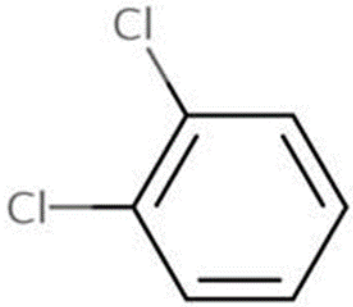
United States
Environmental Protection Agency

EPA Document# EPA-D-20-0001
April 2020
Office of Chemical Safety and
Pollution Prevention

Draft Scope of the Risk Evaluation for *o*-Dichlorobenzene

CASRN 95-50-1



April 2020

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDIX TABLES

ACKNOWLEDGEMENTS

This report was developed by the United States Environmental Protection Agency (U.S. EPA), Office of Chemical Safety and Pollution Prevention (OCSPP), Office of Pollution Prevention and Toxics (OPPT).

Acknowledgements

The OPPT Assessment Team gratefully acknowledges participation or input from Intra-agency reviewers that included multiple offices within EPA, Inter-agency reviewers that included multiple Federal agencies, and assistance from EPA contractors Abt Associates (Contract No. EP-W-16-009), GDIT (Contract No. HHSN316201200013W), ERG (Contract No. EP-W-12-006), ICF (Contract No. 68HERC19D0003), SRC (Contract No. 68HERH19D0022), and Versar (Contract No. EP-W-17-006). EPA also acknowledges the contributions of technical experts from EPA's Office of Research and Development.

Docket

Supporting information can be found in public docket: EPA-HQ-OPPT-2018-0444.

Disclaimer

Reference herein to any specific commercial products, process or service by trade name, trademark, manufacturer or otherwise does not constitute or imply its endorsement, recommendation or favoring by the United States Government.

ABBREVIATIONS AND ACRONYMS

µg	Microgram(s)
AAL	Allowable Ambient Levels
AC	Acute concentration
ACGIH	American Conference of Government Industrial Hygienists
ADME	Absorption, Distribution, Metabolism, and Excretion
Apx	Appendix
ATSDR	Agency for Toxic Substances and Disease Registry
AUC	Area Under the Curve
AWQC	Ambient Water Quality Criteria
BAF	Bioaccumulation Factor
BCF	Bioconcentration Factor
BW3/4	Body weight scaling to the 3/4 power
CAA	Clean Air Act
CARB	California Air Resources Board
CASRN	Chemical Abstracts Service Registry Number
CBI	Confidential Business Information
CCD	Chemical Control Division
CCL	Contaminant Candidate List
CDC	Centers for Disease Control
CDR	Chemical Data Reporting
CEHD	Chemical Exposure Health Data
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CESSD	Chemistry, Economics and Sustainable Strategies Division
CFR	Code of Federal Regulations
ChemSTEER	Chemical Screening Tool for Exposure and Environmental Releases
COC	Concentration of Concern
CoRAP	Community Rolling Action Plan
COU	Conditions of Use
CPCat	Chemical and Product Categories
CPID	Consumer Product Information Database
CSCL	Chemical Substances Control Law
DHHS	Department of Health and Human Services
DMR	Discharge Monitoring Report
DNA	Deoxyribonucleic Acid
EC	Engineering controls
ECOTOX	ECOTOXicology knowledgebase
ED	Exposure duration
E-FAST	Exposure and Fate Assessment Screening Tool
E-FAST2	Exposure and Fate Assessment Screening Tool version 2
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
EPI Suite™	Estimation Program Interface Suite™
EPS	Expanded Polystyrene

ERG	Eastern Research Group, Inc.
ESD	Emission Scenario Document
EU	European Union
FDA	Food and Drug Administration
FF	Far field
g/L	Gram(s) per Liter
HERO	Health and Environmental Research Online
Hg	Mercury
HHE	Health Hazard Evaluation
HMTA	Hazardous Materials Transportation Act
HPV	High Production Volume
HQ	Headquarters
HSDB	Hazardous Substances Data Bank
HUC	Hydrologic Unit Code
IA	Indoor air
IARC	International Agency for Research on Cancer
IECCU	Indoor Environmental Concentrations in Buildings with Conditioned and Unconditioned Zones
IMIS	Integrated Management Information System
K	Thousand
kg	Kilogram(s)
km	Kilometer(s)
L	Liter(s)
lb	Pound
LC50	Lethal Concentration of 50% test organisms
LEV	Local exhaust ventilation
LOAEL	Lowest Observed Adverse Effect Level
LOEC	Lowest Observed Effect Concentration
m	Meter(s)
m3	Cubic Meter(s)
MACT	Maximum Achievable Control Technology
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
mg	Milligram(s)
mg/kg-bw	Milligram(s) per kilogram body weight
mg/L	Milligram(s) per Liter
mg/m3	Milligram(s) per cubic meter
mg/mL	Milligram(s) per milliliter
mmHg	Millimeter(s) of Mercury
MOA	Mode of Action
MOE	Margin of exposure
MRL	Minimal Risk Level
n	number
N/A	Not Applicable
NHANES	National Health and Nutrition Examination Survey

NICNAS (Australia)	National Industrial Chemicals Notification and Assessment Scheme
NIH	National Institutes of Health
NIOSH	National Institute for Occupational Safety and Health
NITE	National Institute of Technology and Evaluation
NOAEL	No Observed Adverse Effect Level
NOEC	No Observed Effect Concentration
NPDES	National Pollutant Discharge Elimination System
NPDWR	National Primary Drinking Water Regulations
NPL	National Priorities List
NPRI	National Pollutant Release Inventory
NR	Not Reported
NRC	National Research Council
NSPS	New Source Performance Standards
NTP	National Toxicology Program
NWIS	National Water Information System
OCSPP	Office of Chemical Safety and Pollution Prevention
OECD	Organisation for Economic Co-operation and Development
OEHHA	Office of Environmental Health Hazard Assessment (California)
OEL	Occupational Exposure Limit
OES	Occupational Exposure Scenario
OLEM	Office of Land and Emergency Management
ONU	Occupational Non-User
OPPT	Office of Pollution Prevention and Toxics
ORD	Office of Research and Development
OSHA	Occupational Safety and Health Administration
OST	Office of Science and Technology
OSWER	Office of Solid Waste and Emergency Response
OW	Office of Water
P	Persistence
P-Chem	Physical Chemical Properties
PBPK	Physiologically Based Pharmacokinetic
PBT	Persistent, Bioaccumulative, Toxic
PECO	Population, Exposure, Comparator and Outcome
PEL	Permissible Exposure Limit
PESS	Potentially Exposed or Susceptible Subpopulation
POD	Point of Departure
POTW	Publicly Owned Treatment Works
ppb	Part(s) per billion
PPE	Personal Protective Equipment
ppm	Part(s) per million
PS	Point Source
PV	Production Volume
PWS	Public Water System
QA	Quality Assurance

QC	Quality Control
QSAR	Quantitative Structure Activity Relationship
RA	Risk Assessment
RAD	Risk Assessment Division
RCRA	Resource Conservation and Recovery Act
REACH (European Union)	Registration, Evaluation, Authorisation and Restriction of Chemicals
REL	Recommended Exposure Limit
RfC	Reference Concentration
RfD	Reference dose
RQ	Risk Quotient
SAB	Science Advisory Board
SACC	Science Advisory Committee on Chemicals
SAR	Structure-activity relationship
SARA	Superfund Amendments and Reauthorization Act
SD	Standard deviation
SDS	Safety Data Sheet
SDWA	Safe Drinking Water Act
SIC	Standard Industrial Classification
SIDS	Screening Information Dataset
STEL	Short-term Exposure Limit
STORET	STORage and RETrieval (water quality data warehouse)
SVOC	Semivolatile Organic Compounds
SWC	Surface Water Concentration
T	Toxic (used with PBT)
TIAB	Title and Abstract
TLV	Threshold Limit Value
TRI	Toxics Release Inventory
TSCA	Toxic Substances Control Act
TTO	Total Toxic Organics
TWA	Time-weighted average
U.S.	United States
U.S.C.	United States Code
UCMR	Unregulated Contaminant Monitoring Rule
UIC	Underground Injection Control
US EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	Volatile Organic Compound
VP	Vapor Pressure
WQP	Water Quality Portal
WQX	Water Quality Exchange
WWT	Wastewater Treatment

EXECUTIVE SUMMARY

In December 2019, EPA designated *o*-dichlorobenzene (CASRN 95-50-1) as a high-priority substance for risk evaluation following the prioritization process as required by section 6(b) of the Toxic Substances Control Act (TSCA) and implementing regulations (40 CFR Part 702) (Docket ID: EPA-HQ-OPPT-2018-0444). The first step of the risk evaluation process is the development of the scope document and this document fulfills the TSCA regulatory requirement to issue a draft scope document as described in 40 CFR 702.41(c)(7). The draft scope for *o*-dichlorobenzene includes the following information: the conditions of use, potentially exposed or susceptible subpopulations (PESS), hazards, and exposures that EPA plans to consider in this risk evaluation, along with a description of the reasonably available information, conceptual model, analysis plan and science approaches, and plan for peer review for this chemical substance. EPA is providing a 45-day comment period on the draft scope. Comments received on this draft scope document will help inform development of the final scope document and the risk evaluation.

General Information. *o*-Dichlorobenzene is a colorless, volatile liquid that is poorly soluble in water but miscible with most organic solvents. It has a total production volume in the United States between 100,000 and 500,000 pounds.

Reasonably Available Information. EPA leveraged the data and information sources already described in the document supporting the High Priority Substance designation for *o*-dichlorobenzene to inform the development of this draft scope document. Furthermore, EPA conducted a comprehensive search to identify and screen multiple evidence streams (i.e., chemistry, fate, release and engineering, exposure, hazard) and the search and screening results are provided in Section 2.1. EPA is seeking public comment on this draft scope document and will consider additional information identified following publication of this draft scope document, as appropriate, in developing the final scope document. EPA is using the systematic review process described in the *Application of Systematic Review in TSCA Risk Evaluations* document (U.S. EPA, 2018a) to guide the process of searching for and screening reasonably available information, including information already in EPA's possession, for inclusion in the risk evaluation. EPA is applying these systematic review methods to collect reasonably available information regarding the hazards, exposures, PESS, and conditions of use that may help inform the risk evaluation for *o*-dichlorobenzene.

Conditions of Use. EPA plans to evaluate manufacturing (including importing), processing, distribution in commerce, commercial and consumer uses, and disposal of *o*-dichlorobenzene in the risk evaluation. *o*-Dichlorobenzene is manufactured (including imported) in the U.S. The chemical is processed as a reactant and incorporated into formulation, mixture, or reaction products. Several commercial uses were identified that ranged from use in lubricant and degreaser products to use in inks and paint strippers. Consumer uses were reported in lubricant and degreaser products, air care products, and other uses such as ceramics glazing and cleaning products. EPA identified these conditions of use from information reported to EPA through Chemical Data Reporting (CDR) and Toxics Release Inventory (TRI) reporting, published literature, public comments, and consultation with stakeholders for both uses currently in

production and uses whose production may have ceased. EPA is aware of information reporting use of *o*-dichlorobenzene in pesticides; however, they are not conditions of use for the chemical substance as defined in TSCA § 3(2) and (4). Section 2.2 provides details about the conditions of use within the scope of the risk evaluation.

Conceptual Model. The conceptual models for *o*-dichlorobenzene are presented in Section 2.6. Conceptual models are graphical depictions of the actual or predicted relationships of conditions of use, exposure pathways (e.g., media), exposure routes (e.g., inhalation, dermal, oral), hazards and receptors throughout the life cycle of the chemical substance. EPA proposes to focus the risk evaluation for *o*-dichlorobenzene on the following exposures, hazards and receptors however, EPA also plans to consider comments received on this draft scope and other reasonably available information when finalizing this scope document, and to adjust the exposure pathways, exposure routes and hazards included in the scope document as needed.

- *Exposures (Pathways and Routes), Receptors and PESS.* EPA plans to evaluate both human and environmental exposures and releases to the environment resulting from the conditions of use of *o*-dichlorobenzene that EPA plans to consider in risk evaluation. Exposures for *o*-dichlorobenzene are discussed in Section 2.3. Additional information gathered through the results of systematic review searches will also informed expected exposures.

  EPA's plan as to evaluating environmental exposure pathways in the draft scope document considers whether and how other EPA administered statues and regulatory programs address the presence of *o*-dichlorobenzene in media pathways falling under the jurisdiction of those authorities. Section 2.6.3. discusses those pathways that may be addressed pursuant to other Federal laws. In Section 2.6.4, EPA presents the conceptual model describing the identified exposures (pathways and routes), receptors and hazards associated with the conditions of use of *o*-dichlorobenzene within the scope of the risk evaluation.

