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Environmental Exposure Assessment for 1,2-Dichloroethane

Technical Support Document for the Risk Evaluation

CASRN 107-06-2

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KEY ABBREVIATIONS AND ACRONYMS

7Q10	Lowest 7-day average flow that occurs (on average) once every 10 years
AERMOD	AMS/EPA Regulatory Model
AUF	Area use factor
BAF	Bioaccumulation factor
BCF	Bioconcentration factor
CASRN	Chemical Abstracts Service Registry Number
COC	Concentration of concern
COU	Condition of use
DMR	Discharge Monitoring Report
E-FAST	Exposure and Fate Assessment Screening Tool
EPA	Environmental Protection Agency (U.S.)
FIR	Feed intake rate
HEM	Human Exposure Model
LOD	Limit of detection
ND	Non-detect
NEI	National Emissions Inventory
OES	Occupational exposure scenario
POTW	Publicly owned treatment works
RQ	Risk quotient
SIR	Soil or sediment intake rate
SSL	Soil screening levels
TRI	Toxics Release Inventory
TSCA	Toxic Substances Control Act
TSD	Technical support document
U.S.	United States
VVWM-PSC	Variable Volume Water Mode – Point Source Calculator
WIR	Water intake rate
ww	Wet weight
WWT	Wastewater treatment

SUMMARY

This technical support document (TSD) accompanies the Toxic Substances Control Act (TSCA) *Risk Evaluation for 1,2-Dichloroethane* (also called the “risk evaluation”) (U.S. EPA, 2026d) and describes the environmental exposures through surface water, sediment, soil, air, and diet (via trophic transfer). Based on the fate and transport and ecological exposure analyses presented in (U.S. EPA, 2026a, b), respectively, the main environmental exposure pathways for 1,2-dichloroethane are surface water and soil. Although inhalation is not expected to be a significant pathway for ecological exposure, air deposition to soil, followed by uptake of 1,2-dichloroethane through incidental ingestion and uptake by plants, are expected to be significant pathways. Whereas 1,2-dichloroethane exposure may also occur via land application of biosolids, soil concentrations through biosolid application are expected to be negligible based on low sorption of 1,2-dichloroethane to solids. Additionally, modeled quantities from biosolid application are lower than the estimated amount of 1,2-dichloroethane occurring from air deposition to soil (for additional details, see the *Chemistry and Fate and Transport Assessment for 1,2-Dichloroethane* and the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026a, b). Thus, land application of biosolids was not assessed quantitatively.

Due to the low availability of relevant, real-world biomonitoring data for exposure media or biota, exposures to aquatic and terrestrial species were assessed using modeled data and known maximum facility releases of 1,2-dichloroethane for each condition of use (COU) under TSCA and occupational exposure scenario (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 organism’s lifespan (bioaccumulation) if the chemicals 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 or biomagnify 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, 1,2-dichloroethane 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, 2026a). 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). Measured concentrations of 1,2-dichloroethane in tissues of aquatic organisms have been reported; accordingly, dietary exposure is a relevant pathway for wildlife.

Assessed aquatic trophic transfer included the ingestion of fish and crayfish by mink (representative aquatic-dependent mammal) and belted kingfishers (representative aquatic-dependent bird). Terrestrial trophic transfer included ingestion of plants by meadow voles and northern bobwhites (representative herbivores), ingestion of earthworms by short-tailed shrews and American woodcocks (representative insectivores), and ingestion of the representative herbivores and representative insectivores by kestrels (representative avian predator).

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

1 APPROACH AND METHODOLOGY

There are two major environmental compartments for 1,2-dichloroethane exposures to ecological receptors—soil (from releases to air and subsequent air deposition) and surface water (from releases to water) (see *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026b)). The U.S. Environmental Protection Agency (EPA or the Agency) assessed 1,2-dichloroethane exposures via surface water, sediment, soil, and air, which were used to determine risks to aquatic and terrestrial species (see *Risk Evaluation for 1,2-Dichloroethane* (U.S. EPA, 2026d). Exposure from air releases to ecological species was assessed via deposition to soil.

EPA estimated 1,2-dichloroethane concentrations from surface water releases following a tiered approach based on Toxic Release Inventory (TRI-) and Discharge Monitoring Report (DMR)-reported releases (2019–2024) as described in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026b). The Agency also modeled 1,2-dichloroethane concentrations in soil via air deposition from TRI-reported emissions, using EPA's Human Exposure Model (HEM), as described in the *Environmental Media Assessment for 1,2-Dichloroethane* TSD (U.S. EPA, 2026b). EPA modeled air deposition for TRI data from 2015 to 2024. The distance of 10 m from source for TRI-reported emissions was selected as the most conservative scenario because the highest concentrations occurred at this distance from fugitive emissions. Although deposition from both National Emissions Inventory (NEI; 2014 and 2017) and TRI (2015–2020) releases was modeled for the draft risk evaluation, EPA screened using the highest resulting soil and soil pore water concentrations across the entire dataset as a conservative approach, which was based on a TRI-reported release of 1,2-dichloroethane. The Agency expects the TRI releases to be protective since the entire facility's releases are modeled at one emission point, whereas NEI-reported releases are spread out through multiple points of release—thus only TRI releases from more recent years (2021–2024) were modeled for the 1,2-dichloroethane final risk evaluation. Further refinement was not conducted for the air deposition to soil pathway because the screening scenario did not result in risk quotients (RQs) above 1 (U.S. EPA, 2026d).

EPA used calculated soil concentrations to assess risk to terrestrial species via trophic transfer (see Section 4). Specifically, the Agency based trophic transfer of 1,2-dichloroethane and potential risk to terrestrial animals on modeled air deposition to soil. Potential risk to aquatic-dependent wildlife was screened using surface water and benthic pore water concentrations modeled via Variable Volume Water Mode – Point Source Calculator (VVWM-PSC) for the COU/OES with the highest surface water concentration, Disposal/Waste handling, treatment, and disposal (non-publicly owned treatment works [POTW] wastewater treatment [WWT]) in combination with 1,2-dichloroethane fish and crayfish concentrations, using the estimated BCF of 4.4 (see *Chemistry and Fate and Transport Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026a)). Additional exposure factors for terrestrial organisms used within the trophic transfer analyses are presented in Section 4.1. Application of exposure factors and hazard values for organisms at different trophic levels is detailed within Section 4.2 and used equations described in EPA's *Guidance for Developing Ecological Soil Screening Levels* (U.S. EPA, 2005a).

2 EXPOSURES TO AQUATIC SPECIES

2.1 Measured Concentrations in Aquatic Species

There are limited data available on 1,2-dichloroethane concentrations in fish and other invertebrates. A study in coastal Japan found a concentration of 0.28 µg/L 1,2-dichloroethane in mussels (*Mytilus edulis*; n = 2), and a similar concentration (0.29 µg/L; n = 2) of another chlorinated solvent, 1,1,2,2-tetrachloroethane (non-detects [ND] not reported; limit of detection [LOD] not reported; (Yasuhara and Morita, 1987)). A study in Lake Pontchartrain in Louisiana found 1,2-dichloroethane concentrations of 95 µg/kg ww (wet weight) in oysters (*Crassostrea virginica*; n = 5) and 1 to 1.5 µg/kg ww in clams (*Rangia cuneata*; sample size not reported; LOD not reported; (Ferrario et al., 1985)). Other similar chlorinated solvents—including 1,1,1-trichloroethane, 1,1-dichloroethane, and trichloroethylene—reported concentrations of 0.6 to 310 µg/kg ww in oysters (*C. virginica* and *C. gigas*; n = 5 or not reported) and 0.8 to 160 µg/kg ww in clams (*R. cuneata* and *Tapes japonica*; sample size not reported, ND for 1,1-dichloroethane), in the same Lake Pontchartrain study as well as in a study in Japan (limit of quantitation [LOQ] = 0.1 µg/kg or not reported; (Gotoh et al., 1992; Ferrario et al., 1985)). No reasonably available data on 1,2-dichloroethane concentrations in fish tissue were identified; however, data in fish muscle and liver tissue for other chlorinated solvents ranged from 0.51 to 4.9 µg/kg for 1,1,1-trichloroethane (n = 9–20; LOD = 6×10^{-3} µg/kg) and 0.36 to 29 µg/kg for trichloroethylene (n = 6–20; LOD = 2×10^{-2} µg/kg) (NDs not reported; (Roose, 1998, 645743}). One study in Oslo, Norway, tested for but did not detect 1,2-dichloroethane and trichloroethylene in fish livers (cod [*Gadus morhua*]), fish fillets (perch [*Perca fluviatilis*] and roach [*Rutilus rutilus*]), whole fish (perch, ruffe [*Acerina cernua*] and minnow [*Phoxinus phoxinus*]), blue mussels (*Mytilus edulis*), snails (*Littorina* sp.), shrimp (*Pandalus borealis*), krill (*Meganyctiphanes norvegica*), and crayfish (*Astacus astacus*; detection limit of 20 µg/kg dry weight; (COWI A/S, 2018)).

