence in the assessment of the occupational inhalation exposure scenarios, including remaining uncertainties across multiple OES. Detailed discussion of the inhalation exposure estimates for each OES is provided Section 5.3.3.1. As the same dermal modeling approach was utilized for dermal exposure assessment for all OES, the discussion of confidence in the dermal occupational exposure risk estimates is provided in Section 5.3.3.2.

Inhalation Exposure Risk Estimates

EPA has moderate-to-robust confidence in the inhalation data utilized for the majority of the OES that were evaluated as part of this 1,2-dichloroethane risk evaluation. Confidence is increased by the utilization of full-shift, personal breathing zone monitoring data from test order submissions across many of these OES, where it was applied as directly applicable or analogous exposure monitoring data. There was lower confidence in the OESs with limited inhalation monitoring data (area data, small sample size), or where modeling approaches were utilized 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. The parameter of exposure duration (days) impacts the estimates of the doses for chronic non-cancer and cancer effects. For most OES, EPA assumed up to 250 days of exposure per year, with 8-hour shifts each working day. This is consistent with the OSHA PEL and other OELs, but it is uncertain if this captures all potential worker schedules and exposures for any given OES.

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.

The parameter of working years impacts the estimates of the doses for cancer effects. For most OES, EPA relies on estimates of working years provided by BLS, which captures the expected lifetime career exposure of a worker. EPA utilized central tendency value of 31 years and high-end value of 40 years based on analysis of the BLS data. For this risk evaluation, EPA also used industry provided data on working years as well for certain OESs (manufacturing, processing as a reactant). Estimates of working years provided by BLS capture the expected lifetime career exposure of a worker, but are not industry specific. The industry provided data is specific to length of service (years) for workers at the facilities monitored as part of the test order. These values are industry specific, but do not capture the expected lifetime career exposure of a worker who may work at multiple facilities during their lifetime. As there are limitations with both sets data used to calculate working years, EPA considers the use of both sets of working years data to increase confidence in the overall assessment of these OES.

Inhalation monitoring results are obtained from the use of samplers attached to the workers to measure exposure concentrations near the workers' breathing zone. The placement of the samplers would be outside of any respiratory protection used so 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.

Overall, EPA has higher confidence where high risk exposures did not indicate risk relative to the benchmark, as many of these scenarios are likely to be overly conservative, especially for chronic non-cancer and cancer exposures. Additionally, EPA has lower confidence in risk estimates where ONU data were not available, as EPA assumed that the central tendency exposures for workers were appropriate for characterization of ONUs.

Uncertainties with the PPE Use and Protection Factors

Respirator APFs have technical significance but are generic values based on assumed workplace conditions, and usage of a specific respirator type does not guarantee achieving the generic APF during all use scenarios. Nevertheless, respirator APFs are based on specific conditions and approved by NIOSH in conjunction with OSHA regulations.

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; however, respirators are used during specific 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. For example, some operators at Site A who collected samples and connected/disconnected hoses were noted as not wearing respiratory protection, while some operators at Site D were described as wearing full-face respirators during process sample collection tasks. Given the variation in tasks and reported respirator use associated with specific tasks, it is difficult to assume 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 (Stantec ChemRisk, 2024) and associated documentation, EPA has included additional discussion of respiratory PPE worn by workers for select OES and SEGs in Section 5.3.3.1 (Occupational Inhalation Exposure Risk Characterization).

During EPA'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. The Vinyl Institute Consortium indicated limitations in the level of detail they could provide due to confidentiality concerns. A summary of the PPE and engineering controls information collected during the inhalation monitoring is provided in Appendix K.

5.3.8.3 General Population Risk Estimates

General Population: Air Pathway

For the ambient air pathway, EPA provides an OES-specific risk characterization that is based on the lines of evidence available for each OES (Table 5-46). This section also provides overarching characterizations of each line of evidence that feed into the OES-specific characterization. Across all OESs, EPA relied on and has robust confidence in the non-cancer and cancer inhalation hazard values that are based on the weight of scientific evidence across a number of studies.

1,2-Dichloroethane ambient air concentrations were estimated using either facility release data reported in TRI and NEI corresponding to COUs or EPA-estimated releases for generic facilities/sites (see Table 5-45 for the data sources available for each OES). The Agency used high-end release data based on TRI release data from 2015 to 2024 and NEI release data from 2014, 2017, and 2020 (see Section 5.3.6.8.1 for additional information). Additionally, EPA used HEM5.0 to characterize populations living near releasing facilities (see Sections 5.1.2.1 and 5.1.2.4 for additional information).

The population analysis performed using HEM5.0 is based on the centroids of census blocks. HEM5.0 does not provide population distribution within a census block and individuals within a census may live closer to or farther from the 1,2-dichloroethane-releasing facility than the centroid. Additionally, the current population analysis does not account for future residential land use changes and population shifts. Because EPA used TRI and NEI release data the cover multiple years, , EPA has robust confidence that the population analysis performed in this evaluation has captured populations living nearest to releasing facilities that are exposed to ambient air concentrations of 1,2-dichloroethane that would result in risk above 1×10^{-6}.

Overall, EPA has robust confidence in risk estimates that were calculated using release data reported to both TRI and NEI release data, and that the risks are representative of actual exposures to the general population living near releasing facilities. 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 use of both NEI and TRI data provides a complete and robust dataset. The use of HEM5.0 also allowed for the characterization of populations living near facilities and provided strong evidence for distances that are most relevant for general population exposure.

Additionally, overall, the Agency has slight confidence in risk estimates that relied on EPA-estimated releases from generic facilities/sites; however, there was only one OES (Commercial Aerosol Products) for which EPA relied solely on estimated releases from generic facilities/sites. Although EPA 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 overall slight confidence in the risk estimates. For OESs where the Agency had facility-reported releases and EPA-estimated releases for generic facilities/site, the Agency preferred risks calculated using reported releases due to the uncertainties associated with the estimated releases.

Table 5-46. Overall Confidences in General Population Inhalation Risk Estimates for Each OES

OES	Data Source	Overall Confidence
Manufacturing	TRI and NEI	For this OES, EPA modeled facility-reported releases from TRI and NEI using HEM5.0. The use of both NEI and TRI databases provides robust confidence that EPA captured high-end releases across the years assessed in this evaluation. Although both NEI and TRI both provide high-quality data, EPA is deferring to risk estimates calculated using TRI-reported releases for this risk evaluation and OES because of the larger number of release years that were used for modeling and because more recent reporting years are available. The use of HEM5.0 to model risks at census block centroids provides robust confidence that there are populations that are exposed to ambient air concentrations that would result in inhalation cancer risk estimates greater than 1 in 1 million. 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.
Repackaging	TRI and NEI	For this OES, EPA modeled facility-reported releases from TRI and NEI using both HEM5.0. The use of both NEI and TRI databases provides robust confidence that EPA captured high-end releases across the years assessed in this evaluation. Although both NEI and TRI both provide high-quality data, EPA is deferring to risk estimates calculated using TRI-reported releases for this risk evaluation and OES because of the larger number of release years that were used for modeling and because more recent reporting years are available. The use of HEM5.0 to model risks at census block centroids provides robust confidence that there are populations that are exposed to ambient air concentrations that would result in inhalation cancer risk estimates greater than 1 in 1 million. 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.
Processing as a Reactant	TRI and NEI	For this OES, EPA modeled facility-reported releases from TRI and NEI using HEM5.0. The use of both NEI and TRI databases provides robust confidence that EPA captured high-end releases across the years assessed in this evaluation. Although both NEI and TRI both provide high-quality data, EPA is deferring to

OES	Data Source	Overall Confidence
		risk estimates calculated using TRI-reported releases for this risk evaluation and OES because of the larger number of release years that were used for modeling and because more recent reporting years are available. The use HEM5.0 to model risks at census block centroids provides robust confidence that there are that are exposed to ambient air concentrations that would result in inhalation cancer risk estimates greater than 1 in 1 million. 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.
Processing into Formulation, Mixture, or Reaction Product	TRI and NEI	For this OES, EPA modeled facility-reported releases from TRI and NEI using both HEM5.0. The use of both NEI and TRI databases provides robust confidence that EPA captured high-end releases across the years assessed in this evaluation. Although both NEI and TRI both provide high-quality data, EPA is deferring to risk estimates calculated using TRI-reported releases for this risk evaluation and OES because of the larger number of release years that were used for modeling and because more recent reporting years are available. The use of HEM5.0 to model risks at census block centroids provides robust confidence that there are populations that are exposed to ambient air concentrations that would result in inhalation cancer risk estimates greater than 1 in 1 million. Based on the overall weight of evidence, EPA 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.
Industrial Application of Adhesives and Sealants	NEI and EPA-estimated releases from generic facilities/sites	For this OES, EPA modeled facility-reported releases from NEI using HEM5.0 and EPA-estimated releases for generic facilities/sites using AERMOD. The use of the NEI database provides robust confidence that EPA captured high-end releases. The use of HEM5.0 to model risks at census block centroids provides robust confidence that there are populations that are exposed to ambient air concentrations that would result in inhalation cancer risk estimates greater than 1 in 1 million. Additionally, due to the limited number of facility-reported releases, the Agency calculated risk estimates for EPA-estimated releases from generic sites/facilities. Due to the uncertainties in these releases, EPA has slight confidence in the accuracy of the risk estimates for generic facilities/sites and is relying on risks calculated using facility-reported releases; however, the estimated risks from the generic/facilities likely represent high-end estimations. Based on the overall weight of evidence, the Agency has robust confidence in the risk estimates calculated using facility-reported releases and that the estimated risks are protective of actual exposures to the general population living near releasing facilities.
Industrial Application of Lubricants and Greases	NEI	For this OES, EPA modeled facility-reported releases from NEI using HEM5.0 and EPA-estimated releases for generic facilities/sites using AERMOD. The use of the NEI database across three reporting years provides moderate confidence that EPA captured high-end releases; however, the most recent NEI data at the time of this evaluation was 2020, so more recent years of data might show that releases have increased or decreased.. EPA did not find any census block centroids with either cancer risk estimates exceeding 1×10^{-6} or non-cancer risk estimates below the relevant benchmarks at any modeled census block centroid. Based on the overall weight of evidence, the Agency has robust confidence in the risk estimates and that the estimated risks are representative of actual exposures

OES	Data Source	Overall Confidence
		to the general population living near releasing facilities, but moderate confidence that these estimates represent high-end risks that are protective of the most recent operating conditions.
Commercial Aerosol Products	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 AERMOD and assumed physical characteristics (*e.g.,* stack height, stack diameter, exit temperature, etc.) and site characteristics (*e.g.,* meteorology station and land use) for inputs to the model. EPA found cancer risk estimates exceeding 1×10^{-6} at a modeled distance up to 100 m. However, the Agency has slight confidence in the accuracy of the risk estimates due to uncertainties in the inputs to AERMOD, the uncertainties associated with the release estimates, and the lack of population data for generic facilities/sites.
Non-Aerosol Cleaning and Degreasing	TRI, NEI, and EPA-estimated releases from generic facilities/sites	For this OES, EPA modeled facility-reported releases from TRI and NEI using HEM 5.0 and EPA-estimated releases for generic facilities/sites using AERMOD. For this OES EPA is deferring to risk estimates made using releases reported to NEI because only 1 facility in this OES reported to TRI. The use of the NEI database provides moderate confidence that EPA captured all releases; however, the most recent NEI data at the time of this evaluation was 2020, so more recent years of data might show that releases have increased or decreased.. The additional use of TRI data up to 2024 provides additional confidence that high-end releases were captured. EPA did not find any census block centroids with either cancer risk estimates exceeding 1×10^{-6} or non-cancer risk estimates below the relevant benchmarks at any modeled census block centroid. Due to the uncertainties in the releases, the Agency has slight confidence in the accuracy of the risk estimates for generic facilities/sites and is relying on risks calculated using facility-reported releases; however, the estimated risks from the generic/facilities likely represent high-end estimations. Based on the overall weight of evidence, the Agency has moderate confidence in the risk estimates calculated using facility-reported releases and that the risks are protective of actual exposures to the general population living near releasing facilities.
Laboratory Use	NEI and EPA-estimated releases from generic facilities/sites	For this OES, EPA modeled facility-reported releases from NEI using HEM5.0 and EPA-estimated releases for generic facilities/sites using AERMOD. The use of the NEI database provides moderate confidence that EPA captured all releases; however, the most recent NEI data at the time of this evaluation was 2020, so more recent years of data might show that releases have increased or decreased.. EPA did not find any census block centroids with either cancer risk estimates exceeding 1×10^{-6} or non-cancer risk estimates below the relevant benchmarks at any modeled census block centroid. Additionally, due to the limited number of facility-reported releases, the Agency calculated risk estimates for EPA-estimated releases from generic sites/facilities. Due to the uncertainties in these releases, EPA has slight confidence in the accuracy of the risk estimates for generic facilities/sites and is relying on risks calculated using facility-reported releases; however, the estimated risks from the generic/facilities likely represent high-end estimations. Based on the overall weight of evidence, the Agency has moderate confidence in the risk estimates calculated using facility-reported releases and that the risks are protective of actual exposures to the general population living near releasing facilities.

OES	Data Source	Overall Confidence
Waste Handling, Treatment, and Disposal (Incinerator)	TRI and NEI	For this OES, EPA modeled facility-reported releases from TRI and NEI using HEM5.0 The use of both NEI and TRI databases provides robust confidence that EPA captured high-end releases across the years assessed in this evaluation. Although both NEI and TRI both provide high-quality data, EPA is deferring to risk estimates calculated using TRI-reported releases for this risk evaluation and OES because of the larger number of release years that were used for modeling and because more recent reporting years are available. The use of HEM5.0 to model risks at census block centroids provides robust confidence in the population analysis. EPA did not find any census block centroids with either cancer risk estimates exceeding 1×10^{-6} or non-cancer risk estimates below the relevant benchmarks at any modeled census block centroid. 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.
Waste Handling, Treatment, and Disposal (Landfill)	NEI	or this OES, EPA modeled facility-reported releases from NEI using HEM5.0. The use of the NEI database provides moderate confidence that EPA captured high-end releases; however, the most recent NEI data at the time of this evaluation was 2020, so more recent years of data might show that releases have increased or decreased. EPA did not find any census block centroids with either cancer risk estimates exceeding 1×10^{-6} or non-cancer risk estimates below the relevant benchmarks at any modeled census block centroid.. The use of HEM5.0 to model risks at census block centroids provides robust confidence in the population analysis. Based on the overall weight of evidence, the Agency has moderate confidence in the risk estimates.
Waste Handling, Treatment, and Disposal (Non-POTW WWT)	NEI	For this OES, EPA modeled facility-reported releases from NEI using HEM5.0. The use of the NEI database provides moderate confidence that the Agency captured high-end releases; however, the most recent NEI data at the time of this evaluation was 2020, so more recent years of data might show that releases have increased or decreased The use of HEM5.0 to model risks at census block centroids provides robust confidence that there are populations living at distances that would result in inhalation cancer risks greater than 1×10^{-6}. 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.
Waste Handling, Treatment, and Disposal (POTW)	NEI	For this OES, EPA modeled facility-reported releases from NEI using HEM5.0. The use of the NEI database provides moderate confidence that EPA captured high-end releases; however, the most recent NEI data at the time of this evaluation was 2020, so more recent years of data might show that releases have increased or decreased. EPA identified five census blocks associated with two facilities that showed risk greater than 1×10^{-6} for this OES. However, for one facility (EIS ID 4103311), the modeled location does not appear to be located on the facility property, so there is uncertainty associated with the population count for this facility. Additionally, both these facilities use emissions factors to estimate emissions to air, which increases the uncertainty with the risk estimates. Based on the overall weight of evidence, the Agency has slight confidence in the risk estimates. Also, due to the uncertainties, the Agency has slight confidence that the estimated risks are representative of actual exposures to the general population.

OES	Data Source	Overall Confidence
Waste Handling, Treatment, and Disposal (Remediation)	NEI	For this OES, EPA modeled facility-reported releases from NEI using HEM5.0. The use of the NEI database provides moderate confidence that EPA captured high-end releases; however, the most recent NEI data at the time of this evaluation was 2020, so more recent years of data might show that releases have increased or decreased. EPA did not find any census block centroids with either cancer risk estimates exceeding 1×10^{-6} or non-cancer risk estimates below the relevant benchmarks at any modeled census block centroid. The use of HEM5.0 to model risks at census block centroids provides robust confidence in the population analysis. 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.

Other General Population Exposure Pathways

EPA quantitatively assessed general population exposures to 1,2-dichloroethane based on the reported facility-specific releases to surface waters and soil. High-end estimates of drinking water intake, fish ingestion, as well as incidental ingestion via swimming and pica of soil are based on EPA's *Exposure Factors Handbook* (U.S. EPA, 2011a). These estimates represent exposures to people who consume more drinking water, fish or soil. Estimated risks based on high-end exposures did not result in non-cancer risks below the benchmark for all these pathways, namely—drinking water exposures, fish ingestion, incidental oral ingestion from swimming or soil as well as dermal exposures from swimming.

Across all OESs, EPA relied on and has robust confidence in the non-cancer and cancer oral hazard values that are based on the weight of scientific evidence across a number of studies. The Agency has robust confident in the conservative high-end exposure estimates (see Sections 5.1.2.2 and 0) because they are based on reported facility-specific release data and has robust confidence in the non-cancer risk estimates below the benchmark for the assessed pathways. EPA also has robust confidence that the risk estimates resulting from the high-end exposures are protective of various life stages, PESS, and tribal nations with higher fish consumption.

5.3.8.4 Consumer Risk Estimates

EPA identified three imported articles that showed evidence of 1,2-dichloroethane emissions and potential exposures to consumers: squishy toys, Christmas ornaments, and molded plastic figures and lamp bases. As presented in Section 5.3.4.1 above and the *Consumer Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026o), the Agency used conservative assumptions in terms of duration and frequency of exposures such as mouthing and dermal handling of toys and ornaments used as toys by children as well as inhalation exposures for adults as bystanders of emissions from these articles. EPA has robust confidence that these conservative assumptions represent high-end exposure scenarios for both children and adults and that the non-cancer risk estimates (see Table 5-32) below benchmark are protective of children's exposures to 1,2-dichloroethane. Cancer was not assessed as the decay of 1,2-dichloroethane emissions from these articles would not result in lifetime exposures.

Consumer Exposure

EPA assessed exposures to consumers from articles that were identified through peer-reviewed literature as emitting 1,2-dichloroethane. The number of articles were limited in terms of an identified lamp base but were broader for a series of Christmas ornaments and children's squishy toys—all of which were imported from China. EPA used conservative assumptions in terms of duration and frequency of exposures such as mouthing and dermal handling of toys and ornaments used as toys by children as well as inhalation exposures for adults as bystanders of emissions from these articles. The Agency has robust confidence in and based risk estimates on the oral, dermal, and inhalation non-cancer hazard values. Lastly, EPA has robust confidence that these conservative assumptions represent high-end exposure scenarios for both children and adults and that the non-cancer risk estimates below benchmark are protective of children's exposures to 1,2-dichloroethane.

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 PESS identified by the Agency as relevant to the risk evaluation, under the COUs. 1,2-Dichloroethane is a highly volatile organic compound mainly used to manufacture vinyl chloride (CASRN 75-01-4); however, other processing, industrial, and consumer applications exist and are considered in this risk evaluation.

EPA determined that 1,2-dichloroethane presents unreasonable risk of injury to human health. The following COUs significantly contribute to the unreasonable risk determination: 15 COUs due to non-cancer and cancer effects from inhalation and dermal exposures to workers and 12 COUs to ONUs from inhalation. (Further clarification is provided below in Section 6.2.1.) EPA did not identify unreasonable risk to the environment, consumers, or the general population, including to fenceline populations under any COU.

This unreasonable risk determination is based on the information provided in previous sections of this risk evaluation, the assessments/TSDs, appendices, public comments, peer review comments, and supplemental files (see Appendix C)—in accordance with TSCA section 6(b). This unreasonable risk determination and the underlying evaluation are consistent with the best available science (TSCA section 26(h)) and based on the weight of scientific evidence (TSCA section 26(i)).

The unreasonable risk determination must be informed by science, and in making a finding of "presents unreasonable risk," EPA considers risk-related factors beyond exceedance of 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—including PESS—and the confidence in the information used to inform the hazard and exposure values. This risk evaluation discusses important assumptions and key sources of uncertainty in the risk characterization, which are described in more detail in the respective weight of scientific evidence conclusions sections for environmental concentrations (Section 3.3.4), environmental exposures (Section 4.1.1), environmental hazards (Section 4.2.2), as well as human health hazards (Section 5.2.1). It also includes a discussion of overall confidence and remaining uncertainties sections for human health (Section 5.3.8) and environmental risk characterizations (Section 4.3.5).

EPA will initiate risk management for 1,2-dichloroethane by applying one or more of the requirements under TSCA section 6(a) to the extent necessary so that 1,2-dichloroethane no longer presents an unreasonable risk. The Agency expects risk management requirements to focus on those COUs that significantly contribute to the determination of unreasonable risk of 1,2-dichloroethane. EPA may select from among a suite of risk management options related to manufacture (including import), processing, distribution in commerce, commercial use, and disposal to address unreasonable risk. The Agency could also consider whether such risk may be prevented or reduced to a sufficient extent by action taken under another federal law such that referral to another agency under TSCA section 9(a) or use of another EPA administered authority to protect against such risk pursuant to TSCA section 9(b) may be appropriate.

Environment Summary

EPA evaluated risk of injury to the environment due to exposures via soil, air, surface water, and sediment (*e.g.,* reproductive effects to aquatic invertebrates, growth and developmental effects to algae). The Agency determined that 1,2-dichloroethane does not present unreasonable risk of injury to the environment.

Workers and ONUs Summary
EPA evaluated 19 COUs with exposures to workers and ONUs for 1,2-dichloroethane. The Agency determined that 1,2-dichloroethane presents an unreasonable risk of injury to human health due to non-cancer health effects and cancer risk to workers from inhalation and dermal exposures and ONUs from inhalation exposures. Specifically, EPA determined that the following 15 COUs significantly contribute to the unreasonable risk to workers, and 12 workplace COUs significantly contribute to the unreasonable risk to ONUs of 1,2-dichloroethane:

- Manufacturing – Domestic manufacture (dermal, inhalation)
- Manufacturing – Import (dermal, inhalation)
- Processing – As a reactant – Intermediate in: Petrochemical manufacturing; Plastic material and resin manufacturing; All other basic organic chemical manufacturing; All other basic inorganic chemical manufacturing (dermal, inhalation)
  - *[No ONU inhalation risk found for this COU]*
- Processing – Incorporated into a formulation, mixture, or reaction product – Fuels and fuel additives: All other petroleum and coal products manufacturing (dermal, inhalation)
- Processing – Incorporated into a formulation, mixture, or reaction product – Processing aids: Specific to petroleum production; Plastics material and resin manufacturing (dermal, inhalation)
- Processing – Incorporated into a formulation, mixture, or reaction product – Adhesives and sealants; Lubricants and greases; Oxidizing/reducing agents; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing (dermal, inhalation);
- Processing – Repackaging (dermal, inhalation)
- Processing – Recycling (dermal, inhalation)
  - *[No ONU inhalation risk found for this COU]*
- Industrial use – Adhesives and sealants (dermal, inhalation)
- Industrial use – Lubricants and greases – Solid film lubricants and greases (inhalation)
- Industrial use – Other use – Process solvent (dermal, inhalation)
- Industrial use – Process regulator – *e.g.* Catalyst moderator, Oxidation inhibitor (dermal, inhalation)
  - *[No ONU inhalation risk found for this COU]*
- Industrial use – Solvents (for cleaning and degreasing) – Degreasing and cleaning solvents (dermal, inhalation)
- Commercial use – Other use – Laboratory chemical (dermal, inhalation)
- Disposal (dermal, inhalation).

Table 5-27 shows that for all occupational COUs with calculated inhalation risk estimates, risk estimates would no longer indicate unreasonable risk (*i.e.,* exceed the benchmark) if respirators that achieve a minimum assigned protection factor (APF) of 10 to 1,000 are used.

EPA did *not* identify significant contributions of unreasonable risk of injury to human health of workers or ONUs from the following four worker-relevant COUs:

- Distribution in commerce;
- Industrial use – Functional fluids (closed systems) – Heat transferring agent;
- Commercial use – Plastic and rubber products; and
- Commercial use – Fuels and related products.

Consumer Summary
EPA evaluated risk of injury to human health due to non-cancer risk from inhalation and dermal exposures to consumers and bystanders under one COU: Consumer use – Plastic and rubber products. Since the estimated 1,2-dichloroethane emissions decay from articles containing 1,2-dichloroethane result in very low 1,2-dichloroethane emissions after 1 year, lifetime exposures are not anticipated and cancer risks from lifetime exposures were not assessed. The Agency determined that consumer exposures to 1,2-dichloroethane do not significantly contribute to unreasonable risk.

General Population Summary
EPA evaluated risk of injury to the general population based on cancer and non-cancer risks from 1,2-dichloroethane from ambient air (including fenceline communities) and other assessed routes of exposure (incidental oral and dermal exposure from swimming, drinking water exposure, fish ingestion, and soil ingestion). Based on these risk estimates, EPA determined that general population exposure pathways, including those for fenceline communities, do not significantly contribute to unreasonable risk from 1,2-dichloroethane.

Byproducts Summary
EPA evaluated the production of five byproducts (1,1-dichloroethane, trichloroethylene, perchloroethylene, methylene chloride, and carbon tetrachloride) produced during the manufacture of 1,2-dichloroethane as part of the Manufacturing – Domestic manufacture COU. Although the manufacture of 1,2-dichloroethane also produces 1,1,2-trichloroethane and *trans*-1,2-dichloroethylene as byproducts, these byproducts will be assessed in separate risk evaluations. Based on the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j), the Agency has considered the risk (*i.e.,* human health and environmental risks related to exposures to byproducts) in this 1,2-dichloroethane unreasonable risk determination and concluded that, based on the reasonably available information, the risk identified in the byproducts assessment did not change any of the conclusions of this risk determination for the Manufacturing – Domestic manufacture COU under which the byproducts were assessed because both 1,2-dichlorethane and the byproducts present unreasonable risk to workers and ONUs under this COU (see Sections 6.1 and 6.2 below). Additional information is provided in the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j).

6.1 Environment

Based on the environmental risk assessment, EPA determined that 1,2-dichloroethane does not significantly contribute to unreasonable risk of injury to the environment. Although EPA preliminarily found unreasonable risk to the environment in the draft risk evaluation, based on public comment, the Agency re-ran the environmental modeling with release data (2021–2024), added a third tier to the modeling to consider effluent concentrations and plant flow rates, and found that those facilities no longer present risk for this final risk evaluation. See Section 4.1 of the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad) TSD for more information on the refined approach taken in this final risk evaluation.

For environmental pathways that were quantitatively assessed, the Agency used a three-tiered approach with refinements. First, EPA compared the highest release estimates to environmental media for a given pathway with the hazard values for aquatic and terrestrial species. If the exposure for the COU with the highest amount of environmental release (*i.e.,* the COU with the highest environmental exposures, the most conservative exposure estimates) did not exceed the hazard threshold for aquatic or terrestrial species, it was determined that exposures due to releases from other COUs would not lead to environmental risk. Second, if the above analysis indicated risk, EPA considered effluent concentrations from effluent monitoring data as a refinement of the surface water concentrations evaluated in the first tier. Third, if the effluent concentrations identified in the second tier were higher than the chronic aquatic COC (480 µg/L) for a facility, then that facility proceeded to the third tier of modeling. As discussed above, the third tier included consideration of effluent concentrations and plant flow rates and the RQs were quantified. The tiered approach was applied to all the facilities with surface water releases, and only the Disposal COU proceeded to the final Tier III assessment. Discussion of the three-tiered approach and the refinements made can be found in Section 4.3.

Calculated risk quotients (RQs) 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 causes effects. An RQ less than 1, when the exposure is less than the effect concentration, generally indicates that there is no risk of injury to the environment that would support a determination of unreasonable risk for the chemical substance. An RQ exceeding 1, when the exposure is greater than the effect concentration, generally indicates that there is risk of injury to the environment that would support a determination of unreasonable risk for the chemical substance, though this value is not used as a "bright-line." Additionally, if an RQ is 1 or greater, EPA evaluates whether the RQ is 1 or greater for the days of exceedance before making a determination of unreasonable risk.