  Preliminarily, EPA plans to evaluate the following human and environmental exposure pathways, routes, receptors and PESS in the scope of the risk evaluation. However, EPA plans to consider comments received on this draft scope and other reasonably available information when finalizing this scope document, and to adjust the exposure pathways, exposure routes and hazards included in the scope document as needed.:
  - *Occupational exposure pathways associated with industrial and commercial conditions of use:* EPA plans to evaluate exposures to workers and/or occupational non-users via the inhalation route and exposures to workers via the dermal route associated with manufacturing, processing, industrial/commercial use, and disposal of *o*-dichlorobenzene.
  - *Consumer and bystander exposure pathways associated with consumer conditions of use:* EPA plans to evaluate the inhalation and dermal exposure to *o*-dichlorobenzene when consumers are using lubricants and greases, air care and other products.

- *General population pathways:* EPA plans to evaluate exposure to *o*-dichlorobenzene via groundwater, ambient air, and fish ingestion for the general population via the oral, inhalation and dermal routes.
- *Receptors and PESS:* EPA plans to include children, women of reproductive age (e.g., pregnant women per TSCA statute), workers and consumers as receptors and PESS in the risk evaluation.
- *Environmental exposure pathways:* EPA plans to evaluate exposure to *o*-dichlorobenzene for aquatic and terrestrial receptors (biota).

Hazards. Hazards for *o*-dichlorobenzene are discussed in section 2.4. EPA completed preliminary reviews of information from peer-reviewed assessments and databases to identify potential environmental and human health hazards for *o*-dichlorobenzene as part of the prioritization process. Environmental hazard effects were identified for aquatic and terrestrial organisms. Information collected through systematic review methods and public comments may identify additional environmental hazards that warrant inclusion in the environmental hazard assessment of the risk evaluation.

EPA plans to use systematic review methods to evaluate the epidemiological and toxicological literature for *o*-dichlorobenzene. Relevant mechanistic evidence will also be considered, if reasonably available, to inform the interpretation of findings related to potential human health effects and the dose-repose assessment. EPA plans to evaluate all of the potential human health hazards for *o*-dichlorobenzene identified in Section 2.4.2. The broad health effect categories include reproductive and developmental, immunological, nervous system, genotoxicity, carcinogenicity and absorption, distribution, metabolism, and excretion (ADME).

Analysis Plan. The analysis plan for *o*-dichlorobenzene is presented in Section 2.7. The analysis plan outlines the general science approaches that EPA plans to consider use for the various evidence streams (i.e., chemistry, fate, release and engineering, exposure, hazard) supporting the risk evaluation. The analysis plan is based on EPA's knowledge of *o*-dichlorobenzene to date which includes a partial, but ongoing, review of identified information as described in Section 2.1. EPA plans to continue to consider new information submitted by the public. Should additional data or approaches become reasonably available, EPA may update its analysis plan in the final scope document.

EPA plans to seek public comments on the systematic review methods supporting the risk evaluation of *o*-dichlorobenzene including the methods for assessing the quality of data and information and the approach for evidence synthesis and evidence integration supporting the exposure and hazard assessments. The details will be provided in a supplemental document that EPA anticipates releasing for public comment prior to finalization of the scope document.

Peer Review. The draft risk evaluation for *o*-dichlorobenzene will be peer reviewed. Peer review will be conducted in accordance with relevant and applicable methods for chemical risk evaluations, including using EPA's Peer Review Handbook and other methods consistent with section 26 of TSCA (See 40 CFR 702.45).

1 INTRODUCTION

This document presents for comment the scope of the risk evaluation to be conducted for *o*-dichlorobenzene under the Frank R. Lautenberg Chemical Safety for the 21st Century Act. The Frank R. Lautenberg Chemical Safety for the 21st Century Act amended the Toxic Substances Control Act (TSCA), the Nation's primary chemicals management law, on June 22, 2016. The new law includes statutory requirements and deadlines for actions related to conducting risk evaluations of existing chemicals.

Under TSCA § 6(b), the Environmental Protection Agency (EPA) must designate chemical substances as high-priority substances for risk evaluation or low-priority substances for which risk evaluations are not warranted at the time, and upon designating a chemical substance as a high-priority substance, initiate a risk evaluation on the substance. TSCA § 6(b)(4) directs EPA risk evaluations for existing chemicals, to "*determine whether a chemical substance presents an unreasonable risk of injury to health or the environment, without consideration of costs or other non- risk factors, including an unreasonable risk to a potentially exposed or susceptible subpopulation identified as relevant to the risk evaluation by the Administrator under the conditions of use*."

TSCA § 6(b)(4)(D) and implementing regulations require that EPA publish the scope of the risk evaluation to be conducted, including the hazards, exposures, conditions of use and potentially exposed or susceptible subpopulations that the Administrator expects to consider, within 6 months after the initiation of a risk evaluation. In addition, a draft scope is to be published pursuant to 40 CFR 702.41. In December 2019, EPA published a list of 20 chemical substances that have been designated high priority substances for risk evaluations (Docket ID: EPA-HQ-OPPT-2018-0444), as required by TSCA § 6(b)(2)(B), which initiated the risk evaluation process for those chemical substances. *o*-Dichlorobenzene is one of the chemicals designated as a high priority substance for risk evaluation.

2 SCOPE OF THE EVALUATION

2.1 Reasonably Available Information

EPA conducted a comprehensive search for reasonably available information[1] to support the development of this draft scope document for *o*-dichlorobenzene. EPA leveraged the data and information sources already collected in the documents supporting the chemical substance's high-priority substance designation. In addition, EPA searched for additional data and information physical and chemical properties, environmental fate, engineering, exposure, environmental and human health hazards that could be obtained from the following general categories of sources:

1. Databases containing publicly available, peer-reviewed literature;

[1] *Reasonably available information* means information that EPA possesses or can reasonably generate, obtain, and synthesize for use in risk evaluations, considering the deadlines specified in TSCA section 6(b)(4)(G) for completing such evaluation. Information that meets the terms of the preceding sentence is reasonably available information whether or not the information is confidential business information, that is protected from public disclosure under TSCA section 14 (40 CFR 702.33).

2. Gray literature, which is defined as the broad category of data/information sources not found in standard, peer-reviewed literature databases.
3. Data and information submitted under TSCA sections 4, 5, 8(e), and 8(d), as well as "for your information" (FYI) submissions

Following the comprehensive search, EPA performed a title and abstract screening to identify information potentially relevant for the risk evaluation process. This step also classified the references into useful categories or tags to facilitate the sorting of information through the systematic review process. The search and screening process was conducted based on EPA's general expectations for the planning, execution and assessment activities outlined in the *Application of Systematic Review in TSCA Risk Evaluations* document (U.S. EPA, 2018a). EPA plans to publish supplemental documentation on the systematic review methods supporting the *o*-dichlorobenzene risk evaluation to explain the literature and screening process presented in this document in the form of literature inventory trees. Please note that EPA focuses on the data collection phase (consisting of data search, data screening, and data extraction) during the preparation of the TSCA scope document, whereas the data evaluation and integration stages will occur during the development of the draft risk evaluation and thus are not part of the scoping activities described in this document.

The subsequent sections summarize the data collection activities completed to date for the general categories of sources and topic areas (or disciplines) using systematic review methods. EPA plans to seek public comments on the systematic review methods supporting the risk evaluation for *o*-dichlorobenzene upon publication of the supplemental documentation of those methods.

2.1.1 Search of Gray Literature

EPA surveyed the gray literature[2] and identified 116 search results relevant to EPA's risk assessment needs for *o*-dichlorobenzene. Appendix A lists the gray literature sources that yielded 116 discrete data or information sources relevant to *o*-dichlorobenzene. EPA further categorized the data and information into the various topic areas (or disciplines) supporting the risk evaluation (e.g., physical chemistry, environmental fate, ecological hazard, human health hazard, exposure, engineering) and the breakdown is shown in Figure 2-1. EPA is currently identifying additional reasonably available information (e.g., public comments), and the reported numbers in Figure 2-1 may change.

[2] Gray literature is defined as the broad category of data/information sources not found in standard, peer-reviewed literature databases (e.g., PubMed and Web of Science). Gray literature includes data/information sources such as white papers, conference proceedings, technical reports, reference books, dissertations, information on various stakeholder websites and other databases.

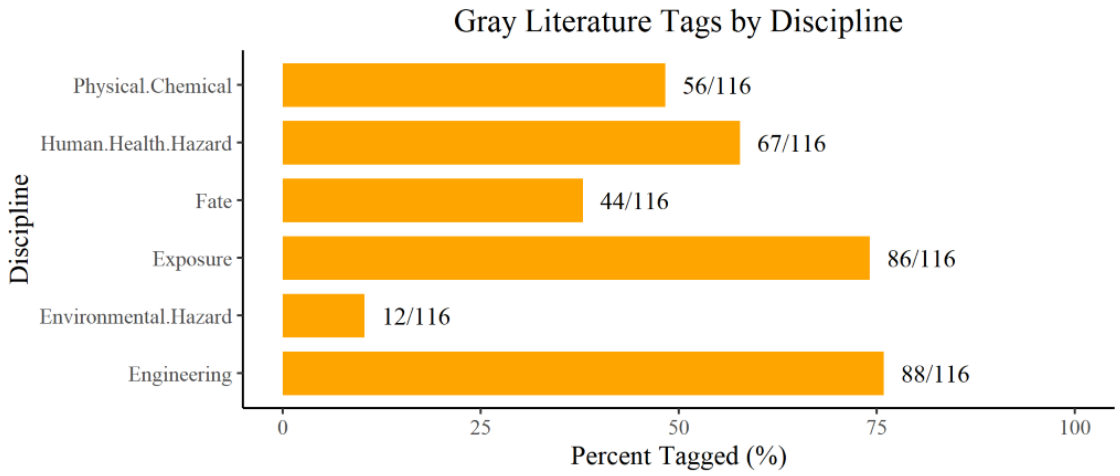


Figure 2-1. Gray Literature Tags by Discipline for *o*-Dichlorobenzene
The percentages across disciplines do not add up to 100%, as each source may provide data or information for various topic areas (or disciplines).

2.1.2 Search of Literature from Publicly Available Databases (Peer-reviewed Literature)

EPA is currently conducting a systematic review of the reasonably available literature. This includes performing a comprehensive search of the reasonably available peer review literature on physical-chemical properties, environmental fate and transport, engineering (environmental release and occupational exposure), exposure (environmental, general population and consumer) and environmental and human health hazards of *o*-dichlorobenzene. Eligibility criteria were applied in the form of PECO (population, exposure, comparator, outcome) statements. Included references met the PECO criteria, whereas excluded references did not meet the criteria (i.e., not relevant), and supplemental material was considered as potentially relevant. EPA plans to evaluate the reasonably available information identified for each discipline during the development of the risk evaluation. The literature inventory trees depicting the number of references that were captured and those that were included, excluded, or tagged as supplemental material during the screening process for each discipline area are shown in Figure 2-2 through Figure 2-6. “TIAB” in these figures refer to “title and abstract” screening. Note that in some figures the sum of the numbers for the various sub-categories may be larger than the broader category because some studies may be included under multiple sub-categories. In other cases, the sum of the various sub-categories may be smaller than the main category because some studies may not be depicted in the sub-categories if their relevance to the risk evaluation was unclear.