Because these studies report limited details on non-detects and LODs and report few samples per study (sample sizes ranged from 2–20 or are not reported), the data are insufficient for use in calculating exposure to 1,2-dichloroethane. Additionally, these studies are not associated with known discharges but rather represent distant or ambient exposure. Due to the low amount of animal tissue data as well as the lack of surface water data associated with the concentrations reported above, 1,2-dichloroethane concentrations in fish and crayfish were modeled as described below to estimate exposure.

2.2 Modeled Concentrations in Aquatic Species

2.2.1 Modeled Concentrations Under Normal Conditions

EPA used VVWM-PSC to estimate 1,2-dichloroethane surface water, benthic pore water, and particulate sediment concentrations as described in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026b) for one COU (Disposal) used in the aquatic risk assessment and in the screening-level trophic transfer risk assessment. EPA calculated 1,2-dichloroethane concentrations in fish and crayfish by multiplying the EPI Suite™-generated bioconcentration factor (BCF) of 4.4 by the surface water (fish) and benthic pore water (crayfish) concentrations. The EPI Suite™-generated BCF value was selected for use in these calculations because the experimental and estimated BCF values showed similar bioaccumulation potential, ranging from 2 to 4.4, and the estimated BCF of 4.4 was the highest value that is appropriate for use in a conservative screening scenario (U.S. EPA, 2026a). Refinement of the BCF value used was not conducted as the screening trophic transfer analysis did not result in RQ values above 1 (U.S. EPA, 2026d). The calculated concentrations of 1,2-dichloroethane in fish and crayfish were 7,568 and 6,996 µg/kg, respectively, for the Disposal COU. The calculated concentrations are two orders of magnitude greater than the 1,2-dichloroethane concentration reported in oysters (Ferrario et al.,

1985) and the highest reported concentrations of other chlorinated solvents in fish tissues (Roose, 1998, 645743}, indicating the calculated concentrations represent a conservative scenario. These whole fish and crayfish 1,2-dichloroethane concentrations were used within the screening-level assessment for trophic transfer described below in Section 4.

Table 2-1. Estimated Maximum Concentrations of 1,2-Dichloroethane in Aquatic Media and Biota Using Facility Operating Days per Year as the Days of Release

COU (Life Cycle Stage/ Category/ Subcategory)	OES	Facility NPDES	Surface Water Concentration (µg/L)	Pore Water Concentration (µg/L)	Sediment Concentration (µg/kg)	Fish Concentration (µg/kg)	Crayfish Concentration (µg/kg)
Disposal/Disposal/Disposal	Waste Handling, Treatment, and Disposal (Non-POTW WWT)	PA0080594	1,720	1,590	4,320	7,568	6,996
COU = condition of use; OES = occupational exposure scenario; POTW = publicly owned treatment works; WWT = wastewater treatment							

3 EXPOSURES TO TERRESTRIAL SPECIES

3.1 Measured Concentrations in Terrestrial Species

Only one environmental study was identified that tested for 1,2-dichloroethane or related solvents in terrestrial organisms. This study of urban rats in Oslo, Norway, tested for but did not detect 1,2-dichloroethane and trichloroethylene in the livers of rats (n = 11; LOD = 20 µg/kg dry weight) (COWI A/S, 2018).

3.2 Modeled Concentrations in Terrestrial Species

Based on the fate and transport and ecological exposure analyses presented in (U.S. EPA, 2026a, b), releases to air result in one of the main environmental exposure pathways for 1,2-dichloroethane. 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 evaluated the relative contribution of inhalation exposures for terrestrial mammals and birds per the *Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs)* (U.S. EPA, 2003a). That guidance shows that the contribution of inhalation to the exposure dose is less than 0.01% and 1% for ambient air and particulates, respectively. Another factor that guided EPA's decision to qualitatively assess 1,2-dichloroethane inhalation exposure to terrestrial receptors at a population level was the lack of ecologically relevant endpoints from available terrestrial mammal inhalation hazard data.

The contribution of air releases to exposure to terrestrial species was assessed quantitatively via air deposition to soil. Air deposition to soil modeling is described in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026b). EPA determined the primary exposure pathway for terrestrial organisms is through soil via dietary uptake and incidental ingestion. As described in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026b), HEM was used to assess the estimated release of 1,2-dichloroethane to soil via air deposition 10 m from the facility from emissions reported to TRI (2015–2024). Annual application of biosolids was also considered as a potential source of 1,2-dichloroethane in soil as described in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026b). However, the quantities of 1,2-dichloroethane through biosolid application are expected to be negligible based on its low sorption to solids (see Section 3.8 of the *Chemistry and Fate and Transport Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026a)).

Exposure from aggregated air deposition to soil and biosolid land application was not assessed because the highest soil and soil pore water concentrations occurred 10 m from the source, which would not be a relevant distance to aggregate with biosolid land application. If these routes were aggregated at the 10-meter air deposition distance, resulting aggregated soil and soil pore water concentrations would not exceed relevant hazard thresholds. Thus, RQ values were only calculated for the air deposition exposure pathway (U.S. EPA, 2026d). Resulting soil pore water concentrations from daily air deposition were calculated as described in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026b). The maximum soil and soil pore water concentrations resulting from air deposition for each OES are reported in Table 3-1.

Table 3-1. Modeled Maximum Concentrations of 1,2-Dichloroethane from Air Deposition to Soil and Soil Pore Water by COU/OES

COU (Life Cycle Stage/ Category/ Subcategory)	OES	Soil (µg/kg)	Soil Pore Water Concentration (µg/L)
Manufacture/ Domestic manufacture/ Domestic manufacture	Manufacturing	1,352	621
Manufacturing/ Import/ Import	Repackaging	2.6	1.2
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	14	6.4
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	178	82
Processing/ Processing – Incorporated into formulation, mixture, or reaction product/Processing aids: Specific to petroleum production; Plastics material and resin manufacturing			
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			
Industrial Use/ Solvents (for cleaning and degreasing)/ Degreasing and cleaning solvents	Non-Aerosol Cleaning/Degreasing	7.35E−05	3.38E−05
Disposal/ Disposal/ Disposal	Waste Handling, Disposal, and Treatment (Incinerator)	5.3	2.5
COU = condition of use; OES = occupational exposure scenario			

Terrestrial plants were assessed for exposure to 1,2-dichloroethane soil pore water concentrations, and 1,2-dichloroethane soil and soil pore water concentrations were used for estimating dietary exposure through trophic transfer, as described in the *Risk Evaluation for 1,2-Dichloroethane* (U.S. EPA, 2026d). For trophic transfer, EPA assumed (1) 1,2-dichloroethane concentrations in the plant dietary species *Trifolium* sp. as equal to the 1,2-dichloroethane maximum soil pore water concentrations for daily air deposition to soil (see Table_Apx A-1), and (2) in earthworms (*Eisenia fetida*) as equal to the aggregate of maximum soil and soil pore water concentrations from daily air deposition of 1,2-dichloroethane. These are both conservative assumptions because they presume that all 1,2-dichloroethane in the soil and soil pore water is taken up into the organism and the assessment used the highest soil and soil pore water concentrations. The highest concentrations of 1,2-dichloroethane resulting from air deposition to soil in *Trifolium* sp. and earthworms were 0.62 and 2.0 mg/kg, respectively, for the Manufacture – Domestic manufacture COU/Manufacturing OES.

4 TROPHIC TRANSFER EXPOSURE

4.1 Trophic Transfer (Wildlife)

Trophic transfer is the process by which chemical contaminants can be taken up by organisms through dietary and media exposures and be transferred from one trophic level to another. EPA assessed the available studies collected in accordance with the *Draft Systematic Review Protocol Supporting TSCA Risk Evaluations for Chemical Substances Version 1.0; A Generic TSCA Systematic Review Protocol with Chemical-Specific Methodologies* (also called "Draft Systematic Review Protocol") (U.S. EPA, 2021) and *Systematic Review Protocol for 1,2-Dichloroethane* (U.S. EPA, 2026e) relating to the biomonitoring of 1,2-dichloroethane.

1,2-Dichloroethane is released to the environment by multiple exposure pathways (see *Chemistry and Fate and Transport Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026a). The primary exposure pathway for terrestrial mammals and birds is through diet. On land, deposition of 1,2-dichloroethane from air to soil is the primary exposure pathway for dietary exposure to terrestrial mammals and birds, whereas the primary exposure pathway for aquatic organisms is surface water releases from facilities. The benthic pore water 1,2-dichloroethane concentration determined by VVWM-PSC modeling based on the COU/OES-specific number of operating days per year for the Disposal COU (see the risk evaluation (U.S. EPA, 2026d)) is approximately equal to the surface water concentration (see *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026b))—indicating that exposure to 1,2-dichloroethane through the aquatic dietary exposure pathway for higher trophic levels will occur from consumption of organisms in the water column or sediment.