EPA evaluated aquatic RQs and days of exceedance across two days-of-release scenarios: (1) at a hazard based-release duration (21 consecutive days of release); and (2) at the total number of operating days assumed as the maximum release duration. RQ values exceeded 1 in both release scenarios. The Agency did not have reasonably available information to support the hazard-based release scenario nor the assumption that annual loads are released in consecutive days. For the second days-of-release scenario, EPA used different durations based on the OES: 350 days for Manufacturing and Processing as a Reactant OESs and 250 days for the Processing/Incorporation into Formulation, Mixture, or Reaction Product and Waste Handling, Treatment, and Disposal OESs. The Agency is basing this risk determination on the operating days release scenario because the risk estimates are based on known or generic patterns of operation for each OES. EPA evaluated terrestrial RQs by modeling the highest predicted daily air deposition to soil and determined they do not contribute to unreasonable risk from 1,2-dichloroethane to the environment. The Agency evaluated aquatic and terrestrial exposure via trophic transfer RQs using conservative assumptions for factors such as area use or absorption from diet and determined they do not contribute to unreasonable risk from 1,2-dichloroethane to the environment via trophic transfer. Additional details are available in Section 4.3.

Based on the three-tier assessment, EPA determined that 17 COUs had RQs below 1 and do not contribute to the unreasonable risk of 1,2-dichloroethane (see Table 4-3). While one COU, Disposal, has RQs over 1, EPA determined that this risk is driven by a single facility that is already regulated by a state discharge permit. The model was accounting for information indicating that this facility had previously exceeded the now permitted release levels, leading to risk. However, EPA has data showing that the facility has generally been in compliance with the state discharge permit since 2023 (Permit ID #PA0080594, EPA ECHO Database; accessed on April 29, 2026). The initial, limited exceedances all result in RQs less than 1. Considering this facility's recent, post-permit release levels, this COU does not contribute to unreasonable risk to the environment because absent the prior exceedances discussed above EPA's models would find RQs below the level of concern. EPA expects that the other six COUs have negligible environmental releases and therefore do not significantly contribute to the unreasonable risk of 1,2-dichloroethane. More information about how COUs were assessed for risk to the environment is available in Section 4.3 of this risk evaluation.

Byproducts

EPA also evaluated risk to the environment from byproducts produced during the manufacture of 1,2-dichloroethane and determined that these byproducts do not significantly contribute to unreasonable risk to the environment. RQs for aquatic species for each byproduct were all less than 1 and no risk was found for terrestrial species based on physical and chemical and fate properties of the byproducts. Uncertainties and confidence in the exposure and hazard assessment for the byproducts have been described in the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j). EPA has moderate confidence that the byproducts do not present risk to aquatic and terrestrial species from releases to air, water, and land. For more information, see Section 3 of the *Byproducts Assessment for 1,2-Dichloroethane*.

6.1.1 Basis for No Unreasonable Risk to the Environment

Based on the risk evaluation for 1,2-dichloroethane—including the populations and exposures assessed, the environmental effects, the derived risk estimates, and consideration of uncertainties—EPA determined that 1,2-dichloroethane does not significantly contribute to unreasonable risk of injury to the environment.

EPA quantitatively evaluated surface water, sediment, air deposition to soil, as well as trophic transfer exposure pathways for 1,2-dichloroethane. The Agency qualitatively evaluated biosolids and landfill exposure pathways.

Consistent with the Agency's consideration of benchmarks and its 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. EPA's overall environmental risk characterization confidence level is moderate-to-robust, as summarized in Section 4.3.5. The Agency's confidence in the aquatic, terrestrial mammalian, terrestrial avian, and terrestrial plant assessments is moderate. EPA also has moderate confidence that exposure to the byproducts via releases to air, water, and land does not exceed hazard thresholds for aquatic and terrestrial species.

6.2 Human Health

Calculated risk estimates (margin of exposures [MOEs[16]] or cancer risk estimates[17]) can provide a risk profile of 1,2-dichloroethane 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 conducts baseline assessments of risk and makes its determination of unreasonable risk in a manner that takes into consideration reasonably available information (*e.g.,* test order information, site visits). It should be noted that in some cases baseline conditions may reflect certain mitigation measures, such as engineering controls, in instances where exposure estimates are based on monitoring data at facilities that have such controls in place. For example, in this risk evaluation, monitoring data submitted pursuant to a test order submission from the Vinyl Institute (Stantec ChemRisk, 2024) and information provided by stakeholders (EPA-HQ-OPPT-2018-0427-0065; EPA-HQ-OPPT-2018-0427-0067) regarding workers wearing personal protective equipment (PPE) was taken into consideration. Specifically, EPA had reasonably available information regarding respiratory protections during high exposure periods for four COUs associated with the Manufacturing and Processing as a reactant OESs that informed the risk determination. Although EPA does not have

[16] EPA derives non-cancer MOEs by dividing the non-cancer POD (HEC [mg/m^3] or HED [mg/kg-day]) by the exposure estimate (mg/m^3 or mg/kg-day). Section 5.3.1 has additional information on the risk assessment approach for human health.

[17] Section 5.3.1 explains how cancer risk estimates for 1,2-dichloroethane are calculated.

information from all facilities associated with this COU, the PPE information in the test order is from representative facilities intended to characterize the typical range of worker inhalation exposure to 1,2-dichloroethane across the industry. In addition, the risk estimates are based on workplace exposure scenarios, including monitoring data that reflect existing OSHA workplace requirements (*i.e.,* OSHA permissible exposure limits [PELs]) and industry or sector exposure controls.

An MOE that is less than the benchmark MOE is a starting point for informing a determination of unreasonable risk of injury to health, based on non-cancer effects. Similarly, a calculated cancer risk estimate that is greater than the cancer benchmark is a starting point for informing a determination of unreasonable risk of injury to health from cancer. Inhalation cancer risk estimates represent the incremental increase in probability of an individual in an exposed population developing cancer over a lifetime (excess lifetime cancer risk [ELCR]) following exposure to the chemical. Standard cancer benchmarks used by EPA and other regulatory agencies are an increased cancer risk ranging from 1 in 1,000,000 to 1 in 10,000 (*i.e.,* 1×10^{-6} to 1×10^{-4})—depending on the subpopulation(s) exposed and other considerations. In this assessment the Agency considers 1×10^{-4} as the appropriate benchmark for increased cancer risk for workers, including ONUs.

It is important to emphasize that these calculated risk estimates alone are not bright-line indicators of unreasonable risk. In this risk determination, 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.

For this 1,2-dichloroethane risk evaluation, EPA accounted for the following PESS groups: workers, infants exposed to drinking water during formula bottle feeding, subsistence and tribal fishers, men of reproductive age, individuals with preexisting conditions such as chronic kidney disease, people with the CYP2E1 and aldehyde dehydrogenase-2 polymorphism, lifestyle factors such as smoking cigarettes or secondhand smoke, and communities who live near facilities that emit 1,2-dichloroethane (see Section 5.3.2 and Table 5-28). Although there is likely to be variability in susceptibility across the human population, EPA did not identify specific human groups that are expected to be more susceptible to cancer or non-cancer effects following 1,2-dichloroethane exposure. However, it should be noted that EPA used an uncertainty factor of 10 to account for human variability that would include the PESS identified above.

EPA determined that the unreasonable risk presented by 1,2-dichloroethane is due to the following:

- non-cancer olfactory effects in workers and ONUs from acute inhalation exposures;
- non-cancer male reproductive effects in workers and ONUs from intermediate and chronic inhalation exposures;
- non-cancer renal system effects in workers from acute and chronic dermal exposures; and
- cancer risk (tumors) to workers from inhalation and dermal exposures and to ONUs from inhalation exposures.

For oral and dermal exposures, the acute and intermediate benchmark MOE for 1,2-dichloroethane is 30 and the chronic benchmark MOE is 100. For inhalation exposures the acute, intermediate, and chronic benchmark MOEs are 30. Derived from the total uncertainty factors (UFs), these benchmark MOEs are conservative given the reasonably available information as described in Section 5.2. The overall confidence in the selected POD for each exposure duration and route is summarized in Table 5-23 and Table 5-24.

Byproducts

EPA also evaluated risk to human health from byproducts produced during the manufacture of 1,2-dichloroethane and determined that these byproducts significantly contribute to unreasonable risk to human health of workers and ONUs. The determination that the Domestic manufacture COU significantly contributes to the unreasonable risk to workers is driven by acute, intermediate, chronic non-cancer, and cancer inhalation and dermal risks. EPA notes that the unreasonable risk identified where 1,2-dichloroethane is produced as an unintentional byproduct is driven by scenarios with higher percentages of 1,2-dichloroethane produced (*i.e.*, 95–100%). Based on public comments, EPA also considered a scenario where as little as 1% is produced. See Section 5.3.3.1.2 for more information. Carbon tetrachloride was determined to significantly contribute to unreasonable risk due to chronic, non-cancer risk and cancer risk for operators, maintenance technicians, and laboratory technicians, at central tendency inhalation exposures; for ONUs at high-end inhalation exposures; and for workers at central tendency dermal exposures. No risks were identified for the other byproduct chemicals (see Table 6-2). As explained in Section 7 of the *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j), EPA has moderate-to-robust confidence in the byproducts risk estimates for workers and ONUs. The Agency has robust confidence that the byproducts do not present risk to the general population from releases to air and water. For more information, see Section 7 of the Byproducts TSD.

6.2.1 Basis for the Unreasonable Risk to Workers

Based on the occupational risk estimates and related risk factors, EPA determined that 15 COUs significantly contribute to unreasonable risk to workers from 1,2-dichloroethane. Risk estimates are numerical expressions of many conditional assumptions, modeling choices, exposure data, and toxicity values derived by EPA specifically for the purposes of the COUs included in the TSCA risk evaluation. Because of these reasons, the Agnecy 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. For example, dermal hazards were assessed using route-to-route extrapolation from oral studies (non-cancer) and inhalation (cancer). The simplified relationship between dermal exposure and oral or inhalation exposure may result in uncertain hazard estimates given the internal dose equivalent between the oral and/or inhalation route and dermal for 1,2-dichloroethane is unknown and the first pass effect may play a role in toxicity. Additionally, information related to mode of action would provide additional confidence in the cancer classification.

EPA analyzed dermal and inhalation exposure in the occupational scenarios using a time-weighted average (TWA) for a typical 8-hour shift (see Section 5.3) for male and female workers. Estimates of central tendency and high-end inhalation and dermal exposures were made for workers directly working with 1,2-dichloroethane as well as separate estimates for inhalation exposures for ONUs not directly handling 1,2-dichloroethane, as appropriate. 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).

EPA calculated 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 individuals exposed at sentinel exposure levels, whereas risk estimates at the central tendency exposure are intended to cover average or typical worker exposure. To determine whether a specific COU significantly contributes to the unreasonable risk, EPA may consider chemical-specific information and risk-related factors, including how the central tendency and high-end risk estimates best represent each COU. Additionally, the Agency considers a threshold for determining unreasonable risk due to cancer effects based on risk estimates above a benchmark of 1×10^{-4} for workers. For all COUs with sufficient confidence to support a risk determination, and based on the reasonably available information as well as the Agency's confidence and uncertainties described earlier in this risk evaluation, EPA bases its 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, the ONU exposure was assumed to be equivalent to the central tendency exposure for workers for the corresponding COU, as described in Section 5.1.1.1.2.

COUs Covered by 1,2-Dichloroethane Monitoring Data

Because EPA's occupational risk assessment incorporates 1,2-dichloroethane inhalation monitoring data (*e.g.,* PBZ monitoring) for 12 COUs, EPA has confidence that the Agency's risk estimates reflect working conditions at facilities handling 1,2-dichloroethane. However, uncertainty in the estimates based on a statistical distribution of multiple single day measurements increases as the single day results are extrapolated to longer durations, and there is uncertainty in high exposure tasks being performed on a daily basis during the working year. As explained in Section 5.3.6.8.1, without consideration of existing respiratory protections, high-end exposure and risk estimates are most appropriate for consideration of shorter duration exposures (acute, intermediate), while central tendency values are more representative for chronic exposures. 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 shorter periods of time, while central tendency estimates are used for longer-term exposures (*i.e.*, several decades for chronic non-cancer effects). As noted previously, there are four COUs in this grouping associated with the Manufacturing and Processing as a reactant OES where the reasonably available information on PPE informed the risk determination, including EPA's reliance on high-end exposures for certain SEGs.

For dermal risk estimates, for all COUs for which the use is known to take place in closed systems (Manufacturing –Domestic manufacture and Processing – As a reactant), EPA based its unreasonable risk determination for workers for acute and intermediate dermal exposure on the high-end (this is due to the potential for high short-term exposures during maintenance activities, for example), though neither acute nor intermediate dermal risk was found for these two COUs), and for chronic dermal exposures and dermal cancer risks on the central tendency (though no chronic non-cancer dermal risk was found for these two COUs). For all other COUs, the Agency based its unreasonable risk determination for workers for dermal exposure on the high-end for all exposures. The central tendency risk estimates were identified as more appropriate than the high-end for chronic dermal exposures and dermal cancer risks for uses known to take place in closed systems (Manufacturing – Domestic manufacture and Processing – As a reactant), which was due to differences in the magnitude and frequency of expected workplace exposures. However, for all other COUs, the high-end dermal risk estimates were identified as more appropriate for all dermal exposures because of increased risks to workers due to not taking place in closed systems (see also Section 5.3.8.1). Additional information on occupational risk estimates is provided in Section 5.3.3.

EPA has determined that all 12 COUs associated with 1,2-dichloroethane test order monitoring data significantly contribute to unreasonable risk to workers from acute, intermediate, and chronic inhalation exposures and/or dermal exposures:

- Manufacturing – Domestic manufacture
- Manufacturing – Import

- Processing – As a reactant – Intermediate in: Petrochemical manufacturing; Plastic material and resin manufacturing; All other basic organic chemical manufacturing; All other basic inorganic chemical manufacturing
- Processing – Incorporated into a formulation, mixture, or reaction product – Fuels and fuel additives: All other petroleum and coal products manufacturing
- Processing – Incorporated into a formulation, mixture, or reaction product – Processing aids: Specific to petroleum production; Plastics material and resin manufacturing
- Processing – Incorporated into a formulation, mixture, or reaction product – Adhesives and sealants; Lubricants and greases; Oxidizing/reducing agents; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing
- Processing – Repackaging
- Processing – Recycling
- Industrial use – Other use – Process solvent
- Industrial use – Process regulator – *e.g.,* Catalyst moderator, oxidation inhibitor
- Commercial use – Other use – Laboratory chemical
- Disposal.

The determination that the Domestic manufacture COU significantly contributes to the unreasonable risk to workers is driven by acute, intermediate, chronic non-cancer, and cancer inhalation and dermal risks. (For ONUs, the unreasonable risk is driven by acute and intermediate inhalation risks.) For inhalation, the Agency identified significant contributions to unreasonable risk for this COU for the operator, logistic technician, maintenance technician, and laboratory technician SEG. For this COU, there is evidence that operators, maintenance technicians, and logistics technicians wear respiratory protection during high-end exposures and, though these high-end exposures are informed by real-world data and therefore reasonably expected to occur, they likely over-estimate actual worker risk. As explained in Section 5.3.6.8.2, the Agency has evidence from this test order on the use of respirators for certain SEGs when exposed to high levels of 1,2-dichloroethane. As explained in Section 5.3.8.2, the Agency has evidence from this test order on the use of respirators for certain SEGs when exposed to high levels of 1,2-dichloroethane. For certain SEGs, respiratory protection was also worn during some tasks with exposures representative of the central tendency risk estimates. When considering the confidences and uncertainties in both the high-end and central tendency risks, including the likely overestimation in high-end risk estimates for these three SEGs, EPA concluded that only one (*i.e.*, the operator associated with the Manufacturing OES) was still driving unreasonable risk for acute and intermediate durations—even after accounting for PPE usage (respirators with APF 10–1,000; see Section 5.3.3). The unreasonable risks associated with the other SEGs (*i.e.,* logistic technician, maintenance technician, and laboratory technician) are driven either by acute and intermediate high-end estimates that do not account for PPE or by chronic non-cancer or cancer risk based on central tendency estimates.

The determination that two COUs (*i.e.,* Manufacturing – Import and Processing – Repackaging) associated with the Repackaging OES significantly contribute to the unreasonable risk to workers for two COUs (*i.e.,* Manufacturing – Import and Processing – Repackaging) associated with the Repackaging OES is driven by acute, intermediate, and cancer inhalation and dermal risks. (For ONUs, the unreasonable risk for these COUs is driven by cancer inhalation risks.) This risk is found based on the modeled assessment of Repackaging and the assessment utilizing PBZ monitoring data from the 1,2-dichloroethane test order.

The determination that three COUs (*i.e.,* [1] Processing – As a reactant – Intermediate in: Petrochemical manufacturing, Plastic material and resin manufacturing, All other basic organic chemical manufacturing, All other basic inorganic chemical manufacturing; [2] Processing – Recycling; and [3]

Industrial use – Process regulator – *e.g.*, Catalyst moderator; oxidation inhibitor) associated with the Processing as a Reactant OES significantly contribute to the unreasonable risk to workers is driven by acute, intermediate, and cancer inhalation and dermal risks. (EPA determined that these COUs do not significantly contribute to unreasonable risk to ONUs.) For inhalation, the Agency identified significant contributions to unreasonable risk for these COUs for the logistics technician and herbicide manufacturer SEGs. Risk was not driven by the activities covered under the operator, maintenance technician, and laboratory technician SEGs. Similar to the Manufacturing COU, there is evidence that certain SEGs (*i.e.*, logistics technician) wear respiratory protection during high-end exposures and respiratory protection is generally not worn during tasks with exposures representative of the central tendency risk estimates. Therefore, EPA's unreasonable risk determination, driven by the logistics technician SEG, considered this uncertainty a likely overestimation. However, even after accounting for PPE usage, the logistics technician continues to contribute to the unreasonable risk under these COUs with MOEs below benchmark for acute and intermediate durations at both the central tendency and high-end exposures and cancer risk estimates above benchmark at the central tendency exposure. The contributions to unreasonable risk associated with the other SEG driving risk (*i.e.*, herbicide manufacture) are driven by acute and intermediate high-end estimates that do not account for PPE and by cancer risk based on central tendency estimates. EPA notes that there is slight confidence in the risk estimates for the Herbicide manufacturer SEG, in part due to the high number of non-detect samples.

The determination that four COUs (*i.e.,* [1] Processing – Incorporated into a formulation, mixture, or reaction product – Fuels and fuel additives: All other petroleum and coal products manufacturing; [2] Processing – Incorporated into a formulation, mixture, or reaction product – Processing aids: Specific to Petroleum production; Plastics material and resin manufacturing; [3] Processing – Incorporated into a formulation, mixture, or reaction product – Adhesives and sealants; Lubricants and greases; Oxidizing/reducing agents; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing; and [4] Industrial use – Other use – Process solvent) associated with the Processing into Formulation, Mixture, or Reaction Product OES significantly contribute to unreasonable risk to workers is driven by acute, intermediate, and cancer inhalation and dermal risks. (For ONUs, the unreasonable risk contribution for these COUs is driven by cancer inhalation risks.) EPA notes the slight confidence in the risk estimates for the Processing into Formulation, Mixture, or Reaction Product OES.

The determination that one COU (*i.e.,* Commercial use – Other use – Laboratory chemical) associated with the Laboratory Use OES significantly contributes to the unreasonable risk to workers is driven by acute, intermediate, and cancer inhalation and dermal risks. (For ONUs, the unreasonable risk for this COU is driven by cancer inhalation risk.) The Agency assessed the 1,2-dichloroethane laboratory use in the manufacturing setting (*i.e.*, the Agency assumes the tasks described for laboratory technicians in a manufacturing or processing setting would be similar to tasks performed by laboratory technicians in a commercial laboratory setting), during the manufacturing of a herbicide, and in an academic setting using analogous methylene chloride data. All of these categories were found to significantly contribute to unreasonable risk of 1,2-dichloroethane.

For the last COU in this category, Disposal, the determination that it significantly contributes to unreasonable risk to workers is driven by acute, intermediate, and cancer inhalation and dermal risks. (For ONUs, the unreasonable risk for this COU is driven by cancer inhalation risks.) The unreasonable risk was only found for wastewater treatment (WWT) and publicly owned treatment works (POTW) facilities where EPA had directly applicable PBZ data obtained from workers at a WWT plant. Risk was not indicated for workers for disposal at landfills receiving municipal and industrial waste.

COUs Assessed Using Trichloroethylene Test Order Data
For two COUs, EPA did not identify any 1,2-dichloroethane inhalation monitoring data related to these uses and therefore used surrogate data from trichloroethylene during use of paints, coatings, adhesives, and sealants and during batch open-top vapor degreasing:

- Industrial use – Adhesives and sealants; and
- Industrial use – Solvents (for cleaning and degreasing) – Degreasing and cleaning solvents).

The determination that the Industrial use – Adhesives and sealants COU significantly contributes to the unreasonable risk to workers is driven by acute, intermediate, chronic non-cancer, and cancer inhalation and dermal risks. (For ONUs, the unreasonable risk for this COU is driven by acute, intermediate, chronic non-cancer, and cancer inhalation risks.) This determination is based on the high-end risk estimates for acute and intermediate durations and the central tendency risk exposures for chronic non-cancer and cancer risks. Although the use of surrogate data is a less preferred approach for estimating inhalation exposure, EPA's confidence increases for this COU based on the inclusion of PBZ inhalation monitoring data, mapping to similar OESs, and the similarity in vapor pressure of the surrogate data chemical to 1,2-dichloroethane in vapor pressure. This risk is found based on exposures from facilities using trichloroethylene in adhesive and coating applications.

The determination that the Industrial use – Solvents (for cleaning and degreasing) – Degreasing and cleaning solvents COU significantly contributes to the unreasonable risk to workers is driven by acute, intermediate, chronic non-cancer, and cancer inhalation and dermal risks. (For ONUs, the unreasonable risk for this COU is driven by acute, intermediate, chronic non-cancer, and cancer inhalation risks.) The data used for this assessment encompasses exposures to trichloroethylene from various industries such as metal tube production, valve manufacturing, jet and rocket engine manufacturing, air conditioning preparation and assembly, and air conditioning motor parts. EPA used data on trichloroethylene exposures from open-top vapor degreasing based on the availability of surrogate monitoring data and because this process presents a conservative estimate of exposure due to its higher exposure potential. However, this resulted in exposure estimates that may represent an overly conservative estimate of risk. For example, there is uncertainty in whether the vapor degreasing scenario assessed is representative of 1,2-dichloroethane for this COU. Based on the limitations and potential overestimation in EPA's assessment of this COU, EPA's basis of unreasonable risk is based on central tendency inhalation exposures for all populations and durations.

COU Assessed with Modeling
There was one COU, Industrial use – Lubricants and greases – Solid film lubricants and greases, for which EPA did not identify relevant inhalation monitoring data and only used modeling to estimate occupational exposures. (The previously mentioned COU, Industrial use – Solvents [for cleaning and degreasing] – Degreasing and cleaning solvents, was also modeled in addition to the use of trichloroethylene surrogate data.) As discussed above EPA has determined that this COU significantly contributes to unreasonable risk of 1,2-dichloroethane. For the Industrial use – Lubricants and greases – Solid film lubricants and greases COU, the determination of significant contributions to unreasonable risk to both workers and ONUs is driven by acute, intermediate, chronic non-cancer, and cancer inhalation risks. This risk determination is supported by the central tendency estimates and modeled weight fraction of 5 to 10% of 1,2-dichloroethane in the product. The estimates were modeled from applicable exposure scenarios such as the CARB brake service study and the use of known 1,2-dichloroethane concentration data from products currently on the market. There is uncertainty in the brake servicing scenario being representative of the use rates for the application of lubricants and greases containing 1,2-dichloroethane and of the representation of the true distribution of potential inhalation concentrations for the industries and sites covered by this scenario. Based on the limitations

and potential overestimation in EPA's assessment of this COU, EPA's determination is based on central tendency exposures for all populations and durations.

ONU Unreasonable Risk

Of the 15 COUs that significantly contribute to the unreasonable risk, EPA has determined that 12 significantly contribute to unreasonable risk to ONUs from acute, intermediate, and/or chronic inhalation exposures:

- Manufacturing – Domestic manufacture
- Manufacturing – Import
- Processing – Incorporated into a formulation, mixture, or reaction product – Fuels and fuel additives: All other petroleum and coal products manufacturing
- Processing – Incorporated into a formulation, mixture, or reaction product – Processing aids: Specific to petroleum production; Plastics material and resin manufacturing
- Processing – Incorporated into a formulation, mixture, or reaction product – Adhesives and sealants; Lubricants and greases; Oxidizing/reducing agents; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing
- Processing – Repackaging
- Industrial use – Adhesives and sealants
- Industrial use – Lubricants and greases – Solid film lubricants and greases
- Industrial use – Other use – Process solvent
- Industrial use – Solvents (for cleaning and degreasing) – Degreasing and cleaning solvents
- Commercial use – Other use – Laboratory chemical
- Disposal.

Similar to EPA's determination for workers who are not ONUs, because the occupational risk assessment for seven of the above listed COUs incorporates 1,2-dichloroethane inhalation monitoring data for ONUs, EPA has confidence that the Agency's risk estimates (except for in cases where there are a high number of non-detect samples), including estimates at the high-end (95th percentile), reflect working conditions. Therefore, EPA's risk determination generally relies on high-end estimates to support its determination for these ONUs for shorter term inhalation exposures. This is because consistent high-end exposures are more likely to occur over shorter periods of time, while central tendency estimates are used for longer-term exposures (*i.e.*, several decades for chronic non-cancer). Based on EPA's consideration of the data and confidence in its risk estimates, these seven COUs (*i.e.*, [1] Domestic manufacturing; [2] Processing – Incorporated into a formulation, mixture, or reaction product – Fuels and fuel additives: All other petroleum and coal products manufacturing; [3] Processing – Incorporated into a formulation, mixture, or reaction product – Processing aids: Specific to petroleum production; Plastics material and resin manufacturing; [4] Processing – Incorporated into a formulation, mixture, or reaction product – Adhesives and sealants; Lubricants and greases; Oxidizing/reducing agents; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing; [5] Industrial use – Adhesives and sealants; [6] Industrial use – Other use – Process solvent; and [7] Disposal) significantly contribute to the unreasonable risk of 1,2-dichloroethane due to exposure to ONUs.

There is one COU (*i.e.,* Industrial use – Solvents (for cleaning and degreasing) – Degreasing and cleaning solvents) that also has ONU specific data, but for which the unreasonable risk is driven by central tendency exposure estimates. This is due to EPA's use of surrogate monitoring data from trichloroethylene exposures from open-top vapor degreasing and because this presents a conservative estimate of exposure due to its higher exposure potential.

For the remaining four COUs, ONU-specific sampling data for 1,2-dichloroethane inhalation exposures was not available and EPA used a default assumption of the central tendency from modeled workers inhalation exposures to represent ONU inhalation exposures. Considering the uncertainties associated with these risk estimates, the Agency's risk determination is driven only by the modeled central tendency exposures for these ONUs for all durations.

COUs Assessed Qualitatively and Do Not Contribute to Unreasonable Risk
For four COUs, EPA characterized the risk by integrating limited amounts of reasonably available information in a qualitative characterization. Based on this qualitative characterization, the Agency does not expect the following four COUs to contribute to the unreasonable risk of 1,2-dichloroethane due to negligible human exposures:

- Distribution in commerce;
- Industrial use – Functional fluids (closed systems) – Heat transferring agent;
- Commercial use – Plastic and rubber products; and
- Commercial use – Fuels and fuel additives.

For the Commercial use – Plastic and rubber products COU, EPA characterized risks to consumers using a screening-level approach (see Section 5.3.4.1). Based on this screening approach, the Agency determined that both the commercial and consumer use of plastic and rubber products do not contribute to unreasonable risk of 1,2-dichloroethane due to negligible human exposures (see Section 6.2.2 for EPA's no unreasonable risk determination for consumers).

Dermal Considerations
EPA derived dermal risk estimates for both a deterministic and probabilistic calculation. The deterministic model used a single set of representative parameters but did not address variability in exposure duration and frequency. The probabilistic model did use the full distribution for most of the modeled parameters (except for fraction absorbed and event frequency). EPA used the probabilistic model as the basis for the unreasonable risk determination for 1,2-dichloroethane because the Agency had increased confidence in the probabilistic model, as further discussed in Section 5.1.1.1.2.