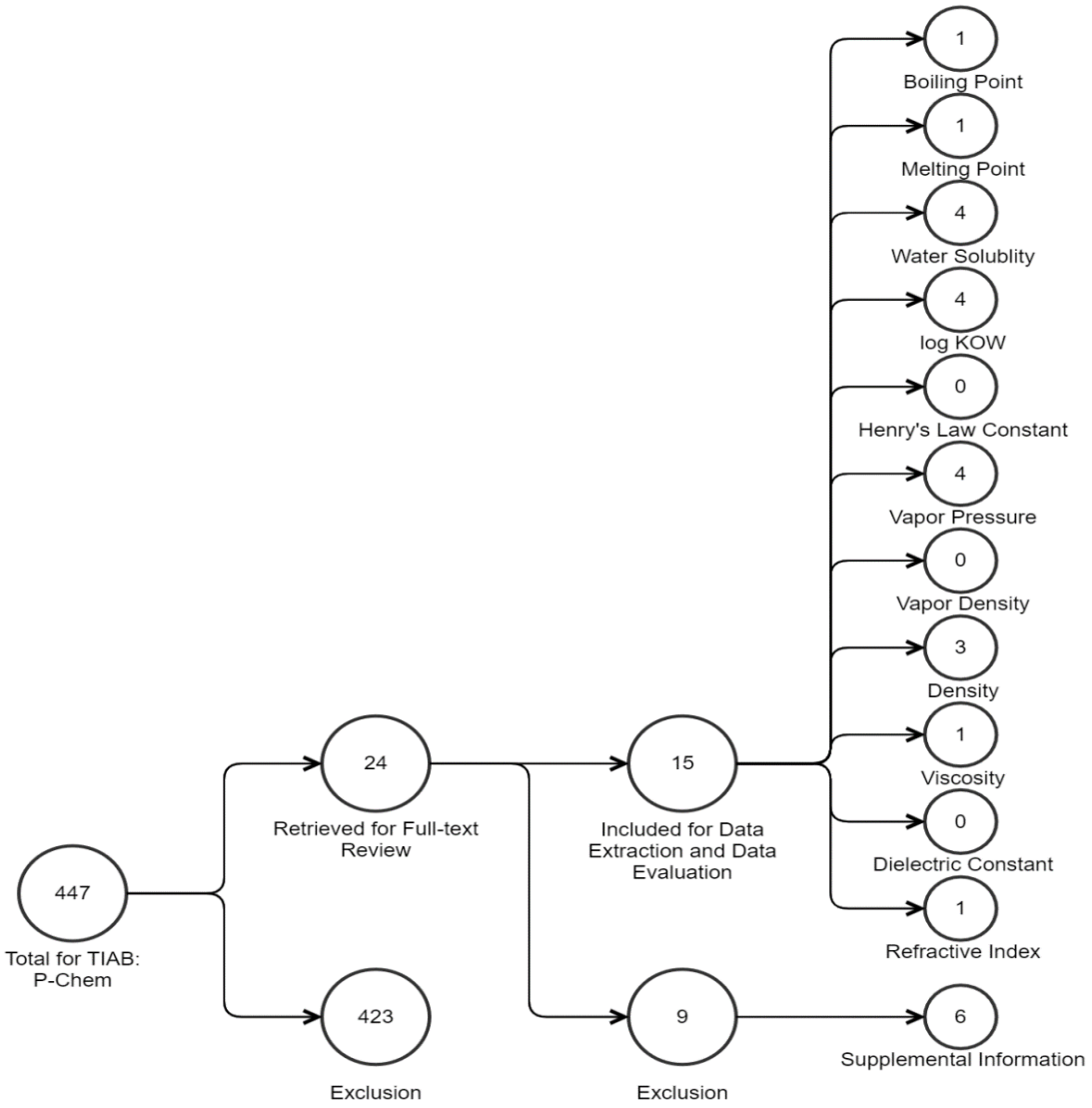


Figure 2-2. Peer-Reviewed Literature- Physical-Chemical Properties Search Results for *o*-Dichlorobenzene

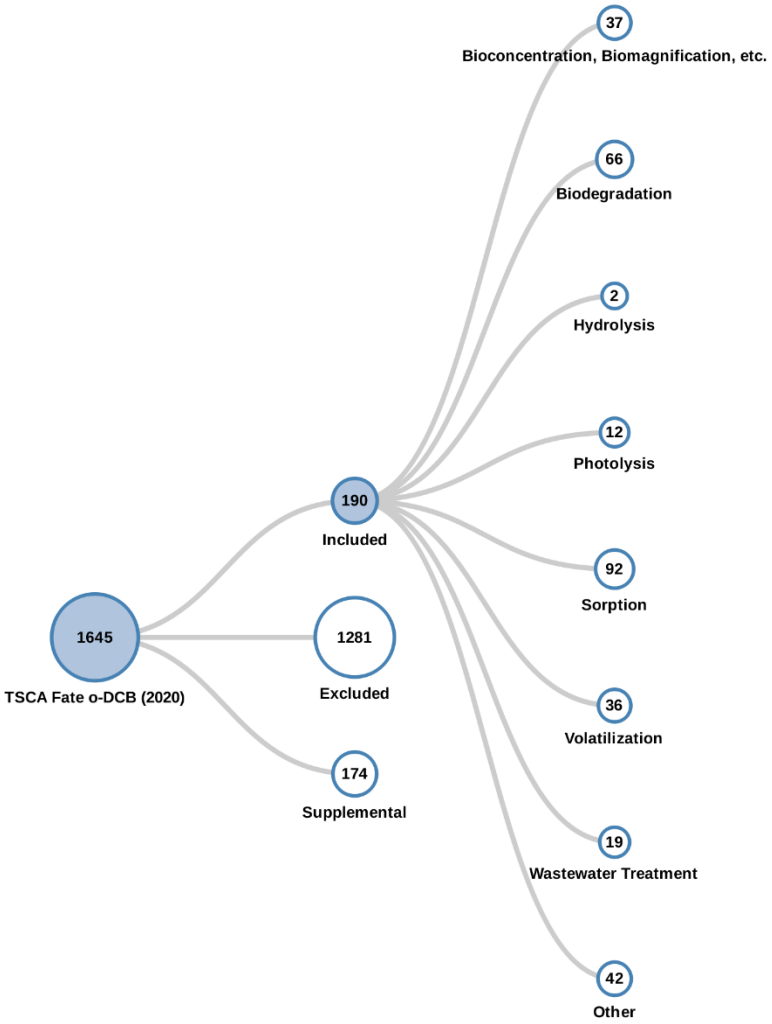


Figure 2-3. Peer-reviewed Literature - Fate Search Results for o-Dichlorobenzene
Click here for interactive Health Assessment Workplace Collaborative (HAWC) diagram

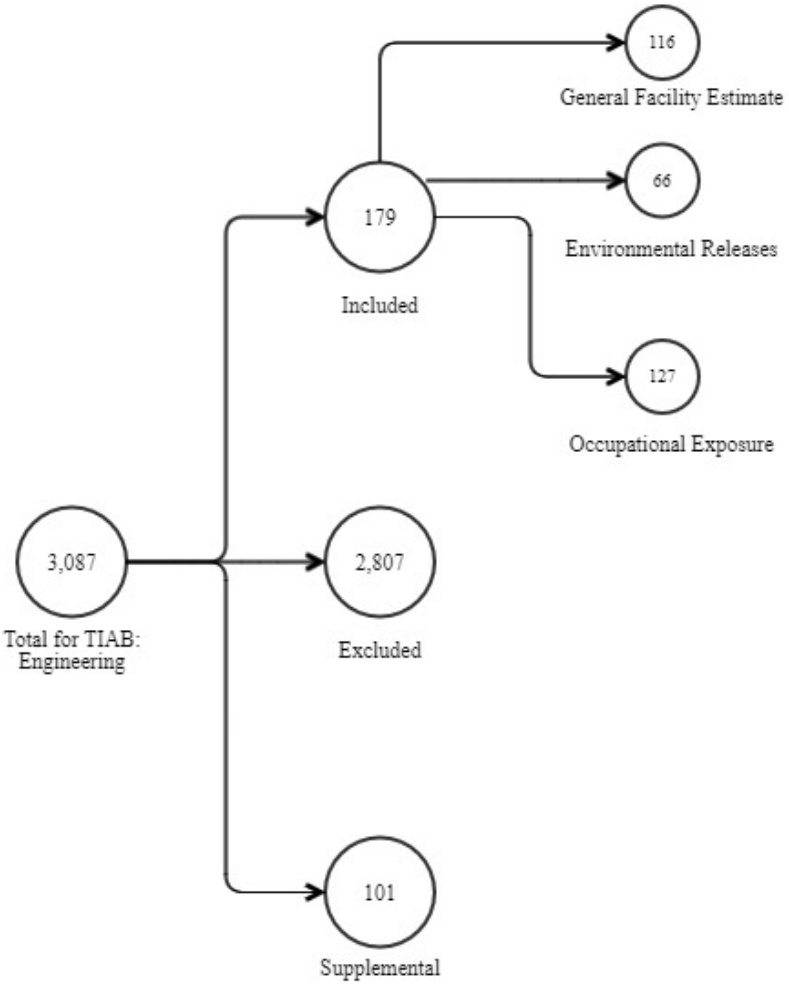


Figure 2-4. Peer-reviewed Literature - Engineering Search Results for *o*-Dichlorobenzene

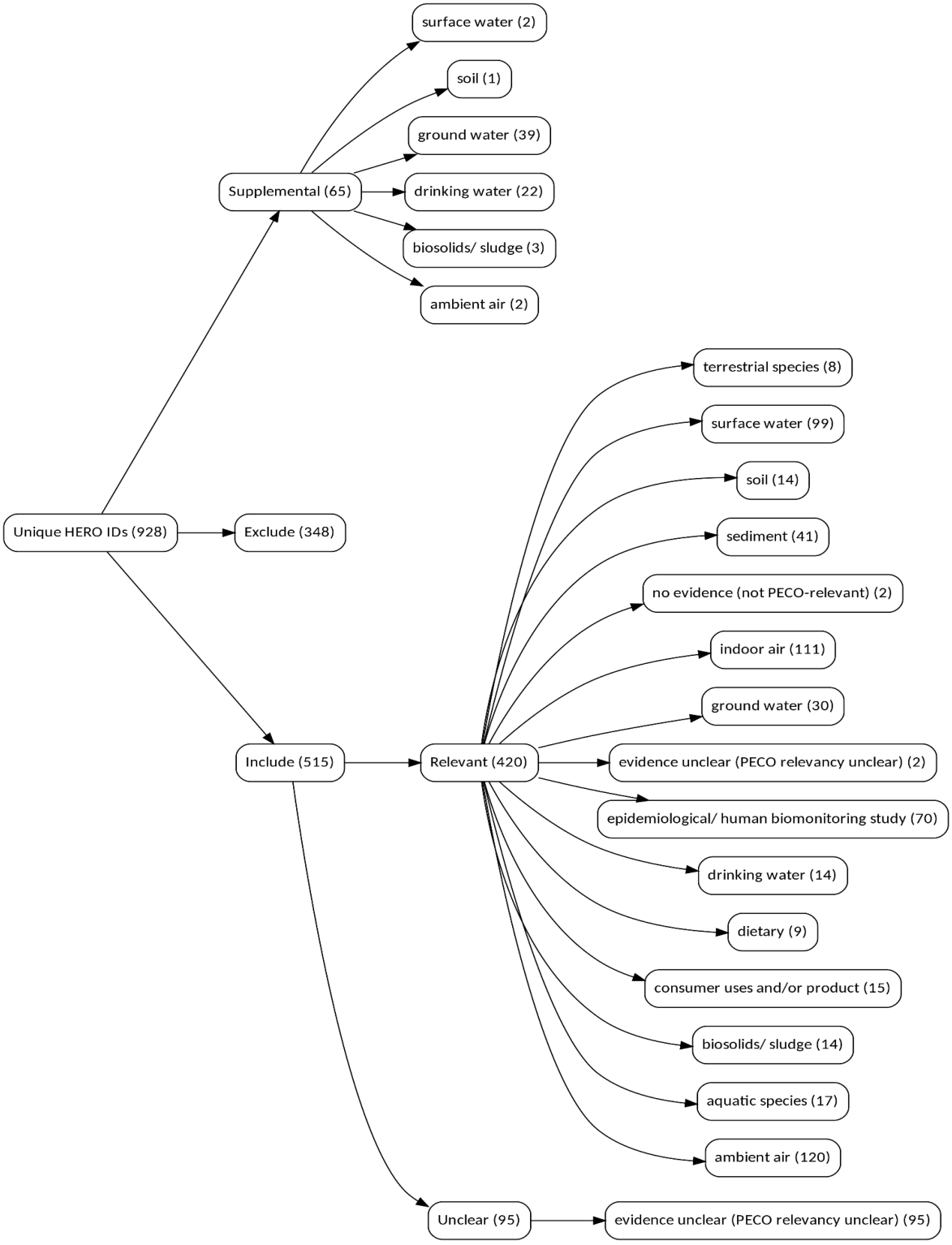


Figure 2-5. Peer-reviewed Exposure Search Results for *o*-Dichlorobenzene

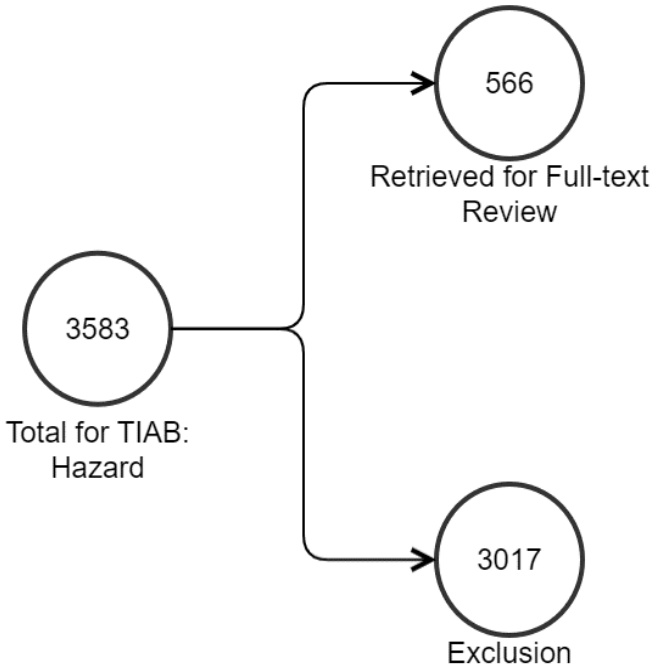


Figure 2-6. Peer-reviewed Hazard Search Results for *o*-Dichlorobenzene

2.1.3 Search of TSCA Submissions

Table 2-1 presents the results of screening the titles of data sources and reports submitted to EPA under various sections of TSCA. EPA screened a total of 129 submissions using inclusion/exclusion criteria specific to individual disciplines (see Table 2-1 for the list of disciplines). The details about the criteria are not part of this document but will be provided in a supplemental document that EPA anticipates releasing prior to the finalization of the scope document. EPA identified 89 submissions that met the inclusion criteria in these statements and identified 28 submissions with supplemental data. EPA excluded 12 submissions because the reports were identified as one of the following:

- Published report that would be identified via other peer or gray literature searches
- Summary of other reports
- Preliminary report of a final available submitted report
- Duplicate of another report
- Submission on a different chemical
- List of references with no original data

EPA plans to conduct additional deduplication at later stages of the systematic review process (e.g., full text screening), when more information regarding the reports is available.