Representative mammal and bird species were chosen to connect the 1,2-dichloroethane transport exposure pathway via terrestrial trophic transfer. Uptake of contaminated soil pore water is connected by the representative plant *Trifolium* sp., through the representative herbivorous mammal meadow vole (*Microtus pennsylvanicus*) and the representative herbivorous bird northern bobwhite (*Colinus virginianus*), to the predatory American kestrel (*Falco sparverius*). The meadow vole and northern bobwhite were selected to represent herbivores as the majority of their diet consists of plant matter and they are native North American species. *Trifolium* sp. was selected as the representative plant because plants of this genus comprise a significant portion of the meadow vole diet (Lindroth and Batzli, 1984). Uptake of aggregated contaminated soil and soil pore water is connected by the representative soil invertebrate earthworm (*Eisenia fetida*) to the representative insectivorous mammal, short-tailed shrew (*Blarina brevicauda*), and the representative insectivorous bird, the American woodcock (*Scolopax minor*), through to the American kestrel. The short-tailed shrew and American woodcock were selected to represent insectivores as they both are highly insectivorous and native North American species. The earthworm was selected as the representative soil invertebrate because earthworms and other annelids comprise a significant portion of the short-tailed shrew diet (U.S. EPA, 1993). American kestrel was selected as the representative predator because it is a native North American species with a varied diet that includes invertebrates and vertebrates.

Meadow vole primarily feed on plant shoots with a preference for dicotyledonous (dicot) shoots in the summer and fall. When green vegetation is not available, meadow vole will feed on other foods such as seeds and roots. Depending on the location and season, dicot shoots may comprise 12 to 66% of the meadow vole's diet (U.S. EPA, 1993). Northern bobwhite primarily consume seeds as well as a smaller portion of fruits and green vegetation with total plant foods comprising 78.7 to 96.8% (crop and gizzard volume) of their diet. Short-tailed shrew primarily feed on invertebrates with earthworms comprising approximately 31% (stomach volume) to 42% (frequency of occurrence) of their diet. American woodcock primarily feed on invertebrates with a preference for earthworms. When earthworms are not available, other soil invertebrates and a small proportion of vegetation may be consumed. Depending on the location and season, earthworms may comprise 58 to 99% of the American woodcock diet. American kestrel have a varied diet that includes invertebrates, mammals, birds, and reptiles. The proportion of prey type will vary by habitat and prey availability. For trophic transfer analysis, the American kestrel diet comprised equal proportions of the three representative prey species, which approximates the dietary composition of the American kestrel winter diet reported by Meyer (1987).

The calculations for assessing 1,2-dichloroethane exposure from soil uptake by plant and earthworm and the transfer of 1,2-dichloroethane through diet to higher trophic levels are presented in Section 4.2; biota concentrations are provided in Table_Apx A-2 and Table_Apx A-3. Because surface water sources for wildlife water ingestion are typically ephemeral, the trophic transfer analysis for terrestrial organisms assumed 1,2-dichloroethane exposure concentration for wildlife water intake are equal to soil concentrations for each corresponding exposure scenario. Because these concentrations also come from a distance relatively close to the release source, this is a conservative assumption.

The representative, semi-aquatic terrestrial mammal species is the American mink (*Mustela vison*), which has a highly variable diet depending on their habitat. In a riparian habitat, American mink derive 74 to 92% of their diet from aquatic organisms, which includes fish, crustaceans, birds, mammals, and vegetation (Alexander, 1977). The representative aquatic-dependent avian species is the belted kingfisher (*Megaceryle alcyon*), which is a year-round resident across most of the United States that can typically be found near water. The belted kingfisher primarily consumes fish but also consumes crayfish (U.S. EPA, 1993).

Similar to soil concentrations used for terrestrial organisms, the highest modeled surface water and benthic pore water 1,2-dichloroethane concentration across exposure scenarios were used as surrogates for the 1,2-dichloroethane concentration found in the American mink's and American kestrel's diets in the form of both water intake and a diet of either fish (bioconcentration from surface water) or crayfish (bioconcentration from benthic pore water). For trophic transfer, fish and crayfish concentrations shown in Table 2-1 are used in conjunction with trophic transfer calculations provided in Section 4.2.

4.2 Trophic Transfer (Dietary Exposure)

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 (AUF) as well as 1,2-dichloroethane absorption from diet, soil, sediment, and water. This chlorinated solvent has releases to both aquatic and terrestrial environments as shown in the *Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026c). Due to lack of reasonably available measured data, a BCF of 4.4 for 1,2-dichloroethane was estimated using EPI Suite™ (U.S. EPA, 2012). Table 2-1 reports estimated concentrations of 1,2-dichloroethane within representative fish and crayfish tissue based on the estimated BCF. A screening-level analysis was conducted for trophic transfer, which employs a combination of conservative assumptions (*i.e.,* conditions for several exposure factors included within Equation 4-1) and use of the maximum values obtained from modeled and/or monitoring data from relevant environmental compartments.

Following the basic equations reported in Chapter 4 of the *U.S. EPA Guidance for Developing Ecological Soil Screening Levels* (U.S. EPA, 2005a), wildlife receptors may be exposed to contaminants in soil by two main pathways: incidental ingestion of soil while feeding as well as ingestion of food items that have become contaminated due to uptake from soil. The general equation used to estimate dietary exposure via these two pathways is provided below. It was adapted to include consumption of water contaminated with 1,2-dichloroethane, and for semi-aquatic mammals—incidental ingestion of sediment instead of soil (see also Table 4-1).

Exposure factors for food intake rate (FIR) and water intake rate (WIR) were sourced from the EPA's *Wildlife Exposure Factors Handbook* (U.S. EPA, 1993). The proportion of total food intake that is soil (P_S) is represented at the 90th percentile for representative taxa (short-tailed shrew, meadow vole, northern bobwhite, American woodcock, and American kestrel) and sourced from calculations and modeling in EPA's *Guidance for Developing Ecological Soil Screening Levels* (U.S. EPA, 2005a). The proportion of total food intake that is sediment (P_S) for representative taxa (American mink) was calculated by dividing the sediment ingestion rate (SIR) by food consumption, which was derived by multiplying the FIR by the body weight of the mink (sourced from *Wildlife Exposure Factors Handbook* (U.S. EPA, 1993)). The SIR for American mink was sourced from calculations in EPA's *Second Five Year Review Report Hudson River PCBs Superfund Site Appendix 11 Human Health and Ecological Risks* (U.S. EPA, 2017). Incidental sediment ingestion is expected to be negligible for belted kingfishers (Tetra Tech, 2018).

Equation 4-1.

$$DE_j = \left(\left[S_j * P_s * \mathrm{FIR} * \mathrm{AF}_{sj} \right] + \left[W_j * AF_{wj} * \mathrm{WIR} \right] + \left[\sum_{i=1}^{N} B_{ij} * P_i * \mathrm{FIR} * \mathrm{AF}_{ij} \right] \right) * AUF$$

Where:

DE_j = Dietary exposure for contaminant (*j*) (mg/kg-body weight [bw]/day)
S_j = Concentration of contaminant (*j*) in soil or sediment (mg/kg dry weight)
P_s = Proportion of total food intake that is soil or sediment (kg soil/kg food; SIR ÷ [(FIR)(bw)])
SIR = Sediment intake rate (kg of sediment [dry weight] per day)
FIR = Food intake rate (kg of food [dry weight] per kg body weight per day)
AF_{sj} = Absorbed fraction of contaminant (*j*) from soil or sediment (*s*) (for screening purposes set = 1)
W_j = Concentration of contaminant (*j*) in water (mg/L); assumed to equal soil pore water concentrations for the purposes of terrestrial trophic transfer
AF_{wj} = Absorbed fraction of contaminant (*j*) from water (*w*) (for screening purposes set = 1)
WIR = Water intake rate (kg of water per kg body weight per day)
N = Number of different biota type (*i*) in diet
B_{ij} = Concentration of contaminant (*j*) in biota type (*i*) (mg/kg dry weight)
P_i = Proportion of biota type (*i*) in diet
AF_{ij} = Absorbed fraction of contaminant (*j*) from biota type (*i*) (for screening purposes set = 1)
AUF = Area use factor (for screening purposes set = 1)

Table 4-1. Terms and Values Used to Assess Potential Trophic Transfer of 1,2-Dichloroethane for Terrestrial- and Aquatic-Dependent Receptors