Despite the uncertainties described in Section 5.3.3.2 of this risk evaluation, including the use of modeling to estimate exposure and the fact that dermal loading parameter in the model is based on laboratory studies and not from monitoring data, EPA has moderate confidence in the non-cancer risk estimates, and slight-to-moderate confidence in the cancer risk estimates generated by the model are sufficient for determining whether a COU significantly contributes to the unreasonable risk. The use of available test order dermal absorption data provided increased confidence in the dermal estimates. Generally, the EPA used the high-end exposure estimates for acute and intermediate non-cancer exposures, and the central tendency chronic non-cancer and cancer dermal risk determinations. EPA notes that this risk evaluation did not find that acute, intermediate, and chronic non-cancer dermal risks drive the unreasonable risk of 1,2-dichloroethane—except for acute risk for the Commercial use – Other use – Laboratory chemical COU (for which the Agency assumed that gloves used may not be adequately resistant to 1,2-dichloroethane). EPA did not have sufficient information to assume the use of 1,2-dichloroethane chemically resistant gloves in the risk determination for any COU.

6.2.2 Basis for No Unreasonable Risk to Consumers

EPA used peer-reviewed literature to gather data on consumer articles containing 1,2-dichloroethane. The Agency considered higher intensity consumer exposure scenarios where children are playing and mouthing ornaments and toys. These scenarios are meant to capture the higher exposures that are associated with and representative of children's higher oral and dermal exposures relative to body weight than to adults. EPA did not identify risks from any of the article exposure scenarios to children or adults.

Based on the consumer risk estimates and related risk factors, EPA determined that consumer use does not significantly contribute to the unreasonable risk of 1,2-dichloroethane. The Agency's overall confidence in the acute, intermediate, and chronic consumer inhalation, ingestion, and dermal exposure risk estimates ranges from moderate-to-robust. Additional information on the consumer analysis can be found in Sections 5.1.3 and 5.3.4.1 of this risk evaluation and Section 5 of the *Consumer Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026o).

6.2.3 Basis for No Unreasonable Risk to the General Population

Based on the risk estimates calculated using releases from manufacturing, processing, and commercial uses of 1,2-dichloroethane, as well as the related risk factors, EPA determined that 1,2-dichloroethane, and the byproducts produced during the manufacture of 1,2-dichloroethane, do not significantly contribute to unreasonable risk to the general population. This final determination regarding the general population—particularly from exposures of 1,2-dichloroethane due to the ambient air pathway—considers the updates made to the analysis from the draft to this final risk evaluation, including the use of data from more recent NEI and TRI reporting years in the HEM analysis.

Ambient air was the primary pathway of concern for risk to the general population, including fenceline communities, from 1,2-dichloroethane. EPA did not identify unreasonable risk of injury to the general population based on either cancer or non-cancer risks from 1,2-dichloroethane from other assessed routes of exposure (*i.e.,* incidental dermal from swimming, drinking water exposure, fish ingestion, incidental oral ingestion from swimming, and soil ingestion). Additionally, the non-cancer risk estimates for ambient air exposure for fenceline communities did not indicate risk. Cancer risk estimates for ambient air exposures indicated an increased cancer risk for eight COUs at or above 1 in 1,000,000 to 1 in 10,000 (*i.e.,* 1×10^{-6} to 1×10^{-4}). Considering all the relevant risk-related information and uncertainties, EPA determined that 1,2-dichloroethane exposures to the general population do not significantly contribute to unreasonable risk to the general population due to cancer risk from inhalation exposure under the COUs for reasons discussed below.

EPA used NEI and TRI data to assess ambient air inhalation risks to the general population. EPA used HEM to evaluate exposures and characterize risk to populations living near releasing facilities (fenceline communities). Risk estimates based on HEM utilized TRI-reported releases (2015–2024) and NEI-reported releases (2014, 2017, and 2020). HEM combines U.S. Census data with estimated ambient air concentrations to calculate maximum individual risks and the number of people within each census block with cancer risk above certain benchmarks. These HEM results were calculated using the daily averages of hourly estimated concentrations averaged across 365 days that account for the conditions of that specific facility location such as prevailing winds and local meteorology.

Because stack information is not available in TRI, default release areas for fugitive emissions and default stack parameters for point sources were used in modeling of releases reported to TRI. Some of these assumptions could have resulted in high-end estimated concentrations. In this assessment, reported TRI releases are consistently higher than NEI releases for facilities that reported to both databases, driving higher risk estimates for certain COUs based on TRI data. Additionally, EPA also assumes TRI releases occur at one location, which could result in higher or lower risk estimates depending on the specific locations of the releases, size of the facility, and population distribution around the facility. Because both NEI and TRI provide high-quality data, and a larger number of TRI-reported release years were reasonably available and included in this assessment, EPA considered the risk estimates derived using both datasets in this risk determination.

For risk to the general population, EPA typically considers an increased cancer risk above 1 in 1,000,000 to 1 in 10,000 (*i.e.,* 1×10^{-6} to 1×10^{-4}). Again, these estimates are not treated as a bright-line and other risk-based factors are considered (*e.g.,* confidence in the hazard and exposure characterization, duration, magnitude, uncertainty, and populations exposed, especially since fenceline populations exposed are considered PESS in this risk evaluation) for the purpose of making an unreasonable risk determination. EPA's analytical framework under TSCA is similar to other EPA programs (*e.g.,* the Clean Air Act, Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA]), which include consideration of other relevant risk-related information and uncertainties such as the overall incidence of cancer as well as the number of persons exposed within each individual lifetime risk range. As required by TSCA, EPA also considers PESS.

Based on EPA's analysis, there were 12 COUs where the facility releases resulted in increased maximum cancer risk estimates within or above this cancer range resulting in a maximum estimated 0.0116 excess cancer cases per year for the populations living within 50 km of all facilities associated with all of these COUs:

- Manufacturing – Domestic manufacture
- Manufacturing – Import
- Processing – As a reactant – Intermediate in: Petrochemical manufacturing; Plastic material and resin manufacturing; All other basic organic chemical manufacturing; All other basic inorganic chemical manufacturing
- Processing – Incorporated into a formulation, mixture, or reaction product – Fuel and fuel additives and All other petroleum and coal products manufacturing
- Processing – Incorporated into a formulation, mixture, or reaction product – Processing aids: Specific to Petroleum production; Plastics material and resin manufacturing
- Processing – Incorporated into a formulation, mixture, or reaction product – Adhesives and sealants; Lubricants and greases; Oxidizing/reducing agents; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing
- Processing – Repackaging
- Processing – Recycling
- Industrial use – Adhesives and sealants
- Industrial use – Other use – Process solvent
- Industrial use – Process regulator – *e.g.,* Catalyst moderator, Oxidation inhibitor
- Disposal.

Three facilities, all associated with the Manufacturing COU (TRI IDs 42029WSTLK2468I, 70669GRGGL1600V, and 70669PPGNDCOLUM) resulted in the highest maximum cancer risk estimates derived: 2.08×10^{-5}, 1.73×10^{-5}, and 2.93×10^{-5}, respectively. Based on the HEM Census block analysis using TRI releases, these three facilities resulted in a total population of 628 people exposed to risk at greater than or equal to 1 in 100,000 based on all the Census blocks within 50 km of the facilities. The populations associated with the three census blocks showing highest risk near these facilities total 20 people. The remaining 11 COUs were associated with individual maximum cancer risk estimates above 1×10^{-6} but below 1×10^{-5}. As mentioned previously and as presented in Table 5-36, the maximum individual cancer risk based on all COUs using NEI data is lower at 1.30×10^{-5}.

EPA considers the combination of the risk level and the potentially exposed population, which results in an estimated range of 0.000897 to 0.0000897 excess cancer cases per year for the population (628 people; with exposures from the three manufacturing facilities) with an estimated individual cancer risk that exceeds 1×10^{-5} but is below the upper threshold of 1×10^{-4}.

EPA also considered the following additional risk-related factors in its determination for these 12 COUs: The general population risk estimates assume that individuals are exposed 24 hours/day for a continuous lifetime exposure of 70 years. The values were also derived using TRI data, which as previously discussed is typically associated with higher risk due in part to the dataset, not including information on stack parameters and locations of process level emissions for facilities that have multiple emission points. In the assessment, EPA assumed the use of stack parameters that generally result in high-end estimated concentrations. For example, the highest risk at a populated census block based on TRI data was 2.98×10^{-5}, whereas the risk based on NEI for the same census block was 1.33×10^{-5}, which is a factor of approximately 2 less. Due to these potential biases toward high exposures—combined with a maximum cancer risk below the upper threshold and low cancer incidence—EPA determined that the Manufacturing – domestic manufacture COU, along with the other 11 previously mentioned COUs, do not significantly contribute to unreasonable risk of 1,2-dichloroethane.

Overall, EPA has robust confidence in risk estimates that were calculated using release data reported to both TRI and NEI and that the risks are representative of actual exposures to the general population living near releasing facilities and PESS. 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. Additionally, the use of HEM allowed for the characterization of populations living near facilities and provided strong evidence for distances that are most relevant for general population exposure. However, there are uncertainties and potential conservatisms considered in the risk characterization and in EPA's determination of no unreasonable risk to the general population. As noted above, the modeled scenario informing both the radial distance and HEM estimates is based on continuous inhalation (24 hours a day) of ambient air concentrations over a lifetime (*i.e.,* 70–78 years) using the inputs from the highest release year for the facility. There is uncertainty in the assumption of continuous 1,2-dichloroethane exposure from ambient air to an individual all day, year-round, for their entire lifetime. This uncertainty extends to whether people spend a lifetime living in proximity to the specific facilities where risks are highest and in EPA's assumption of indoor air concentrations being equal to the 1,2-dichloroethane ambient air concentrations from releasing facilities. Additional information on EPA's overall confidence and uncertainties for the general population risk assessment can be found in Section 5.3.8.3.

6.3 Additional Information Regarding the Basis for the Risk Determination

Table 6-1 and Table 6-2 summarize the basis for the unreasonable risk determination of injury to human health presented in this 1,2-dichloroethane risk evaluation. The 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. PPE is not included where the exposed population would not be expected to wear PPE (*e.g.,* ONUs and the general population).

Not all COUs, exposure routes, populations, or receptors evaluated are included in these tables. For this unreasonable risk determination, EPA considered the effects of 1,2-dichloroethane to human health for workers, ONUs, and the general population, as well as effects to human health and the environment from the exposures associated with the COUs, risk estimates, and uncertainties in the analysis. See Sections 4.3 and 5.3 of this risk evaluation for a summary of risk estimates.

Table 6-1. Supporting Basis for the Unreasonable Risk Determination for Human Health of Workers for 1,2-Dichloroethane

COU		OES	Population	Exp. Route	Exp. Level [b]	Human Health Effects (with APF to Address Risk [a])			
Life Cycle Stage	Category/ Subcategory					Acute Non-Cancer (Benchmark MOE = 30) [c]	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 30 for inhalation and 100 for dermal)	Lifetime Cancer [d] (Benchmark = 10^{-4})
Manufacturing	Domestic manufacture	Manufacturing	Worker	Dermal	CT	497	221	237	**2.7E−04**
					HE	290	129	NE	NE
			Worker – operator [e]	Inhalation	CT	**7.4** (APF 10)	**22** (APF 10)	**23** (APF 10)	**7.4E−04** (APF 10)
					HE	**0.49** (APF 1,000)	**1.4** (APF 25)	1.5 (APF 25)	4.2E−02 (APF 1,000)
			Worker – logistics technician [e]	Inhalation	CT	209	613	656	2.6E−05
					HE	15 (APF 10)	43	47	1.4E−03 (APF 25)
			Worker – maintenance technician [e]	Inhalation	CT	73	213	228	7.6E−05
					HE	2.2 (APF 25)	6.5 (APF 10)	7.0 (APF 10)	9.1E−03 (APF 1,000)
			Worker – laboratory technician	Inhalation	CT	76	222	237	7.2E−05
					HE	**2.7** (APF 25)	**8.0** (APF 10)	8.6 (APF 10)	7.4E−03 (APF 1,000)
			ONU	Inhalation	CT	254	745	797	2.2E−05
					HE	**2.2**	**6.5**	7.0	9.1E−03
		Manufacturing – As an Unintended Byproduct	1,2-Dichloroethane as a byproduct: worker	Dermal	CT	497	221	237	**2.7E−04**
					HE	290	129	NE	NE
			1,2-Dichloroethane as a byproduct: worker – operator	Inhalation	CT	48	141	151	**1.4E−04** (APF 10)
					HE	**13** (APF 10)	39	41	1.9E−03 (APF 25)
			1,2-Dichloroethane as a byproduct: worker – logistics technician [e]	Inhalation	CT	55	160	172	**1.2E−04** (APF 10)
					HE	2.1 (APF 25)	6.1 (APF 10)	6.6 (APF 10)	1.2E−02 (APF 1,000)
			1,2-Dichloroethane as a byproduct: worker – maintenance technician	Inhalation	CT	169	496	531	3.9E−05
					HE	**9.9** (APF 10)	**29** (APF 10)	31	2.5E−03 (APF 25)
			1,2-Dichloroethane as a byproduct: worker – laboratory technician	Inhalation	CT	137	401	429	4.8E−05
					HE	47	137	147	5.3E−04 (APF 10)
			1,2-dichloroethane as a byproduct: ONU	Inhalation	CT	726	2,127	2,278	9.0E−06
					HE	**22**	65	70	1.1E−03

COU		OES	Population	Exp. Route	Exp. Level [b]	Human Health Effects (with APF to Address Risk [a])			
Life Cycle Stage	Category/ Subcategory					Acute Non-Cancer (Benchmark MOE = 30) [c]	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 30 for inhalation and 100 for dermal)	Lifetime Cancer [d] (Benchmark = 10^{-4})
Manufacturing	Import	Repackaging (PBZ)	Worker	Dermal	CT	497	221	258	**3.7E−04**
				Dermal	HE	290	129	147	7.3E−04
			Worker	Inhalation	CT	71	209	223	**2.7E−04** (APF 10)
					HE	**1.5** (APF 25)	**4.3** (APF 10)	4.7 (APF 10)	1.7E−02 (APF 1,000)
			ONU	Inhalation	CT	71	209	223	**2.7E−04**
					HE	NA	NA	NA	3.5E−04
Processing	Processing – As a reactant – Intermediate in: Petrochemical manufacturing; Plastic material and resin manufacturing; All other basic organic chemical manufacturing; All other basic inorganic chemical manufacturing	Processing as a Reactant	Worker	Dermal	CT	497	221	237	**2.8E−04**
					HE	290	129	NE	NE
			Worker – operator	Inhalation	CT	2,736	8,018	8,585	2.2E−06
					HE	741	2,172	2,325	2.7E−05
			Worker – logistics technician [e]	Inhalation	CT	**21** (APF 10)	61	66	**2.9E−04** (APF 10)
					HE	**1.5** (APF 25)	4.5 (APF 10)	4.9 (APF 10)	1.3E−02 (APF 1,000)
			Worker – maintenance technician	Inhalation	CT	1.1E04	3.3E04	3.5E04	5.4E−07
					HE	1,694	4,964	5,314	1.2E−05
			Worker – laboratory technician	Inhalation	CT	5,156	1.5E04	1.6E04	1.2E−06
					HE	2,372	6,949	7,440	8.6E−06
			Worker – herbicide manufacture	Inhalation	CT	36	104	112	**1.7E−04** (APF 10)
					HE	**2.6** (APF 25)	**7.6** (APF 10)	8.1 (APF 10)	7.9E−03 (APF 1,000)
			ONU	Inhalation	CT	1.7E04	5.0E04	5.3E04	3.6E−07
					HE	1.4E04	4.0E04	4.3E04	1.5E−06
	Processing – Incorporated into formulation, mixture, or reaction product – Fuels and fuel additives: All other petroleum and coal products manufacturing	Processing into Formulation, Mixture, or Reaction Product	Worker	Dermal	CT	784	349	374	**2.5E−04**
					HE	324	144	137	6.7E−04
			Worker	Inhalation	CT	36	104	112	**5.4E−04** (APF 10)
					HE	**2.6** (APF 25)	**7.6** (APF 10)	8.1 (APF 10)	9.6E−03 (APF 1,000)
			ONU	Inhalation	CT	36	105	112	**5.4E−04**
					HE	32	95	101	7.6E−04

COU		OES	Population	Exp. Route	Exp. Level [b]	Human Health Effects (with APF to Address Risk [a])			
Life Cycle Stage	**Category/ Subcategory**					**Acute Non-Cancer (Benchmark MOE = 30) [c]**	**Intermediate Non-Cancer (Benchmark MOE = 30)**	**Chronic Non-Cancer (Benchmark MOE = 30 for inhalation and 100 for dermal)**	**Lifetime Cancer [d] (Benchmark = 10^{-4})**
Processing	Processing – Incorporated into formulation, mixture, or reaction product – Processing aids: Specific to petroleum production	Processing into Formulation, Mixture, or Reaction Product	Worker	Dermal	CT	784	349	374	**2.5E−04**
Processing	Processing – Incorporated into formulation, mixture, or reaction product – Processing aids: Specific to petroleum production	Processing into Formulation, Mixture, or Reaction Product	Worker	Dermal	HE	324	144	137	6.7E−04
Processing	Processing – Incorporated into formulation, mixture, or reaction product – Processing aids: Specific to petroleum production	Processing into Formulation, Mixture, or Reaction Product	Worker	Inhalation	CT	36	104	112	**5.4E−04** (APF 10)
Processing	Processing – Incorporated into formulation, mixture, or reaction product – Processing aids: Specific to petroleum production	Processing into Formulation, Mixture, or Reaction Product	Worker	Inhalation	HE	**2.6** (APF 25)	**7.6** (APF 10)	8.1 (APF 10)	9.6E−03 (APF 1,000)
Processing	Processing – Incorporated into formulation, mixture, or reaction product – Processing aids: Specific to petroleum production	Processing into Formulation, Mixture, or Reaction Product	ONU	Inhalation	CT	36	105	112	**5.4E−04**
Processing	Processing – Incorporated into formulation, mixture, or reaction product – Processing aids: Specific to petroleum production	Processing into Formulation, Mixture, or Reaction Product	ONU	Inhalation	HE	32	95	101	7.6E−04
Processing	Processing – Incorporated into formulation, mixture, or reaction product – Adhesives and sealants; Lubricants and greases; Process regulators; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing	Processing into Formulation, Mixture, or Reaction Product	Worker	Dermal	CT	784	349	374	**2.5E−04**
Processing	Processing – Incorporated into formulation, mixture, or reaction product – Adhesives and sealants; Lubricants and greases; Process regulators; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing	Processing into Formulation, Mixture, or Reaction Product	Worker	Dermal	HE	324	144	137	6.7E−04
Processing	Processing – Incorporated into formulation, mixture, or reaction product – Adhesives and sealants; Lubricants and greases; Process regulators; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing	Processing into Formulation, Mixture, or Reaction Product	Worker	Inhalation	CT	36	104	112	**5.4E−04** (APF 10)
Processing	Processing – Incorporated into formulation, mixture, or reaction product – Adhesives and sealants; Lubricants and greases; Process regulators; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing	Processing into Formulation, Mixture, or Reaction Product	Worker	Inhalation	HE	**2.6** (APF 25)	**7.6** (APF 10)	8.1 (APF 10)	9.6E−03 (APF 1,000)
Processing	Processing – Incorporated into formulation, mixture, or reaction product – Adhesives and sealants; Lubricants and greases; Process regulators; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing	Processing into Formulation, Mixture, or Reaction Product	ONU	Inhalation	CT	36	105	112	**5.4E−04**
Processing	Processing – Incorporated into formulation, mixture, or reaction product – Adhesives and sealants; Lubricants and greases; Process regulators; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing	Processing into Formulation, Mixture, or Reaction Product	ONU	Inhalation	HE	32	95	101	7.6E−04
Processing	Repackaging	Repackaging (PBZ)	Worker	Dermal	CT	497	221	258	**3.7E−04**
Processing	Repackaging	Repackaging (PBZ)	Worker	Dermal	HE	290	129	147	7.3E−04
Processing	Repackaging	Repackaging (PBZ)	Worker	Inhalation	CT	71	209	223	**2.7E−04** (APF 50)
Processing	Repackaging	Repackaging (PBZ)	Worker	Inhalation	HE	**1.5** (APF 25)	**4.3** (APF 10)	4.7 (APF 10)	1.7E−02 (APF 1,000)
Processing	Repackaging	Repackaging (PBZ)	ONU	Inhalation	CT	71	209	223	**2.7E−04**
Processing	Repackaging	Repackaging (PBZ)	ONU	Inhalation	HE	NA	NA	NA	3.5E−04
Processing	Recycling	Processing as a Reactant	Worker	Dermal	CT	497	221	237	**2.8E−04**
Processing	Recycling	Processing as a Reactant	Worker	Dermal	HE	290	129	NE	NE
Processing	Recycling	Processing as a Reactant	Worker – operator	Inhalation	CT	2,736	8,018	8,585	2.2E−06
Processing	Recycling	Processing as a Reactant	Worker – operator	Inhalation	HE	741	2,172	2,325	2.7E−05
Processing	Recycling	Processing as a Reactant	Worker – logistics technician[e]	Inhalation	CT	**21** (APF 10)	61	66	**2.9E−04** (APF 10)
Processing	Recycling	Processing as a Reactant	Worker – logistics technician[e]	Inhalation	HE	**1.5** (APF 25)	4.5 (APF 10)	4.9 (APF 10)	1.3E−02 (APF 1,000)

COU		OES	Population	Exp. Route	Exp. Level [b]	Human Health Effects (with APF to Address Risk [a])			
Life Cycle Stage	Category/ Subcategory					Acute Non-Cancer (Benchmark MOE = 30) [c]	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 30 for inhalation and 100 for dermal)	Lifetime Cancer [d] (Benchmark = 10^{-4})
	Recycling	Processing as a Reactant	Worker – maintenance technician	Inhalation	CT	1.1E04	3.3E04	3.5E04	5.4E−07
					HE	1,694	4,964	5,314	1.2E−05
			Worker – laboratory technician	Inhalation	CT	5,156	1.5E04	1.6E04	1.2E−06
					HE	2,372	6,949	7,440	8.6E−06
			Worker – herbicide manufacture	Inhalation	CT	**19** (APF 10)	55	59	**3.2E−04** (APF 10)
					HE	**2.5** (APF 25)	**7.2** (APF 10)	7.8 (APF 10)	8.2E−03 (APF 1,000)
			ONU	Inhalation	CT	1.7E04	5.0E04	5.3E04	3.6E−07
					HE	1.4E04	4.0E04	4.3E04	1.5E−06
Distribution in commerce	Distribution in commerce	Distribution in commerce	Qualitatively Assessed						
Industrial use	Adhesives and sealants	Industrial Application of Adhesives and Sealants	Worker	Dermal	CT	498	222	333	**2.9E−04**
					HE	281	125	164	6.5E−04
			Worker	Inhalation	CT	**0.77** (APF 50)	**2.3** (APF 25)	**2.4** (APF 25)	**2.5E−02** (APF 1,000)
					HE	**9.0E−02** (APF 1,000)	**0.26** (APF 1,000)	0.28 (APF 1,000)	0.27 (APF 10,000)
			ONU	Inhalation	CT	**4.0**	**12**	**12**	**4.8E−03**
					HE	**3.6**	**10**	11	6.9E−03
	Functional fluids (closed systems) – Heat transferring agent		Qualitatively Assessed						
	Lubricants and greases – Solid film lubricants and greases	Industrial application of lubricants and greases	Worker	Dermal	CT	1.2E04	5,492	5,880	1.6E−05
					HE	6,512	2,901	3,106	3.4E−05
			Worker	Inhalation	CT	**1.0** (APF 50)	**3.0** (APF 10)	**3.2** (APF 10)	**1.9E−02** (APF 1,000)
					HE	0.40 (APF 1,000)	1.2 (APF 50)	1.2 (APF 25)	6.2E−02 (APF 1,000)
			ONU	Inhalation	CT	**1.5**	**4.5**	**4.8**	**1.2E−02**
					HE	0.48	1.4	1.5	5.1E−02
	Other use – Process solvent	Processing into formulation, mixture, or reaction product	Worker	Dermal	CT	784	349	374	**2.5E−04**
					HE	324	144	155	6.8E−04

COU		OES	Population	Exp. Route	Exp. Level [b]	Human Health Effects (with APF to Address Risk [a])			
Life Cycle Stage	Category/ Subcategory					Acute Non-Cancer (Benchmark MOE = 30) [c]	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 30 for inhalation and 100 for dermal)	Lifetime Cancer [d] (Benchmark = 10^{-4})
Industrial use		Processing into Formulation, Mixture, or Reaction Product	Worker	Inhalation	CT	36	104	112	**5.4E−04** (APF 10)
					HE	**2.6** (APF 25)	**7.6** (APF 10)	8.1 (APF 10)	9.6E−03 (APF 1,000)
			ONU	Inhalation	CT	36	105	112	**5.4E−04**
					HE	32	95	101	7.6E−04
	Process regulator – *e.g.* Catalyst moderator, oxidation inhibitor	Processing as a Reactant	Worker	Dermal	CT	497	221	237	**2.8E−04**
					HE	290	129	NE	NE
			Worker – operator	Inhalation	CT	2,736	8,018	8,585	2.2E−06
					HE	741	2,172	2,325	2.7E−05
			Worker – logistics technician[e]	Inhalation	CT	**21** (APF 10)	61	66	**2.9E−04** (APF 10)
					HE	**1.5** (APF 25)	4.5 (APF 10)	4.9 (APF 10)	1.3E−02 (APF 1,000)
			Worker – maintenance technician	Inhalation	CT	1.1E04	3.3E04	3.5E04	5.4E−07
					HE	1,694	4,964	5,314	1.2E−05
			Worker – laboratory technician	Inhalation	CT	5,156	1.5E04	1.6E04	1.2E−06
					HE	2,372	6,949	7,440	8.6E−06
			Worker – herbicide manufacture	Inhalation	CT	**19** (APF 10)	55	59	**3.2E−04** (APF 10)
					HE	**2.5** (APF 25)	**7.2** (APF 10)	7.8 (APF 10)	8.2E−03 (APF 1,000)
			ONU	Inhalation	CT	1.7E04	5.0E04	5.3E04	3.6E−07
					HE	1.4E04	4.0E04	4.3E04	1.5E−06
	Solvents (for cleaning and degreasing) – Degreasing and cleaning solvents	Industrial and Commercial Non-Aerosol Cleaning/ Degreasing	Non-aerosol – worker	Dermal	CT	500	223	238	**4.0E−04**
					HE	292	130	139	7.8E−04
			Non-aerosol – Worker	Inhalation	CT	**0.26** (APF 1,000)	**0.76** (APF 50)	**0.81** (APF 50)	**7.4E−02** (APF 1,000)
					HE	4.6E−02 (APF 1,000)	0.13 (APF 1,000)	0.14 (APF 1,000)	0.54 (APF 10,000)
			Non-aerosol – ONU	Inhalation	CT	**3.2**	**9.5**	**10**	**5.9E−03**
					HE	0.39	1.1	1.2	6.3E−02

COU		OES	Population	Exp. Route	Exp. Level [b]	Human Health Effects (with APF to Address Risk [a])			
Life Cycle Stage	Category/ Subcategory					Acute Non-Cancer (Benchmark MOE = 30) [c]	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 30 for inhalation and 100 for dermal)	Lifetime Cancer [d] (Benchmark = 10^{-4})
Industrial use	Solvents (for cleaning and degreasing) – Degreasing and cleaning solvents	Commercial Aerosol Products (Aerosol Degreasing, Aerosol Lubricants)	Aerosol – worker	Dermal	CT	523	233	250	**3.8E−04**
					HE	305	136	146	7.4E−04
		Commercial Aerosol Products (Aerosol Degreasing, Aerosol Lubricants)	Aerosol – worker	Inhalation	CT	**7.8E−02** (APF 1,000)	**0.23** (APF 1,000)	**0.25** (APF 1,000)	**0.24** (APF 10,000)
					HE	3.2E−02 (APF 1,000)	9.3E−02 (APF 1,000)	9.9E−02 (APF 1,000)	0.78 (APF 10,000)
			Aerosol – ONU	Inhalation	CT	**0.12**	**0.34**	**0.37**	**0.16**
					HE	3.8E−02	0.11	0.12	0.64
Commercial use	Plastic and rubber products – Plastic and rubber products		Qualitatively Assessed						
	Fuels and related products – Fuels and related products		Qualitatively Assessed						
	Other uses – Laboratory chemical	Laboratory use	Worker	Dermal	CT	580	258	301	**3.2E−04**
					HE	**3.7**	98	133	1.7E−03
			Worker – herbicide manufacturing	Inhalation	CT	62	183	196	**3.1E−04** (APF 10)
					HE	61	180	192	4.0E−04 (APF 10)
			Worker – academic laboratory	Inhalation	CT	52	151	162	**3.7E−04** (APF 10)
					HE	**4.7** (APF 10)	**14** (APF 10)	15 (APF 10)	5.3E−03 (APF 1,000)
			ONU	Inhalation	CT	123	360	386	**1.6E−04**
					HE				2.0E−04
Disposal	Disposal	Waste handling, treatment, and disposal (POTW and Non-POTW WWT)	Worker	Dermal	CT	784	349	374	**2.5E−04**
					HE	324	144	154	6.8E−04
			Worker (wastewater treatment)	Inhalation	CT	**25** (APF 10)	72	78	**7.7E−04** (APF 10)
					HE	**5.0** (APF 10)	**15** (APF 10)	16 (APF 10)	5.0E−03 (APF 25)
			ONU (wastewater treatment)	Inhalation	CT	78	227	243	**2.5E−04**
					HE	**27**	80	86	9.0E−04

COU		OES	Population	Exp. Route	Exp. Level [b]	Human Health Effects (with APF to Address Risk [a])			
Life Cycle Stage	Category/ Subcategory					Acute Non-Cancer (Benchmark MOE = 30) [c]	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 30 for inhalation and 100 for dermal)	Lifetime Cancer [d] (Benchmark = 10^{-4})
		Waste handling, treatment, and disposal (landfill)	Worker (landfill)	Inhalation	CT	4,571	1.3E04	1.4E04	4.2E−06
					HE	1,280	3,750	4,015	1.9E−05
			ONU (landfill)	Inhalation	CT	4,571	1.3E04	1.4E04	4.2E−06
					HE				5.4E−06

[a] This value is the protection factor of personal protective equipment required to raise the acute MOE above the benchmark of 30. 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 for detailed descriptions on the respirators corresponding to the APFs in the table.
[b] CT = central tendency; HE = high-end; MOE = margin of exposure, APF = assigned protection factor, Pop = Population, Expos = Exposure, Repro = Reproductive, Inter = Intermediate
[c] **Bold text** in a gray shaded cell indicates that a risk estimate significantly contributes to unreasonable risk.
[d] Using Vinyl Institute Working Years where available (for Manufacturing – Domestic manufacture; Processing – As a reactant; Processing – Recycling; and Industrial use – Process regulator – *e.g.,* Catalyst moderator, Oxidation inhibitor COUs)
NE = Not Estimated
[e] There is evidence that this SEG wears respiratory protection during high-end exposures but not always during central-tendency exposures, resulting in an overestimation of risk at the high-end. However, EPA is not able to quantify the exposure reduction of the reported respirator use, as it is not used during the full-shift. Additionally, it is unclear if the respirators utilized by workers in this SEG provide the minimum APF to mitigate exposures so that they do not exceed applicable benchmarks.