Table 2-1. Results of Title Screening of Submissions to EPA under Various Sections of TSCA[a]

Discipline	Included	Supplemental [b]
Physicochemical Properties	1	0
Environmental Fate and Transport	10	0
Environmental and General Population Exposure	46	1
Occupational Exposure/Release Information	12	0
Environmental Hazard	5	2
Human Health Hazard	30	25

[a] Individual submissions may be relevant to multiple disciplines.
[b] Included submissions may contain supplemental data for other disciplines, which will be identified at full-text review.

2.2 Conditions of Use

As described in the *Proposed Designation of o-Dichlorobenzene (CASRN 95-50-1) as a High-Priority Substance for Risk Evaluation* (U.S. EPA, 2019a), EPA assembled information from the CDR and TRI programs to determine conditions of use[3] or significant changes in conditions of use of the chemical substance. EPA also consulted a variety of other sources to identify uses of *o*-dichlorobenzene, including: published literature, company websites, and government and commercial trade databases and publications. To identify formulated products containing *o*-dichlorobenzene, EPA searched for safety data sheets (SDS) using internet searches, EPA Chemical and Product Categories (CPCat) data, and other resources in which SDSs could be found. SDSs were cross-checked with company websites to make sure that each product SDS was current. In addition, EPA incorporated communications with companies, industry groups, environmental organizations, and public comments to supplement the use information.

EPA identified and described the categories and subcategories of conditions of use that will be included in the scope of the risk evaluation (Section 2.2.1; Table 2-2). The conditions of use that EPA plans to include in the scope are those reflected in the life cycle diagrams and conceptual models.

After gathering reasonably available information related to the manufacture, processing, distribution in commerce, use and disposal of *o*-dichlorobenzene, EPA identified those categories or subcategories of use activities for *o*-dichlorobenzene the Agency determined not to be conditions of use or will otherwise be excluded during scoping. These categories and subcategories are described in Section 2.2.2.

[3] *Conditions of use* means the circumstances, as determined by the Administrator, under which a chemical substance is intended, known, or reasonably foreseen to be manufactured, processed, distributed in commerce, used, or disposed of.

2.2.1 Categories and Subcategories of Conditions of Use Included in the Scope of the Risk Evaluation

Table 2-2 lists the conditions of use that are included in the scope of the risk evaluation.

Table 2-2. Categories and Subcategories of Conditions of Use Included in the Scope of the Risk Evaluation

Life-Cycle Stage	Category	Subcategory	Reference
Manufacturing	Domestic manufacture/Import	CBI	U.S. EPA, 2019b
	Import	Import	U.S. EPA, 2019b
Processing	Processing as a reactant	In All other chemical product and preparation manufacturing	U.S. EPA, 2019b
	Processing – incorporation into formulation, mixture or reaction product	Intermediates in All other basic organic chemical manufacturing	U.S. EPA, 2019b
		Solvents (which become part of product formulation or mixture) in Plastic material and resin manufacturing	U.S. EPA, 2019b; EPA-HQ-OPPT-2018-0444-0013
		Pigments in: Printing ink manufacturing; Paint and coating manufacturing; Synthetic dye and pigment manufacturing	U.S. EPA, 2019b
Distribution in commerce	Distribution in commerce	Distribution in commerce	
Commercial use	Ink, toner, and colorant products	Ink and toners	U.S. EPA, 2019b; EPA-HQ-OPPT-2018-0444-0004
	Paints and coatings	Coatings and paints, thinners, paint removers	U.S. EPA, 2019b; EPA-HQ-OPPT-2018-0444-0004
	Lubricants and greases	Lubricants and greases, degreasers	EPA-HQ-OPPT-2018-0444-0004; EPA-HQ-OPPT-2018-0444-0013; EPA-HQ-OPPT-2019-0131-0022; Marvel Oil Company (2017)

	Air care products	Continuous action air fresheners (including toilet/urinal deodorizers/fresheners)	DeLima Associates (2014)
	Other use	e.g., Laboratory chemicals; Sheep-branding fluid; Cleaning and furniture care products	EPA-HQ-OPPT-2018-0444-0013; Heiniger (2016)
Consumer use	Lubricants and greases	Lubricants and greases, degreasers	EPA-HQ-OPPT-2018-0444-0013; EPA-HQ-OPPT-2019-0131-0022; Marvel Oil Company (2017)
	Air care products	Continuous action air fresheners (including toilet/urinal deodorizers/fresheners)	DeLima Associates (2014)
	Other use	e.g., Thinners (Products for cleaning brushes and tools used with overglazes); Ceramics glaze; Sheep-branding fluid; Cleaning and furniture care products	EPA-HQ-OPPT-2018-0444-0013; Duncan Enterprises (2014); Duncan Enterprises (2015); Heiniger (2016)
Disposal	Disposal	Disposal	

- Life Cycle Stage Use Definitions (40 CFR § 711.3)
  - "Industrial use" means use at a site at which one 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.
- These categories of conditions of use appear in the Life Cycle Diagram, reflect CDR codes, and broadly represent conditions of use of *o*-Dichlorobenzene in industrial and/or commercial settings
- These subcategories reflect more specific uses of *o*-Dichlorobenzene.
- At this time, "CBI" indicates that a data element has been claimed CBI by the information submitter; it does not reflect the result of an EPA substantiation review.

2.2.2 Activities Excluded from the Scope of the Risk Evaluation

As explained in the final rule for *Procedures for Chemical Risk Evaluation Under the Amended Toxic Substances Control Act*, TSCA section 6(b)(4)(D) requires EPA to identify the hazards,

exposures, conditions of use, and the potentially exposed or susceptible subpopulations the Administrator expects to consider in a risk evaluation, suggesting that EPA may exclude certain activities that it determines to be conditions of use on a case-by-case basis. (82 FR 33736, 33729; July 20, 2017). TSCA section 3(4) also grants EPA the authority to determine what constitutes a condition of use for a particular chemical substance. EPA does not plan to include in this scope or in the risk evaluation the activities described below that the Agency has concluded do not constitute conditions of use.

Public comments submitted to EPA in the docket indicate the use of *o*-dichlorobenzene in pesticides (EPA-HQ-OPPT-2018-0444-0013) but these activities are not "conditions of use" (defined in TSCA § 3(4)) as circumstances associated with "a chemical substance," as defined in TSCA § 3(2). TSCA defines "chemical substance" to exclude pesticides, which are covered under EPA's Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 7 U.S.C. § 136 et seq. (1996). Additionally, the last pesticidal products containing *o*-dichlorobenzene were cancelled in 1992. Therefore, the use of *o*-dichlorobenzene in pesticides is outside the scope of the definition of chemical substance[4] as regulated by TSCA and EPA does not plan to consider those activities in the risk evaluation.

2.2.3 Production Volume

As reported to EPA during the 2016 CDR reporting period and described here as a range to protect production volumes that were claimed as confidential business information (CBI), total production volume of *o*-dichlorobenzene in 2015 was between 100,000 and 500,000 pounds (Figure 2-1) (U.S. EPA, 2017). EPA also uses pre-2015 CDR production volume information, as detailed in the *Proposed Designation of o-Dichlorobenzene (CASRN 95-50-1) as a High-Priority Substance for Risk Evaluation* (U.S. EPA, 2019a) and will include future production volume information as it becomes available to support the exposure assessment.

2.2.4 Overview of Conditions of Use and Lifecycle Diagram

The life cycle diagram provided in Figure 2-7 depicts the conditions of use that are considered within the scope of risk evaluation for the various life cycle stages. This section provides a brief overview of the industrial, commercial and consumer use categories included in the life cycle diagram. The activities that EPA determined are out of scope are not included in the life cycle diagram. 2.8Appendix E contains additional descriptions (e.g., process descriptions, worker activities, process flow diagrams) for each manufacture, processing, distribution in commerce, use and disposal category.

[4] *Chemical substance* means any organic or inorganic substance of a particular molecular identity, including any combination of such substances occurring in whole or in part as a result of a chemical reaction or occurring in nature, and any element or uncombined radical. Chemical substance does not include (1) any mixture; (2) any pesticide (as defined in the Federal Insecticide, Fungicide, and Rodenticide Act) when manufactured, processed, or distributed in commerce for use as a pesticide; (3) tobacco or any tobacco product; (4) any source material, special nuclear material, or byproduct material (as such terms are defined in the Atomic Energy Act of 1954 and regulations issued under such Act); (5) any article the sale of which is subject to the tax imposed by section 4181 of the Internal Revenue Code of 1954 (determined without regard to any exemptions from such tax provided by section 4182 or 4221 or any other provision of such Code), and; (6) any food, food additive, drug, cosmetic, or device (as such terms are defined in section 201 of the Federal Food, Drug, and Cosmetic Act) when manufactured, processed, or distributed in commerce for use as a food, food additive, drug, cosmetic, or device.

The information in the life cycle diagram is grouped according to the CDR processing codes and use categories (including functional use codes for industrial uses and product categories for industrial, commercial and consumer uses).