Term	Earthworm (*Eisenia fetida*)	Short-Tailed Shrew (*Blarina brevicauda*)	American Woodcock (*Scolopax minor*)	*Trifolium* sp.	Meadow Vole (*Microtus pennsylvanicus*)	Northern Bobwhite (*Colinus virginianus*)	American Kestrel (*Falco sparverius*)	American Mink (*Mustela vison*)	Belted Kingfisher (*Megaceryle alcyon*)
P_s	1	3.0E−02 [a]	0.16 [a]	1.0	3.2E−02 [a]	0.14 [a]	5.7E−02 [a]	5.4E−04 [b]	0 [c]
SIR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.2E−04 [e]	0
FIR	1	0.555 [d]	0.77 [d]	1	0.325 [d]	0.07775 [d]	0.3 [d]	0.22 [d]	0.5 [d]
AF_{sj}	1	1	1	1	1	1	1	1	1
AF_{wj}	1	1	1	1	1	1	1	1	1
WIR	1	0.223 [d]	0.1 [d]	1	0.21 [d]	0.115 [d]	0.115 [d]	0.105[d]	0.11 [d]
N	1	1	1	1	1	1	2 to 3 [g]	1	1
P_i	1	1	1	1	1	1	1	1	1
AF_{ij}	1	1	1	1	1	1	1	1	1
bw	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.0195 kg [f]	N/A
AUF	1	1	1	1	1	1	1	1	1
Highest values based on daily air deposition									
S_j [h]	2.0 mg/kg [i] 1,2-Dichloroethane	2.0 mg/kg [i] 1,2-Dichloroethane	2.0 mg/kg[i] 1,2-Dichloroethane	0.62 mg/kg [j] 1,2-Dichloroethane	2.0 mg/kg [i] 1,2-Dichloroethane	2.0 mg/kg [i] 1,2-Dichloroethane	2.0 mg/kg [i] 1,2-Dichloroethane	N/A	N/A
W_j	0.62 mg/kg [i] 1,2-Dichloroethane	0.62 mg/kg [i] 1,2-Dichloroethane	0.62 mg/kg [i] 1,2-Dichloroethane	0.62 mg/kg [i] 1,2-Dichloroethane	0.62 mg/kg [i] 1,2-Dichloroethane	0.62 mg/kg [i] 1,2-Dichloroethane	0.62 mg/kg [i] 1,2-Dichloroethane	N/A	N/A
B_{ij}	2.0 mg/kg [i] 1,2-Dichloroethane (soil and soil pore water)	2.0 mg/kg 1,2-Dichloroethane (worm)	2.0 mg/kg 1,2-Dichloroethane (worm)	0.62 mg/kg [j] 1,2-Dichloroethane (soil pore water)	0.22 mg/kg 1,2-Dichloroethane (plant)	7.0E−02 mg/kg 1,2-Dichloroethane (plant)	2.0 mg/kg 1,2-Dichloroethane (worm) 1.1 mg/kg 1,2-Dichloroethane (shrew) 1.8 mg/kg 1,2-Dichloroethane (woodcock) 0.22 mg/kg 1,2-Dichloroethane (vole) 7.0E−02 mg/kg 1,2-Dichloroethane (bobwhite)	N/A	N/A
Highest values based on release to surface water									
S_j [h]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.32 mg/kg [k]	N/A

Term	**Earthworm (*Eisenia fetida*)**	**Short-Tailed Shrew (*Blarina brevicauda*)**	**American Woodcock (*Scolopax minor*)**	***Trifolium* sp.**	**Meadow Vole (*Microtus pennsylvanicus*)**	**Northern Bobwhite (*Colinus virginianus*)**	**American Kestrel (*Falco sparverius*)**	**American Mink (*Mustela vison*)**	**Belted Kingfisher (*Megaceryle alcyon*)**
								1,2-Dichloroethane	
W_j	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.7 mg/L [l] 1,2-Dichloroethane	1.7 mg/L [l] 1,2-Dichloroethane
B_{ij}	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.8 mg/kg [m] 1,2-Dichloroethane (fish)	4.0 mg/kg [m] 1,2-Dichloroethane (fish)
								1.7 mg/kg [n] 1,2-Dichloroethane (crayfish)	3.7 mg/kg [n] 1,2-Dichloroethane (crayfish)

AEROMOD = AMS/EPA Regulatory Model; FIR = food intake rate; SIR = soil/sediment intake rate; VVWM-PSC = Variable Volume Water Mode – Point Source Calculator (Model); WIR = water intake rate

[a] Soil ingestion as proportion of diet represented at the 90th percentile sourced from EPA's *Guidance for Developing Ecological Soil Screening Levels* (U.S. EPA, 2005a)

[b] Sediment ingestion as proportion of diet, calculated by dividing the SIR by kg food, where kg food = FIR multiplied by body weight (*bw*) of the mink

[c] Negligible sediment ingestion sourced from *Screening Level Ecological Risk Assessment San Juan River and Lake Powell Gold King Mine Incident Utah* (Tetra Tech, 2018)

[d] Exposure factors (FIR and WIR) sourced from EPA's *Wildlife Exposure Factors Handbook* (U.S. EPA, 1993)

[e] Exposure factor (SIR) sourced from EPA's *Second Five Year Review Report Hudson River PCBs Superfund Site Appendix 11 Human Health and Ecological Risks* (U.S. EPA, 2017)

[f] Mink body weight used to calculate Ps sourced from EPA's *Wildlife Exposure Factors Handbook* (U.S. EPA, 1993)

[g] For the trophic transfer pathway starting with earthworm, the American kestrel consumes earthworm, short-tailed shrew, and American woodcock. For the trophic transfer pathway starting with *Trifolium sp.*, the American kestrel consumes meadow vole and northern bobwhite

[h] 1,2-Dichloroethane concentration in aggregated soil and soil pore water for earthworm, short-tailed shrew, and meadow vole; 1,2-dichloroethane concentration in soil pore water for *Trifolium sp.*; 1,2-dichloroethane concentration in sediment for mink

[i] Highest modeled aggregated soil and soil pore water concentration of 1,2-dichloroethane calculated based on HEM modeling (daily deposition) for air 1,2-dichloroethane releases reported to Toxics Release Inventory (TRI) for the COU/OES Manufacturing of 1,2-dichloroethane. Concentration of contaminant in water assumed to be equal to this concentration

[j] Highest modeled soil pore water concentration of 1,2-dichloroethane calculated based on HEM modeling (daily deposition) for air 1,2-dichloroethane releases reported to TRI for the COU/OES Manufacturing of 1,2-dichloroethane. Concentration of contaminant in water assumed to be equal to this concentration

[k] Highest sediment concentration of 1,2-dichloroethane obtained using VVWM-PSC modeling

[l] Highest surface water concentration of 1,2-dichloroethane obtained using VVWM-PSC modeling

[m] Highest fish concentration (mg/kg) calculated from highest surface water concentration of 1,2-dichloroethane (VVWM-PSC) and estimated BCF of 4.4 (U.S. EPA, 2012)

[n] Highest crayfish concentration (mg/kg) calculated from highest benthic pore water concentration of 1,2-dichloroethane (VVWM-PSC) and estimated BCF of 4.4 (U.S. EPA, 2012)

As illustrated in Figure 4-1, representative mammal and bird species were chosen to connect (1) the 1,2-dichloroethane transport exposure pathway via trophic transfer of 1,2-dichloroethane uptake from contaminated soil and soil pore water to earthworm followed by consumption by an insectivorous mammal (short-tailed shrew) or insectivorous bird (American woodcock) and then their consumption by an avian predator (American kestrel); and (2) 1,2-dichloroethane uptake from contaminated soil pore water to plant (*Trifolium* sp.) followed by consumption by an herbivorous mammal (meadow vole) or herbivorous bird (northern bobwhite) and then their consumption by an avian predator (American 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 from contaminated surface water and benthic pore water.

A screening-level trophic transfer assessment includes multiple conservative assumptions. For example, it is presumed that all 1,2-dichloroethane in the soil and soil pore water is taken up into the organism. The assumption for the invertebrate diet for the short-tailed shrew and American woodcock is that it comprises 100% earthworms from contaminated soil. Similarly, the dietary assumption for the meadow vole and the northern bobwhite is 100% *Trifolium* sp. from contaminated soil. For the American mink and belted kingfisher, in one scenario, 100% of their diet is predicted to come from fish; in the second scenario, 100% of their diet is predicted to come from crayfish. Additionally, the screening-level analysis uses the highest modeled 1,2-dichloroethane soil, soil pore water, surface water, or benthic pore water contaminate levels based on daily air deposition (soil and soil pore water) as well as the COU/OES-specific number of operating days per year for surface water releases (surface water, benthic pore water, and sediment) to determine whether a more detailed assessment is required.

The highest soil and soil pore water concentrations calculated based on HEM daily air deposition for the COUs/OESs described in Table 3-1 were used to represent 1,2-dichloroethane concentrations in media for terrestrial trophic transfer. Similarly, the highest VVWM-PSC-modeled surface water and sediment concentrations over the operating days per year for the Disposal/Waste handling, treatment, and disposal (non-POTW WWT) COU/OES described in Table 2-1 were used to represent 1,2-dichloroethane concentrations in media for trophic transfer to a semi-aquatic mammal (mink) and aquatic-dependent bird (kingfisher). Additional assumptions for this analysis have been considered to represent conservative screening values (U.S. EPA, 2005a). Within this model, incidental oral soil or sediment exposure is added to the dietary exposure (including water consumption) resulting in total oral exposure to 1,2-dichloroethane. In addition, EPA assumes that 100% of the contaminant is absorbed from the soil (AFsj), water (AFwj), and biota representing prey (AFij). The proportional representation of time an animal spends occupying an exposed environment is the AUF and has been set at one for all biota within this equation (Table 4-1).