Table 6-2. Supporting Basis for the Unreasonable Risk Determination for Human Health from the Light- and Heavy-End Streams of Byproducts for 1,2-Dichloroethane with Working Year Adjustment for Cancer Risk

COU	Byproduct	Population	Exposure Route	Exposure Level	Human Health Effects (with APF to Address Risk)			
					Acute Non-Cancer	Intermediate Non-Cancer	Chronic Non-Cancer	Lifetime Cancer
Domestic manufacture (of 1,2-dichloroethane)	1,1-Dichloroethane	*Benchmarks*			*30*	*30*	*300*	*1.0E−04*
		Worker	Dermal	Central tendency	2,362	1,052	1,126	N/A
				High-end	787	351	NE	NE
		Worker – operator	Inhalation	Central tendency	2,279	2.8E04	7,214	2.4E−06
				High-end	394	4,895	1,248	5.1E−05
		Worker – maintenance technician	Inhalation	Central tendency	1.5E04	1.9E05	4.9E04	3.5E−06
				High-end	1,316	1.6E04	4,164	1.5E−05
		Worker – logistics technician	Inhalation	Central tendency	5.3E04	6.6E05	1.7E05	1.0E−07
				High-end	2,220	2.8E04	7,026	9.1E−06
		Worker – laboratory technician	Inhalation	Central tendency	2.2E04	2.8E05	7.0E04	2.4E−07
				High-end	1,076	1.3E04	3,407	1.9E−05
		ONU	Inhalation	Central tendency	5.1E04	6.4E05	1.6E05	3.7E−07
				High-end	778	9,658	2,462	3.1E−05
	Trichloroethylene	*Benchmarks*			*10*	*N/A*	*30*	*1E−04*
		Worker	Dermal	Central tendency	1,117	N/A	58	1.5E−05
				High-end	432	N/A	NE	NE
		Worker – operator	Inhalation	Central tendency	733	N/A	36	2.3E−06
				High-end	171	N/A	8.5 (APF 10)	3.6E−05
		Worker – maintenance technician	Inhalation	Central tendency	2,740	N/A	136	6.1E−07
				High-end	614	N/A	31	1.0E−05
		Worker – logistics technician	Inhalation	Central tendency	2.4E04	N/A	1,179	7.8E−08
				High-end	5,662	N/A	281	1.1E−06
		Worker – laboratory technician	Inhalation	Central tendency	2,658	N/A	132	6.3E−07
				High-end	593	N/A	29 (APF 10)	1.0E−05
		ONU	Inhalation	Central tendency	3,983	N/A	198	6.3E−07
				High-end	877	N/A	44	1.0E−05
	Perchloroethylene	*Benchmarks*			*10*	*N/A*	*10*	*1E−04*
		Worker	Dermal	Central tendency	157	N/A	676	7.3E−06
				High-end	52	N/A	NE	NE
		Worker	Inhalation	Central tendency	2,620	N/A	2.4E04	1.0E−07
				High-end	172	N/A	1,576	5.8E−06
		ONU	Inhalation	Central tendency	9.0E04	N/A	8.2E05	3.0E−09
				High-end	786	N/A	7,190	1.3E−06

COU	Byproduct	Population	Exposure Route	Exposure Level	Human Health Effects (with APF to Address Risk)			
					Acute Non-Cancer	Intermediate Non-Cancer	Chronic Non-Cancer	Lifetime Cancer
Domestic manufacture (of 1,2-dichloroethane)	Methylene chloride	*Benchmarks*			*30*	*N/A*	*10*	*1E−04*
		Worker	Dermal	Central tendency	4.3E04	N/A	5,854	6.5E−09
				High-end	1.4E04	N/A	NE	NE
		Worker	Inhalation	Central tendency	9,514	N/A	1,373	8.3E−09
				High-end	626	N/A	90	4.7E−07
		ONU	Inhalation	Central tendency	3.3E05	N/A	4.7E04	2.4E−10
				High-end	2,854	N/A	412	1.0E−07
	Carbon Tetrachloride	*Dermal Benchmarks*			*30*	*N/A*	*30*	*1.0E−04*
		Worker	Dermal	Central tendency	243	N/A	35	**9.5E−04**
				High-end	85	N/A	NE	NE
		Inhalation Benchmarks			*10*	*N/A*	*30*	*1.0E−04*
		Worker – operator	Inhalation	Central tendency	165	N/A	**15** (APF 10)	**6.6E−04** (APF 25)
				High-end	38	N/A	3.4 (APF 10)	1.1E−02 (APF 1,000)
		Worker – maintenance technician	Inhalation	Central tendency	613	N/A	55	**1.8E−04** (APF 10)
				High-end	136	N/A	12 (APF 10)	3.0E−03 (APF 50)
		Worker – logistics technician	Inhalation	Central tendency	5,333	N/A	476	2.1E−05
				High-end	1,255	N/A	112	3.1E−03 (APF 10)
		Worker – laboratory technician	Inhalation	Central tendency	601	N/A	54	**1.8E−04** (6.4E−05 with APF 10)
				High-end	131	N/A	12 (APF 10)	3.8E−03 (APF 50)
		ONU	Inhalation	Central tendency	892	N/A	80	**4.3E−04**
				High-end	195	N/A	17	2.5E−03

N/A = not assessed; NE = not estimated
EPA believes the central tendency from the closed system monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated dermal exposure (*i.e.,* chronic, cancer) for risk determination.

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APPENDICES

Appendix A KEY ABBREVIATIONS AND ACRONYMS

7Q10	Lowest 7-day average flow that occurs (on average) once every 10 years
30Q5	Lowest 30-day average flow that occurs (on average) once every 5 years
AAD	Acute absorbed dose
AADR	Acute absorbed dose rate
ACGIH	American Conference of Governmental Industrial Hygienists
AD	Acute dose
ADD	Chronic average daily dose
AERMOD	American Meteorological Society (AMS)/EPA Regulatory Model
AF	Adjustment factor
AMTIC	Ambient Monitoring Technology Information Center
APDR	Acute potential dose rate
APF	Assigned protection factor
BAF	Bioaccumulation factor
BCF	Bioconcentration factor
BLS	Bureau of Labor Service (U.S.)
BMC	Benchmark concentration
BMCL	Lower confidence limit of the BMC
BMD	Benchmark dose
BMDL	Lower confidence limit of the BMD
BMR	Benchmark response
CAD	Chronic absorbed dose
CASRN	Chemical Abstracts Service Registry Number
CBI	Confidential business information
CDR	Chemical Data Reporting
ChV	Chronic value
COC	Concentration of concern
COU	Condition of use
CSF	Cancer slope factor
DMR	Discharge Monitoring Report
DOT	Department of Transportation (U.S.)
ECEL	Existing chemical exposure limit
ECHA	European Chemicals Agency
ELCR	Excess lifetime cancer risk
EPA	Environmental Protection Agency (U.S.)
ESD	Emission scenario document
GC/MS	Gas chromatography with mass spectroscopy
GS	Generic scenario
HCx	Hazardous concentration for x% of species
HEC	Human equivalent concentration
HED	Human equivalent dose
HEM	Human Exposure Model
HERO	Health and Environmental Research Online (Database)
HLC	Henry’s Law constant
IAD	Intermediate absorbed dose
IIOAC	Integrated Indoor-Outdoor Air Calculator (Model)

IRIS	Integrated Risk Information System (EPA)
IUR	Inhalation unit risk
K_{OC}	Organic carbon:water partition coefficient
K_{OW}	Octanol: water partition coefficient
LCAD	Lifetime chronic absorbed dose
LADC	Lifetime average daily concentration
LADD	Lifetime average daily dose
LCD	Life cycle diagram
LCx	Lethal concentration at which x% of test organisms die
LOAEL	Lowest-observed-adverse-effect level
LOD	Limit of detection
LOEC	Lowest-observed-effect concentration
LOQ	Limit of quantification
MCL	Maximum contaminant limit
MOE	Margin of exposure
NAICS	North American Industry Classification System
ND	Non-detect
NEI	National Emissions Inventory
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHDPlus	National Hydrography Dataset Plus
NIOSH	National Institute for Occupational Safety and Health
NOAEL	No-observed-adverse-effect level
NOEC	No-observed-effect concentration
NPDES	National Pollutant Discharge Elimination System
NPDWR	National Primary Drinking Water Regulation
NRC	National Response Center
NTP	National Toxicology Program
OCSPP	Office of Chemical Safety and Pollution Prevention (EPA)
OECD	Organisation for Economic Co-operation and Development
OEHHA	Office of Environmental Health Hazard Assessment (California)
OEL	Occupational exposure limit
OES	Occupational exposure scenario
OEV	Occupational exposure value
ONU	Occupational non-user
OPPT	Office of Pollution Prevention and Toxics (EPA)
OSHA	Occupational Safety and Health Administration (U.S.)
PBZ	Personal breathing zone
pOEL	Provisional occupational exposure limit
PEL	Permissible exposure limit
PESS	Potentially exposed or susceptible subpopulations
PF	Protection factor
POD	Point of departure
POTW	Publicly owned treatment works
PSC	Point Source Calculator
RCRA	Resource Conservation and Recovery Act
RQ	Risk quotient
SACC	Science Advisory Committee on Chemicals
SDS	Safety data sheet
SDWA	Safe Drinking Water Act

SEG	Similar exposure group
SIC	Standard Industrial Classification
SpERC	Specific Environmental Release Categories
SSD	Species sensitivity distribution
STEL	Short-term exposure limit
TLV	Threshold Limit Value
TRI	Toxics Release Inventory
TRV	Toxicity reference value
TSCA	Toxic Substances Control Act
TSD	Technical support document
TWA	Time-weighted average
VOC	Volatile organic compound
VVWM	Variable Volume Water Model
WHO	World Health Organization
WQP	Water Quality Portal
WWT	Wastewater treatment
UF	Uncertainty factor
U.S.	United States

Appendix B REGULATORY AND ASSESSMENT HISTORY

B.1 Federal Laws and Regulations

Table_Apx B-1. Federal Laws and Regulations for 1,2-Dichloroethane

Statutes/Regulations	General Description of Regulation	Description of Authority/Regulation
EPA statutes/regulations		
Toxic Substances Control Act (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.	1,2-Dichloroethane is one of the 20 chemicals EPA designated as a High-Priority Substance for risk evaluation under TSCA (84 FR 71924, Dec. 30, 2019). Designation of 1,2-dichloroethane as a high-priority substance constitutes the initiation of the risk evaluation on the chemical.
TSCA – section 8(a)	The TSCA section 8(a) Chemical Data Reporting (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.	1,2-Dichloroethane manufacturing (including importing), processing and use information is reported under the CDR rule (85 FR 20122, April 2, 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 in the United States.	1,2-Dichloroethane was on the initial TSCA Inventory and therefore was not subject to EPA's new chemicals review process under TSCA Section 5 (60 FR 16309, March 29, 1995).
TSCA – section 8(d)	Provides EPA with authority to issue rules requiring producers, importers, and (if specified) processors of a chemical substance or mixture to submit lists and/or copies of ongoing and completed, unpublished health and safety studies.	Seventeen health and safety studies were received for 1,2-dichloroethane (2021–2022) (U.S. EPA, 2019a). (Accessed October 21, 2024). These studies were included in the 1,2-dichloroethane systematic review process.
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.	Nine risk reports were received for 1,2-dichloroethane (years when the submissions were received: 1990–2022) (U.S. EPA, ChemView. Accessed October 18, 2024). These reports were included in the 1,2-dichloroethane systematic review process.

Statutes/Regulations	General Description of Regulation	Description of Authority/Regulation
TSCA – section 4	Provides EPA with authority to issue rules and orders requiring manufacturers (including importers) and processors to test chemical substances and mixtures.	EPA issued two TSCA section 4(a)(2) test orders for the development of new information in support of this risk evaluation. TSCA Section 4(a)(2) Test Order for 1,2-Dichloroethane, January 2021 (pdf); TSCA Section 4(a)(2) Test Order for 1,2-Dichloroethane, August 2022 (pdf). EPA received three studies in response to these test orders. Also, six chemical data submissions from prior test rules and enforceable consent agreements were received for 1,2-dichloroethane: one acute inhalation toxicity study (2006), four studies on metabolism and pharmacokinetics (2005, 2006, 2009, 2010) and one study on neurological toxicity (2006) (U.S. EPA, ChemView. Accessed October 18, 2024).
Emergency Planning and Community Right-to-Know Act (EPCRA) – section 313	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 Toxic Release Inventory (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 (*e.g.,* 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.e.,* air, land, and water).	1,2-Dichloroethane is a listed substance subject to reporting requirements under 40 CFR 372.65 effective as of January 1, 1987.
CAA – section 111(b)	Requires EPA to establish new source performance standards (NSPS) for any category of new or modified stationary sources that EPA determines causes, or contributes significantly to, air pollution, which may reasonably be anticipated to endanger public health or welfare. The standards are based on the degree of emission limitation achievable through the application of the best system of emission reduction (BSER) which (taking into account the cost of achieving reductions and environmental impacts and energy requirements) EPA determines has been adequately demonstrated.	1,2-Dichloroethane is subject to the NSPS for equipment leaks of volatile organic compounds (VOCs) in the synthetic organic chemicals manufacturing industry for which construction, reconstruction or modification began after January 5, 1981 (40 CFR Part 60, Subparts VV, NNN, and RRR).

Statutes/Regulations	General Description of Regulation	Description of Authority/Regulation
CAA – section 112(b)	Contains the original list of 189 HAPs. Under 112(c) of the CAA, EPA must identify and list source categories that emit HAP and then set emission standards for those listed source categories under CAA section 112(d). CAA section 112(b)(3)(A) specifies that any person may petition the Administrator to modify the list of HAP by adding or deleting a substance. Since 1990, EPA has removed two pollutants from the original list leaving 187 at present.	1,2-Dichloroethane is listed as a HAP (42 U.S. Code Section 7412).
CAA – section 112(d)	Directs EPA to establish, by rule, NESHAPs for each category or subcategory of listed major sources and area sources of HAP (listed pursuant to section 112(c)). The standards must require the maximum degree of emission reduction that EPA determines is achievable by each particular source category. This is generally referred to as maximum achievable control technology (MACT).	EPA has established NESHAPs for a number of source categories that emit 1,2-dichloroethane to air.
CAA – sections 112(d) and 112(f)	Risk and technology review (RTR) of section 112(d) national emission standards for hazardous air pollutants (NESHAP). Section 112(f)(2) requires EPA to conduct risk assessments for each source category subject to section 112(d) NESHAP that require maximum achievable control technology (MACT), and to determine if additional standards are needed to reduce remaining risks. Section 112(d)(6) requires EPA to review and revise the emission standards, as necessary, taking into account developments in practices, processes, and control technologies.	EPA has promulgated a number of RTR NESHAP and will do so, as required, for the remaining source categories with NESHAP.
CAA – section 112(k)	From the HAPs that EPA is required to control, EPA identified 30 that as a result of emissions from area sources pose the greatest potential health threat in urban areas. These HAPs are referred to as the 30 urban air toxics.	1,2-Dichloroethane is listed as one of the 30 Urban Air Toxics.
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 1,2-dichloroethane, including a recommendation of 9.9 (µg/L) for "Human Health for the consumption of Water + Organism" and 650 (µg/L) for "Human Health for the consumption of Organism Only" for states and authorized tribes to consider when adopting criteria into their water quality standards (80 FR 36986, June 29, 2015).

Statutes/Regulations	General Description of Regulation	Description of Authority/Regulation
Clean Water Act (CWA) – sections 301, 304, 306, 307 and 402	Clean Water Act Section 307(a) establishes a list of toxic pollutants or combination of pollutants under the CWA. The statute specifies a list of families of toxic pollutants also listed at 40 CFR 401.15. The list of "priority pollutants" lists the individual chemical names within the toxic pollutants and is found in 40 CFR Part 423 Appendix A. These are pollutants (along with non-conventional pollutants) for which best available technology 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 CWA Section 402(a)(1)(B). EPA identifies the best available technology that is economically achievable (BAT) for that industry after considering statutorily prescribed factors and sets regulatory requirements based on the performance of that technology.	1,2-Dichloroethane is designated as a toxic pollutant under Section 307(a)(1) of the CWA and as a priority pollutant under section 423 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). Under CWA section 304, 1,2-dichloroethane is included in the list of total toxic organics (TTO) (40 CFR 413.02(i)).
Clean Water Act (CWA) – sections 311(b) (2)(A) and 501(a) of the Federal Water Pollution Control Act.	Requires EPA to develop, promulgate, and revise as may be appropriate, regulations designating as hazardous substances, other than oil, which, when discharged present an imminent and substantial danger to the public health or welfare, including, but not limited to, fish, shellfish, wildlife, shorelines, and beaches.	1,2-Dichloroethane is a designated hazardous substance in accordance with Section 311(b) (2)(A) of the Federal Water Pollution Control Act (40 FR 116.4, March 13, 1978).
Safe Drinking Water Act (SDWA) – section 1412	Requires EPA to publish a non-enforceable maximum contaminant level goal (MCLG) 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. When EPA publishes an MCLG, EPA must also promulgate a National Primary Drinking Water Regulation (NPDWR) which includes either an enforceable maximum contaminant level (MCL), or a required treatment technique. Public water systems are required to comply with NPDWRs.	1,2-Dichloroethane is subject to NPDWR under the SDWA with a MCLG of zero and an enforceable MCL of 0.005 mg/L (section 1412).

Statutes/Regulations	General Description of Regulation	Description of Authority/Regulation
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, persistence, and degradability in nature, potential for accumulation in tissue and other related factors such as flammability, corrosiveness, and other hazardous characteristics.	1,2-Dichloroethane is included on the list of hazardous wastes pursuant to RCRA 3001. RCRA Hazardous Waste Code: D028 (40 CFR 261.24); U077 (40 CFR 261.33); F024, F025 (40 CFR 261.31); K018, K019, K020, K029, K030 K096 (40 CFR 261.32).
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) – sections 102(a) and 103	Authorizes EPA to promulgate regulations designating as hazardous substances those substances which, 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.	1,2-Dichloroethane is a hazardous substance under CERCLA. Releases of 1,2-dichloroethane in excess of 100 pounds must be reported (40 CFR 302.4).
Superfund Amendments and Reauthorization Act (SARA)	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.	1,2-Dichloroethane 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.
Other federal statutes/regulations		
Federal Food, Drug, and Cosmetic Act (FFDCA)	Provides the FDA with authority to oversee the safety of food, drugs and cosmetics.	The FDA regulates 1,2-dichloroethane in bottled water. The maximum permissible level of 1,2-dichloroethane in bottled water is 0.005 mg/L (21 CFR 165.110). 1,2-Dichloroethane can be used as a solvent for the extraction of certain color additives in 21 CFR part 73 and used in the production of certain direct and indirect food additives as described in 21 CFR parts 172, 173, 175, 176, and 177.

Statutes/Regulations	General Description of Regulation	Description of Authority/Regulation
Occupational Safety and Health Act (OSHA)	Requires employers to provide their workers with a place of employment free from 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 PEL, exposure monitoring, engineering and administrative control measures, and respiratory protection.	In 1979, OSHA issued occupational safety and health standards for 1,2-dichloroethane that included a PEL of 50 ppm TWA, exposure monitoring, control measures and respiratory protection (29 CFR 1910.1000).
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.	The Department of Transportation (DOT) has designated 1,2-dichloroethane as a hazardous material, and there are special requirements for marking, labeling and transporting it (U.S. DOT 49 CFR Part 172.101)

B.2 State Laws and Regulations

Table_Apx B-2. State Laws and Regulations for 1,2-Dichloroethane

State Actions	Description of Regulation	
State Air Regulations	Michigan Initial Risk Screening Level (IRSL) (Michigan Administrative Code R.336.1229 List of Screening Levels)	0.04 µg/m^3 (annual)
	Allowable Ambient Levels (AALs): New Hampshire (Env-A 1400: Regulated Toxic Air Pollutants)..	State AALs: 143 µg/m^3 (24-hour); 95 µg/m^3 (annual)
	New York Annual Guidance Concentration (AGC) (6 NYCRR Part 212)	State AGC: 63 µg/m^3
	Rhode Island (Air Pollution Regulation No. 22)	State AAL: 0.04 µg/m^3 (annual)
	Texas Effect Screening Levels (ESLs)	State ESLs: 650 µg/m^3 (short-term); 2.9 µg/m^3 (long-term)
State Drinking Water Standards and Guidelines	Arizona (14 Ariz. Admin. Register 2978, August 1, 2008), California (Cal Code Regs. Title 26, § 22-64444), Delaware (Del. Admin. Code Title 16, § 4462), Connecticut (Conn. Agencies Regs. § 19-13-B102), Maine (10 144 Me. Code R. Chap. 231), Massachusetts (310 Code Mass. Regs. § 22.00), Michigan (Mich. Admin. Code r.299.44 and r.299.49, 2017), Minnesota (Minn R. Chap. 4720), Pennsylvania (25 Pa. Code § 109.202), Rhode Island (Rules and Regulations Pertaining to Public Drinking Water R46-13-DWQ), Texas (30 Tex. Admin. Code § 290.104).	Federal MCL: 5 µg/L
	Florida (Fla. Admin. Code R. Chap. 62–550)	State MCL: 3 ug/L
	New Jersey (7:10 N.J Admin. Code § 5.2)	State MCL: 2 ug/L
State PELs	Alaska (Alaska Administrative Code 8 AAC 61.1100 and incorporates OSHA 1910.1000), California (Cal Code Regs. Title 8, § 5155), Connecticut (Connecticut Administrative Code), Hawaii (Hawaii Administrative Rules Section 12-60-50), Illinois (Illinois Administrative Code 820 ILCS 219 and incorporates OSHA 1910.1000), Indiana (Indiana Administrative Code 620 article 1−30), Iowa (Iowa Administrative Code IAC 10/21/98), Kentucky (Kentucky Administrative Regulations 803 KAR chapter 2), Maryland (Code of Maryland Regulations COMAR 09.12.32), Minnesota (Minnesota Administrative Rules 5206.0400), Nevada (Nevada Administrative Code Chapter 618), New Jersey (New Jersey Administrative Code 8:59-4.2), New Mexico (New Mexico Administrative Code Title 20), New York (New York Code, Rules, Regulations Title 12 § 800.5), North Carolina (North Carolina Administrative Code 13 NCAC 07F), South Carolina (South Carolina Code of	PEL: 1 ppm STEL: 2 ppm

State Actions	Description of Regulation	
	Law Title 41 Chapter 15), Tennessee (Tennessee Administrative Code 0800-01-01-07), Utah (Utah Administrative Code Title R614), Vermont (Vermont Statutes Online Title 21 Chapter 3, 201–232), Virginia (Virginia Administrative Code 4VAC25-40-720), Washington (Washington Administrative Code WAC 296-841-20025), Wyoming (Wyoming Administrative Rule 053−26 Wyo. Code R 26-1)	
	Massachusetts (https://www.mass.gov/info−details/massdep−ambient−air−toxics−guidelines)	TEL: 1 ug/m^3
	Oregon (Oregon Administrative Rules Chapter 437)	TWA: 50 ppm STEL: 200 ppm
State Right-to-Know Acts	Massachusetts (105 Code Mass. Regs. § 670.000 Appendix A), New Jersey (N.J.A.C. 7:1G) and Pennsylvania (P.L. 734, No. 159 and 34 Pa. Code § 323).	
Chemicals of High Concern to Children	Several states have adopted reporting laws for chemicals in children's products containing 1,2-dichloroethane, including Maine (38 MRSA Chapter 16-D), Minnesota (Toxic Free Kids Act Minn. Stat. 116.9401–116.9407).	
Volatile Organic Compound (VOC) Regulations for Consumer Products	Many states regulate 1,2-dichloroethane as a VOC. These regulations may set VOC limits for consumer products and/or ban the sale of certain consumer products as an ingredient and/or impurity. Regulated products vary from state to state, and could include California (Title 17, California Code of Regulations, Division 3, Chapter 1, Subchapter 8.5, Articles 1, 2, 3 and 4), Delaware (Adm. Code Title 7, 1141), Illinois (35 Adm Code 223), New Hampshire (Env-A 4100), among other products.	
Other	California listed 1,2-dichloroethane on Proposition 65 in 1987 due to cancer. (Cal Code Regs. Title 27, § 27001). 1,2-Dichloroethane is listed as a Candidate Chemical under California's Safer Consumer Products Program (Health and Safety Code § 25252 and 25253). California issued a Health Hazard Alert for 1,2-dichloroethane (Hazard Evaluation System and Information Service, 2016). California lists 1,2-dichloroethane as a designated priority chemical for biomonitoring (California SB 1379). 1,2-Dichloroethane is on the MA Toxic Use Reduction Act (TURA) list of 2019 (301 CMR 41.03).	