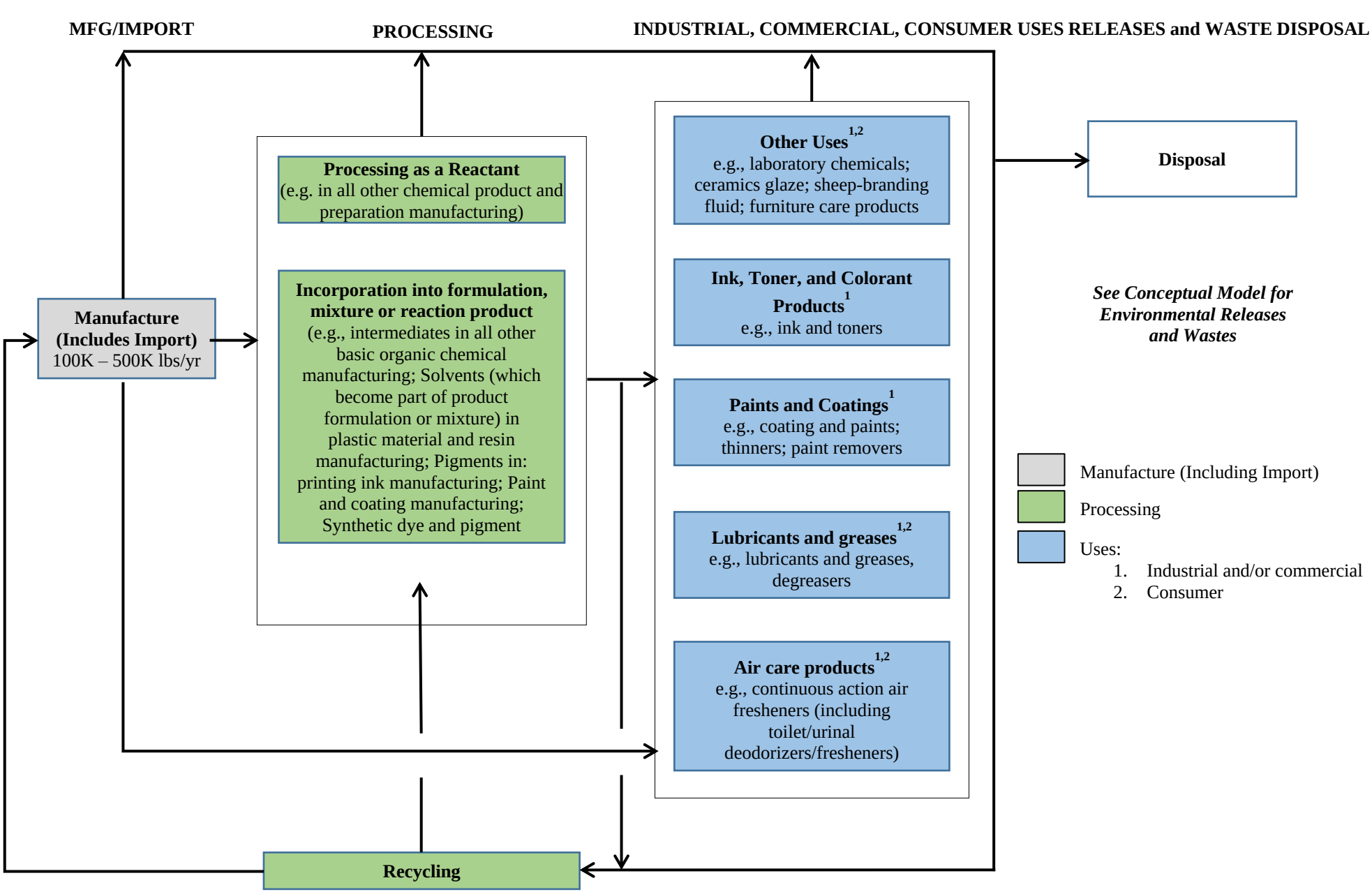


Figure 2-7. *o*-Dichlorobenzene Life Cycle Diagram

Volume is not depicted in the life cycle diagram for processing and industrial, commercial, and consumer uses as specific production volume is claimed confidential business information (CBI) or withheld pursuant to TSCA Section § 14.

2.3 Exposures

For TSCA exposure assessments, EPA plans to analyze exposures and releases to the environment resulting from the conditions of use within the scope of the risk evaluation of *o*-dichlorobenzene. Release pathways and routes will be described to characterize the relationship or connection between the conditions of use of the chemical and the exposure to human receptors, including potentially exposed or susceptible subpopulations, and environmental receptors. EPA plans to consider, where relevant, the duration, intensity (concentration), frequency and number of exposures in characterizing exposures to *o*-dichlorobenzene.

2.3.1 Physical and Chemical Properties

Physical and chemical properties are essential for a thorough understanding or prediction of environmental fate (i.e., transport and transformation) and the eventual environmental concentrations. They can also inform the hazard assessment. EPA plans to use the physical and chemical properties described in Table 7 of the *Proposed Designation of o-Dichlorobenzene (CASRN 95-50-1) as a High-Priority Substance for Risk Evaluation* (U.S. EPA, 2019a) to support the development of the risk evaluation for *o*-dichlorobenzene. The values for the physical and chemical properties (Appendix B) may be updated as EPA collects additional information through systematic review methods.

2.3.2 Environmental Fate and Transport

Understanding of environmental fate and transport processes assists in the determination of the specific exposure pathways and potential human and environmental receptors that need to be assessed in the risk evaluation for *o*-dichlorobenzene. EPA plans to use the environmental fate characteristics described in Appendix C of the *Proposed Designation of o-Dichlorobenzene (CASRN 95-50-1) as a High-Priority Substance for Risk Evaluation* (U.S. EPA, 2019a) to support the development of the risk evaluation for *o*-dichlorobenzene. The values for the environmental fate properties (Appendix C) may be updated as EPA collects additional information through systematic review methods.

2.3.3 Release to the Environment

Releases to the environment from conditions of use (e.g., manufacturing. industrial, and commercial processes, commercial or consumer uses) are a component of potential exposure and may be derived from reported data that are obtained through direct measurement, calculations based on empirical data and/or assumptions and models.

A source of information that EPA plans to consider in evaluating exposure are data reported to the Toxics Release Inventory (TRI) program. EPA's TRI database contains information on chemical waste management activities that are disclosed by industrial and federal facilities, including quantities released into the environment (i.e., to air, water, and disposed of to land), treated, burned for energy, recycled, or transferred off-site to other facilities for these purposes.

Under the Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA, *o*-dichlorobenzene is a TRI-reportable substance, under the name 1,2-dichlorobenzene, effective January 01, 1987 (40 CFR 372.65). For TRI reporting[5], facilities in covered sectors in the United

[5] For TRI reporting criteria see https://www.epa.gov/toxics-release-inventory-tri-program/basics-tri-reporting

States are required to disclose releases and other waste management activity quantities of *o*-dichlorobenzene under the CASRN 95-50-1 if they manufacture (including import) or process more than 25,000 pounds or otherwise use more than 10,000 pounds of the chemical in a given year by July 1 of the following year.

Table 2-3 provides production-related waste management data for *o*-dichlorobenzene reported by facilities to the TRI program for reporting year 2018.[6] As shown in the table, 17 facilities reported in total over 55.3 million pounds of *o*-dichlorobenzene waste for 2018. Nearly all (97%) of the *o*-dichlorobenzene managed as waste during 2018 was managed on site by recycling. Waste treatment quantities (nearly 1.6 million pounds) accounted for 2.8% of the total. Contributions from quantities burned for energy recovery or released to the environment were very small, amounting to only 0.5% and 0.1%, respectively, of the total quantity of *o*-dichlorobenzene managed as waste during 2018. Overall, 99.2% of the *o*-dichlorobenzene production-related waste was managed as such on site.

Table 2-3. Summary of o-Dichlorobenzene TRI Production-Related Waste Managed in 2018

Year	Number of Facilities (lbs)	Recycled (lbs)	Recovered for Energy (lbs)	Treated (lbs)	Released[a,b,c] (lbs)	Total Production Related Waste (lbs)
2018	17	53,448,206	272,008	1,560,880	62,159	55,343,252

Data source: 2018 TRI Data (U.S. EPA, 2019c)
[a] Terminology used in these columns may not match the more detailed data element names used in the TRI public data and analysis access points.
[b] Does not include releases due to one-time event not associated with production such as remedial actions or earthquakes.
[c] Counts all releases including release quantities transferred and release quantities disposed of by a receiving facility reporting to TRI.

Table 2-4 provides a summary of *o*-dichlorobenzene released to the environment during 2018 as reported to TRI.[2] Land disposal and releases to air accounted for nearly all releases to the environment, with extremely minor contributions from discharges to water and other releases. Roughly 55% of total releases were in the form of land disposal, with slightly more than half in RCRA Subtitle C landfills, and slightly less than half in Class I underground injection wells. *o*-Dichlorobenzene releases to air accounted for nearly all remaining environmental releases. Roughly 60% of these air releases originated from point sources with fugitive air releases accounting for the remainder. Overall, more than 99.9% of *o*-dichlorobenzene releases during 2018 occurred on site, and only about three pounds of *o*-dichlorobenzene waste were sent off site for disposal.

[6] Reporting year 2018 is the most recent TRI data available. Data presented in Table2-3 were queried using TRI Explorer and uses the 2018 National Analysis data set (released to the public in November 2019). This dataset includes revisions for the years 1988 to 2018 processed by EPA.

Table 2-4. Summary of Releases of *o*-Dichlorobenzene to the Environment During 2018

Year	Number of Facilities	Air Releases		Water Releases	Land Disposal			Other Releases [a] (lbs)	Total Releases [b, c] (lbs)
		Stack Air Releases (lbs)	Fugitive Air Releases (lbs)		Class I Under-ground Injection (lbs)	RCRA Subtitle C Landfills (lbs)	All other Land Disposal [a] (lbs)		
2018	17	16,672	11,380	7	15,700	18,400	0	0.101	62,159
		28,052			34,100				

Data source: 2018 TRI Data (U.S. EPA, 2019c)
[a] Terminology used in these columns may not match the more detailed data element names used in the TRI public data and analysis access points.
[b] These release quantities do include releases due to one-time events not associated with production such as remedial actions or earthquakes.
[c] Counts release quantities once at final disposition, accounting for transfers to other TRI reporting facilities that ultimately dispose of the chemical waste.

While production-related waste managed shown in Table 2-3 excludes any quantities reported as catastrophic or one-time releases (TRI section 8 data), release quantities shown in Table 2-4 include both production-related and non-production-related quantities. For *o*-dichlorobenzene the total release quantities shown in each table are the same, but for other TRI chemicals total release quantities between the two tables may differ slightly and may further reflect differences in TRI calculation methods for reported release range estimates (U.S. EPA, 2019d).

EPA plans to review these data in conducting the exposure assessment component of the risk evaluation for *o*-dichlorobenzene.

2.3.4 Environmental Exposures

The manufacturing, processing, distribution, use and disposal of *o*-dichlorobenzene can result in releases to the environment and exposure to aquatic and terrestrial receptors (biota). Environmental exposures to biota are informed by releases into the environment, overall persistence, degradation, and bioaccumulation within the environment, and partitioning across different media. Concentrations of chemical substances in biota provide evidence of exposure. EPA plans to review reasonably available information on environmental exposure in biota to inform development of the environmental exposure assessment for *o*-dichlorobenzene.

2.3.5 Occupational Exposures

EPA plans to evaluate worker activities where there is a potential for exposure under the various conditions of use (manufacturing, processing and industrial/commercial uses) described in Section 2.2. In addition, EPA plans to evaluate exposure to occupational non-users (ONUs), i.e., workers who do not directly handle the chemical but perform work in an area where the chemical is present. EPA also expects to consider the effect(s) that engineering controls and/or personal protective equipment have on occupational exposure levels as part of the draft risk evaluation.

Worker activities associated with the conditions of use within the scope of the risk evaluation for *o*-dichlorobenzene that will be analyzed include, but are not limited to:

- Unloading and transferring *o*-dichlorobenzene to and from storage containers and process vessels;
- Handling, transporting and disposing of waste containing *o*-dichlorobenzene;

- Cleaning and maintaining equipment;
- Sampling chemicals, formulations, or products containing *o*-dichlorobenzene for quality control;
- Repackaging chemicals, formulations, or products containing *o*-dichlorobenzene;

o-Dichlorobenzene is a liquid with vapor pressure of 1.36 mmHg at room temperature. Based on the chemical's volatility, EPA plans to analyze inhalation exposure to vapor for workers and ONUs. EPA also plans to evaluate inhalation exposure to mists for workers and ONUs where products containing *o*-dichlorobenzene may be spray-applied. EPA plans to evaluate dermal exposures for workers, who are expected to have skin contact with *o*-dichlorobenzene. Occupational non-users do not directly handle *o*-dichlorobenzene; therefore, skin contact with *o*-dichlorobenzene is not expected for occupational non-users.

In addition, for certain COUs, *o*-dichlorobenzene may be present as a component of solid products. For these COUs, EPA plans to consider inhalation exposure to dust/particulates (e.g., particulate generated during handling of plastic resins, finishing operations associated with the manufacture and finishing of plastics and plastic articles and incorporation of plastics and other article components into finished products) for workers and ONUs.

EPA generally does not evaluate occupational exposures through the oral route because oral exposure is typically incidental in nature. Workers may inadvertently transfer chemicals from their hands to their mouths, ingest inhaled particles that deposit in the upper respiratory tract or consume contaminated food, the frequency and significance of this exposure route are dependent on several factors including the p-chem properties of the substance during expected worker activities, workers' awareness of the chemical hazards, the visibility of the chemicals on the hands while working, workplace practices, and personal hygiene that is difficult to predict (Cherrie et al., 2006). However, EPA will consider oral exposure on a case-by-case basis for certain COUs and worker activities where there is information and data on incidental ingestion of inhaled dust. EPA will consider ingestion of inhaled dust as an inhalation exposure for *o*-dichlorobenzene.

The United States has several regulatory and non-regulatory exposure limits for *o*-dichlorobenzene: the Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) (29 CFR 1910.1000) and the National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL) (NIOSH, 2019) are both equal to 50 parts per million (ppm) or 300 milligrams (mg)/cubic meter (m^3) as a ceiling limit.