Values for calculated dietary exposure by COU are shown in Table_Apx A-2 and Table_Apx A-3 for trophic transfer to American kestrel from air deposition of 1,2-dichloroethane to soil and Table 2-1 for trophic transfer to mink or kingfisher consuming fish and crayfish. In each trophic transfer scenario for concentrations resulting from air deposition to soil, the Manufacturing – Domestic manufacture COU results in the highest biota concentrations and dietary exposure (Appendix A.1). For the trophic transfer scenario for concentrations resulting from releases to surface water, the Waste Handling, Treatment, and Disposal (non-POTW WWT) OES/Disposal COU had the highest surface water concentration, and was used to calculate the biota concentrations and dietary exposure. The highest dietary exposure across all scenarios results from the Disposal COU and consumption of fish or crayfish by belted kingfisher and is 4.0 mg/kg/day for fish consumption (Table 4-2).

Earthworm and *Trifolium* sp. concentrations (mg/kg) were conservatively assumed equal to aggregated soil and soil pore water concentrations (earthworm) or soil pore water concentrations only (*Trifolium* sp.). Fish and crayfish concentrations (mg/kg) were calculated using surface water and benthic pore water concentrations of 1,2-dichloroethane, respectively, from VVWM-PSC and an estimated BCF of 4.4 (U.S. EPA, 2012). A comparison of fish consumption in mink and kingfisher is also provided using actual measured concentrations of 1,2-dichloroethane in Lake Pontchartrain oysters (Ferrario et al., 1985) and the maximum measured surface water concentration of 1,2-dichloroethane as reported in the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026b) instead of the modeled values. The estimated exposure for mink and kingfisher consuming fish based on these reported values are compared to the modeled values in Table 4-2.

Table 4-2. Comparison of Modeled and Measured Trophic Transfer Values for 1,2-Dichloroethane in Consumption of Fish by Mink and Kingfisher

Predator	Modeled Dietary Concentration (mg/kg/day) [a]	Lake Pontchartrain Oyster Consumption Concentration (mg/kg/day) [c]
Mink	1.8	0.21
Kingfisher	4.0	4.8E−02

[a] Disposal COU/Waste handling, treatment, and disposal (non-POTW WWT) occupational exposure scenario (OES)
[c] (Ferrario et al., 1985)

The trophic transfer of 1,2-dichloroethane from media to biota is illustrated in Figure 4-1 with movement through the food web, as indicated by black arrows. Within the aquatic environment, the benthic zone is bounded by dashed black lines from the bottom of the water column to sediment surface and subsurface layers. The depth that the benthic environment extends into subsurface sediment is site-specific. Figure 4-1 illustrates the 1,2-dichloroethane BCF for aquatic organisms and FIRs for the representative terrestrial organisms.

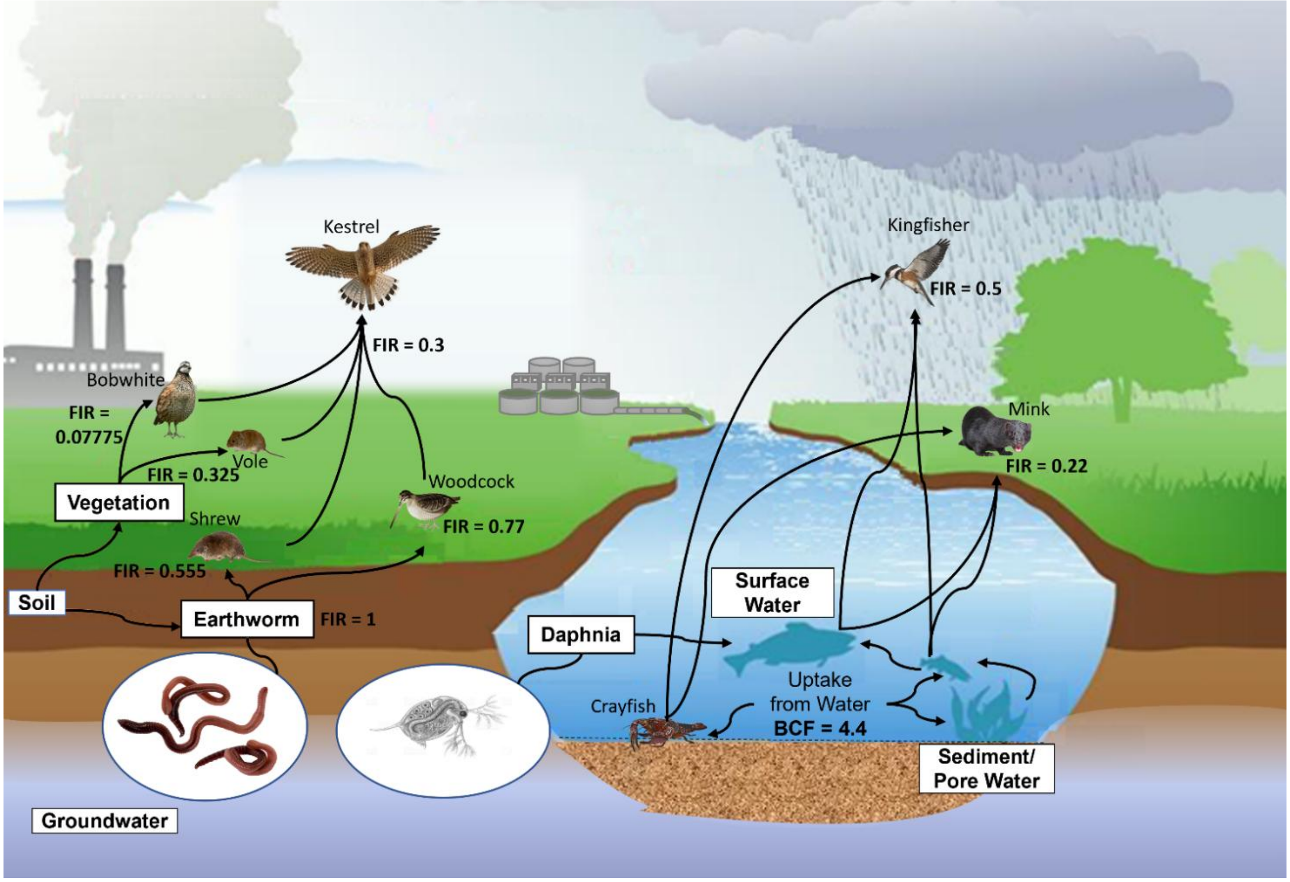

Figure 4-1. Trophic Transfer of 1,2-Dichloroethane in Aquatic and Terrestrial Ecosystems

5 WEIGHT OF SCIENTIFIC EVIDENCE CONCLUSIONS FOR ENVIRONMENTAL EXPOSURE ASSESSMENT

5.1 Strengths, Limitations, Assumptions, and Key Sources of Uncertainty for the Environmental Exposure Assessment

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, contribute to concentrations of 1,2-dichloroethane in the environment. Proximity to facilities and other sources may lead to elevated concentrations in soil or water via air deposition compared to locations that are more remote. The ability to locate 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 National Pollutant Discharge Elimination System (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 7.2 of the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026b). 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 (U.S. EPA, 2026b) using site-specific information such as flow data for the receiving water body at a release location. The confidence in the precision of the estimated surface water, benthic pore water, and sediment concentrations resulting from surface water releases is characterized as robust as it is based on facility-reported release or effluent monitoring data. For additional details, see the *Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2026b).

No monitoring studies conducted in the United States with data on concentrations of 1,2-dichloroethane in soil were 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 (U.S. EPA, 2026b) and estimation of resulting bulk soil and soil pore water concentrations using conservative assumptions regarding persistence and mobility. 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 used in this assessment.

5.2 Trophic Transfer Confidence

EPA uses several considerations when weighing the scientific evidence to determine confidence in the dietary exposure estimates. These considerations include the quality of the database, consistency, strength and precision, and relevance (Table_Apx A-4). This approach is in agreement with the Draft Systematic Review Protocol (U.S. EPA, 2021) and the *Systematic Review Protocol for 1,2-Dichloroethane* (U.S. EPA, 2026e). EPA has slight confidence in the quality of database and slight-to-moderate confidence in the precision and relevancy of the dietary exposure estimates used in the trophic transfer assessment as described in detail below. The Agency has robust confidence that actual dietary exposures will not exceed estimates used in this assessment.