B.3 International Laws and Regulations

Table_Apx B-3. International Laws and Regulations for 1,2-Dichloroethane

Country/ Organization	Requirements and Restrictions
World Health Organization (WHO)	WHO Guidelines for drinking water quality concentrations of 1,2-dichloroethane in drinking water estimated to be associated with excess risks of 1E−04, 1E−05, and 1E−06 are 300, 30, and 3 µg/L, respectively.
Canada	1,2-dichloroethane is on the Canadian List of Toxic Substances (CEPA 1999 Schedule 1) and is on the Domestic Substances List (Government of Canada. Managing substances in the environment. Substances search. Database accessed October 30, 2024). Other regulations include: Canada's National Pollutant Release Inventory (NPRI) Environmental Emergency Regulations, 2019 (SOR/2019-51).
European Union	On August 14, 2014, 1,2-dichloroethane was added to Annex XIV of REACH (Authorisation List) with a sunset date of November 22, 2017. After the sunset date, only persons with approved authorization applications may continue to use the chemical. Eighteen applications for authorization have been received and decided, for uses as an industrial solvent, emulsifying and swelling agent, and reaction medium (European Chemicals Agency [ECHA] database; accessed October 31, 2024). Directive 2010/75/EU on Industrial Emissions
Australia	1,2-Dichloroethane was assessed under both Human Health and Environment Tier II of the Inventory Multi-Tiered Assessment and Prioritisation (IMAP). Uses reported in Australia include as a component of solvents to remove grease, resins, glue and dirt; and as an anti-knock component of leaded petrol (previous use only); as a solvent in the manufacture of polystyrene and styrene butadiene rubber (SBR) latex. International uses include in solvents; in varnish and finish removers, paints, coatings and adhesives for professional use (European product registers contain entries of products with the chemical as an ingredient. The product types are paints and lacquers (concentrations between 1–100%), adhesives (concentrations between 10–50%) and fertilizers (concentrations below 1%); as a component in leaded gasoline; as a chemical intermediate in the production of vinyl choride monomer which in turn is used in the manufacture of polymers; and as a chemical intermediate in the manufacture of other chlorinated solvents. (NICNAS, Ethane, 1,2-dichloro-: Human health tier II assessment, 22 March 2013; accessed October 31, 2024).
Japan	1,2-Dichloroethane is regulated in Japan under the following legislation: Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. (Chemical Substances Control Law; CSCL) Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof (PRTR-SDS Law) Industrial Safety and Health Act (ISHA) Air Pollution Control Act Water Pollution Control Act Soil Contamination Countermeasures Act Food Sanitation Act Fire Service Act

<table>
<tr><th>Country/ Organization</th><th colspan="2">Requirements and Restrictions</th></tr>
<tr><td></td><td colspan="2">(National Institute of Technology and Evaluation [NITE] Chemical Risk Information Platform [CHRIP]; accessed October 31, 2024).</td></tr>
<tr><td>Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade</td><td colspan="2">In February 2001, 1,2-dichloroethane was added to the Rotterdam Convention’s list of chemicals under Annex III. The chemicals listed in Annex III include pesticides and industrial chemicals that have been banned or severely restricted for health or environmental reasons by two or more Parties and which the Conference of the Parties has decided to subject to the PIC procedure, which includes, among other things, the exercise of export controls. (UNEP/FAO/RC/DGD/GUID/EDC/2005)</td></tr>
<tr><td rowspan="12">Institute for Occupational Safety and Health of the German Social Accident Insurance (IFA) GENTIS (accessed March 30, 2026) Internation Limit Values for Chemical Agents Database</td><td>Australia, Canada (Ontario), Japan, Singapore, South Korea</td><td>TWA: 10 ppm</td></tr>
<tr><td>Austria</td><td>TWA: 2 ppm
STEL: 8 ppm</td></tr>
<tr><td>Belgium, European Union, France, Ireland, Italy, Latvia, Romania, Spain</td><td>TWA: 2 ppm</td></tr>
<tr><td>Canada (Québec), Denmark</td><td>TWA: 1 ppm
STEL: 2 ppm</td></tr>
<tr><td>Finland, Sweden</td><td>TWA: 1 ppm
STEL: 5 ppm</td></tr>
<tr><td>Hungary, Poland</td><td>TWA: 8.2 mg/m^3</td></tr>
<tr><td>New Zealand, United Kingdom</td><td>TWA: 5 ppm</td></tr>
<tr><td>Norway</td><td>TWA 0.25 ppm</td></tr>
<tr><td>People’s Republic of China</td><td>TWA: 7 mg/m^3
STEL: 15 mg/m^3</td></tr>
<tr><td>South Africa</td><td>TWA: 20 ppm</td></tr>
<tr><td>Switzerland</td><td>TWA: 52 ppm</td></tr>
<tr><td>The Netherlands</td><td>TWA: 7 mg/m^3</td></tr>
<tr><td colspan="3">STEL = short-term exposure limit; TWA = time-weighted average</td></tr>
</table>

B.4 Assessment History

Table_Apx B-4. Assessment History of 1,2-Dichloroethane

Authoring Organization	Publication[a]
EPA publications	
U.S. EPA, Integrated Risk Information System (IRIS)	IRIS Summary. 1,2-dichloroethane; CASRN 107-06-2

Authoring Organization	Publication[a]
U.S. EPA, National Service Center for Environmental Publications (NSCEP)	Exposure and Risk Assessment for Dichloroethanes 1,1-dichloroethane, 1,2-dichloroethane
U.S. EPA, Office of Chemical Safety and Pollution Prevention (OCSPP)	*Final Scope of the Risk Evaluation for 1,2-Dichloroethane CASRN 107-06-2* (2020)
U.S. EPA, Office of Pollution Prevention and Toxics (OPPT)	Chemview (TSCA submissions – chemical test rule data and substantial risk reports)
U.S.EPA, Superfund Health Risk Technical Support Center, National Center for Environmental Assessment, Office of Research and Development	Provisional Peer Reviewed Toxicity Values for 1,2-dichloroethane (CASRN 107-06-2)
Other U.S.–based organizations	
Agency for Toxic Substances and Disease Registry (ATSDR)	Toxicological Profile for 1,2-Dichloroethane CAS#: 107-06-2, July 2024
Centers for Disease Control and Prevention (CDC)	National Report on Human Exposure to Environmental Chemicals
National Cancer Institute (NCI)	National Cancer Institute (NCI) 1978. Bioassay of 1,2-Dichloroethane for Possible Carcinogenicity (CAS No. 107-06-2). Technical Report Series No. 55 (NCI-CG-TR-55). U.S. Department of Health, Education, and Welfare.
National Institute for Occupational Safety and Health (NIOSH)	Current Intelligence Bulletin 27: Chloroethanes Review of Toxicity
NIOSH	1,2-Dichloroethane. NIOSH Pocket Guide to Chemical Hazards. Atlanta, GA: National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention. 2015.
National Toxicology Program (NTP), National Institute of Environmental Health Sciences (NIEHS), National Institutes of Health (NIH)	1,2-Dichloroethane: Target Organs and Levels of Evidence for TR-055
International	
ECHA European Union Risk Assessment Report	Agreement of the Member State Committee on the Identification of 1,2-Dicloroethane as a Substance of Very High Concern, November 2011
Government of Canada, Environment Canada, Health Canada	Toxic substances list: 1,2-dichloroethane

[a] All hyperlinks/URLs included in table last accessed on April 9, 2026.

Appendix C LIST OF TECHNICAL SUPPORT DOCUMENTS AND SUPPLEMENTAL FILES

This appendix provides a list and citations for all technical support documents (TSDs) and supplemental files included in the risk evaluation for 1,2-dichloroethane. These include a nontechnical summary (document “0”), 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 (“1” is for this risk evaluation): EPA-HQ-OPPT-2018-0427.

0. *Nontechnical Summary of the TSCA Risk Evaluation for 1,2-Dichloroethane* (U.S. EPA, 2026au)
1. *Risk Evaluation for 1,2-Dichloroethane* (U.S. EPA, 2026bb)
2. *Summary of and Response to External Peer Review and Public Comments on the Risk Evaluation for 1,1-Dichloroethane and Human Health Hazard Technical Support Document for 1,2-Dichloroethane* (U.S. EPA, 2025g)
3. *Summary of and Response to Public Comments on the Risk Evaluation for 1,2-Dichloroethane* (U.S. EPA, 2026bc)

Associated **Technical Support Documents** – Provide additional details and information on physical chemistry, fate, exposure, hazard, and risk assessments.

4. *Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026j)
5. *Chemistry and Fate and Transport Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026n)
6. *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae)
7. *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ad)
8. *Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026aw)
9. *Consumer Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026o)
10. *General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ah)
11. *Human Health Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2024c)
12. *Environmental Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ab)
13. *Environmental Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ac)

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.

14. *Systematic Review Protocol for 1,2-Dichloroethane* (U.S. EPA, 2026bi) – In lieu of an update to the *Draft Systematic Review Protocol Supporting TSCA Risk Evaluations for Chemical Substances: A Generic TSCA Systematic Review Protocol with Chemical-Specific Methodologies* (also referred to as “2021 Draft Systematic Review Protocol” this systematic review protocol for the *Risk Evaluation for 1,2-Dichloroethane* 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 “1,2-Dichloroethane Systematic Review Protocol.”

15. *Data Quality Evaluation and Data Extraction Information for Physical and Chemical Properties for 1,2-Dichloroethane* (U.S. EPA, 2026t) – Provides a compilation of tables for the data extraction and data quality evaluation information for 1,2-dichloroethane. Each table

shows the data point, set, or information element that was extracted and evaluated from a data source that has information relevant for the evaluation of physical and chemical properties. This supplemental file may also be referred to as the "1,2-dichloroethane Data Quality Evaluation and Data Extraction Information for Physical and Chemical Properties."

16. *Data Quality Evaluation and Data Extraction Information for Environmental Fate and Transport for 1,2-Dichloroethane* (U.S. EPA, 2026r) – Provides a compilation of tables for the data extraction and data quality evaluation information for 1,2-dichloroethane. Each table shows the data point, set, or information element that was extracted and evaluated from a data source that has information relevant for the evaluation for Environmental Fate and Transport. This supplemental file may also be referred to as the "1,2-Dichloroethane Data Quality Evaluation and Data Extraction Information for Environmental Fate and Transport."

17. *Data Quality Evaluation and Data Extraction Information for Environmental Release and Occupational Exposure for 1,2-Dichloroethane* (U.S. EPA, 2026s) – Provides a compilation of tables for the data extraction and data quality evaluation information for 1,2-dichloroethane. Each table shows the data point, set, or information element that was extracted and evaluated from a data source that has information relevant for the evaluation of environmental release and occupational exposure. This supplemental file may also be referred to as the "1,2-Dichloroethane Data Quality Evaluation and Data Extraction Information for Environmental Release and Occupational Exposure."

18. *Data Quality Evaluation Information for General Population, Consumer, and Environmental Exposure for 1,2-Dichloroethane* (U.S. EPA, 2026w) – Provides a compilation of tables for the data extraction for 1,2-dichloroethane. Each table shows the data point, set, or information element that was extracted from a data source that has information relevant for the evaluation of general population, consumer, and environmental exposure. This supplemental file may also be referred to as the "1,2-Dichloroethane Data Extraction Information for General Population, Consumer, and Environmental Exposure."

19. *Data Extraction Information for General Population, Consumer, and Environmental Exposure for 1,2-Dichloroethane* (U.S. EPA, 2026q) – Provides a compilation of tables for the data quality evaluation information for 1,2-dichloroethane. Each table shows the data point, set, or information element that was evaluated from a data source that has information relevant for the evaluation of general population, consumer, and environmental exposure. This supplemental file may also be referred to as the "1,2-Dichloroethane Data Quality Evaluation Information for General Population, Consumer, and Environmental Exposure."

20. *Data Quality Evaluation Information for Human Health Hazard Animal Toxicology for 1,2-Dichloroethane* (U.S. EPA, 2026x) – Provides a compilation of tables for the data quality evaluation information for 1,2-dichloroethane. Each table shows the data point, set, or information element that was evaluated from a data source that has information relevant for the evaluation of human health hazard animal toxicity information. This supplemental file may also be referred to as the "1,2-Dichloroethane Data Quality Evaluation Information for Human Health Hazard Animal Toxicology."

21. *Data Quality Evaluation Information for Human Health Hazard Epidemiology for 1,2-Dichloroethane* (U.S. EPA, 2026y) – Provides a compilation of tables for the data quality evaluation information for 1,2-dichloroethane. Each table shows the data point, set, or

information element that was evaluated from a data source that has information relevant for the evaluation of epidemiological information. This supplemental file may also be referred to as the "1,2-Dichloroethane Data Quality Evaluation Information for Human Health Hazard Epidemiology."

22. *Data Quality Evaluation Information for Environmental Hazard for 1,2-Dichloroethane* (U.S. EPA, 2026v) – Provides a compilation of tables for the data quality evaluation information for 1,2-dichloroethane. Each table shows the data point, dataset, or information element that was evaluated from a data source that has information relevant for the evaluation of environmental hazard toxicity information. This supplemental file may also be referred to as the "1,2-Dichloroethane Data Quality Evaluation Information for Environmental Hazard."

23. *Data Extraction Information for Environmental Hazard and Human Health Hazard Animal Toxicology and Epidemiology for 1,2-Dichloroethane* (U.S. EPA, 2026p) – Provides a compilation of tables for the data extraction for 1,2-dichloroethane. Each table shows the data point, set, or information element that was extracted from a data source that has information relevant for the evaluation human health hazard animal toxicology and epidemiology information. In contrast with other risk evaluations, this file contains dose-response information for every assessed endpoint within each animal toxicology study. This supplemental file may also be referred to as the "1,2-Dichloroethane Data Extraction Information for Environmental Hazard and Human Health Hazard Animal Toxicology and Epidemiology."

24. *Data Quality Evaluation Information for Dermal Absorption for 1,2-Dichloroethane* (U.S. EPA, 2026u) – Provides a compilation of tables for the data extraction and data quality evaluation information for 1,2-dichloroethane. Each table shows the data point, set, or information element that was extracted and evaluated from a data source that has information relevant for the evaluation for Dermal Absorption. This supplemental file may also be referred to as the "1,2-Dichloroethane Data Quality Evaluation Information for Dermal Absorption."

Associated **Supplemental Information Document** – Provide additional details and information on fate, exposure, hazard, and risk assessments.

25. *Supplemental Information on EPI Suite Modeling Results in the Fate Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026be)
26. *Water Releases for 1,2-Dichloroethane* (U.S. EPA, 2026bl)
27. *Air Releases for 1,2-Dichloroethane* (U.S. EPA, 2026d)
28. *Land Releases for 1,2-Dichloroethane (*U.S. EPA, 2026ar*)*
29. *Byproducts Releases for 1,2-Dichloroethane* (U.S. EPA, 2026l)
30. *Number of Sites for 1,2-Dichloroethane* (U.S. EPA, 2026av)
31. *Estimates of Number of Workers and ONUs Model for 1,2-Dichloroethane* (U.S. EPA, 2026af)
32. *Application of Adhesives Release Model for 1,2-Dichloroethane* (U.S. EPA, 2026f)
33. *Aerosol Products Release Model for 1,2-Dichloroethane* (U.S. EPA, 2026c)
34. *Aerosol Products Exposure Model for 1,2-Dichloroethane* (U.S. EPA, 2026b)
35. *Non-aerosol Cleaning and Degreasing Release Model for 1,2-Dichloroethane* (U.S. EPA, 2026at)
36. *Repackaging Release Model for 1,2-Dichloroethane* (U.S. EPA, 2026ay)
37. *Repackaging Exposure Model for 1,2-Dichloroethane* (U.S. EPA, 2026ax)
38. *Laboratory Use Release Model for 1,2-Dichloroethane* (U.S. EPA, 2026aq)

39. *Application of Lubricants and Greases Exposure Model for 1,2-Dichloroethane* (U.S. EPA, 2026g)
40. *Dermal Monte Carlo Exposure Model for 1,2-Dichloroethane* (U.S. EPA, 2026z)
41. *Risk Calculator for Occupational Exposure for 1,2-Dichloroethane* (U.S. EPA, 2026ba)
42. *Risk Calculator for Consumer Exposure for 1,2-Dichloroethane* (U.S. EPA, 2026az)
43. *Byproducts Risk Calculator for Occupational Exposure for 1,2-Dichloroethane* (U.S. EPA, 2026m)
44. *Byproducts Risk Calculator for Occupational Exposure for 1,2-Dichloroethane with Adjusted Working Years* (U.S. EPA, 2026bm)
45. *Byproducts General Population Exposures for 1,2-Dichloroethane* (U.S. EPA, 2026k)
46. *Ambient Monitoring Technology Information Center (AMTIC) Monitoring Data 2015 to 2022 for 1,2-Dichloroethane* (U.S. EPA, 2026e)
47. *Supplemental Information on HEM TRI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2026bg)
48. *HEM TRI Input Files for 1,2-Dichloroethane* (U.S. EPA, 2026am)
49. *Supplemental Information on HEM NEI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2026bf)
50. *HEM NEI Input Files for 1,2-Dichloroethane* (U.S. EPA, 2026al)
51. *Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2026bd)
52. *AERMOD Generic Facilities/Sites Files for 1,2-Dichloroethane* (U.S. EPA, 2026a)
53. *HEM Input and Output Files for 1,2-Dichloroethane* (U.S. EPA, 2026ai)
54. *HEM Input and Output Files for 1,2-Dichloroethane-Byproducts* (U.S. EPA, 2026aj)
55. *Water Quality Portal Data for 1,2-Dichloroethane* (U.S. EPA, 2026bk)
56. *Surface Water Concentration Estimates for 1,2-Dichloroethane* (U.S. EPA, 2026bh)
57. *Fish Ingestion Risk Calculator for 1,2-Dichloroethane* (U.S. EPA, 2026ag)
58. *Drinking Water Exposure Estimates for 1,2-Dichloroethane* (U.S. EPA, 2026aa)
59. *Benchmark Dose Modeling for 1,2-Dichloroethane* (U.S. EPA, 2026i)
60. *Human Health Hazard Exposure Response Array Data and Figures for 1,2-Dichloroethane* (U.S. EPA, 2026ao)
61. *OPPT/ECRAD Review of OECD 428 Report Submission to EPA Test Order for 1,2-Dichloroethane (CAS No 107-06-2)* (U.S. EPA, 2025c)
62. *in vitro Dermal Absorption Study Calculation for 1,2-Dichloroethane* (U.S. EPA, 2026ap)
63. *Risk Evaluation for 1,1-Dichloroethane – Supplemental Information File: in vitro Dermal Absorption Study Analysis* (U.S. EPA, 2025e)
64. *Risk Evaluation for 1,1-Dichloroethane – Supplemental Information File: in vitro Dermal Absorption Study Calculation Sheet* (U.S. EPA, 2025f)
65. *OPPT/ECRAD Review of OECD 428 Report Submission to EPA Test Order for 1,1-Dichloroethane (CAS No 75-34-3)* (U.S. EPA, 2025b)
66. *Mammalian TRV Calculator for 1,2-Dichloroethane* (U.S. EPA, 2026as)
67. *Avian Hazard Value Calculator for 1,2-Dichloroethane* (U.S. EPA, 2026h)
68. *Tool Settings and Analog List for Environmental Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026bj)

Appendix D UPDATES TO THE 1,2-DICHLOROETHANE CONDITIONS OF USE TABLE

D.1 Additions and Name Changes to Conditions of Use Based on Updated 2020 CDR-Reported Data and Stakeholder Engagement

After publication of the final scope (U.S. EPA, 2020b), EPA received updated submissions under the 2020 CDR-reported data. In addition to new submissions received under the 2020 CDR, some industry code names were updated for the 2020 CDR reporting cycle. Therefore, the Agency amended the description of certain 1,2-dichloroethane COUs based on those new submissions and new industry code names. Also, EPA received information from stakeholders clarifying certain conditions of use (COUs) of 1,2-dichloroethane. Table_Apx D-1 summarizes the changes to the COUs based on the new reporting codes in the 2020 CDR and any other new information since the publication of the final scope.

Table_Apx D-1. Additions and Name Changes to Categories and Subcategories of COUs Based on CDR Reporting and Stakeholder Engagement

Life Cycle Stage and Category	Original Subcategory in the Final Scope	Occurred Change	Revised Subcategory in the 2026 Risk Evaluation
Processing, As a reactant	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing	Added "All other basic inorganic chemical manufacturing"	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing
Processing, Incorporation into formulation, mixture, or reaction product	Processing aids: specific to petroleum production	Added "Plastic material and resin manufacturing"	Processing aids: specific to petroleum production; plastic material and resin manufacturing
Processing, Incorporation into formulation, mixture, or reaction product	N/A	Added "Processing, incorporated into formulation, mixture, or reaction product – adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing"	Adhesives and sealants; lubricants and greases; oxidizing/reducing agents; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing
Processing, Repackaging	N/A	Added "Processing, repackaging" subcategory	Repackaging
Industrial use, Lubricants and greases	Paste lubricants and greases	Changed to "Solid film lubricants and greases"	Solid film lubricants and greases
Industrial use, Oxidizing/ reducing agents	Oxidation inhibitor in controlled oxidative chemical reactions	Changed category to "Process regulator" and changed subcategory to "*e.g.* catalyst moderator; oxidation inhibitor"	*e.g.,* Catalyst moderator; oxidation inhibitor
Industrial use, Solvents (for cleaning and degreasing)	A component of degreasing and cleaning solvents	Changed to "Degreasing and cleaning solvents"	Degreasing and cleaning solvents
Industrial use, Other use	N/A	Added "Other use – process solvent"	Process solvent
Commercial use, Other use	Laboratory chemical (*e.g.,* reagent)	Deleted "(*e.g.,* reagent)"	Laboratory chemical

The changes based on CDR reporting, research, or stakeholder activity are listed below:

- "All other basic inorganic chemical manufacturing" was added to "Processing, as a reactant, intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing" based on 2020 CDR reporting.
- "Plastics and resin manufacturing" was added to "Processing, incorporation into formulation, mixture, or reaction product – processing aids: specific to petroleum production" based on input from a stakeholder.
- "Processing, incorporated into formulation, mixture, or reaction product – adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing" was inadvertently omitted from the final scope. This COU is needed to account for the upstream processing of such formulations that include 1,2-dichloroethane.
- "Processing, Repackaging" was inadvertently omitted from the final scope. This COU is needed to account for the transfer of 1,2-dichloroethane from one container to another.
- "Paste lubricants and greases" was changed to "solid film lubricants and greases" in response to input from stakeholders.
- "Industrial Use, Oxidizing/reducing agents – Oxidation inhibitor in controlled oxidative chemical reactions" was changed to "Industrial use, process regulator − *e.g.*, catalyst moderator; oxidation inhibitor" for accuracy and to accommodate additional process regulator uses in stakeholder comments. "A component of degreasing and cleaning solvents" was changed to "Degreasing and cleaning solvents" for clarity.
- "(e.g,. reagent)" was deleted from "Laboratory chemical" for clarity, given that 1,2-dichlorethane may not always be a reagent when used as a laboratory chemical.

D.2 Activities Determined Not to Be Conditions of Use

When developing this risk evaluation, EPA concluded that a subcategory of the conditions of use listed in the final scope (U.S. EPA, 2020b) was not subject to TSCA and should be removed. Section 2.2.2 of the 2020 final scope document explained that EPA determined that several uses of 1,2-dichloroethane were outside the scope of TSCA, such as pesticidal uses regulated under FIFRA. Among other things, TSCA section 3(2) excludes from the "chemical substance" definition "any pesticide (as defined in [FIFRA]) when manufactured, processed, or distributed in commerce for use as a pesticide," "tobacco or any tobacco product," and "any food, food additive, drug, cosmetic, or device (as such terms are defined in…the Federal Food, Drug, and Cosmetic Act (FFDCA)…) when manufactured, processed, or distributed in commerce for use as a food, food additive, drug, cosmetic, or device" (TSCA section 3(2)(B)(ii), (iii), (vi)). When developing this risk evaluation, EPA concluded that embalming fluid is not a condition of use because the embalming fluid is a pesticide that is excluded from the "chemical substance" definition under TSCA section 3(2)(B)(ii). Therefore, EPA has removed this subcategory from the risk evaluation. Table_Apx D-2 summarizes the change to the COU subcategory descriptions.

Table_Apx D-2. Subcategory Removed from the Risk Evaluation

Life Cycle Stage and Category	Original Subcategory in the Final Scope Document	Occurred Change	Revised Subcategory in the 2026 Risk Evaluation
Commercial use, Other use	Embalming Fluid	Removed	N/A

This change was made from the final scope of the risk evaluation for the following reasons:

- In Section 2.2.2 of the final scope (U.S. EPA, 2020b), EPA explained that "TSCA Section 3(2) also excludes from the definition of 'chemical substance' 'any food, food additive, drug, cosmetic, or device (as such terms are defined in section 201 of the Federal Food, Drug, and Cosmetic Act [21 U.S.C. 321]) when manufactured, processed, or distributed in commerce for use as a food, food additive, drug, cosmetic, or device' as well as 'any pesticide (as defined in the Federal Insecticide, Fungicide, and Rodenticide Act [7 U.S.C. 136 et seq.]) when manufactured, processed, or distributed in commerce for use as a pesticide.'" EPA has determined that the commercial use of 1,2-dichloroethane in embalming fluid is a non-TSCA use.
- EPA notes that the processing of such an embalming fluid is addressed in the added COU "Processing – Incorporated into formulation, mixture, or reaction product – Adhesives and sealants; Lubricants and greases, Oxidizing/reducing agents, Degreasing and cleaning solvents; Pesticides," because "pesticides" encompasses embalming fluid.

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 the chemical substance.

E.1 Manufacturing – Domestic Manufacture

Domestic manufacture means to manufacture or produce 1,2-dichloroethane within the Unites States, including to manufacture 1,2-dichloroethane as a byproduct. At a typical manufacturing site, 1,2-dichloroethane can be manufactured by the vapor- or liquid-phase chlorination of ethylene. For purposes of the 1,2-dichloroethane risk evaluation, these byproducts include 1,1-dichloroethane, trichloroethylene, perchloroethylene, methylene dichloride, and carbon tetrachloride as byproducts during the manufacture of 1,2-dichloroethane. This risk evaluation does not include the manufacture of 1,1,2-trichloroethane and *trans*-1,2-dichloroethylene produced during the manufacture of 1,2-dichloroethane (those exposures will be assessed in the risk evaluations for 1,1,2-trichloroethane and *trans*-1,2-dichloroethylene, respectively).

E.2 Manufacturing – Importing

Import refers to the import of 1,2-dichloroethane into the customs territory of the United States. This COU includes loading/unloading and repackaging (but not transport) associated with the import of 1,2-dichloroethane. In general, chemicals may be imported into the United States in bulk via water, air, land, and intermodal shipments.

E.3 Processing – As a Reactant – Intermediate in: Petrochemical Manufacturing; Plastic Material and Resin Manufacturing; All Other Basic Organic Chemical Manufacturing; All Other Basic Inorganic Chemical Manufacturing

Processing as a reactant or intermediate is the use of 1,2-dichloroethane as a feedstock in the production of another chemical via a chemical reaction in which 1,2-dichloroethane is consumed to form the product, though trace amounts may be present in the product as an impurity. Processing as an intermediate in petrochemical manufacturing, plastic material and resin manufacturing, and all other basic organic chemical manufacture includes the use of 1,2-dichloroethane as an intermediate for the manufacture of other chlorinated solvents, mainly vinyl chloride.

E.4 Processing – Incorporated into a Formulation, Mixture, or Reaction Product – Fuels and Fuel Additives: All Other Petroleum and Coal Products Manufacturing

This COU refers to the preparation of a product; that is, the incorporation of 1,2-dichloroethane into a formulation, mixture, or reaction product that occurs when a chemical substance is added to a product (or product mixture) after its manufacture, for distribution in commerce—in this case in petroleum and coal products manufacturing. This includes the incorporation of 1,2-dichloroethane into a fuel additive for combustion research.

E.5 Processing – Incorporated into a Formulation, Mixture, or Reaction Product – Processing Aids: Specific to Petroleum Production; and Plastic Material and Resin Manufacturing

This COU refers to the preparation of a product; that is, the incorporation of 1,2-dichloroethane into a formulation, mixture, or reaction product that occurs when a chemical substance is added to a product (or product mixture) after its manufacture, for distribution in commerce—in this case as a processing aid in petroleum production or in plastic material and resin manufacturing. Processing aids are used to help manufacture or synthesize another chemical substance but are not intended to be part of the final product. As such they are not present in the product, or only present as an impurity in trace quantities.

E.6 Processing – Incorporated into a Formulation, Mixture, or Reaction Product – Adhesives and Sealants; Lubricants and Greases; Process Regulators; Degreasing and Cleaning Solvents; Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing

This COU refers to the preparation of a product; that is, the incorporation of 1,2-dichloroethane into a formulation, mixture, or reaction product that occurs when a chemical substance is added to a product (or product mixture) after its manufacture for distribution in commerce. In this case, this COU refers to such formulation of adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; and pesticide, fertilizer, and other agricultural chemical manufacturing. “Pesticides” includes but is not limited to embalming fluid.

E.7 Processing – Repackaging

Repackaging refers to the preparation of 1,2-dichloroethane for distribution in commerce in a different form, state, or quantity than originally received or stored by various industrial sectors, including chemical product and preparation manufacturing, wholesale and retail trade, and laboratory chemicals manufacturing. This COU includes the transferring of 1,2-dichloroethane from a bulk container into smaller containers. This COU would not apply to the relabeling or redistribution of a chemical substance without removing the chemical substance from the original container in which it was supplied.

E.8 Processing – Recycling

This COU refers to the process of treating generated waste streams (*i.e.,* which would otherwise be disposed of as waste) containing 1,2-dichloroethane that are collected, either on-site or at a third-party site, for commercial purpose.