2.3.6 Consumer Exposures

According to reports of the 2016 CDR, lubricants and greases, air care products, as well as other uses, such as, thinners, ceramics glaze, sheep-branding fluid, and cleaning and furniture care products, were identified as consumer products containing *o*-dichlorobenzene. Consumers using or disposing of *o*-dichlorobenzene-based lubricants and greases, air care products, and other products may be exposed to *o*-dichlorobenzene through direct solid and liquid contact which may lead to dermal exposure, through vapor emissions, which may lead to inhalation exposure, or through mist generation which may lead to inhalation and dermal exposure (see Appendix D). Bystanders present during the consumer use of lubricants and greases, air care products, and

other products or disposal of *o*-dichlorobenzene may also be exposed to vapor emissions and mist generation which may lead to inhalation and dermal exposure. Based on these potential sources and pathways of exposure, EPA plans to analyze dermal and inhalation routes of exposure to consumers that may result from the conditions of use of *o*-dichlorobenzene.

There were no reports to CDR of any use of *o*-dichlorobenzene in children's products.

2.3.7 General Population Exposures

EPA plans to review reasonably available environmental monitoring data for *o*-dichlorobenzene. Outdoor air levels have been measured and range from 0.01 to 0.1 ppb for *o*-dichlorobenzene (ATSDR 2006). The primary route of exposure for the general population is inhalation. Average intake values for the general population were estimated to be 1.8 µg/day, on the basis of ambient outdoor samples from seven large U.S. cities (ATSDR 2006). Several groups within the general population have potentially higher exposures (higher than background levels) to *o*-dichlorobenzene. These populations include individuals living near sites where *o*-dichlorobenzene is produced or used in manufacturing and disposal sites. Individuals living in proximity to hazardous waste sites may also be exposed to *o*-dichlorobenzene by contaminated groundwater. If residential wells are the primary source of drinking water, this may pose a risk to human health by consumption of contaminated water and by increased inhalation of and dermal contact during showering and bathing (ATSDR 2006). Additionally, the National Fish Tissue Study states potential exposure for the general population is likely to this chemical in fish tissue from lakes and reservoirs of the continental United States (EPA 2009).

2.4 Hazards (Effects)

2.4.1 Environmental Hazards

As described in the *Proposed Designation of o-Dichlorobenzene (CASRN 95-50-1) as a High-Priority Substance for Risk Evaluation* (U.S. EPA, 2019a), EPA considered reasonably available information from peer-reviewed assessments and databases to identify potential environmental hazards for *o*-dichlorobenzene. EPA considers all the potential environmental hazards for *o*-dichlorobenzene identified during prioritization to be relevant for the risk evaluation and thus they remain within the scope of the evaluation. EPA is in the process of identifying additional reasonably available information through systematic review methods and public comments, which may update the list of potential environmental hazards associated with *o*-dichlorobenzene. If necessary, EPA plans to update the list of potential hazards in the final scope document for *o*-dichlorobenzene. Based on information identified during prioritization, environmental hazard effects were identified for aquatic and terrestrial organisms.

2.4.2 Human Health Hazards

As described in the *Proposed Designation of o-Dichlorobenzene (CASRN 95-50-1) as a High-Priority Substance for Risk Evaluation* (U.S. EPA, 2019a), EPA considered reasonably available information from peer-reviewed assessments and databases to identify potential human health hazards for *o*-dichlorobenzene. EPA plans to evaluate all of the potential human health hazards for *o*-dichlorobenzene identified during prioritization. The health effect categories screened for during prioritization included acute toxicity, irritation/corrosion, dermal sensitization, respiratory sensitization, genetic toxicity, repeated dose toxicity, reproductive toxicity, developmental

toxicity, immunotoxicity, neurotoxicity, carcinogenicity, epidemiological or biomonitoring studies and ADME[1]. The broad health effect categories include reproductive and, developmental, nervous system, and irritation effects. Studies were identified reporting information on genotoxicity, carcinogenicity and ADME. EPA is in the process of identifying additional reasonably available information through systematic review methods and public input, which may update the list of potential human health hazards under the scope of the risk evaluation. EPA plans to update the list of potential hazards in the final scope document of the *o*-dichlorobenzene risk evaluation.[7].

2.5 Potentially Exposed or Susceptible Subpopulations

TSCA§ 6(b)(4) requires EPA to determine whether a chemical substance presents an unreasonable risk to "a potentially exposed or susceptible subpopulation identified as relevant to the risk evaluation." TSCA §3(12) states that "the term 'potentially exposed or susceptible subpopulation' 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." General population is "the total of individuals inhabiting an area or making up a whole group" and refers here to the U.S. general population (U.S. EPA, 2011).

During the Prioritization process, EPA identified the following potentially exposed or susceptible subpopulations based on CDR information and studies reporting developmental and reproductive effects: children, women of reproductive age (e.g., pregnant women per TSCA statute), workers and consumers (U.S. EPA, 2019b). EPA plans to evaluate these potentially exposed or susceptible subpopulations in the risk evaluation.

In developing exposure scenarios, EPA plans to analyze available data to ascertain whether some human receptor groups may be exposed via exposure pathways that may be distinct to a particular subpopulation or life stage (e.g., children's crawling, mouthing or hand-to-mouth behaviors) and whether some human receptor groups may have higher exposure via identified pathways of exposure due to unique characteristics (e.g., activities, duration or location of exposure) when compared with the general population (U.S. EPA, 2006). Likewise, EPA plans to evaluate available human health hazard information to ascertain whether some human receptor groups may have greater susceptibility than the general population to the chemical's hazard(s).

2.6 Conceptual Models

In this section, EPA presents the conceptual models describing the identified exposures (pathways and routes), receptors and hazards associated with the conditions of use of *o*-dichlorobenzene. Pathways and routes of exposure associated with workers and ONU's are described in Section 2.6.1, and pathways and routes of exposure associated with consumers are described in Section 2.6.2. Pathways and routes of exposure associated with environmental

[1] ADME= absorption, distribution, metabolism, and excretion

[7] Refer to table 10 of the *Proposed Designation of p-Dichlorobenzene (CASRN 106-46-7) as a High-Priority Substance for Risk Evaluation*

releases and wastes, including those pathways that may be addressed pursuant to other Federal laws are discussed and depicted the conceptual model shown in Section 2.6.3. Pathways and routes of exposure associated with environmental releases and wastes, excluding those pathways that may be addressed pursuant to other Federal laws are presented in the conceptual model shown in Section 2.6.4.

2.6.1 Conceptual Model for Industrial and Commercial Activities and Uses: Potential Exposures and Hazards

Figure 2-8 illustrates the conceptual model for the pathways of exposure from industrial and commercial activities and uses of *o*-dichlorobenzene that EPA plans to include in the risk evaluation. There is potential for exposures to workers and/or ONU's via inhalation routes and exposures to workers via dermal routes. It is expected that inhalation exposure to vapors is the most likely exposure route. In addition, workers at waste management facilities may be exposed via inhalation or dermal routes via wastewater treatment, incineration or other disposal methods. EPA plans to evaluate activities resulting in exposures associated with distribution in commerce (e.g., loading, unloading) throughout the various lifecycle stages and conditions of use (e.g., manufacturing, processing, industrial use, commercial use, and disposal) rather than a single distribution scenario. EPA anticipates inhalation and/or oral exposure for workers and occupational non-users, and dermal exposure only for workers. In EPA's 1981 risk assessment of dichlorobenzenes (U.S. EPA, 1981), inhalation exposures to vapor and mist were assessed as the most likely exposure route; however, there is also potential dermal exposure for some conditions of use, such as use in paints and coatings.

For each condition of use identified in Table 2-2, an initial determination was made as to whether each unique combination of exposure pathway, route, and receptor will be analyzed in the risk evaluation. The results of that analysis along with the supporting rationale are presented in Appendix F.

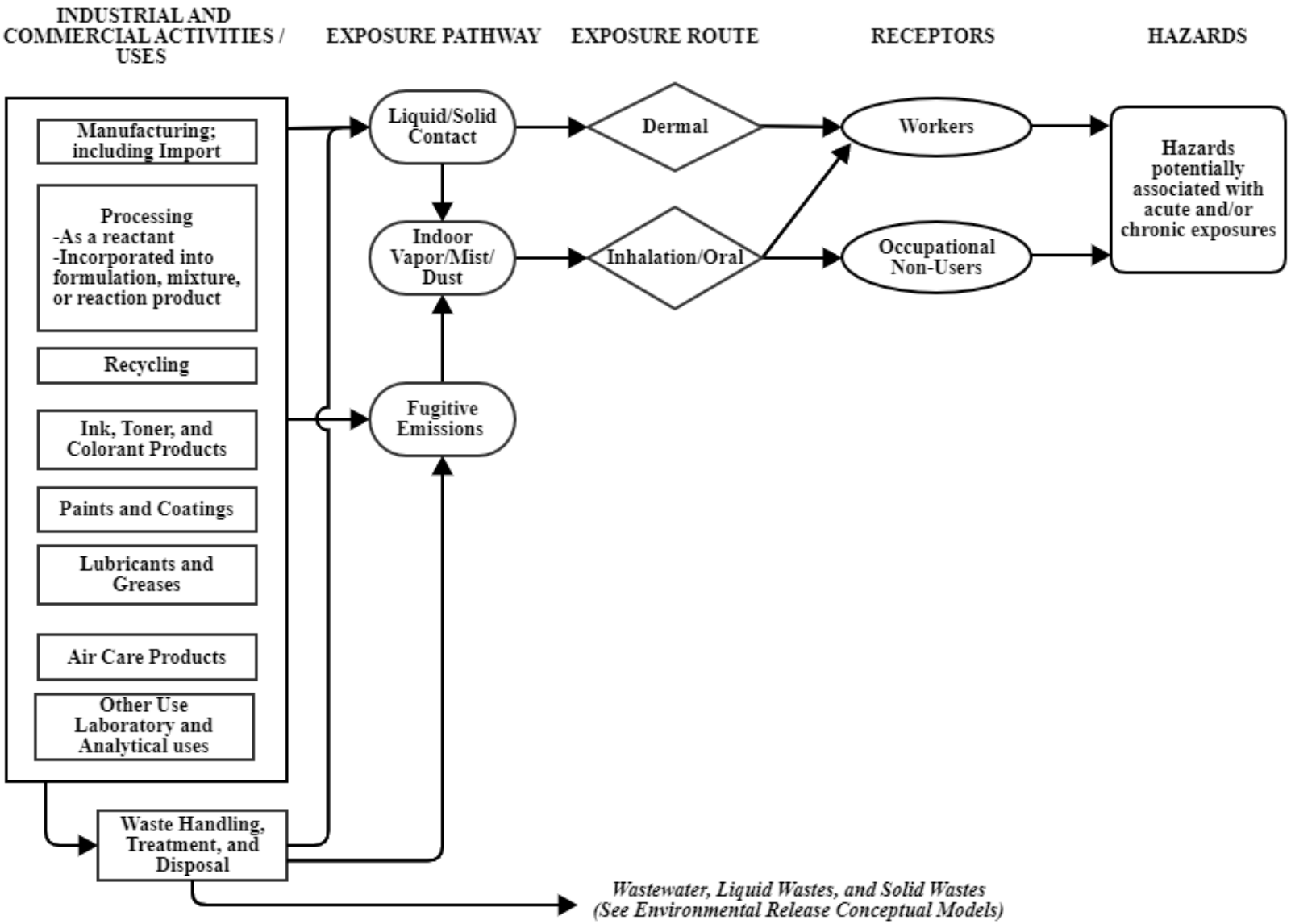


Figure 2-8. *o*-Dichlorobenzene Conceptual Model for Industrial and Commercial Activities and Uses: Worker and Occupational Non-User Exposures and Hazards

The conceptual model presents the exposure pathways, exposure routes, and hazards to human receptors from industrial and commercial activities and uses of *o*-dichlorobenzene.

2.6.2 Conceptual Model for Consumer Activities and Uses

The conceptual model in Figure 2-9 presents the exposure pathways, exposure routes and hazards to human receptors from consumer activities and uses of *o*-dichlorobenzene. EPA expects inhalation to be the primary route of exposure and plans to analyze inhalation exposures to *o*-dichlorobenzene vapor for consumers and bystanders. There is potential for dermal exposures to *o*-dichlorobenzene via direct contact with liquid or solid and via mists generated during consumer uses, and inhalation exposures to *o*-dichlorobenzene via vapor and mists generated from use of consumer products. Bystanders are not expected to have direct dermal contact to *o*-dichlorobenzene but may be exposed dermally to mist and dust generation. In addition, oral exposures to *o*-dichlorobenzene are expected to be negligible and, as a result, EPA does not expect to evaluate this route of exposure for consumers nor bystanders. The supporting rationale for consumer pathways considered for *o*-dichlorobenzene are included in 2.8Appendix G.