Quality of the Database; Consistency; and Strength (Effect Magnitude) and Precision

Few empirical biomonitoring data in ecological receptors were reasonably available for 1,2-dichloroethane or related chlorinated solvents. These data include two studies containing 1,2-dichloroethane measurements in bivalves (Yasuhara and Morita, 1987; Ferrario et al., 1985); one study containing fish tissue concentrations in other similar chlorinated solvents (1,1,1-trichloroethane and trichloroethylene) (Roose and Brinkman, 1998); and a third study with non-detect of 1,2-dichlorethane in fish, invertebrates, and urban rats (COWI A/S, 2018). Thus, the quality of the database was rated slight. For COU/OES-based dietary exposure estimates, biota concentrations in representative species and their diet were calculated based on the methodology described in Section 1. The calculated aquatic biota concentrations were similar to or higher than the reported concentrations of 1,2-dichloroethane and related chlorinated solvents in aquatic biota, which resulted in a moderate confidence for consistency of the aquatic-based dietary exposure estimates for the trophic transfer analyses due to the need for conservative assumption when these numbers are used in risk assessment. This consideration was determined “N/A” for terrestrial-based dietary exposure estimates as no terrestrial biomonitoring data were available.

Because no empirical BCF or BAF data were reasonably available, concentrations in aquatic biota were calculated based on a predicted BCF derived from bioconcentration of a training set of chemicals from water to fish. Because the training set used to generate the 1,2-dichloroethane BCF value in EPI Suite$^{\text{TM}}$ contains other low-molecular weight chlorinated solvents (U.S. EPA, 2012), this results in a moderate confidence for the BCF value used for fish consumption and for the strength and precision considerations for the trophic transfer scenario based on fish consumption. Applying this predicted BCF value based on fish to calculate whole crayfish concentrations adds uncertainty to dietary exposures estimates from consumption of sediment-dwelling invertebrates by mink and kingfishers, resulting in a slight confidence in the strength and precision of the dietary exposure estimates based on crayfish consumption. For terrestrial organism trophic transfer, due to lack of empirical BAF values, it was conservatively assumed that whole earthworm and whole plant concentrations were equal to soil and/or soil pore water concentrations. However, the use of species-specific exposure factors (*i.e.,* feed intake rate, water intake rate, and the proportion of soil or sediment within the diet) from reliable resources assisted in obtaining dietary exposure estimates within the RQ equation (U.S. EPA, 2017, 1993), thereby increasing the confidence for strength and precision and resulting in a moderate confidence for strength and precision of the dietary exposure estimates in terrestrial trophic transfer.

Relevance (Biological, Physical and Chemical, and Environmental)

The mammals and birds selected for the soil invertivore-, soil herbivore-, and aquatic-based trophic transfer analyses (U.S. EPA, 1993) were chosen based on their import in previous trophic transfer analyses conducted by the Agency (U.S. EPA, 2003a, b). Appropriate dietary species (earthworm, plant, fish, crayfish) were selected based on dietary information provided in the Agency’s *Wildlife Exposure Factors Handbook* (U.S. EPA, 1993). The selection of the relevant highest trophic levels and their representative dietary species in the trophic transfer analyses increases confidence in the biological relevance of the dietary exposure estimates. Modeled concentrations for water and soil used to determine biota concentrations for trophic transfer were based on 1,2-dichloroethane data and not those of an analog, therefore increasing confidence in physical and chemical relevance of the dietary exposures in the trophic transfer analyses. The current trophic transfer analysis investigated dietary exposure resulting from 1,2-dichloroethane in biota and environmentally relevant media such as soil, sediment, and water. The screening-level analysis for trophic transfer used equation terms (*e.g.,* AUF and the proportion of 1,2-dichloroethane absorbed from diet as well as soil or sediment) all set to the most conservative values, as a screening-level assessment of risk from 1,2-dichloroethane via trophic transfer.

Assumptions within the trophic transfer equation (Equation 4-1) for this analysis represent conservative screening values (U.S. EPA, 2005a) and those assumptions were applied similarly for each trophic level and representative species. Applications across representative species included assuming 100% 1,2-dichloroethane bioavailability from both the soil (AF_{sj}) and biota representing prey (AF_{ij}), and no biotransformation or other absorption, distribution, metabolism, or excretion. No additional dietary species other than the selected dietary species were included as part of the dietary exposure for the respective terrestrial mammal ($P_i = 1$). The AUF, defined as the home range size relative to the contaminated area (*i.e.,* site ÷ home range = AUF) within this screening-level analysis was designated as one for all organisms that assumes that the organism lives its entire life within the exposure area. These conservative approaches, which likely overrepresent 1,2-dichloroethane's ability to transfer across trophic levels and decrease environmental relevance of the dietary exposures within the trophic transfer analyses, result in an overall moderate confidence for relevance of the dietary exposure estimates.

6 ENVIRONMENTAL EXPOSURE ASSESSMENT CONCLUSIONS

EPA assessed the reasonably available information for environmental exposures of 1,2-dichloroethane to aquatic and terrestrial species. The key points of the environmental exposure assessment are summarized in the bullets below:

- EPA expects the main environmental exposure pathways for 1,2-dichloroethane to be surface water and air. The air pathway was assessed for its contribution via deposition to soil.
- 1,2-Dichloroethane exposure to aquatic species through surface water and sediment were modeled to estimate concentrations at the point of release.
    - Modeled data based on number of operating days per year estimate surface water, benthic pore water, and sediment concentrations were 1,720 µg/L, 1,590 µg/L, and 4,320 µg/kg respectively, from facility releases to surface waters for the Disposal COU/Waste Handling, Treatment, and Disposal (non-POTW WWT) OES.
    - EPA also estimated fish tissue and crayfish tissue concentrations using the modeled water releases from the Disposal COU.
- 1,2-Dichloroethane exposure to terrestrial species through soil, surface water, and soil pore water was also assessed using modeled data.
    - Modeled air deposition to soil resulted in estimated soil concentrations ranging from 2.6 to 1,352 mg/kg and estimated soil pore water concentrations ranging from 1.1 to 621 mg/L.
- Exposure through diet was assessed through a trophic transfer analysis, which estimated the transfer of 1,2-dichloroethane from soil through the terrestrial food web and from surface water and sediment through the aquatic food web using representative species.
    - 1,2-Dichloroethane exposure to terrestrial organisms occurs primarily through diet via the surface water pathway for semi-aquatic terrestrial mammals and aquatic-dependent birds, with release of 1,2-dichloroethane to surface water as a source and via the soil pathway for terrestrial mammals. Deposition from air to soil is another source of 1,2-dichloroethane.
    - Maximum concentrations of 1,2-dichloroethane in diet were 1.8 mg/kg/day in mink (consuming fish), 4.0 mg/kg/day in belted kingfisher (consuming fish), and 1.6 mg/kg/day for American kestrel (consuming insectivorous animals).
    - For terrestrial mammals and birds, relative contribution to total exposure associated with inhalation is generally secondary in comparison to exposures by diet and indirect ingestion. Therefore, direct inhalation exposure of 1,2-dichloroethane to terrestrial receptors via air was not assessed quantitatively.

REFERENCES

Alexander, GR. (1977). Food of vertebrate predators on trout waters in north central lower Michigan. Mich Acad 10: 181-195. https://hero.epa.gov/reference/3700746/

COWI A/S. (2018). Screening programme 2017: Suspected PBT compounds. Trondheim, Norway: The Norwegian Environment Agency. https://hero.epa.gov/reference/7303021/

Ferrario, JB; Lawler, GC; Deleon, IR; Laseter, JL. (1985). Volatile organic pollutants in biota and sediments of Lake Pontchartrain. Bull Environ Contam Toxicol 34: 246-255. https://hero.epa.gov/reference/28993/

Gotoh, M; Sekitani, Y; Aramaki, T; Kobayashi, H; Ogino, K; Hobara, T. (1992). Pollution due to volatile halocarbon compounds in biota. Bull Environ Contam Toxicol 49: 186-191. https://hero.epa.gov/reference/658811/

Lindroth, RL; Batzli, GO. (1984). Food habits of the meadow vole (Microtus pennsylvanicus) in bluegrass and prairie habitats. Journal of Mammalogy 65: 600-606. https://hero.epa.gov/reference/3181845/

Meyer, RL; Balgooyen, TG. (1987). A study and implications of habitat separation by sex of wintering American kestrels (Falco sparverius L.). Raptor Research 6: 107-123. https://hero.epa.gov/reference/3664232/

Roose, P; Brinkman, UA. (1998). Determination of volatile organic compounds in marine biota. J Chromatogr A 799: 233-248. https://hero.epa.gov/reference/645743/

Tetra Tech. (2018). Screening level ecological risk assessment: San Juan River and Lake Powell Gold King Mine incident, Utah. Salt Lake City, UT: Utah Department of Environmental Quality, Division of Water Quality. https://hero.epa.gov/reference/12039459/

U.S. EPA. (1993). Wildlife exposure factors handbook [EPA Report]. (EPA/600/R-93/187). Washington, DC: Office of Research and Development. https://hero.epa.gov/reference/3056849/

U.S. EPA. (1998). Guidelines for ecological risk assessment [EPA Report]. (EPA/630/R-95/002F). Washington, DC: U.S. Environmental Protection Agency, Risk Assessment Forum. https://hero.epa.gov/reference/42805/

U.S. EPA. (2003a). Attachment 1-3 Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs): Evaluation of Dermal Contact and Inhalation Exposure Pathways for the Purpose of Setting Eco-SSLs. (OSWER9285755E). Washington, DC: .S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. https://hero.epa.gov/reference/6544724/