E.9 Distribution in Commerce

For purposes of assessment in this risk evaluation, distribution in commerce consists of the transportation associated with the moving of 1,2-dichloroethane. EPA expects 1,2-dichloroethane to be transported from manufacturing sites to downstream processing and repackaging sites, and/or for final disposal of 1,2-dichloroethane. 1,2-Dichloroethane may be transported in pure liquid form and in various liquid formulations with a range of potential 1,2-dichloroethane concentrations. For the purposes of 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 Use – Adhesives and Sealants

This COU refers to 1,2-dichloroethane as it is used in various industrial sectors as a component of adhesive or sealant mixtures, meaning the use of 1,2-dichloroethane after it has already been incorporated into an adhesive and/or sealant product or mixture, as opposed to when it is used upstream, (*e.g.,* when 1,2-dichloroethane is processed into the adhesive and sealant formulation).

E.11 Industrial Use – Functional Fluids (Closed Systems) – Heat Transferring Agent

This COU refers to the use of 1,2-dichloroethane as a component in a functional fluid as a heat transferring agent. This includes the use of 1,2-dichloroethane in a supplemental engine coolant additive. This is a use of 1,2-dichloroethane after it has already been incorporated into the heat transferring agent, as opposed to when it is used upstream (*e.g.,* when 1,2-dichloroethane is processed into the heat transferring agent).

E.12 Industrial Use – Lubricants and Greases – Solid Film Lubricants and Greases

This COU refers to the use of 1,2-dichloroethane as a component in solid film lubricants and greases, including products that prevent metal to metal contact when used in the presence of conventional lubricants, low-friction and anti-knock coatings for the aerospace industry, and dry film and solid film lubricants for national security uses. This is a use of 1,2-dichloroethane after it has already been incorporated into the lubricant or grease, as opposed to when it is used upstream (*e.g.,* when 1,2-dichloroethane is processed into the lubricant or grease).

E.13 Industrial Use – Other Use – Process Solvent

This COU refers to the use of 1,2-dichloroethane as a process solvent in chemical reactions, including a proprietary use in pesticide, fertilizer, and other agricultural chemical manufacturing.

E.14 Industrial Use – Process Regulator – *e.g.*, Catalyst Moderator Oxidation Inhibitor

This COU refers to the use of 1,2-dichloroethane as a process regulator. This includes use as an oxidation inhibitor in controlled oxidative chemical reactions and use in chemical reactions to moderate a catalyst. This is a use of 1,2-dichloroethane after it has already been incorporated into a process regulator product, as opposed to when it is used upstream (*e.g.,* when 1,2-dichloroethane is processed into the process regulator product).

E.15 Industrial Use – Solvents for Cleaning and Degreasing – Degreasing and Cleaning Solvents

This COU refers to the use of 1,2-dichloroethane as a component of degreasing and cleaning solvents, including as a process cleaner. These degreasing and cleaning solvents may be spray-applied (aerosolized) in liquid or vapor form, such as vapor degreasing. This is a use of 1,2-dichloroethane after it has already been incorporated into the degreasing or cleaning solvent, as opposed to when it is used upstream (*e.g.,* when 1,2-dichloroethane is processed into the degreasing or cleaning solvent).

E.16 Commercial Use – Plastic and Rubber Products

This COU refers to the commercial use of 1,2-dichloroethane in some plastic and rubber products.

E.17 Commercial Use – Fuels and Related Products

This COU refers to the commercial use of 1,2-dichloroethane as a fuel additive, including for combustion research.

E.18 Commercial Use – Other Uses – Laboratory Chemical

This COU refers to the use of 1,2-dichloroethane as a laboratory chemical, such as a chemical standard for research, equipment calibration and sample preparation, including as a reference material during analysis. EPA emphasizes that industrial and commercial use of 1,2-dichloroethane as a laboratory chemical applies to research, government, and academic institutions, as well as to industrial and commercial laboratories. Note that embalming fluids; products used to preserve animal or animal organ specimens in mortuaries, laboratories, hospitals, museums and institutions of learning; and products used to preserve the integrity of milk, urine, blood, or other body fluids for laboratory analysis are excluded from the TSCA section 3(2) definition of "chemical substance" when manufactured, processed, or distributed in commerce. Such uses would not be considered laboratory chemicals under TSCA.

E.19 Consumer Use – Plastic and Rubber Products

This COU refers to the use of 1,2-dichloroethane in various plastics and rubber products for consumers, such as molded plastic used in decorative ornaments or squishy toys.

E.20 Disposal

Each of the conditions of use of 1,2-dichloroethane may generate waste streams of the chemical that are collected and transported to third-party sites for disposal, treatment, or recycling. For purposes of this 1,2-dichloroethane risk evaluation, this COU generally refers to the 1,2-dichloroethane 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 COU also encompasses 1,2-dichloroethane contained in wastewater discharged by occupational users to a POTW or other, Non-POTWs for treatment, as well as other wastes. 1,2-Dichloroethane is expected to be released to other environmental media, such as introductions of biosolids to soil or migration to water sources or through waste disposal (*e.g.,* disposal of formulations containing 1,2-dichloroethane or transport containers). Disposal may also include destruction and removal by incineration. Recycling of 1,2-dichloroethane and 1,2-dichloroethane-containing products is considered a different COU. Environmental releases from manufacturing and processing sites that treat or dispose of onsite waste are generally assessed in each COU.

Appendix F OCCUPATIONAL EXPOSURE VALUE DERIVATION AND ANALYTICAL METHODS USED TO DETECT 1,2-DICHLOROETHANE

Based on the available hazard and exposure profile for 1,2-dichloroethane, EPA has calculated an 8-hour time-weighted average (TWA) existing chemical occupational exposure value and a 15-minute short-term occupational exposure value (STEV). The calculated values may be used to support risk management efforts for 1,2-dichloroethane under TSCA section 6(a), 15 U.S.C. §2605. EPA calculated the value rounded to 0.06 mg/m^3 (0.014 ppm) for inhalation exposures to 1,2-dichloroethane as an 8-hour TWA and for consideration in workplace settings (see Appendix F.1 below) based on the non-cancer human equivalent concentration (HEC) for lifetime cancer unit risk (IUR) for a combined/multi-tumor model. EPA has determined that the most sensitive occupational exposure value is already protective of any hazards specific to short-term exposure (see Appendix F.3 for details).

TSCA requires risk evaluations to be conducted without consideration of cost and other non-risk factors, and thus these occupational exposure values represent risk-only numbers. EPA may consider cost and other non-risk factors, such as analytical feasibility, technological feasibility, the availability of alternatives, and the potential for critical or essential uses during risk management. Any existing chemical exposure limit (ECEL) established for occupational safety risk management purposes could differ from the occupational exposure value presented in this appendix based on additional consideration of exposures and non-risk factors consistent with TSCA section 6(c).

The calculated values for 1,2-dichloroethane represent the exposure concentrations below which exposed workers and occupational non-users are not expected to exhibit any appreciable risk of adverse toxicological outcomes. This value accounts for the corresponding risk estimates (MOEs) will fall below the benchmark MOE for exposed workers and occupational non-users, accounting for PESS. The values derived are based on EPA's evaluation of the best available science associated with deriving human health benchmarks for 1,2-dichloroethane. The calculated value is intended to be protective of carcinogenicity (an HEC based on lifetime unit cancer risk (IUR)) and male reproductive effects. This value 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 across a 40-year working life.

All hazard values used in these calculations are based on non-cancer, human equivalent concentrations (HECs), associated uncertainty factor (UF) derivations, and the inhalation unit risk (IUR) value from the *Human Health Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2024c). Of the identified occupational monitoring data for 1,2-dichloroethane, there have been measured workplace air concentrations below the calculated exposure value. 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. That table presents validated methods from governmental agencies and is not intended to be a comprehensive list of available air monitoring methods for 1,2-dichloroethane. 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.

F.1 Occupational Exposure Value Calculations

This section presents the calculations used to estimate the occupational exposure values using inputs derived in this risk evaluation. Multiple values are presented below for hazard endpoints based on different exposure durations. For 1,2-dichloroethane, the most sensitive occupational exposure value is based on lifetime cancer and the resulting 8-hour TWA is rounded to 0.014 ppm. The human health hazard values (HECs, IUR) used in the equations are derived in this risk evaluation and provided in the *Human Health Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2024c).

Most Sensitive Occupational Exposure Value (Lifetime Cancer)

The EV_{cancer} is the concentration at which the extra cancer risk is equivalent to the benchmark cancer risk of 1×10^{-4}:

$$EV_{cancer} = \frac{Benchmark_{Cancer}}{IUR} \times \frac{AT_{IUR}}{ED \times EF \times WY} \times \frac{IR_{resting}}{IR_{workers}}$$

$$= \frac{1X10^{-4}}{2.9 \times 10^{-2}\ per\ ppm} \times \frac{24\frac{h}{d} \times \frac{365d}{y} \times 78y}{8\frac{h}{d} \times \frac{250d}{y} \times 40y} \times \frac{0.6125\frac{\mathrm{m}^3}{h}}{1.25\frac{\mathrm{m}^3}{h}} = \mathbf{0.014\ ppm}$$

$$EV_{cancer}\ (mg/m^3) = \frac{EV\ ppm\ \times\ MW}{Molar\ Volume} = \frac{0.014\ ppm\ \times\ 98.96\ \frac{g}{mol}}{24.45\ \frac{L}{mol}} = \mathbf{0.058\ mg/m^3}$$

Where:

Molar Volume	=	24.45 L/mol, the volume of a mole of gas at 1 atm and 25 °C
MW	=	Molecular weight of 1,2-dichloroethane (98.96 g/mole)

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:

$$EV_{acute} = \frac{HEC_{acute}}{Benchmark\ MOE_{acute}} \times \frac{AT_{HEC\ acute}}{ED} \times \frac{IR_{resting}}{IR_{workers}}$$

$$= \frac{2.42\ ppm}{30} \times \frac{\frac{24h}{d}}{\frac{8h}{d}} \times \frac{0.6125\frac{m^3}{h}}{1.25\frac{m^3}{h}} = \mathbf{0.12\ ppm}$$

$$EV_{acute}\ \left(\frac{mg}{m^3}\right) = \frac{EV\ ppm\ \times\ MW}{Molar\ Volume} = \frac{0.12\ ppm\ \times\ 98.96\ \frac{g}{mol}}{24.45\ \frac{L}{mol}} = \mathbf{0.48\ mg/m^3}$$

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:

$$EV_{intermediate} = \frac{HEC_{intermediate}}{Benchmark\ MOE_{intermediate}} \times \frac{AT_{HEC\ intermediate}}{ED \times EF} \times \frac{IR_{resting}}{IR_{workers}}$$

$$= \frac{\mathbf{5.2\ ppm}}{\mathbf{30}} \times \frac{\frac{\mathbf{24h}}{\mathbf{d}} \times \mathbf{30d}}{\frac{\mathbf{8h}}{\mathbf{d}} \times \mathbf{22d}} \times \frac{\mathbf{0.6125}\frac{\mathbf{m^3}}{\mathbf{h}}}{\mathbf{1.25}\frac{\mathbf{m^3}}{\mathbf{h}}} = \mathbf{0.35\ ppm}$$

$$EV_{intermediate}\left(\frac{mg}{m^3}\right) = \frac{EV\ ppm\ \times\ MW}{Molar\ Volume} = \frac{0.35\ ppm\ \times\ 98.96\ \frac{g}{mol}}{24.45\ \frac{L}{mol}} = \mathbf{1.4\ mg/m^3}$$

Chronic Non-Cancer Occupational Exposure Value

The chronic occupational exposure value ($EV_{chronic}$) was calculated as the concentration at which the chronic MOE would equal the benchmark MOE for 8-hour chronic occupational exposures with the following equation:

$$EV_{chronic} = \frac{HEC_{chronic}}{Total\ UF_{chronic}} \times \frac{AT_{HEC\ chronic}}{ED \times EF\ \times WY} \times \frac{IR_{resting}}{IR_{workers}}$$

$$= \frac{5.2\ ppm}{30} \times \frac{\frac{24h}{d} \times \frac{365d}{y} \times\ 40\ y}{\frac{8h}{d} \times \frac{250d}{y} \times 40\ y} \times \frac{0.6125\frac{m^3}{h}}{1.25\frac{m^3}{h}} = \mathbf{0.37\ ppm}$$

$$EV_{chronic}\left(\frac{mg}{m^3}\right) = \frac{EV\ ppm\ \times\ MW}{Molar\ Volume} = \frac{0.37\ ppm\ \times\ 98.96\ \frac{g}{mol}}{24.45\ \frac{L}{mol}} = \mathbf{1.5\ mg/m^3}$$

The parameters used in the above equations are summarize below. Numerical values chosen for the parameters are described in relevant sections of this risk evaluation and the *Human Health Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2024c).

Where:

$AT_{HECchronic}$	=	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
$AT_{HECintermediate}$	=	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)
$AT_{HECacute}$	=	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)
AT_{IUR}	=	Averaging time for the cancer IUR, based on study conditions and any adjustments (24 hours/day for 365 days/year) and averaged over a lifetime (78 years)

Total $UF_{chronic}$	=	Total uncertainty factor of 30 (see Section 5.3.1)
Total $UF_{intermediate}$	=	Total uncertainty factor of 30 (see Section 5.3.1)
Total UF_{acute}	=	Total uncertainty factor of 30 (see Section 5.3.1)
$Benchmark_{cancer}$	=	Benchmark for excess lifetime cancer risk
EV_{acute}	=	Draft occupational exposure value based on degeneration with necrosis of the olfactory mucosa
$EV_{intermediate}$	=	Draft occupational exposure value based on decrease in sperm concentration
$EV_{chronic}$	=	Draft occupational exposure value based on decrease in sperm concentration
EV_{cancer}	=	Draft occupational exposure value based on excess cancer risk
ED	=	Exposure duration (8 hours/day)
EF	=	Exposure frequency (1 day/year for acute, 22 days/year for intermediate, 250 days/year for chronic and lifetime)
$HEC_{acute, intermediate, or chronic}$	=	Human equivalent concentration for acute, intermediate, or chronic OESs
IUR	=	Inhalation unit risk (per mg/m^3 and per ppm)
IR	=	Inhalation rate (default is 1.25 m^3/h for workers and 0.6125 m^3/h for the general population at rest; 0.6125 m^3/h is also assumed for animals in toxicity studies if they are "at rest" vs. exercising)
WY	=	Working years per lifetime at the 95th percentile (40 years)
Molar volume	=	24.45 L/mol, the volume of a mole of gas at 1 atm and 25 °C
MW	=	Molecular weight of 1,2-dichloroethane (98.96 g/mole)
Unit conversion:		
1 ppm	=	4.05 mg/m^3 (based on the molecular weight of 98.96 g/mol for 1,2-dichloroethane)

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 1,2-dichloroethane in air (see Table Apx F-1). This table presents validated methods from governmental agencies and is not intended to be a comprehensive list of available air monitoring methods for 1,2-dichloroethane. The sources used for the search included the following:

1) NIOSH Manual of Analytical Methods (NMAM); 5th Edition
2) NIOSH NMAM; 4th Edition (accessed November 12, 2025)
3) OSHA Index of Sampling and Analytical Methods (accessed November 12, 2025)
4) EPA Environmental Test Method and Monitoring Information (accessed November 12, 2025)

Table Apx F-1. Limit of Detection (LOD) and Limit of Quantification (LOQ) Summary for Air Sampling Analytical Methods Identified for 1,2-Dichloroethane

Air Sampling Analytical Methods	Year Published	LOD[a] (ppm)	LOQ (ppm)	Notes	Source
NIOSH Method 1003	2003	5.8E−02	0.19	The working range is 16–1,320 ppm at 50 L.	NIOSH NMAM, 4th Edition
OSHA Method 03	1979	1.6E−04	N/A	The lower limit of the estimated working range, assuming adequate desorption efficiency, is 0.05 ppm. The upper limit of the working range is dependent on the capacity of the collection medium.	OSHA Index of Sampling and Analytical Methods

ppm = parts per million; ppb = parts per billion; ppt = parts per trillion
[a] These sources cover a range of LOD including both below and above the OEV value.
Note: All websites/hyperlinks provided in table last accessed November 11, 2025.

The OSHA 03 analytical method can be used for detecting 1,2-dichloroethane in occupational air sampling. The lower limit of the working range for the OSHA Method 03 is 0.05 ppm. The draft 8-hour TWA occupational exposure value (0.014 ppm) is below the reliable quantitative limit of the OSHA 03 method, and above the reliable quantitation limit for the modified NIOSH method discussed in Appendix J.

Additionally, the working range of NIOSH 1003 for 1,2-dichloroethane is 16 to 1,320 parts per million (ppm) (16,000–1,320,000 ppb), which is significantly higher than EPA's provisional occupational exposure limit (pOEL) for 1,2-dichloroethane of 5 ppb (0.005 ppm). To allow for a comparison to this value, a validated method of sample analysis was developed and identified as "NIOSH 1003 modified". For the modified NIOSH 1003 method, the LOD is 4×10^{-4} ppm (0.40 ppb) and the LOQ is 1.4×10^{-4} ppm (0.14 ppb). The laboratory method validation report is included in Appendix K of the Test Order Inhalation Monitoring Data Package for 1,1-Dichloroethane (EPA-HQ-OPPT-2024-0114-0040) and further details are provided in Appendix J of this document.

OSHA has set a permissible exposure limit (PEL) as an 8-hour TWA for 1,2-dichloroethane of 50 ppm in 1979 (https://www.osha.gov/annotated-pels; accessed November 12, 2025). However, as noted on OSHA's website, "OSHA recognizes that many of its permissible exposure limits (PELs) are outdated and inadequate for ensuring protection of worker health. Most of OSHA's PELs were issued shortly after adoption of the Occupational Safety and Health (OSH) Act in 1970 and have not been updated since that time." The OSHA PEL for 1,2-dichloroethane was established in 1979. In addition, OSHA's PEL must undergo both risk assessment and feasibility assessment analyses before selecting a level that will substantially reduce risk under the Occupational Safety and Health Act. The California Division of Occupational Safety and Health (Cal/OSHA) has set an 8-hour TWA for 1,2-dichloroethane of 1 ppm, a short-term exposure limit (STEL) of 2 ppm, and a ceiling limit of 200 ppm. EPA's calculated exposure value is a lower value and is based on newer information and analysis from this risk evaluation.

Other governmental agencies and independent groups have also set recommended exposure limits (accessed November 12, 2025), established for 1,2-dichloroethane. The American Conference of Governmental Industrial Hygienists (ACGIH) has set a Threshold Limit Value (TLV) at 10 ppm TWA in 1979. This chemical also has a NIOSH Recommended Exposure Limit (REL) of 1 ppm TWA and a 15-minute STEL of 2 ppm and a revised Immediately Dangerous to Life or Health (IDLH) value of 50 ppm.

Table_Apx F-2. Summary of Occupational Exposure Limits for 1,2-Dichloroethane

Country	Limit Value (8-hour TWA)		STEL (15-minute)		Notes / Reference[a]
	ppm	mg/m³	ppm	mg/m³	
U.S. EPA Values	0.014	0.058	0.46	1.9	- Values derived in Appendix F of this risk evaluation (not considered regulatory limits)
Australia	10	40	–	–	- Based on 1991 ACGIH TLV documentation - Safe Work Australia – Hazardous Chemical Information System
Austria	2	8.2	8	32.8	- STEL is a ceiling limit value (5 minutes) - GESTIS – International Limit Values
Belgium	2	8.2	–	–	- GESTIS – International Limit Values
Canada – Ontario	10		–	–	- Based on 2017 ACGIH TLV documentation - Occupational Exposure Limits for Ontario Workplaces
Canada – Quebec	1	4	–	–	- GESTIS – International Limit Values
Denmark	1	4	–	–	- GESTIS – International Limit Values
European Union	2	8.2			
Finland	1	4	–	–	- Established in 1993 - Ministry of Social Affairs and Health – HTP values 2025: Concentrations known to be harmful
France	2	8.2	–	–	- GESTIS – International Limit Values
Hungary	2	8.2	–	–	- GESTIS – International Limit Values
Ireland	2	8.2	–	–	- Health and Safety Authority – 2021 Code of Practice
Japan	10		–	–	- Established in 1998 - STEL is a ceiling limit value - Japan Society for Occupational Health
Latvia	2	8.2	–	–	- GESTIS – International Limit Values
New Zealand	5	21	–	–	- Established in 2022 - WorkSafe New Zealand
Norway	.25	1	–	–	- GESTIS – International Limit Values
People's Republic of China		7		15	- STEL is a ceiling limit value - GESTIS – International Limit Values
Poland		8.2	–	–	- GESTIS – International Limit Values
Romania	2	8.2	–	–	- GESTIS – International Limit Values
Singapore	10	40	–	–	- Workplace Safety and Health (General Provisions) Regulations
South Africa	20		–	–	- GESTIS – International Limit Values
South Korea	10		–	–	- GESTIS – International Limit Values
Spain	2	8.2	–	–	- GESTIS – International Limit Values
Sweden	1	4	–	–	- Established in 2011 - Swedish Work Environment Authority
Switzerland	2	8.2	–	–	- GESTIS – International Limit Values
The Netherlands		7	–	–	
United Kingdom	5	21	–	–	- Health and Safety Executive: EH40/2005 Workplace Exposure Limits
USA – ACGIH	10	40	–	–	Not applicable
USA – NIOSH	1	4	2	8	- NIOSH

Country	Limit Value (8-hour TWA)		STEL (15-minute)		Notes / Reference[a]
	ppm	mg/m³	ppm	mg/m³	
USA – OSHA	50	–	100	–	- Adopted in 1971 - STEL is a ceiling limit value - OSHA
[a] All websites/hyperlinks provided in this table were last accessed on April 20, 2026. '–' indicates that no value is available.					

F.3 Short-Term Occupational Exposure Value Derivation

According to *Current Intelligence Bulletin 69: NIOSH Practices in Occupational Risk Assessment* (NIOSH, 2020), a short-term occupational exposure value (described as a short-term exposure limit [STEL] in (NIOSH, 2020)) should be derived if there is a concern for effects following short-term exposure at 15-minute concentrations. The 8-hour TWA most sensitive occupational exposure value would prevent 15-minute exposures above 32× that value (based on 32 15-minute periods in 8 hours), assuming only a single 15-minute chemical exposure in 1 day. Therefore, if short-term health effects are expected and can be quantified with a derived short-term occupational exposure value (STEV) lower than 32×, the most sensitive exposure value (EV), implementing a short-term exposure value could be justified.

EPA derived an acute exposure value (EV_{acute}) of 0.12 ppm for 1,2-dichlororoethane based on degeneration with necrosis of the olfactory mucosa in rats resulting from acute exposure (Dow Chemical, 2006) with an uncertainty factor (UF) of 30. According to principles of (ten Berge et al., 1986), Haber's Law is adjusted by the use of an exponent to create a more shallow slope, resulting in a more health-protective value when extrapolating to shorter durations. Due to lack of a published chemical-specific exponent value in (ten Berge et al., 1986) or other study for 1,2-dichloroethane, use of the default exponent of 3, as per NIOSH IDLH guidance (NRC, 2001) and the Standard Operating Procedure for AEGLs (NIOSH, 2013), and a benchmark MOE of 30, the 15-minute HEC is 33.5 ppm and the STEV is 1.12 ppm (see calculations below). This value was based on the reported analytical exposure NOAEL concentration from Dow Chemical (2006) of 52.8 ppm that, in accordance with (U.S. EPA, 1994) guidance, was dosimetrically adjusted using the regional gas dose ratio for extrathoracic effects ($RGDR_{ET}$) of 0.2 in rats for these nasal effects to 10.56 ppm.

The most sensitive occupational exposure value for 1,2-dichloroethane is 0.014 ppm based on lifetime cancer IUR, based on an 8-hour TWA assuming a typical 40-hour work week. The calculated short-term exposure value (1.12 ppm) is higher than the 15-minute TWA occupational exposure equivalent value (Table_Apx F-3; *i.e.,* 0.46 ppm), and therefore the most sensitive occupational exposure value is already protective of any hazards specific to short-term exposure.

Table_Apx F-3. Comparison Between Occupational Exposure Values for 1,2-Dichloroethane

Value Type	Most Sensitive Occupational Exposure Value (8-hour TWA)	Chronic Non-Cancer Occupational Exposure Value	Most Sensitive Occupational Exposure Value (15-minute TWA)	Possible Short-Term Occupational Exposure Value (15-minute value)
Health effect	Cancer	Male reproductive effects	Cancer	Respiratory (olfactory)
Exposure value (ppm)	0.014	0.37	0.46	1.12

Below are the calculations used to derive the short-term occupational exposure value. EPA used study data from (Dow Chemical, 2006), which is also the basis of the EV_{acute}.

The initial step in adjusting an acute HEC for a shorter duration is to derive the ten Berge constant (k) based on the POD and exposure duration from the study along with the ten Berge exponent (n) for 1,2-dichloroethane as follows:

$$k = C^n \times t$$
$$k = 10.56^3 \times 8$$
$$k = 9420.67$$

Where:

C	=	Air concentration / study POD at duration *t* in ppm (10.56 ppm; calculated HEC from (Dow Chemical, 2006) based on the dosimetrically adjusted NOAEL of the analytical exposure concentration of 52.8 ppm to 10.56 [52.8 ppm × 0.2 ($RGDR_{ET}$) for rat])
n	=	ten Berge exponent (3.0; default based on (NRC, 2001) and (NIOSH, 2013))
t	=	Timepoint of the measured concentration, in hours (8 hours in (Dow Chemical, 2006))
k	=	Calculated ten Berge constant

The new HEC is then calculated using the same equation, where k and n remain constant:

$$C^n \times t = k$$
$$C^3 \times 0.25 = 9420.67$$
$$C = \left(\frac{9420.67}{0.25}\right)^{\frac{1}{3}}$$
$$C_{STEV} = 33.5\ ppm$$

Where:

C_{STEV}	=	HEC at short-term exposure value duration *t* in ppm
t	=	Relevant exposure duration for a short-term exposure value (15 minutes, or 0.25 hours)

Finally, the short-term exposure value is calculated from the C_{STEV} by applying the benchmark MOE used for non-cancer acute risk estimates and the EV_{acute} derivation, as follows:

$$STEV = C_{STEV}/Benchmark\ MOE$$
$$STEV = 33.5/30$$
$$STEV = 1.12\ ppm$$

Where:

STEV	=	Short-term exposure value
Total UF	=	Total uncertainty factor of 30 (see Section 5.2.2)

Appendix G GENERAL POPULATION CANCER AMBIENT AIR INHALATION RISK TABLES

Table_Apx G-1. General Population Cancer Inhalation Risk Summary Table at 10–50,000 m from TRI-Reported Facility Releases from 2015–2024 Based on Modeled Ambient Air Concentrations for 1,2-Dichloroethane Estimated Using HEM5.0[a b c]

Occupational Exposure Scenario (OES)	Number of Facilities Evaluated in OES[c]	Statistic	Cancer Risks Based on the 95th Percentile Annual Average Ambient Air Concentrations (µg/m³) Estimated for 10–50,000 m from Releasing Facilities										
			10 m	30 m	60 m	100 m	1,000 m	2,500 m	5,000 m	10,000 m	15,000 m	25,000 m	50,000 m
Manufacturing	24	max	1.87E−02	1.66E−02	5.59E−03	2.42E−03	5.05E−05	1.13E−05	3.53E−06	1.18E−06	6.40E−07	2.71E−07	9.98E−08
		mean	4.53E−03	2.07E−03	7.68E−04	3.61E−04	9.12E−06	2.22E−06	7.66E−07	2.65E−07	1.43E−07	6.44E−08	2.26E−08
		median	2.73E−03	1.03E−03	3.82E−04	1.75E−04	3.65E−06	1.10E−06	3.75E−07	1.29E−07	6.93E−08	3.21E−08	1.13E−08
Repackaging	4	max	6.67E−05	2.38E−05	8.30E−06	4.38E−06	1.42E−07	3.87E−08	1.45E−08	5.24E−09	2.86E−09	1.32E−09	4.58E−10
		mean	1.69E−05	6.08E−06	2.13E−06	1.13E−06	3.83E−08	1.11E−08	4.46E−09	1.72E−09	8.94E−10	4.74E−10	1.51E−10
		median	5.16E−07	2.68E−07	1.00E−07	7.07E−08	5.60E−09	2.77E−09	1.69E−09	8.14E−10	3.57E−10	2.89E−10	7.29E−11
Processing as a Reactant	13	max	2.96E−04	1.09E−04	4.29E−05	1.99E−05	4.98E−07	1.10E−07	3.96E−08	1.44E−08	8.36E−09	4.04E−09	1.57E−09
		mean	7.02E−05	2.88E−05	1.11E−05	5.11E−06	1.23E−07	2.87E−08	9.75E−09	3.34E−09	1.80E−09	8.24E−10	2.96E−10
		median	1.98E−05	8.52E−06	3.13E−06	1.53E−06	4.06E−08	9.48E−09	2.85E−09	1.14E−09	3.95E−10	1.76E−10	7.23E−11
Processing into Formulation, Mixture, or Reaction Product	11	max	8.10E−03	1.88E−03	6.19E−04	2.60E−04	4.31E−06	9.00E−07	2.92E−07	1.13E−07	6.74E−08	3.58E−08	1.58E−08
		mean	1.17E−03	2.89E−04	9.65E−05	4.22E−05	8.90E−07	2.21E−07	7.78E−08	2.77E−08	1.56E−08	7.63E−09	2.96E−09
		median	5.28E−05	2.16E−05	7.63E−06	6.46E−06	1.20E−07	2.37E−08	7.70E−09	2.52E−09	1.33E−09	5.88E−10	2.40E−10
Non-Aerosol Cleaning and Degreasing	1	max	6.90E−08	3.93E−08	4.86E−08	6.88E−08	9.38E−09	2.87E−09	1.28E−09	4.53E−10	2.44E−10	1.11E−10	3.63E−11
		mean	6.90E−08	3.93E−08	4.86E−08	6.88E−08	9.38E−09	2.87E−09	1.28E−09	4.53E−10	2.44E−10	1.11E−10	3.63E−11
		median	6.90E−08	3.93E−08	4.86E−08	6.88E−08	9.38E−09	2.87E−09	1.28E−09	4.53E−10	2.44E−10	1.11E−10	3.63E−11
Waste Handling, Treatment, and Disposal (Incinerator)	23	max	4.35E−04	1.47E−04	6.72E−05	3.35E−05	8.42E−07	1.86E−07	6.09E−08	1.99E−08	1.04E−08	4.56E−09	1.55E−09
		mean	3.57E−05	1.43E−05	5.64E−06	2.76E−06	6.79E−08	1.54E−08	5.04E−09	1.90E−09	9.94E−10	4.57E−10	1.61E−10
		median	1.97E−06	9.37E−07	3.45E−07	1.54E−07	3.79E−09	1.11E−09	4.14E−10	1.46E−10	7.27E−11	2.33E−11	1.15E−11

HEM5.0 = Human Exposure Model Version 5; TRI = Toxic Release Inventory
[a] The full inputs and results are presented in the *HEM TRI Input Files for 1,2-Dichloroethane* (U.S. EPA, 2026am) and *Supplemental Information on HEM TRI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2026bg).