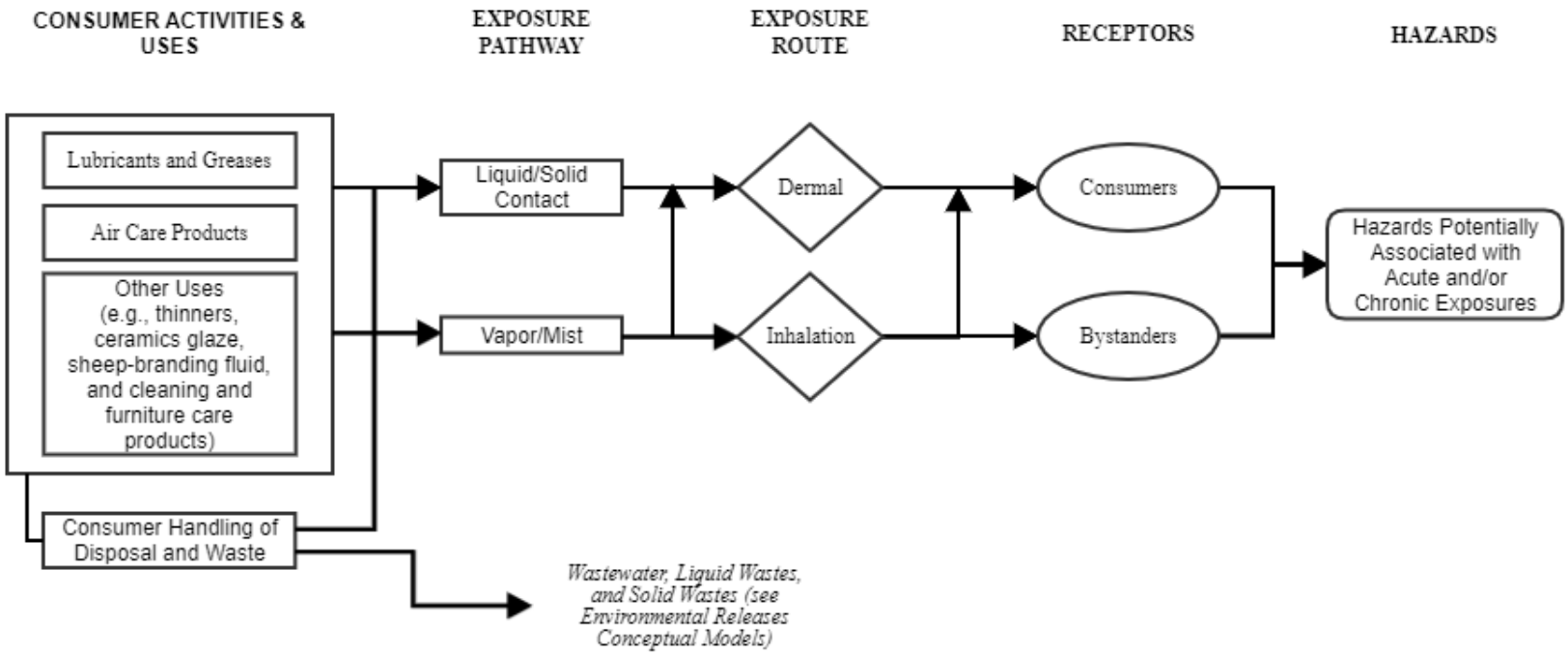


Figure 2-9. *o*-Dichlorobenzene Conceptual Model for Consumer Activities and Uses: Consumer Exposures and Hazards
The conceptual model presents the exposure pathways, exposure routes and hazards to human receptors from consumer activities and uses of *o*-dichlorobenzene.

2.6.3 Conceptual Model for Environmental Releases and Wastes: Potential Exposures and Hazards (Regulatory Overlay)

In this section, EPA presents the conceptual models describing the identified exposures (pathways and routes), receptors and hazards associated with the conditions of use of *o*-dichlorobenzene within the scope of the risk evaluation. It also discusses those pathways that may be addressed pursuant to other Federal laws.

In complying with TSCA, EPA plans to efficiently use Agency resources, avoid duplicating efforts taken pursuant to other Agency programs, maximize scientific and analytical efforts, and meet the statutory deadline for completing risk evaluations. OPPT is working closely with the offices within EPA that administer and implement the Clean Air Act (CAA), the Safe Drinking Water Act (SDWA), the Clean Water Act (CWA) and the Resource Conservation and Recovery Act (RCRA), to identify how those statutes and any associated regulatory programs address the presence of *o*-dichlorobenzene in exposure pathways falling under the jurisdiction of these EPA statutes.

The conceptual model in Figure 2-10 presents the potential exposure pathways, exposure routes and hazards to human and environmental receptors from releases and waste streams associated with industrial, commercial and consumer uses of *o*-dichlorobenzene. The conceptual model shows the overlays, labeled and shaded to depict the regulatory programs (e.g., SDWA, CWA, RCRA) and associated pathways that EPA considered in developing this conceptual model for the draft scope document. The regulatory programs that cover these environmental release and waste pathways are further described in Section 2.6.3.1 through Section 2.6.3.3.

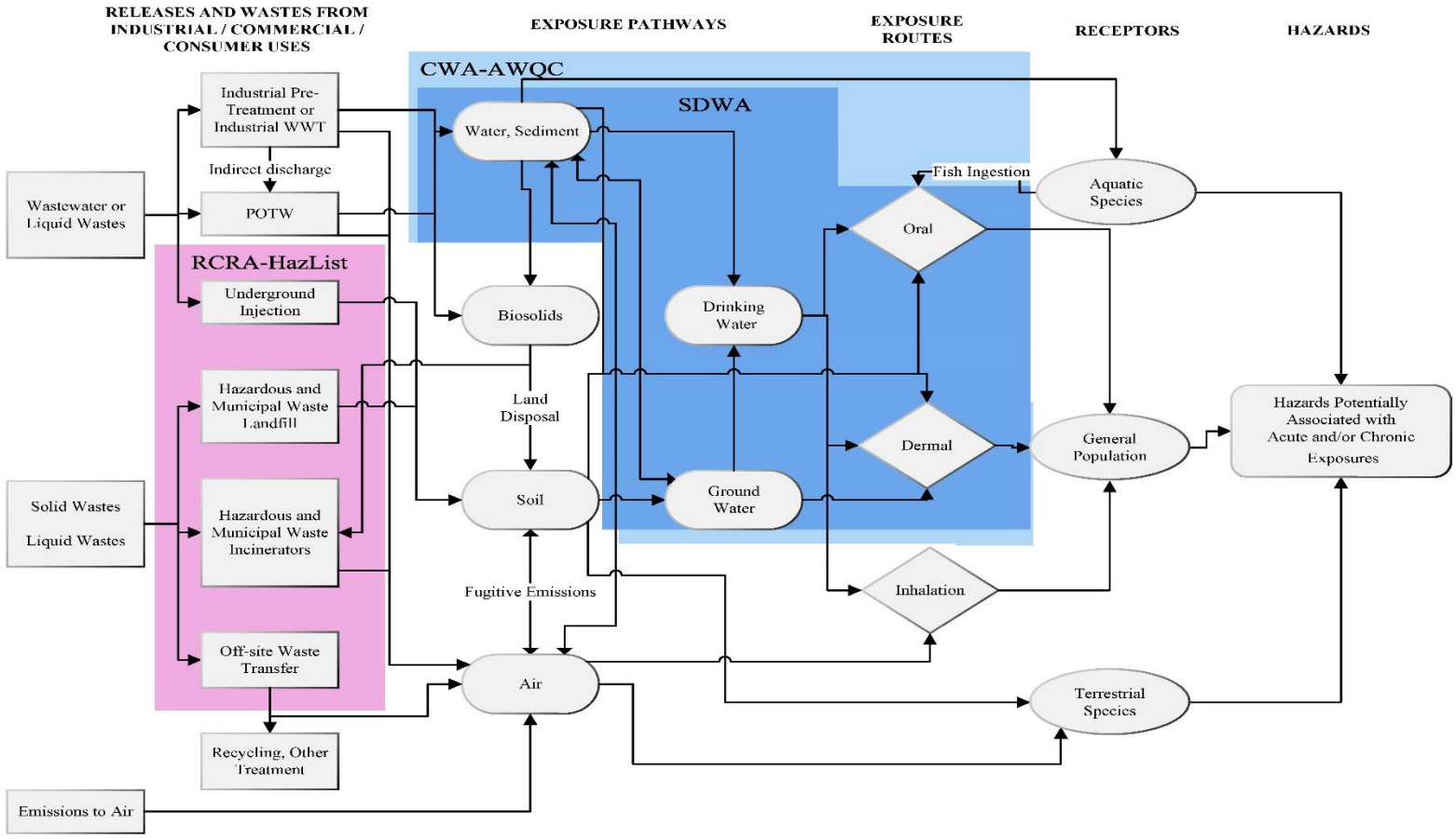


Figure 2-10. *o*-Dichlorobenzene Conceptual Model for Environmental Releases and Wastes: Environmental and General Population Exposures and Hazards (Regulatory Overlay)

The conceptual model presents the exposure pathways, exposure routes and hazards to human receptors from releases and wastes from industrial and commercial uses of *o*-dichlorobenzene showing the regulatory laws that adequately assess and manage those pathways.

2.6.3.1 Drinking Water Pathway

EPA has promulgated National Primary Drinking Water Regulations (NPDWRs) under the Safe Drinking Water Act for *o*-dichlorobenzene. EPA has set an enforceable Maximum Contaminant Level (MCL) as close as feasible to a health based, non-enforceable Maximum Contaminant Level Goal (MCLG). Feasibility refers to both the ability to treat water to meet the MCL and the ability to monitor water quality at the MCL, SDWA Section 1412(b)(4)(D), and public water systems are required to monitor for the regulated chemical based on a standardized monitoring schedule to ensure compliance with the MCL. The MCL for *o*-dichlorobenzene in water is 0.6 mg/L.

The drinking water exposure pathway for *o*-dichlorobenzene is currently addressed in the SDWA regulatory analytical process for public water systems. EPA's Office of Water and Office of Pollution Prevention and Toxics will continue to work together providing understanding and analysis of the SDWA regulatory analytical processes and to exchange information related to toxicity and occurrence data on chemicals undergoing risk evaluation under TSCA.

2.6.3.2 Ambient Water Pathway

EPA develops recommended water quality criteria under section 304(a) of the CWA for pollutants in surface water that are protective of aquatic life or human health designated uses. EPA has developed recommended water quality criteria for protection of human health for *o*-dichlorobenzene which are available for possible adoption into state water quality standards and are available for possible use by NPDES permitting authorities in deriving effluent limits to meet state narrative criteria. EPA's OW and OPPT will continue to work together providing understanding and analysis of the CWA water quality criteria development process and to exchange information related to toxicity of chemicals undergoing risk evaluation under TSCA. EPA may update its CWA section 304(a) water quality criteria for *o*-dichlorobenzene in the future under the CWA.

EPA has developed CWA section 304(a) recommended human health criteria for 122 chemicals and aquatic life criteria for 47 chemicals. A subset of these chemicals is identified as "priority pollutants" (103 human health and 27 aquatic life), including *o*-dichlorobenzene. The CWA requires that states adopt numeric criteria for priority pollutants for which EPA has published recommended criteria under section 304(a), the discharge or presence of which in the affected waters could reasonably be expected to interfere with designated uses adopted the state. For pollutants with recommended human health criteria, EPA regulations require that state criteria contain sufficient parameters and constituents to protect designated uses. Once states adopt criteria as water quality standards, the CWA requires that National Pollutant Discharge Elimination System (NPDES) discharge permits include effluent limits as stringent as necessary to meet standards CWA section 301(b)(1)(C). This permit issuance process accounts for risk in accordance with the applicable ambient water exposure pathway (human health or aquatic life as applicable) for the designated water use and, therefore, the risk from the pathway can be considered assessed and managed.

EPA has not developed CWA section 304(a) recommended water quality criteria for the protection of aquatic life for *o*-dichlorobenzene, so there are no national recommended criteria for this use available for adoption into state water quality standards and available for use in

NPDES permits. The Office of Water may issue CWA section 304(a) aquatic life criteria for *o*-dichlorobenzene in the future.

2.6.3.3 Disposal and Soil Pathways

o-Dichlorobenzene is included on the list of hazardous wastes pursuant to RCRA 3001 (40 CFR §§ 261.33) as a listed waste on the U070 lists. The general standard in section RCRA 3004(a) for the technical criteria that govern the management (treatment, storage, and disposal) of hazardous waste are those "necessary to protect human health and the environment," RCRA 3004(a). The regulatory criteria for identifying "characteristic" hazardous wastes and for "listing" a waste as hazardous also relate solely to the potential risks to human health or the environment (40 CFR §§ 261.11, 261.21-261.24). RCRA statutory criteria for identifying hazardous wastes require EPA to "tak[e] 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." Subtitle C controls cover not only hazardous wastes that are landfilled, but also hazardous wastes that are incinerated (subject to joint control under RCRA Subtitle C and the Clean Air Act (CAA) hazardous waste combustion Maximum Achievable Control Technology (MACT)) or injected into Underground Injection Control (UIC) Class I hazardous waste wells (subject to joint control under Subtitle C and the Safe Drinking Water Act (SDWA)).