U.S. EPA. (2003b). Attachment 1-4. Guidance for developing ecological soil screening levels (Eco-SSLs): Review of background concentration for metals. (OSWER Directive 92857-55). Washington, DC. https://hero.epa.gov/reference/783960/

U.S. EPA. (2005a). Guidance for developing ecological soil screening levels [EPA Report]. (OSWER Directive 92857-55). Washington, DC: U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. https://hero.epa.gov/reference/81978/

U.S. EPA. (2005b). Guidelines for carcinogen risk assessment [EPA Report]. (EPA630P03001F). Washington, DC. https://hero.epa.gov/reference/6324329/

U.S. EPA. (2012). Estimation Programs Interface Suite™ for Microsoft® Windows, v 4.11 [Computer Program]. Washington, DC. Retrieved from https://www.epa.gov/tsca-screening-tools/epi-suitetm-estimation-program-interface

U.S. EPA. (2017). Second Five Year Review report: Hudson River PCBs Superfund Site - Appendix 11: Human health and ecological risks. https://hero.epa.gov/reference/11345965/

U.S. EPA. (2021). Draft systematic review protocol supporting TSCA risk evaluations for chemical substances, Version 1.0: A generic TSCA systematic review protocol with chemical-specific methodologies. (EPA Document #EPA-D-20-031). Washington, DC: Office of Chemical Safety and Pollution Prevention. https://hero.epa.gov/reference/10415760/

U.S. EPA. (2026a). Chemistry and Fate and Transport Assessment for 1,2-Dichloroethane. Washington, DC: Office of Pollution Prevention and Toxics, Office of Chemical Safety and Pollution Prevention. https://hero.epa.gov/reference/11816713/

U.S. EPA. (2026b). Environmental Media Assessment for 1,2-Dichloroethane. Washington, DC: Office of Pollution Prevention and Toxics, Office of Chemical Safety and Pollution Prevention. https://hero.epa.gov/reference/11816718/

U.S. EPA. (2026c). Environmental Release Assessment for 1,2-Dichloroethane. Washington, DC: Office of Pollution Prevention and Toxics, Office of Chemical Safety and Pollution Prevention. https://hero.epa.gov/reference/11816714/

U.S. EPA. (2026d). Risk Evaluation for 1,2-Dichloroethane. Washington, DC: Office of Pollution Prevention and Toxics, Office of Chemical Safety and Pollution Prevention. https://hero.epa.gov/reference/11151778/

U.S. EPA. (2026e). Systematic Review Protocol for 1,2-Dichloroethane. Washington, DC: Office of Pollution Prevention and Toxics, Office of Chemical Safety and Pollution Prevention. https://hero.epa.gov/reference/11151731/

Yasuhara, A; Morita, M. (1987). Identification of volatile organic components in mussel. Chemosphere 16: 2559-2565. https://hero.epa.gov/reference/25095/

APPENDICES

Appendix A ENVIRONMENTAL EXPOSURE ESTIMATES

A.1 Concentrations in Biota and Associated Dietary Exposure Estimates

Table_Apx A-1. 1,2-Dichlorethane Plant (*Trifolium* sp.) and Earthworm Concentrations Calculated from HEM-Modeled Industrial and Commercial Releases Reported to TRI

COU (Life Cycle Stage/ Category/ Subcategory)	OES	Soil (µg/kg) [a]	Soil Pore Water Conc. (µg/L) [a]	Plant Concentration (mg/kg)	Earthworm Concentration (mg/kg)
Manufacturing/ Domestic manufacture/ Domestic manufacture	Manufacturing	1,353	624	0.62	2.0
Manufacturing/ Import/ Import	Repackaging	2.6	1.2	1.2E−03	3.8E−03
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	14	6.4	6.4E−03	2.0E−02
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	178	82	8.2E−02	0.26
Processing/ Processing – Incorporated into formulation, mixture, or reaction product/ Processing aids: specific to petroleum production; Plastics material and resin manufacturing					
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					
Industrial Use/ Solvents (for cleaning and degreasing/ Degreasing and cleaning solvents	Non-Aerosol Cleaning and Degreasing	7.4E−05	3.4E−05	3.4E−08	1.1E−07

COU (Life Cycle Stage/ Category/ Subcategory)	OES	Soil (µg/kg) [a]	Soil Pore Water Conc. (µg/L) [a]	Plant Concentration (mg/kg)	Earthworm Concentration (mg/kg)
Disposal/ Disposal/ Disposal	Waste Handling, Disposal, and Treatment (Incinerator)	9.1E−04	2.5	7.8E−03	2.5E−03

COU = condition of use; HEM = Human Exposure Model; OES = occupational exposure scenario

[a] Soil catchment and soil catchment pore water concentrations estimated from daily air deposition rates 10 or 30 m from facility for 1,2-dichloroethane air releases reported to the Toxics Release Inventory (TRI).

Table_Apx A-2. Dietary Exposure Estimates Using EPA's Wildlife Risk Model for Eco-SSLs for Screening Level Trophic Transfer of 1,2-Dichloroethane to the American Kestrel Consuming Insectivorous Animals from Air Deposition to Soil for 1,2-Dichloroethane Releases Reported to TRI

COU (Life Cycle Stage/ Category/ Subcategory)	OES	Earthworm Concentration (mg/kg) [a]	Short-Tailed Shrew Concentration (mg/kg/day) [b]	American Woodcock Concentration (mg/kg/day) [b]	1,2-Dichloroethane Dietary Exposure (mg/kg/day) [b]
Manufacturing/ Domestic manufacture/ Domestic manufacture	Manufacturing	2.0	1.1	1.8	1.6
Manufacturing/ Import/ Import	Repackaging	3.8E−03	2.1E−03	3.4E−03	3.0E−03
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	2.0E−02	1.2E−02	1.8E−02	1.6E−02
Processing/ Recycling/ Recycling					
Industrial Use/ Process regulator *e.g.,* Catalyst moderator; Oxidation inhibitor					

COU (Life Cycle Stage/ Category/ Subcategory)	OES	Earthworm Concentration (mg/kg) [a]	Short-Tailed Shrew Concentration (mg/kg/day) [b]	American Woodcock Concentration (mg/kg/day) [b]	1,2-Dichloroethane Dietary Exposure (mg/kg/day) [b]
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	0.26	0.15	0.23	0.21
Processing/ Processing – Incorporated into formulation, mixture, or reaction product/ Processing aids: specific to petroleum production; Plastics material and resin manufacturing					
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					
Industrial Use/ Solvents (for cleaning and degreasing)/ Degreasing and cleaning solvents	Non-Aerosol Cleaning and Degreasing	1.1E−07	6.1E−08	9.6E−08	8.5E−08
Disposal/ Disposal/ Disposal	Waste Handling, Disposal, and Treatment (Incinerator)	7.8E−03	4.5E−03	7.0E−03	6.2E−03

COU = condition of use; OES = occupational exposure scenario; SSL = soil screening levels; TRI = Toxics Release Inventory

[a] Estimated 1,2-dichloroethane concentration in representative soil invertebrates and earthworms assumed equal to aggregated highest calculated soil and soil pore water concentration via air deposition of 1,2-dichloroethane in fugitive air releases reported to TRI to soil.

[b] Dietary exposure to 1,2-dichloroethane includes consumption of biota (earthworm), incidental ingestion of soil, and ingestion of water.

Table_Apx A-3. Dietary Exposure Estimates Using EPA's Wildlife Risk Model for Eco-SSLs for Screening Level Trophic Transfer of 1,2-Dichloroethane to the American Kestrel Consuming Herbivorous Animals from Air Deposition to Soil for 1,2-Dichloroethane Releases Reported to TRI

COU (Life Cycle Stage/ Category/ Subcategory)	OES	Plant Conc. (mg/kg) [a]	Meadow Vole Conc. (mg/kg/day) [b]	Northern Bobwhite Conc. (mg/kg/day) [b]	1,2-Dichloroethane Dietary Exposure (mg/kg/day) [b]
Manufacturing/ Domestic manufacture/ Domestic manufacture	Manufacturing	0.62	0.22	7.0E−02	0.19
Manufacturing/ Import/ Import	Repackaging	1.2E−03	4.2E−04	1.3E−04	2.3E−05
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	6.4E−03	2.3E−03	7.2E−04	2.0E−03
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	8.2E−02	2.9E−02	9.2E−03	2.5E−02
Processing/ Processing – Incorporated into formulation, mixture, or reaction product/ Processing aids: specific to petroleum production; Plastics material and resin manufacturing					
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					
Industrial Use/ Solvents (for cleaning and degreasing)/ Degreasing and cleaning solvents	Non-Aerosol Cleaning and Degreasing	3.4E−08	1.2E−08	3.8E−09	1.0E−08
Disposal/ Disposal/ Disposal	Waste Handling, Disposal, and Treatment (Incinerator)	2.5E−03	8.8E−04	2.7E−04	7.6E−04

COU = condition of use; OES = occupational exposure scenario; SSL = soil screening levels

[a] Estimated 1,2-dichloroethane concentration in representative soil invertebrate, earthworm, assumed equal to aggregated highest calculated soil and soil pore water concentration via air deposition of 1,2-dichloroethane in fugitive air releases reported to Toxics Release Inventory (TRI) to soil.