Occupational Exposure Scenario (OES)	Number of Facilities Evaluated in OES[c]	Statistic	Cancer Risks Based on the 95th Percentile Annual Average Ambient Air Concentrations (µg/m³) Estimated for 10–50,000 m from Releasing Facilities										
			10 m	30 m	60 m	100 m	1,000 m	2,500 m	5,000 m	10,000 m	15,000 m	25,000 m	50,000 m

[b] At each distance there are 16 receptors that form a circle around the release location. HEM5.0 calculates an annual average at each point, giving 16 averages. The 95th percentile was calculated for these 16 averages for each release location and distance separately. The max values in this table are the cancer risks associated highest of the 95th percentile annual average concentrations for each OES. Similarly, the mean and median risks cancer are based are the mean and media of the 95th percentile annual average concentrations of all facilities associated with each OES.
[c] For each OES, EPA modeled the highest total (fugitive + stack) annual Toxic Release Inventory-reported release for each facility from 2015–2024 for facilities that reported using Form R.

Table_Apx G-2. General Population Cancer Inhalation Risk Summary Table at 10–50,000 m from Reported NEI Facility Releases from 2014, 2017, and 2020 Based on Modeled Ambient Air Concentrations Estimated Using HEM5.0[a b c]

OES	Number of Releases[d]	Statistic	Cancer Risks based on the 95th Percentile Annual Average Ambient Air Concentrations (µg/m³) Estimated for 10–50,000 m from NEI Releases										
			10 m	30 m	60 m	100 m	1,000 m	2,500 m	5,000 m	10,000 m	15,000 m	10,000 m	50,000 m
Manufacturing	399	max	1.30E−02	1.69E−02	5.12E−03	2.15E−03	3.93E−05	8.42E−06	2.54E−06	8.52E−07	4.35E−07	1.91E−07	6.73E−08
		mean	3.52E−05	4.47E−05	1.56E−05	9.48E−06	3.84E−07	1.01E−07	2.61E−08	8.83E−09	4.68E−09	2.15E−09	7.61E−10
		median	1.89E−08	2.15E−08	2.48E−08	2.70E−08	9.17E−09	3.25E−09	1.03E−09	3.82E−10	2.04E−10	9.55E−11	3.53E−11
Repackaging	13	max	7.20E−06	1.74E−05	2.43E−05	7.91E−06	6.78E−06	1.97E−07	7.09E−08	2.58E−08	1.42E−08	6.67E−09	2.40E−09
		mean	1.28E−06	2.29E−06	2.94E−06	1.68E−06	6.22E−07	4.24E−08	1.35E−08	4.61E−09	2.47E−09	1.13E−09	4.00E−10
		median	9.16E−08	2.25E−07	4.33E−07	4.04E−07	2.93E−08	7.07E−09	2.36E−09	7.91E−10	4.24E−10	1.92E−10	6.43E−11
Processing as a Reactant	133	max	1.28E−03	4.72E−04	1.73E−04	1.70E−04	3.14E−06	1.77E−06	2.29E−07	6.68E−08	3.56E−08	1.62E−08	5.30E−09
		mean	1.24E−05	5.67E−06	3.17E−06	2.37E−06	1.16E−07	3.79E−08	9.49E−09	2.61E−09	1.32E−09	5.84E−10	1.97E−10
		median	1.85E−09	1.97E−09	2.14E−09	2.42E−09	1.27E−09	5.03E−10	2.71E−10	7.50E−11	2.92E−11	1.28E−11	3.86E−12
Processing into Formulation, Mixture, or Reaction Product	51	max	1.97E−03	1.34E−03	5.65E−04	2.96E−04	8.71E−06	1.95E−06	6.32E−07	2.06E−07	1.07E−07	4.73E−08	1.59E−08
		mean	4.62E−05	3.14E−05	1.37E−05	8.13E−06	2.31E−07	5.44E−08	1.82E−08	5.82E−09	3.19E−09	1.44E−09	4.88E−10
		median	2.42E−11	7.53E−11	8.66E−10	1.73E−09	1.27E−09	6.51E−10	2.77E−10	9.30E−11	6.01E−11	3.14E−11	1.19E−11
Industrial Application of Adhesives and Sealants	104	max	2.38E−05	8.46E−06	5.58E−06	3.35E−06	2.15E−07	9.35E−08	4.36E−08	1.67E−08	8.62E−09	3.80E−09	1.40E−09
		mean	1.01E−06	5.77E−07	3.62E−07	2.37E−07	1.24E−08	3.81E−09	1.45E−09	5.82E−10	3.20E−10	1.53E−10	6.13E−11
		median	3.38E−11	1.57E−10	4.27E−10	6.63E−10	3.44E−10	1.21E−10	7.81E−11	2.60E−11	1.53E−11	7.66E−12	2.73E−12

OES	Number of Releases[d]	Statistic	Cancer Risks based on the 95th Percentile Annual Average Ambient Air Concentrations (μg/m³) Estimated for 10–50,000 m from NEI Releases										
			10 m	30 m	60 m	100 m	1,000 m	2,500 m	5,000 m	10,000 m	15,000 m	10,000 m	50,000 m
Industrial Application of Lubricants and Greases	1	max	1.84E−05	1.67E−05	6.71E−06	2.83E−06	5.27E−08	9.36E−09	3.25E−09	1.19E−09	5.97E−10	2.51E−10	9.62E−11
		mean	1.84E−05	1.67E−05	6.71E−06	2.83E−06	5.27E−08	9.36E−09	3.25E−09	1.19E−09	5.97E−10	2.51E−10	9.62E−11
		median	1.84E−05	1.67E−05	6.71E−06	2.83E−06	5.27E−08	9.36E−09	3.25E−09	1.19E−09	5.97E−10	2.51E−10	9.62E−11
Non-Aerosol Cleaning and Degreasing	27	max	7.01E−06	1.18E−06	3.56E−07	1.44E−07	1.40E−08	4.71E−09	2.78E−09	1.75E−09	1.23E−09	7.43E−10	3.90E−10
		mean	3.76E−06	5.94E−07	1.93E−07	8.14E−08	6.19E−09	1.89E−09	1.03E−09	6.17E−10	4.27E−10	2.56E−10	1.33E−10
		median	4.28E−06	6.05E−07	2.22E−07	9.83E−08	2.55E−09	5.57E−10	1.85E−10	6.23E−11	3.32E−11	1.54E−11	5.72E−12
Laboratory Use	4	max	7.70E−06	2.59E−06	8.41E−07	3.32E−07	6.80E−08	2.78E−08	1.16E−08	4.44E−09	2.44E−09	1.20E−09	4.15E−10
		mean	3.62E−06	1.07E−06	4.03E−07	2.01E−07	2.00E−08	7.66E−09	3.14E−09	1.20E−09	6.60E−10	3.22E−10	1.11E−10
		median	3.39E−06	8.40E−07	3.85E−07	2.35E−07	5.41E−09	1.13E−09	3.71E−10	1.18E−10	6.60E−11	3.11E−11	1.09E−11
Waste Handling, Treatment, and Disposal (Incinerator)	21	max	8.30E−05	5.59E−05	1.76E−05	8.11E−06	1.45E−07	3.02E−08	9.49E−09	4.00E−09	2.10E−09	9.86E−10	3.59E−10
		mean	8.03E−06	5.46E−06	2.27E−06	1.01E−06	1.77E−08	3.43E−09	1.02E−09	4.43E−10	2.30E−10	1.04E−10	3.66E−11
		median	1.44E−06	7.37E−07	2.30E−07	8.38E−08	1.66E−09	4.00E−10	1.28E−10	4.33E−11	2.21E−11	1.04E−11	3.60E−12
Waste Handling, Treatment, and Disposal (Landfill)	563	max	7.82E−04	6.06E−05	2.46E−05	1.25E−05	2.57E−07	6.55E−08	2.02E−08	7.15E−09	3.75E−09	1.64E−09	5.61E−10
		mean	1.18E−05	1.95E−06	7.51E−07	3.48E−07	8.69E−09	2.16E−09	7.34E−10	2.58E−10	1.35E−10	6.29E−11	2.20E−11
		median	1.42E−06	5.75E−07	2.10E−07	9.88E−08	3.46E−09	8.98E−10	3.05E−10	1.03E−10	5.37E−11	2.40E−11	8.36E−12
Waste Handling, Treatment, and Disposal (Non-POTW WWT)	26	max	6.07E−06	4.52E−06	8.16E−06	1.75E−05	1.41E−07	2.55E−08	7.73E−09	2.51E−09	1.42E−09	6.53E−10	2.37E−10
		mean	8.48E−07	8.15E−07	1.35E−06	1.88E−06	2.43E−08	4.95E−09	1.53E−09	4.90E−10	2.66E−10	1.19E−10	4.07E−11
		median	1.48E−07	1.71E−07	2.18E−07	1.50E−07	3.22E−09	7.97E−10	2.85E−10	9.69E−11	5.17E−11	2.32E−11	7.87E−12
Waste Handling, Treatment, and Disposal (POTW)	61	max	4.68E−04	5.00E−05	1.63E−05	6.44E−06	1.00E−07	2.36E−08	7.63E−09	2.47E−09	1.31E−09	5.18E−10	1.75E−10
		mean	1.51E−05	3.36E−06	1.07E−06	4.31E−07	8.62E−09	1.93E−09	6.20E−10	1.99E−10	1.04E−10	4.51E−11	1.45E−11
		median	2.33E−07	8.02E−08	3.10E−08	3.66E−08	9.09E−10	1.73E−10	5.78E−11	1.83E−11	9.62E−12	4.28E−12	1.55E−12
Waste Handling, Treatment, and Disposal (Remediation)	32	max	1.73E−04	4.45E−05	1.94E−05	9.65E−06	2.43E−07	9.59E−08	3.95E−08	1.45E−08	8.49E−09	3.93E−09	1.24E−09
		mean	7.59E−06	2.12E−06	9.48E−07	5.08E−07	2.43E−08	7.66E−09	2.88E−09	1.02E−09	5.75E−10	2.64E−10	8.54E−11
		median	2.58E−07	6.26E−08	4.53E−08	1.89E−08	4.79E−10	1.27E−10	5.34E−11	1.73E−11	9.30E−12	4.22E−12	1.46E−12

OES	Number of Releases[d]	Statistic	Cancer Risks based on the 95th Percentile Annual Average Ambient Air Concentrations (µg/m³) Estimated for 10–50,000 m from NEI Releases										
			10 m	30 m	60 m	100 m	1,000 m	2,500 m	5,000 m	10,000 m	15,000 m	10,000 m	50,000 m
Facilities not mapped to an OES [e]	3	max	5.80E−05	5.39E−06	1.98E−06	1.62E−06	7.50E−07	2.55E−07	8.62E−08	3.94E−08	2.14E−08	8.96E−09	3.48E−09
		mean	3.77E−06	6.23E−07	2.56E−07	1.60E−07	2.69E−08	8.81E−09	2.97E−09	1.32E−09	7.18E−10	3.02E−10	1.16E−10
		median	3.32E−10	9.76E−09	5.97E−09	5.34E−09	3.36E−10	9.10E−11	3.94E−11	1.38E−11	7.10E−12	3.47E−12	1.40E−12

HEM5.0 = Human Exposure Model Version 5; NEI = National Emissions Inventory; OES = occupational exposure scenario; POTW = publicly owned treatment works; WWT = wastewater treatment

[a] The full inputs and results are presented in the *HEM NEI Input Files for 1,2-Dichloroethane* (U.S. EPA, 2026al) and *Supplemental Information on HEM NEI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2026bf)

[b] For NEI data, EPA used data reported 2014, 2017, and 2020 in this analysis. In the draft risk evaluation, EPA modeled all available data for 2014 and 2017 using AERMOD (U.S. EPA, 2025a). For this evaluation, EPA modeled, in HEM5.0, each facility that showed a risk greater than 1×10^{-6} based on the 95th percentile concentration at 10 m from the release location based on the analysis performed in the draft risk evaluation. EPA also modeled any releases that were new to the 2020 NEI if they were greater than the lowest release from 2014 and 2017 that resulted in a risk greater than 1×10^{-6} based on the 95th percentile concentration at 10 m from the release location. If a facility reported in multiple years and had total releases greater than the threshold described above, then EPA used the maximum release across all years in this analysis.

[c] At each distance there are 16 receptors that form a circle around the release location. HEM5.0 calculates an annual average at each point, giving 16 averages. The 95th percentile was calculated for these 16 averages for each release location and distance separately. The max values in this table are the cancer risks associated highest of the 95th percentile annual average concentrations for each OES. Similarly, the mean and median cancer risks are based are the mean and media of the 95th percentile annual average concentrations of all facilities associated with each OES.

[d] Number of releases associated with each OES, not the total number of facilities assessed, as a single facility can have multiple release points.

[e] Facilities were not mapped to an OES in cases where information on the 1,2-dichloroethane use at the site was not available.

Appendix H ACUTE GENERAL POPULATION NON-CANCER AMBIENT AIR INHALATION RISK TABLES

Table_Apx H-1. General Population Acute Inhalation Risk Summary Table at 10–50,000 m from TRI-Reported Facility Releases from 2015–2024 Based on Ambient Air Concentrations Estimated Using HEM5.0[a b c]

Occupational Exposure Scenario (OES)	Number of Facilities Evaluated in OES[d]	Highest Acute Inhalation Risks based on the 95th Percentile Daily Average Ambient Air Concentrations Estimated for Distance of 10–50,000 m from Releasing Facilities (Benchmark = 330)										
		10 m	30 m	60 m	100 m	1,000 m	2,500 m	5,000 m	10,000 m	15,000 m	10,000 m	50,000 m
Manufacturing	24	1.01E00	1.19E00	3.59E00	7.78E00	2.75E02	1.24E03	3.34E03	9.21E03	1.62E04	3.79E04	1.08E05
Repackaging	4	2.49E02	5.17E02	1.62E03	2.72E03	8.12E04	3.32E05	9.55E05	2.87E06	5.09E06	1.08E07	3.11E07
Processing as a Reactant	13	7.56E01	1.47E02	3.94E02	7.81E02	2.35E04	9.84E04	2.99E05	8.94E05	1.76E06	4.04E06	1.13E07
Processing into Formulation, Mixture, or Reaction Product	11	3.70E00	7.81E00	2.35E01	5.52E01	2.75E03	1.13E04	3.44E04	9.72E04	1.45E05	2.84E05	7.88E05
Non-Aerosol Cleaning and Degreasing	1	2.48E05	3.59E05	2.34E05	1.67E05	1.13E06	3.76E06	7.99E06	2.19E07	4.29E07	9.57E07	2.75E08
Waste Handling, Treatment, and Disposal (Incinerator)	23	5.68E01	1.54E02	3.22E02	6.24E02	1.84E04	7.39E04	2.21E05	6.44E05	1.19E06	2.27E06	7.00E06

HEM5.0 = Human Exposure Model Version 5; TRI = Toxic Release Inventory

[a] The full inputs and results are presented in the *HEM TRI Input Files for 1,2-Dichloroethane* (U.S. EPA, 2026am) and *Supplemental Information on HEM TRI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2026bg).

[b] At each distance there are 16 receptors that form a circle around the release location. For this analysis, HEM5.0 calculated daily averages for 365 days and then output the 18th highest value, which equates to approximately the 95th percentile concentration. The risks presented in this table are calculated the highest of the 95th percentile concentrations at each distance.

[c] For each OES, EPA modeled the highest total (fugitive + stack) annual Toxic Release Inventory-reported release for each facility from 2015–2024.

[d] Total number of facilities associated with each OES.

Table_Apx H-2. General Population, Acute Inhalation Risk Summary Table at 10–50,000 m from NEI-Reported Facility Releases from 2014,2017, and 2020 Based on Modeled Ambient Air Concentrations Estimated Using HEM5.0[a b c]

Occupational Exposure Scenario (OES)	Number of Facilities Evaluated in OES[d]	Highest Acute Inhalation Risks based on the 95th Percentile Daily Average Ambient Air Concentrations Estimated for Distance of 10–50,000 m from Releasing Facilities (Benchmark = 30)										
		10 m	30 m	60 m	100 m	1,000 m	2,500 m	5,000 m	10,000 m	15,000 m	10,000 m	50,000 m
Manufacturing	399	1.30E00	1.18E00	3.61E00	7.84E00	3.23E02	1.34E03	3.74E03	9.91E03	2.06E04	4.63E04	1.35E05
Repackaging	13	5.60E03	4.95E03	4.62E03	4.48E03	5.25E03	8.24E04	1.75E05	4.33E05	7.41E05	1.52E06	3.69E06
Processing as a Reactant	133	1.72E01	4.05E01	1.12E02	1.54E02	6.22E02	4.22E03	1.68E04	5.50E04	9.66E04	1.94E05	6.35E05
Processing into Formulation, Mixture, or Reaction Product	51	1.39E01	2.21E01	2.44E01	6.99E01	1.48E03	5.98E03	1.89E04	5.85E04	1.09E05	2.43E05	7.35E05
Industrial Application of Adhesives and Sealants	104	9.47E02	1.88E03	2.42E03	3.74E03	5.81E04	1.19E05	2.41E05	5.63E05	9.74E05	1.99E06	6.28E06
Industrial Application of Lubricants and Greases	1	6.72E02	7.57E02	1.81E03	3.85E03	1.86E05	1.05E06	2.98E06	8.89E06	1.69E07	3.49E07	9.68E07
Non-Aerosol Cleaning and Degreasing	27	1.20E02	4.12E02	8.64E02	1.70E03	6.18E04	1.66E05	3.58E05	9.15E05	1.59E06	3.46E06	1.15E07
Laboratory Use	4	2.57E03	1.01E04	3.23E04	6.77E04	2.44E05	5.72E05	1.26E06	3.29E06	5.90E06	1.18E07	3.26E07
Waste Handling, Treatment, and Disposal (Incinerator)	21	1.87E02	2.83E02	8.74E02	1.86E03	8.04E04	3.60E05	1.13E06	2.70E06	5.22E06	1.15E07	3.54E07
Waste Handling, Treatment, and Disposal (Landfill)	563	2.88E01	2.46E02	6.25E02	1.27E03	4.43E04	1.98E05	5.24E05	1.61E06	3.09E06	6.84E06	1.83E07
Waste Handling,	26	2.48E03	3.40E03	1.77E03	7.07E02	8.48E04	4.38E05	1.45E06	3.39E06	6.56E06	1.57E07	3.63E07

Occupational Exposure Scenario (OES)	Number of Facilities Evaluated in OES[d]	Highest Acute Inhalation Risks based on the 95th Percentile Daily Average Ambient Air Concentrations Estimated for Distance of 10–50,000 m from Releasing Facilities (Benchmark = 30)										
		10 m	30 m	60 m	100 m	1,000 m	2,500 m	5,000 m	10,000 m	15,000 m	10,000 m	50,000 m
Treatment, and Disposal (Non-POTW WWT)												
Waste Handling, Treatment, and Disposal (POTW)	61	1.08E02	5.54E02	1.77E03	4.12E03	1.32E05	5.80E05	1.55E06	5.19E06	1.03E07	2.34E07	6.63E07
Waste Handling, Treatment, and Disposal (Remediation)	32	4.11E02	5.17E03	1.19E04	9.03E03	2.45E04	5.81E04	1.77E05	3.20E05	5.71E05	1.28E06	3.07E06
Facilities not mapped to an OES[e]	3	1.89E03	1.16E04	3.80E04	9.25E04	9.11E05	2.74E06	3.96E06	6.82E06	8.71E06	1.49E07	2.84E07

HEM5.0 = Human Exposure Model Version 5; NEI = National Emissions Inventory; OES = occupational exposure scenario; POTW = publicly owned treatment works; WWT = wastewater treatment

[a] The full inputs and results are presented in the *HEM NEI Input Files for 1,2-Dichloroethane* (U.S. EPA, 2026al) and *Supplemental Information on HEM NEI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2026bf).

[b] For NEI data, EPA used data reported 2014, 2017, and 2020 in this analysis. In the draft risk evaluation, EPA modeled all available data for 2014 and 2017 using AERMOD (U.S. EPA, 2025a). For this evaluation, EPA modeled, in HEM5.0, each facility that showed a risk greater than 1×10^{-6} based on the 95th percentile concentration at 10 m from the release location based on the analysis performed in the draft risk evaluation. EPA also modeled any releases that were new to the 2020 NEI if they were greater than the lowest release from 2014 and 2017 that resulted in a risk greater than 1×10^{-6} based on the 95th percentile concentration at 10 m from the release location. If a facility reported in multiple years and had total releases greater than the threshold described above, then EPA used the maximum release across all years in this analysis.

[c] At each distance there are 16 receptors that form a circle around the release location. For this analysis, HEM5.0 calculated daily averages for 365 days and then output the 18th highest value, which equates to approximately the 95th percentile concentration. The risks presented in this table are calculated the highest of the 95th percentile concentrations at each distance.

[d] Number of releases associated with each OES, not the total number of facilities assessed, as a single facility can have multiple release points.

[c] Facilities were not mapped to an OES in cases where information on the 1,2-dichloroethane use at the site was not available.

Table_Apx H-3. Maximum 95th Percentile Acute Inhalation Risks Estimated Within 100–2,500 m of Generic Facilities/Sites for OESs with EPA-Estimated Releases Based on Modeled Ambient Air Concentrations Estimated Using AERMOD[a b c]

OES [d]	Meteorology [e]	Land Use	Maximum Acute Risk (Benchmark = 30)			Overall Confidence [f]
			100–1,000 m	1,000 m	2,500 m	
Industrial Application of Adhesives and Sealants	Lake Charles, LA	Rural	31	71	307	Slight
	Lake Charles, LA	Urban	105	268	1.24E03	
Commercial Aerosol Products	Lake Charles, LA	Rural	8.59E04	3.25E05	2.15E06	Slight
	Lake Charles, LA	Urban	9.42E04	3.15E05	2.01E06	
Non-Aerosol Cleaning and Degreasing	Lake Charles, LA	Rural	1.46E03	5.14E03	3.25E04	Slight
	Lake Charles, LA	Urban	1.60E03	5.78E03	3.42E04	
Laboratory Use	Lake Charles, LA	Rural	5.77E06	1.66E07	1.05E08	Moderate
	Lake Charles, LA	Urban	5.59E06	1.54E07	9.92E07	

[a] See *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae) for discussion of EPA modeled releases for generic facilities/sites.
[b] Acute risks are based on a continuous inhalation exposure at a single modeled distance.
[c] Acute inhalation risks were calculated at additional distances from 10–10,000 m from all facilities and can be found in *Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2026bd).
[d] See Table 3-3 for mapping of the OES to COU mapping for the OESs of Industrial Application of Adhesives and Sealants; Non-Aerosol Cleaning and Degreasing; and Laboratory Use. For the OES of Commercial Aerosol Products, the life cycle stage is Industrial use, the category is Solvents (for cleaning and degreasing), and the subcategory is Degreasing and cleaning solvents.
[e] For OESs with estimated releases from generic facilities/sites, EPA assumed meteorology stations for modeling of ambient air concentrations. EPA is presenting results when using the Lake Charles, LA, station in this table. Previous work has shown that the Lake Charles, LA, station tends to produce higher air concentrations relative to other meteorology stations available in AERMOD. EPA also modeled estimated releases from generic facilities/sites using the Sioux Falls, SD, meteorology station, which tends to produce central-tendency air concentrations relative to other stations. The results using the Sioux Falls, SD, station are presented in *Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2026bd).
[f] Rationale for the overall confidences can be found in *General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ah).

Appendix I CHRONIC GENERAL POPULATION NON-CANCER AMBIENT AIR INHALATION RISK TABLES

Table_Apx I-1. General Population Chronic, Non-Cancer Inhalation Risk Summary Table at 10–50,000 m from TRI-Reported Facility Releases from 2015–2024 Based on Modeled Ambient Air Concentrations for 1,2-Dichloroethane Estimated Using HEM5.0[a b c]

Occupational Exposure Scenario (OES)	Number of Facilities Evaluated in OES[c]	Statistic	Chronic Non-Cancer Risks Based on the 95th Percentile Annual Average Ambient Air Concentrations (µg/m^3) Estimated for 10–50,000 m from Releasing Facilities (Benchmark = 30)										
			10 m	30 m	60 m	100 m	1,000 m	2,500 m	5,000 m	10,000 m	15,000 m	25,000 m	50,000 m
Manufacturing	24	max	7.97E00	8.98E00	2.67E01	6.17E01	2.96E03	1.32E04	4.23E04	1.26E05	2.33E05	5.51E05	1.50E06
		mean	3.30E01	7.23E01	1.95E02	4.13E02	1.64E04	6.74E04	1.95E05	5.64E05	1.05E06	2.32E06	6.62E06
		median	5.47E01	1.45E02	3.91E02	8.55E02	4.10E04	1.36E05	3.98E05	1.16E06	2.16E06	4.66E06	1.32E07
Repackaging	4	max	2.24E03	6.28E03	1.80E04	3.41E04	1.05E06	3.86E06	1.03E07	2.85E07	5.22E07	1.13E08	3.27E08
		mean	8.83E03	2.46E04	7.03E04	1.32E05	3.90E06	1.35E07	3.35E07	8.70E07	1.67E08	3.15E08	9.91E08
		median	2.89E05	5.57E05	1.49E06	2.11E06	2.67E07	5.39E07	8.86E07	1.84E08	4.19E08	5.18E08	2.05E09
Processing as a Reactant	13	max	5.06E02	1.37E03	3.48E03	7.52E03	3.00E05	1.36E06	3.78E06	1.04E07	1.79E07	3.70E07	9.49E07
		mean	2.13E03	5.18E03	1.34E04	2.92E04	1.21E06	5.20E06	1.53E07	4.47E07	8.32E07	1.81E08	5.04E08
		median	7.56E03	1.75E04	4.78E04	9.76E04	3.68E06	1.58E07	5.25E07	1.32E08	3.79E08	8.47E08	2.07E09
Processing into Formulation, Mixture, or Reaction Product	11	max	1.84E01	7.93E01	2.41E02	5.76E02	3.47E04	1.66E05	5.13E05	1.32E06	2.22E06	4.18E06	9.48E06
		mean	1.28E02	5.17E02	1.55E03	3.54E03	1.68E05	6.77E05	1.92E06	5.40E06	9.58E06	1.96E07	5.05E07
		median	2.83E03	6.91E03	1.96E04	2.31E04	1.25E06	6.32E06	1.94E07	5.92E07	1.13E08	2.54E08	6.23E08
Non-Aerosol Cleaning and Degreasing	1	max	2.16E06	3.80E06	3.08E06	2.17E06	1.59E07	5.20E07	1.17E08	3.30E08	6.12E08	1.34E09	4.12E09
		mean	2.16E06	3.80E06	3.08E06	2.17E06	1.59E07	5.20E07	1.17E08	3.30E08	6.12E08	1.34E09	4.12E09
		median	2.16E06	3.80E06	3.08E06	2.17E06	1.59E07	5.20E07	1.17E08	3.30E08	6.12E08	1.34E09	4.12E09
Waste Handling, Treatment, and Disposal (Incinerator)	23	max	3.43E02	1.02E03	2.23E03	4.46E03	1.78E05	8.02E05	2.45E06	7.51E06	1.44E07	3.28E07	9.67E07
		mean	4.18E03	1.05E04	2.65E04	5.42E04	2.20E06	9.72E06	2.96E07	7.88E07	1.50E08	3.27E08	9.29E08
		median	7.57E04	1.59E05	4.34E05	9.69E05	3.94E07	1.35E08	3.61E08	1.03E09	2.05E09	6.43E09	1.30E10

HEM5.0 = Human Exposure Model Version 5; TRI = Toxic Release Inventory

[a] The full inputs and results are presented in the *HEM TRI Input Files for 1,2-Dichloroethane* (U.S. EPA, 2026am) and *Supplemental Information on HEM TRI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2026bg).