[b] Dietary exposure to 1,2-dichloroethane includes consumption of biota (*Trifolium* sp.), incidental ingestion of soil, and ingestion of water.

A.2 Rubric for Weight of Scientific Evidence

The weight of scientific evidence fundamentally means that the evidence is weighed (*i.e.,* ranked), and weighted (*i.e.,* a piece or set of evidence or uncertainty may have more importance or influence in the result than another). Based on the weight of scientific evidence and uncertainties, a confidence statement was developed that qualitatively ranks (*i.e.,* robust, moderate, slight, or indeterminate) the confidence in the environmental exposure estimates. The qualitative confidence levels are described below and provided in Table_Apx A-4.

The evidence considerations and criteria detailed within (U.S. EPA, 2021) will guide the application of strength-of-evidence judgments for environmental hazard effect within a given evidence stream and were adapted from Table 7-10 of the Draft Systematic Review Protocol (U.S. EPA, 2021).

EPA used the strength-of-evidence and uncertainties from (U.S. EPA, 2021) for the environmental exposure assessment to qualitatively rank the overall confidence using evidence for environmental exposure. Confidence levels of robust, moderate, slight, or indeterminant are assigned for each evidence property that corresponds to the evidence considerations (U.S. EPA, 2021). The rank of the quality of the database consideration is based on the systematic review data quality rank (high, medium, or low) for studies that measure 1,2-dichloroethane in water or animal tissue and whether there are data gaps in the environmental dataset. Another consideration in the quality of the database is the risk of bias (*i.e.,* how representative is the study to ecologically relevant endpoints). The evidence considerations are weighted based on professional judgement to obtain the overall confidence for each exposure estimate. In other words, the weights of each evidence property relative to the other properties are dependent on the specifics of the weight of scientific evidence and uncertainties that are described in the narrative and may or may not be equal. Therefore, the overall score is not necessarily a mean or defaulted to the lowest score. The confidence levels and uncertainty type examples are described below.

Confidence Levels

- Robust confidence suggests thorough understanding of the scientific evidence and uncertainties. The supporting weight of scientific evidence outweighs the uncertainties to the point where it is unlikely that the uncertainties could have a significant effect on the exposure or hazard estimate.
- Moderate confidence suggests some understanding of the scientific evidence and uncertainties. The supporting scientific evidence weighed against the uncertainties is reasonably adequate to characterize exposure or hazard estimates.
- Slight confidence is assigned when the weight of scientific evidence may not be adequate to characterize the scenario, and when the assessor is making the best scientific assessment possible in the absence of complete information. There are additional uncertainties that may need to be considered.
- Indeterminant indicates information is not available within a specific evidence consideration.

Types of Uncertainties

The following uncertainties may be relevant to one or more of the weight of scientific evidence considerations listed above and will be integrated into that property's rank in the evidence (Table_Apx A-4).

- Scenario uncertainty: Uncertainty regarding missing or incomplete information needed to fully define the exposure and dose.
    - The sources of scenario uncertainty include descriptive errors, aggregation errors, errors in professional judgment, and incomplete analysis.
- Parameter uncertainty: Uncertainty regarding some parameter.

    - Sources of parameter uncertainty include measurement errors, sampling errors, variability, and use of generic or surrogate data.
- Model uncertainty: Uncertainty regarding gaps in scientific theory required to make predictions on the basis of causal inferences.
    - Modeling assumptions may be simplified representations of reality.

Table_Apx A-4 summarizes the weight of scientific evidence and uncertainties while increasing transparency on how EPA arrived at the overall confidence level for each exposure hazard threshold. In contrast, symbols are used to provide a visual overview of the confidence in the body of evidence while de-emphasizing an individual ranking that may give the impression that ranks are cumulative (*e.g.,* ranks of different categories may have different weights).

Table_Apx A-4. Considerations that Inform Evaluations of the Strength of the Evidence Within an Evidence Stream (*i.e.,* Apical Endpoints, Mechanistic, or Field Studies)

Consideration	Increased Evidence Strength (of the Apical Endpoints, Mechanistic, or Field Studies Evidence)	Decreased Evidence Strength (of the Apical Endpoints, Mechanistic, or Field Studies Evidence)
The evidence considerations and criteria presented here guide the application of strength-of-evidence judgments for an outcome or environmental hazard effect within a given evidence stream. Evidence integration or synthesis results that do not warrant an increase or decrease in evidence strength for a given consideration are considered "neutral" and are not described in this table (and, in general, are captured in the assessment-specific evidence profile tables).		
Quality of the database* (risk of bias)	• A large evidence base of high- or medium-quality studies increases strength. • Strength increases if relevant species are represented in a database.	• An evidence base of mostly low-quality studies decreases strength. • Strength also decreases if the database has data gaps for relevant species (*i.e.,* a trophic level that is not represented). • Decisions to increase strength for other considerations in this table should generally not be made if there are serious concerns for risk of bias; in other words, all the other considerations in this table are dependent upon the quality of the database. [a]
Consistency	Similarity of findings for a given outcome (*e.g.,* of a similar magnitude, direction) across independent studies or experiments increases strength, particularly when consistency is observed across species, life stage, sex, wildlife populations, and across or within aquatic and terrestrial exposure pathways.	• Unexplained inconsistency (*i.e.,* conflicting evidence; see (U.S. EPA, 2005b)) decreases strength. • Strength should not be decreased if discrepant findings can be reasonably explained by study confidence conclusions; variation in population or species, sex, or life stage; frequency of exposure (*e.g.,* intermittent or continuous); exposure levels (low or high); or exposure duration.
Strength (effect magnitude) and precision	• Evidence of a large magnitude effect (considered either within or across studies) can increase strength. • Effects of a concerning rarity or severity can also increase strength, even if they are of a small magnitude. • Precise results from individual studies or across the set of studies increases strength, noting that biological significance is prioritized over statistical significance. • Use of probabilistic model (*e.g.,* Web-ICE, SSD) may increase strength.	Strength may be decreased if effect sizes that are small in magnitude are concluded not to be biologically significant, or if there are only a few studies with imprecise results.
Biological gradient/dose-response	• Evidence of dose-response increases strength. • Dose-response may be demonstrated across studies or within studies and it can be dose- or duration-dependent. • Dose-response may not be a monotonic dose-response (monotonicity should not necessarily be expected, *e.g.,* different outcomes may be expected at low vs. high doses due to activation	• A lack of dose-response when expected based on biological understanding and having a wide range of doses/exposures evaluated in the evidence base can decrease strength. • In experimental studies, strength may be decreased when effects resolve under certain experimental conditions (*e.g.*, rapid reversibility after removal of exposure).

Consideration	Increased Evidence Strength (of the Apical Endpoints, Mechanistic, or Field Studies Evidence)	Decreased Evidence Strength (of the Apical Endpoints, Mechanistic, or Field Studies Evidence)
Biological gradient/dose-response (continued)	of different mechanistic pathways or induction of systemic toxicity at very high doses). • Decreases in a response after cessation of exposure (*e.g.*, return to baseline fecundity) also may increase strength by increasing certainty in a relationship between exposure and outcome (this particularly applicable to field studies).	• However, many reversible effects are of high concern. Deciding between these situations is informed by factors such as the toxicokinetics of the chemical and the conditions of exposure, see (U.S. EPA, 1998), endpoint severity, judgments regarding the potential for delayed or secondary effects, as well as the exposure context focus of the assessment (*e.g.*, addressing intermittent or short-term exposures). • In rare cases, and typically only in toxicology studies, the magnitude of effects at a given exposure level might decrease with longer exposures (*e.g.*, due to tolerance or acclimation). • Like the discussion of reversibility above, a decision about whether this decreases evidence strength depends on the exposure context focus of the assessment and other factors. • If the data are not adequate to evaluate a dose-response pattern, then strength is neither increased nor decreased.
Biological relevance	Effects observed in different populations or representative species suggesting that the effect is likely relevant to the population or representative species of interest (*e.g.,* correspondence among the taxa, life stages, and processes measured or observed and the assessment endpoint).	An effect observed only in a specific population or species without a clear analogy to the population or representative species of interest decreases strength.
Physical/chemical relevance	Correspondence between the substance tested and the substance constituting the stressor of concern.	The substance tested is an analog of the chemical of interest or a mixture of chemicals that include other chemicals besides the chemical of interest.
Environmental relevance	Correspondence between test conditions and conditions in the region of concern.	The test is conducted using conditions that would not occur in the environment.

[a] Database refers to the entire dataset of studies integrated in the environmental hazard assessment and used to inform the strength of the evidence. In this context, database does *not* refer to a computer database that stores aggregations of data records such as the ECOTOX Knowledgebase.