[b] At each distance there are 16 receptors that form a circle around the release location. HEM5.0 calculates an annual average at each point, giving 16 averages. The 95th percentile was calculated for these 16 averages for each release location and distance separately. The max values in this table are the cancer risks associated highest of the

Occupational Exposure Scenario (OES)	Number of Facilities Evaluated in OES[c]	Statistic	Chronic Non-Cancer Risks Based on the 95th Percentile Annual Average Ambient Air Concentrations (µg/m^3) Estimated for 10–50,000 m from Releasing Facilities (Benchmark = 30)										
			10 m	30 m	60 m	100 m	1,000 m	2,500 m	5,000 m	10,000 m	15,000 m	25,000 m	50,000 m

95th percentile annual average concentrations for each OES. Similarly, the mean and median risks cancer are based are the mean and media of the 95th percentile annual average concentrations of all facilities associated with each OES.
[c] For each OES, EPA modeled the highest total (fugitive + stack) annual Toxic Release Inventory-reported release for each facility from 2015–2024 for facilities that reported using Form R.

Table_Apx I-2. General Population Chronic Non-Cancer Inhalation Risk Summary Table at 10–50,000 m from Reported NEI Facility Releases from 2014, 2017, and 2020 Based on Modeled Ambient Air Concentrations Estimated Using HEM5.0 [b c]

OES	Number of Releases[d]	Statistic	Chronic Non-Cancer Risks Based on the 95th Percentile Annual Average Ambient Air Concentrations (µg/m^3) Estimated for 10–50,000 m from NEI Releases (Benchmark = 30)										
			10 m	30 m	60 m	100 m	1,000 m	2,500 m	5,000 m	10,000 m	15,000 m	10,000 m	50,000 m
Manufacturing	399	max	1.15E01	8.83E00	2.92E01	6.94E01	3.81E03	1.78E04	5.88E04	1.75E05	3.44E05	7.83E05	2.22E06
		mean	4.24E03	3.34E03	9.60E03	1.58E04	3.89E05	1.47E06	5.73E06	1.69E07	3.19E07	6.96E07	1.96E08
		median	7.89E06	6.95E06	6.02E06	5.53E06	1.63E07	4.59E07	1.45E08	3.91E08	7.32E08	1.56E09	4.23E09
Repackaging	13	max	2.07E04	8.61E03	6.15E03	1.89E04	2.21E04	7.57E05	2.11E06	5.78E06	1.06E07	2.24E07	6.23E07
		mean	1.17E05	6.51E04	5.09E04	8.88E04	2.40E05	3.52E06	1.11E07	3.24E07	6.05E07	1.32E08	3.73E08
		median	1.63E06	6.64E05	3.45E05	3.70E05	5.10E06	2.11E07	6.32E07	1.89E08	3.53E08	7.78E08	2.32E09
Processing as a Reactant	133	max	1.17E02	3.16E02	8.61E02	8.81E02	4.76E04	8.43E04	6.54E05	2.24E06	4.20E06	9.21E06	2.82E07
		mean	1.21E04	2.63E04	4.71E04	6.32E04	1.29E06	3.95E06	1.57E07	5.73E07	1.13E08	2.56E08	7.59E08
		median	8.07E07	7.60E07	6.97E07	6.18E07	1.17E08	2.97E08	5.50E08	1.99E09	5.12E09	1.17E10	3.87E10
Processing into Formulation, Mixture, or Reaction Product	51	max	7.60E01	1.12E02	2.64E02	5.05E02	1.71E04	7.64E04	2.36E05	7.26E05	1.40E06	3.16E06	9.40E06
		mean	3.24E03	4.76E03	1.09E04	1.84E04	6.48E05	2.75E06	8.19E06	2.57E07	4.69E07	1.04E08	3.06E08
		median	6.17E09	1.99E09	1.73E08	8.63E07	1.18E08	2.30E08	5.39E08	1.61E09	2.49E09	4.76E09	1.26E10
Industrial Application of Adhesives and Sealants	104	max	6.29E03	1.77E04	2.68E04	4.46E04	6.96E05	1.60E06	3.43E06	8.96E06	1.73E07	3.93E07	1.07E08
		mean	1.47E05	2.59E05	4.13E05	6.31E05	1.21E07	3.92E07	1.03E08	2.57E08	4.67E08	9.79E08	2.44E09
		median	4.42E09	9.51E08	3.50E08	2.25E08	4.35E08	1.23E09	1.91E09	5.75E09	9.76E09	1.95E10	5.47E10

OES	Number of Releases[d]	Statistic	Chronic Non-Cancer Risks Based on the 95th Percentile Annual Average Ambient Air Concentrations (µg/m^3) Estimated for 10–50,000 m from NEI Releases (Benchmark = 30)										
			10 m	30 m	60 m	100 m	1,000 m	2,500 m	5,000 m	10,000 m	15,000 m	10,000 m	50,000 m
Industrial Application of Lubricants and Greases	1	max	8.12E03	8.97E03	2.23E04	5.27E04	2.84E06	1.60E07	4.60E07	1.26E08	2.50E08	5.95E08	1.55E09
		mean	8.12E03	8.97E03	2.23E04	5.27E04	2.84E06	1.60E07	4.60E07	1.26E08	2.50E08	5.95E08	1.55E09
		median	8.12E03	8.97E03	2.23E04	5.27E04	2.84E06	1.60E07	4.60E07	1.26E08	2.50E08	5.95E08	1.55E09
Non-Aerosol Cleaning and Degreasing	27	max	2.13E04	1.27E05	4.20E05	1.04E06	1.07E07	3.17E07	5.38E07	8.55E07	1.22E08	2.01E08	3.83E08
		mean	3.97E04	2.52E05	7.76E05	1.84E06	2.41E07	7.89E07	1.45E08	2.42E08	3.50E08	5.84E08	1.12E09
		median	3.50E04	2.47E05	6.73E05	1.52E06	5.85E07	2.68E08	8.07E08	2.40E09	4.50E09	9.70E09	2.61E10
Laboratory Use	4	max	1.94E04	5.77E04	1.78E05	4.50E05	2.20E06	5.37E06	1.29E07	3.37E07	6.11E07	1.25E08	3.60E08
		mean	4.13E04	1.40E05	3.71E05	7.43E05	7.46E06	1.95E07	4.75E07	1.25E08	2.26E08	4.64E08	1.34E09
		median	4.41E04	1.78E05	3.88E05	6.35E05	2.76E07	1.32E08	4.03E08	1.27E09	2.26E09	4.80E09	1.37E10
Waste Handling, Treatment, and Disposal (Incinerator)	21	max	1.80E03	2.68E03	8.47E03	1.84E04	1.03E06	4.95E06	1.57E07	3.74E07	7.11E07	1.52E08	4.16E08
		mean	1.86E04	2.74E04	6.59E04	1.48E05	8.43E06	4.36E07	1.46E08	3.37E08	6.51E08	1.44E09	4.08E09
		median	1.04E05	2.03E05	6.50E05	1.78E06	8.99E07	3.74E08	1.16E09	3.45E09	6.77E09	1.44E10	4.15E10
Waste Handling, Treatment, and Disposal (Landfill)	563	max	1.91E02	2.46E03	6.07E03	1.19E04	5.82E05	2.28E06	7.39E06	2.09E07	3.99E07	9.11E07	2.66E08
		mean	1.27E04	7.68E04	1.99E05	4.30E05	1.72E07	6.91E07	2.04E08	5.80E08	1.11E09	2.38E09	6.79E09
		median	1.06E05	2.60E05	7.10E05	1.51E06	4.32E07	1.66E08	4.90E08	1.45E09	2.78E09	6.23E09	1.79E10
Waste Handling, Treatment, and Disposal (Non-POTW WWT)	26	max	2.46E04	3.31E04	1.83E04	8.56E03	1.06E06	5.86E06	1.93E07	5.95E07	1.05E08	2.29E08	6.32E08
		mean	1.76E05	1.83E05	1.10E05	7.94E04	6.14E06	3.02E07	9.78E07	3.05E08	5.61E08	1.25E09	3.67E09
		median	1.01E06	8.75E05	6.84E05	9.94E05	4.64E07	1.88E08	5.24E08	1.54E09	2.89E09	6.45E09	1.90E10
Waste Handling, Treatment, and Disposal (POTW)	61	max	3.19E02	2.99E03	9.17E03	2.32E04	1.49E06	6.34E06	1.96E07	6.05E07	1.14E08	2.88E08	8.52E08
		mean	9.89E03	4.44E04	1.40E05	3.47E05	1.73E07	7.75E07	2.41E08	7.50E08	1.44E09	3.31E09	1.03E10
		median	6.42E05	1.86E06	4.81E06	4.09E06	1.64E08	8.62E08	2.59E09	8.19E09	1.55E10	3.49E10	9.61E10
Waste Handling, Treatment, and Disposal (Remediation)	32	max	8.63E02	3.35E03	7.72E03	1.55E04	6.16E05	1.56E06	3.78E06	1.03E07	1.76E07	3.80E07	1.21E08
		mean	1.97E04	7.06E04	1.58E05	2.94E05	6.14E06	1.95E07	5.19E07	1.47E08	2.60E08	5.66E08	1.75E09
		median	5.80E05	2.39E06	3.30E06	7.93E06	3.12E08	1.17E09	2.80E09	8.64E09	1.61E10	3.54E10	1.03E11

OES	Number of Releases[d]	Statistic	Chronic Non-Cancer Risks Based on the 95th Percentile Annual Average Ambient Air Concentrations (µg/m³) Estimated for 10–50,000 m from NEI Releases (Benchmark = 30)										
			10 m	**30 m**	**60 m**	**100 m**	**1,000 m**	**2,500 m**	**5,000 m**	**10,000 m**	**15,000 m**	**10,000 m**	**50,000 m**
Facilities not mapped to an OES [e]	3	max	2.58E03	2.77E04	7.55E04	9.20E04	1.99E05	5.86E05	1.73E06	3.79E06	6.99E06	1.67E07	4.29E07
		mean	3.96E04	2.40E05	5.83E05	9.37E05	5.55E06	1.70E07	5.04E07	1.13E08	2.08E08	4.96E08	1.28E09
		median	4.50E08	1.53E07	2.50E07	2.80E07	4.45E08	1.64E09	3.79E09	1.08E10	2.10E10	4.31E10	1.07E11

HEM5.0 = Human Exposure Model Version 5; NEI = National Emissions Inventory; OES = occupational exposure scenario; POTW = publicly owned treatment works; WWT = wastewater treatment

[a] The full inputs and results are presented in the *HEM NEI Input Files for 1,2-Dichloroethane* (U.S. EPA, 2026al) and *Supplemental Information on HEM NEI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2026bf).

[b] For NEI data, EPA used data reported 2014, 2017, and 2020 in this analysis. In the draft risk evaluation, EPA modeled all available data for 2014 and 2017 using AERMOD (U.S. EPA, 2025a). For this evaluation, EPA modeled, in HEM5.0, each facility that showed a risk greater than 1×10^{-6} based on the 95th percentile concentration at 10 m from the release location based on the analysis performed in the draft risk evaluation. EPA also modeled any releases that were new to the 2020 NEI if they were greater than the lowest release from 2014 and 2017 that resulted in a risk greater than 1×10^{-6} based on the 95th percentile concentration at 10 m from the release location. If a facility reported in multiple years and had total releases greater than the threshold described above, then EPA used the maximum release across all years in this analysis.

[c] At each distance there are 16 receptors that form a circle around the release location. HEM5.0 calculates an annual average at each point, giving 16 averages. The 95th percentile was calculated for these 16 averages for each release location and distance separately. The max values in this table are the highest of the 95th percentile annual average concentrations for each OES. Similarly, the mean and median are the mean and median of the 95th percentile annual average concentrations of all facilities associated with each OES.

[d] Number of releases associated with each OES, not the total number of facilities assessed, as a single facility can have multiple release points.

[e] Facilities were not mapped to an OES in cases where information on the 1,2-dichloroethane use at the site was not available.

Table_Apx I-3. Maximum 95th Percentile Chronic, Non-Cancer Risks Estimated within 100–2,500 m of Generic Facilities/Sites for OESs with EPA-Estimated Releases Based on Modeled Ambient Air Concentrations Estimated Using AERMOD[a b c]

OES	Meteorology [a]	Land Use	Maximum Chronic Non-Cancer Risk (Benchmark = 300)			Overall Confidence
			100–1,000 m	1,000 m	2,500 m	
Industrial Application of Adhesives and Sealants	Lake Charles, LA	Rural	128	5.79E02	2.33E03	Slight
	Lake Charles, LA	Urban	3.76E02	2.47E03	1.13E04	
Commercial Aerosol Products	Lake Charles, LA	Rural	1.85E05	9.23E05	4.38E06	Slight
	Lake Charles, LA	Urban	2.87E05	1.74E06	9.27E06	
Non-Aerosol Cleaning and Degreasing	Lake Charles, LA	Rural	3.92E03	4.39E04	2.68E05	Slight
	Lake Charles, LA	Urban	4.08E03	4.62E04	3.21E05	
Laboratory Use	Lake Charles, LA	Rural	1.34E07	1.27E08	7.34E08	Moderate
	Lake Charles, LA	Urban	1.35E07	1.34E08	8.10E08	

[a] See *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ae) for discussion of EPA modeled releases for generic facilities/sites.
[b] Chronic non-cancer risks are based on a continuous inhalation exposure at a single modeled distance.
[c] Chronic non-cancer risks were calculated at additional distances from 10–10,000 m from all facilities and can be found in *Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2026bd).
[d] See Table 3-3 for mapping of the OES to COU mapping for the OESs of Industrial Application of Adhesives and Sealants; Non-Aerosol Cleaning and Degreasing; and Laboratory Use. For the OES of Commercial Aerosol Products, the life cycle stage is Industrial use, the category is Solvents (for cleaning and degreasing), and the subcategory is Degreasing and cleaning solvents.
[e] For OESs with estimated releases from generic facilities/sites, EPA assumed meteorology stations for modeling of ambient air concentrations. EPA is presenting results when using the Lake Charles, LA, station in this table. Previous work has shown that the Lake Charles, LA, station tends to produce higher air concentrations relative to other meteorology stations available in AERMOD. EPA also modeled estimated releases from generic facilities/sites using the Sioux Falls, SD, meteorology station, which tends to produce central-tendency air concentrations relative to other stations. The results using the Sioux Falls, SD, station are presented in *Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2026bd).
[f] Rationale for the overall confidences can be found in *General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026ah).

Appendix J SUMMARY OF 1,2-DICHLOROETHANE AIR SAMPLING FROM TEST ORDER

In response to a test order, the Vinyl Institute's Consortium submitted a Draft Final Study Plan (DFSP) that was then reviewed by EPA. After addressing the Agency's comments, the Consortium submitted a revised DFSP that was subsequently approved by EPA in February 2023. The approved DFSP included the use of a modified NIOSH 1003 method capable of detecting below EPA's Occupational Exposure Values. The analytical method recommended in the Test Order, NIOSH 1003, utilizes a gas chromatography (GC), flame ionizer detector (FID) technique for analysis of samples. The working range of NIOSH 1003 for 1,2-dichloroethane is 16 to 1,320 parts per million (ppm) (16,000–1,320,000 ppb), which is significantly higher than EPA's provisional occupational exposure limit (pOEL) for 1,2-dichloroethane of 5 ppb (0.005 ppm). To allow for a comparison to this value, a validated method of sample analysis using a more sensitive analytical technique, gas chromatography with mass spectroscopy (GC/MS) was developed. The laboratory method validation report is included in Appendix K of the *Test Order Inhalation Monitoring Data Package for 1,1-Dichloroethane* (EPA-HQ-OPPT-2024-0114-0040). The sampling methodology that was used were the Assay Technology 525 TraceAir® II (AT525) activated charcoal passive badges and validation was performed to confirm that this media would result in similar performance as compared to the sorbent tube method recommended in NIOSH 1003.

The 1,2-dichloroethane inhalation monitoring was conducted from May 16 through November 28, 2023. A total of 268 full-shift samples and 124 task length samples across SEGs were collected at 9 facilities from 9 different companies of the Vinyl Institute's Consortium. At the 5 facilities that intentionally manufacture 1,2-dichloroethane, 162 full-shift samples, 77 task length samples, and 109 STEL samples were collected. At the 2 facilities that manufacture 1,2-dichloroethane as a byproduct, 53 full-shift samples, 21 task length samples, and 46 STEL samples were collected. At the 2 facilities that process 1,2-dichloroethane as a reactant, 53 full-shift samples, 26 task length samples, and 50 STEL samples were collected.

In February 2024, the Consortium submitted a final study report with the data requested by the Test Order that was reviewed and accepted by EPA. Of the 268 full-shift samples, 14 were non-detect for a percent non-detect of 5.22%. Validation results showed acceptable media and GC/MS method performance for 1,2-dichloroethane over the concentration range evaluated. The limit of quantification (LOQ) for the modified NIOSH 1003 method is below EPA's Occupational Exposure Value (see Table_Apx J-1) and was well below the original NIOSH 1003 method as presented previously in Table Apx F-1.

Table_Apx J-1. Overview and Comparison of OEV, LOD, and LOQ Parameters of NIOSH 1003 Modified

Parameter	Value	Unit
Occupational exposure value (OEV)	1.4E−02	ppm (or 0.058 mg/m^3)
Limit of detection (LOD)	4.8	ng/sample
	1.6	$\mu g/m^3$
	1.6E−03	mg/m^3
	0.40	ppb
	4.0E−04	ppm
Limit of quantification (LOQ)	17	ng/sample
	0.56	$\mu g/m^3$
	5.6E−04	mg/m^3
	0.14	ppb
	1.4E−04	ppm

Appendix K INFORMATION ON PERSONAL PROTECTIVE EQUIPMENT

Information on PPE from the Vinyl Institute Test Order Consortium

Under section 4(a) of TSCA, EPA issued a test order requiring manufactures and processors of 1,2-dichloroethane to develop and submit information for 1,2-dichloroethane. In response, the Vinyl Institute formed a testing consortium and provided data on occupational exposure (Stantec ChemRisk, 2024). The Vinyl Institute prepared a study plan to collect inhalation monitoring data, including identification of representative sites for sampling. The testing consortium provided inhalation monitoring information on nine sites from their members, including 5 facilities that manufacture 1,2-dichloroethane (from 16 sites), 2 facilities that process 1,2-dichloroethane, and 2 facilities that manufacture 1,2-dichlorethane as a byproduct. Sampling was conducted following EPA's review and approval of the study plan.

The Vinyl Institute test order report provided general descriptions of the use of PPE in the identified facilities during standard, task-specific, and emergency operations, as well as PPE that was worn by workers when inhalation monitoring was performed (Stantec ChemRisk, 2024). Additionally, during the inhalation monitoring study, data collection forms were utilized to collect information on PPE use, and such use of PPE during full, task, and short-term sampling was documented in Appendix N-Raw Sample Results of the final study report. A condensed summary of the use of PPE information is provided below. Additional information on PPE is provided in the *Occupational Exposure Assessment for 1,2-Dichloroethane.* Use of respiratory protection per OES for select SEGs (*e.g.,* those where potential risk is indicated) is further discussed in Section 5.3.3 (Risk Estimate for Workers).

According to the test order report (Stantec ChemRisk, 2024), standard PPE was described as "PPE worn during normal operations on a full to near full-shift basis"; task-specific PPE was described as PPE "used during specific batch events, worn for the duration of the task or during specific steps in the task as specified in the company-specific SOP"; and emergency PPE was described as PPE "used only in the event of an upset condition (*e.g.,* spill, leak, accidental release).". The test order report noted that the PPE type used was dependent on the process area and task performed as well as specifications in company-specific SOPs (details of which were not provided). For example, maintenance technicians were described as wearing additional PPE for specific maintenance tasks as necessary, and laboratory technicians were also described as wearing additional PPE when disposing of laboratory waste. Tables 12 to 14 of the Final Study Report provide a summary of different types of PPE used in production process, logistics work, and laboratory work areas.

Routine tasks conducted by ONUs (*e.g.,* office work) did not require access to process areas with exposure potential, and thus no PPE was required for these workers however, ONUs were described as wearing standard process area PPE when conducting process walkthroughs or other tasks that required them to enter process areas.

Respiratory Protection: According to the test order report, operators, maintenance, logistics, and laboratory personnel utilized different respiratory protection depending on the task performed and the type of chemical exposure associated with each task. Respiratory protection was not included as standard PPE in any work areas (production process, logistics, and laboratory) (see Tables 12–14 of the test order report; (Stantec ChemRisk, 2024). It is important to note that reported use of respiratory PPE varied by OES and SEG, as documented in Appendix N- Raw Sample Results of the final study report. This is further discussed in Section 5.3.3 (Risk Estimate for Workers). A general summary of task-based respiratory PPE worn by workers in manufacturing and processing settings from the Final Study Report is provided below:

Operators were generally described as wearing half- or full-face, air-purifying respirators during sample collection tasks (open or closed loop). This corresponds to an assigned protection factor (APF) 10 or 50 when the employer implements a continuing, effective respiratory protection program under the OSHA Respiratory Protection Standard.[18] Additionally, operators were described as wearing full-face respirators of varying types (APF 50–1,000) during other tasks with exposure potential such as process leak response, maintenance preparation activities, and filling totes.

Logistics technicians were generally described as wearing half- or full-face respirators (APF 10 or 50) during loading or offloading tasks, which required connecting and disconnecting process lines to railcars, barges, and trucks.

Maintenance technicians were generally described as wearing full-face airline respirators (APF 1,000) during major maintenance tasks (*e.g.,* line breaks and other equipment openings).

Laboratory technicians were generally described as wearing half-face respirator (APF 10) with organic vapor cartridges (when standards are weighed on benchtop). Certain laboratory personnel were described as wearing full-face air-purifying respirators (APF 1,000) during disposal of hazardous wastes from fume hoods.

ONUs were "primarily" not reported to wear respiratory protection during routine daily tasks, although one supervisor was described as wearing a full-face respirator (APF 50) while observing loading activities from 20 feet away.

Dermal Protection: According to the test order report, generally, within the production process areas, standard dermal PPE worn included neoprene, leather, or cut-resistant gloves and task-specific PPE included nitrile or viton/butyl gloves (Stantec ChemRisk, 2024). Similarly, in logistics work areas, standard dermal PPE included neoprene gloves and task specific PPE included heavy-duty nitrile gloves and eye protection. In the laboratory areas, standard PPE included nitrile gloves. There was no documentation on glove changeout or efficacy, and limited information was provided on type of glove worn relative to specific tasks (*e.g.,* chemical resistant gloves were listed as minimum PPE required during closed and open-loop tasks). Use of gloves was documented in Appendix N- Raw Sample Results of the final study report for the test order and varied by OES and SEG.

Information on PPE from Other Sources

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 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_Apx K-1 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.

[18] https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.134 (accessed November 10, 2025).

Table_Apx K-1. Assigned Protection Factors 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	25
3. Supplied-Air Respirator (SAR) or Airline Respirator					
• Demand mode		10	50		
• Continuous flow mode		50	1,000	25/1,000	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)					

Hand protection provisions are provided in CFR 1910.138, but OSHA has not established protection factors for gloves. OSHA's hand protection standard (29 CFR 1910.138) requires 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.

EPA also gathered information on PPE applicable to the OESs assessed in this risk evaluation that was available in other sources such as EPA-developed GSs and OECD ESDs and NIOSH HHEs, and safety data sheets. This information is summarized below in Table_Apx K-2.

Table_Apx K-2. Other Information on PPE for OES Not Covered in the Test Order

OES	PPE Information
Repackaging	The Chemical Repackaging GS indicated that limited information was found regarding typical PPE workers used during repackaging processes. One chemical wholesaler website indicated that commonly used PPE includes safety glasses, face shields, aprons, and gloves, while engineering controls at another site include vacuum system and centrifugal degassing (U.S. EPA, 2022a).
Processing into Formulation, Mixture, or Reaction Product	The ESD on Adhesive Formulation indicated that no information on typical PPE specific to adhesive formulation was found. Chemical submissions submitted to EPA by adhesive chemical manufacturers showed that, at a minimum, all manufacturers recommended the use of gloves and safety glasses with side shields or goggles. Approximately half of the submissions also recommended the use of some kind of ventilation and respirators if necessary. One submission for a hot-melt adhesive chemical also specifically recommended the use of thermal gloves (OECD, 2009a). EPA also received worker protection information, including on the use of chemical-resistant gloves, safety glasses, Tyvek jackets, and engineering controls, from the U.S. Department of Energy related to activities associated with this COU (DOE, 2025).
Distribution in Commerce	None found.
Industrial Application of Adhesives and Sealants	The ESD on the Use of Adhesives indicated that the flexible packaging manufacturing industry utilizes the following PPE: chemical-resistant gloves and safety glasses (OECD, 2015). A NIOSH HHE for a coating facility (using trichloroethylene) indicates that PPE included single cartridge NIOSH-approved respirators during the mixing and spraying of coatings. The spray painters also used a paper helmet and goggles during paint mixing or applying coatings. The HHE noted that while the painters wore respirators, the foreman did not (Chrostek, 1981). The Shinko Adhesive SDS containing 1,2-dichloroethane recommends that users wear protective gloves and tightly sealed googles when handling the product (Co. and L, 2010).
Industrial Application of Lubricants and Greases	The solid film lubricant SDS containing 1,2-dichloroethane recommends that users wear eye protection and protective gloves, and use a respirator when ventilation is inadequate (Products, 2019).
Commercial Aerosol Products	The process cleaner SDS containing 1,2-dichloroethane recommends that users wear safety glasses with side shields, chemical resistant clothing and footwear, chemical resistant gloves, and a NIOSH approved respirator with organic vapor cartridge filter when handling the product (Corp, 2015).
Non-Aerosol Cleaning and Degreasing	The ESD on the Use of Vapor Degreasers summarized a monitoring study of worker exposure at 5 vapour degreasing facilities across several industries. Only 1 of 5 facilities studied indicated that respiratory protection was used. At this facility, 1 worker (out of 31) effectively used the respirator for less than 15–20 minutes for the entire work shift. Two other workers at the facility briefly wore air-purifying respirator but did not wear it properly and failed quantitative fit testing. Respirators were not used by other employees or in other facilities. The study also reported that only few workers occasionally wore gloves, and those who wore gloves did not choose the proper glove material for the vapor degreasing chemical (OECD, 2021).

OES	PPE Information
	NIOSH HHEs for various vapor degreasing facilities (using trichloroethylene) were varied, some mentioning glove and respirator use. When gloves and respirators were not use, the NIOSH report typically included them in their recommendations (Seitz and Driscoll, 1989; Daniels et al., 1988; NIOSH, 1984; Lewis, 1980; NIOSH, 1973).
Laboratory Use	Use of Laboratory Chemicals GS indicated that the Occupational Exposure to Hazardous Chemicals in Laboratories standard (29 CFR 1910.1450) requires that laboratories have a written Chemical Hygiene Plan (CHP) (OSHA, 2011). The CHP must include criteria for the use of PPE and engineering controls. Examples of PPE include respirators, face shields, goggles, and disposable gloves. OSHA requires the use of eye or face protection where there is potential exposure from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation. Hand protection, such as gloves, is required when hands are 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. Respiratory protection is required if necessary to protect the health of individuals (U.S. EPA, 2023c).
Waste Handling, Treatment, and Disposal	None found.