TRI reporting in 2018 indicated 15,700 pounds released to underground injection to Class I hazardous waste wells. Environmental disposal of *o*-dichlorobenzene injected into Class I hazardous waste well types fall under the jurisdiction of RCRA and SDWA and disposal of *o*-dichlorobenzene via underground injection is not likely to result in environmental and general population exposures.

EPA has identified releases to land that go to RCRA Subtitle C hazardous waste landfills. Based on 2018 reporting, the majority of TRI land disposal includes Subtitle C landfills (18,400 pounds) with a much smaller amount transferred to "other landfills" both on-site and off-site (0 pounds in 2018). Design standards for Subtitle C landfills require double liner, double leachate collection and removal systems, leak detection system, run on, runoff, and wind dispersal controls, and a construction quality assurance program. They are also subject to closure and post-closure care requirements including installing and maintaining a final cover, continuing operation of the leachate collection and removal system until leachate is no longer detected, maintaining and monitoring the leak detection and groundwater monitoring system. Bulk liquids may not be disposed in Subtitle C landfills. Subtitle C landfill operators are required to implement an analysis and testing program to ensure adequate knowledge of waste being managed, and to train personnel on routine and emergency operations at the facility. Hazardous waste being disposed in Subtitle C landfills must also meet RCRA waste treatment standards before disposal. Given these controls, general population exposure to groundwater from Subtitle C landfill leachate is not expected to be a significant pathway.

o-Dichlorobenzene is present in commercial and consumer products that may be disposed of in Municipal Solid Waste (MSW) landfills. On-site releases RCRA Subtitle D municipal solid waste landfills leading to exposures of the general population (including susceptible populations) or terrestrial species from such releases are expected to be minimal based on current TRI releases (i.e., 0 lb in 2018) for 1,1,2- trichloroethane. While permitted and managed by the individual

states, municipal solid waste (MSW) landfills are required by federal regulations to implement some of the same requirements as Subtitle C landfills. MSW landfills generally must have a liner system with leachate collection and conduct groundwater monitoring and corrective action when releases are detected. MSW landfills are also subject to closure and post-closure care requirements and must have financial assurance for funding of any needed corrective actions. MSW landfills have also been designed to allow for the small amounts of hazardous waste generated by households and very small quantity waste generators (less than 220 lb per month). Bulk liquids, such as free solvent, may not be disposed of at MSW landfills.

On-site releases to land from industrial non-hazardous and construction/demolition waste landfills may occur for o-dichlorobenzene. Industrial non-hazardous and construction/demolition waste landfills are primarily regulated under authorized state regulatory programs. States must also implement limited federal regulatory requirements for siting, groundwater monitoring, and corrective action, and a prohibition on open dumping and disposal of bulk liquids. States may also establish additional requirements such as for liners, post-closure and financial assurance, but are not required to do so.

2.6.4 Conceptual Model for Environmental Releases and Wastes: Potential Exposures and Hazards

As described in Section 2.6.3, some pathways in the conceptual models are covered under the jurisdiction of other environmental statutes administered by EPA. The conceptual model depicted in Figure 2-11 presents the exposure pathways, exposure routes and hazards to human and environmental receptors from releases and wastes from industrial, commercial, and consumer uses of *o*-dichlorobenzene that EPA plans to consider in the risk evaluation. The exposure pathways, exposure routes and hazards presented in this conceptual model are subject to change in the final scope, in light of comments received on this draft scope and other reasonably available information. EPA continues to consider whether and how other EPA-administered statutes and any associated regulatory programs address the presence of *o*-dichlorobenzene in exposure pathways falling under the jurisdiction of these EPA statutes.

The diagram shown in Figure 2-11 includes releases from industrial, commercial and/or consumer uses to water/sediment; biosolids and soil, via direct and indirect discharges to water, that may lead to exposure to aquatic and terrestrial receptors, and to the general population and terrestrial species from emissions to air. The supporting basis for environmental pathways considered for *o*-dichlorobenzene are included in Appendix H.

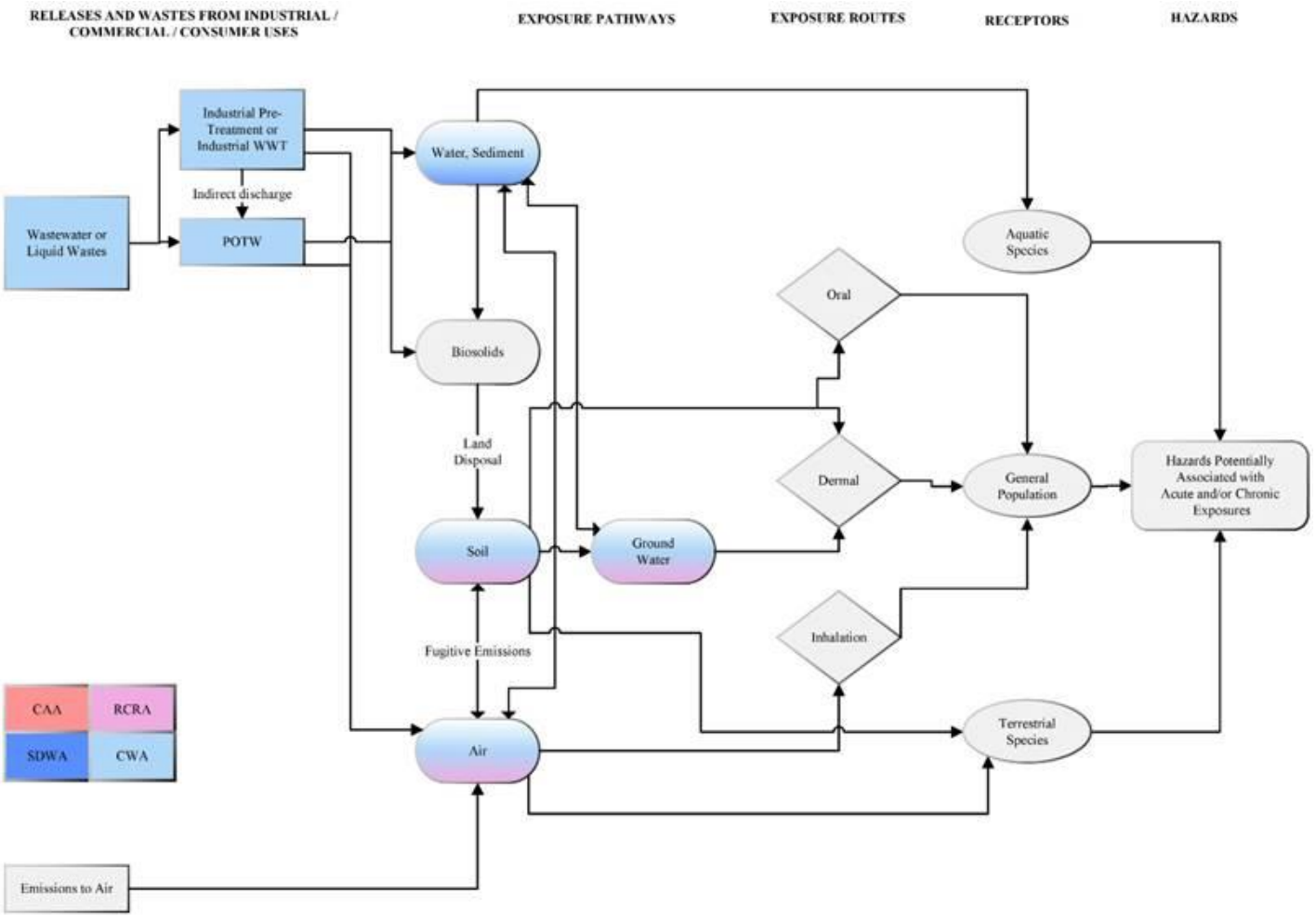


Figure 2-11. *o*-Dichlorobenzene Conceptual Model for Environmental Releases and Wastes: Environmental and General Population Exposures and Hazards

a) The conceptual model presents the exposure pathways, exposure routes and hazards to human receptors from releases and wastes from industrial and commercial uses of *o*-dichlorobenzene that EPA plans to consider in risk evaluation. Notes: Industrial wastewater or liquid wastes may be treated on-site and then released to surface water (direct discharge), or pre-treated and released to POTW (indirect discharge). For consumer uses, such wastes may be released directly to POTW. Drinking water will undergo further treatment in drinking water treatment plant. Ground water may also be a source of drinking water.

b) Receptors include potentially exposed or susceptible subpopulations (see Section 2.5).

2.7 Analysis Plan

The analysis plan is based on EPA's knowledge of *o*-dichlorobenzene to date which includes a partial, but not complete review of identified information as described in Section 2.1. EPA encourages submission of additional existing data, such as full study reports or workplace monitoring from industry sources, that may be relevant for further evaluating conditions of use, exposures, hazards and potentially exposed or susceptible subpopulations during risk evaluation. Further, EPA may consider any relevant CBI in the risk evaluation in a manner that protects the confidentiality of the information from public disclosure. EPA plans to continue to consider new information submitted by the public. Should additional data or approaches become available, EPA may update its analysis plan in the final scope document.

2.7.1 Physical and Chemical Properties and Environmental Fate

EPA plans to analyze the physical and chemical (p-chem) properties and environmental fate and transport of *o*-dichlorobenzene as follows:

1) **Review reasonably available measured or estimated p-chem and environmental fate endpoint data collected using systematic review procedures and, where available, environmental assessments conducted by other regulatory agencies.**
   EPA plans to review data and information collected through the systematic review methods and public comments about the p-chem properties (Appendix B) and fate endpoints (Appendix C) previously summarized in the *Proposed Designation of o-Dichlorobenzene (CASRN 95-50-1) as a High-Priority Substance for Risk Evaluation* (U.S. EPA, 2019a). All sources cited in EPA's analysis will be evaluated according to the procedures described in the systematic review documentation that EPA plans to publish prior to finalizing the scope document. Where the systematic review process fails to identify experimentally measured chemical property values of sufficiently high quality, these values will be estimated using chemical parameter estimation models as appropriate. Model-estimated fate properties will be reviewed for applicability and quality.

2) **Using measured data and/or modeling, determine the influence of p-chem and environmental fate endpoints (e.g., persistence, bioaccumulation, partitioning, transport) on exposure pathways and routes of exposure to human and environmental receptors.**
   Measured data and, where necessary, model predictions of physical-chemical properties and environmental fate endpoints will be used to characterize the persistence and movement of *o*-dichlorobenzene within and across environmental media. The fate endpoints of interest include volatilization, sorption to organic matter in soil and sediments, water solubility, aqueous and atmospheric photolysis rates, aerobic and anaerobic biodegradation rates, and potential bioconcentration and bioaccumulation. These endpoints will be used in exposure calculations.

3) **Conduct a weight-of-evidence evaluation of p-chem and environmental fate data, including qualitative and quantitative sources of information.**
   During risk evaluation, EPA plans to evaluate and integrate the environmental fate evidence identified in the literature inventory using the methods described in the

systematic review documentation that EPA plans to publish prior to finalizing the scope document.

2.7.2 Exposure

EPA plans to analyze exposure levels for indoor air, ambient air, surface water, sediment, soil, ground water, dietary food sources, aquatic biota, and terrestrial biota associated to exposure to *o*-dichlorobenzene. EPA has not yet determined the exposure levels in these media or how they may be used in the risk evaluation. Exposure scenarios are combinations of sources (uses), exposure pathways, and exposed receptors. Draft release/exposure scenarios corresponding to various conditions of use for *o*-dichlorobenzene are presented in 2.8Appendix E. EPA plans to analyze scenario-specific exposures.

Based on their physical-chemical properties, expected sources, and transport and transformation within the outdoor and indoor environment, chemical substances are more likely to be present in some media and less likely to be present in others. Exposure level(s) can be characterized through a combination of available monitoring data and modeling approaches.

2.7.2.1 Environmental Releases

EPA expects to analyze releases to environmental media as follows:

1) **Review reasonably available published literature and other reasonably available information on processes and activities associated with the conditions of use to analyze the types of releases and wastes generated.**
   EPA has reviewed some sources containing information on processes and activities resulting in releases, and the information found is described in Appendix E. EPA plans to review additional data sources identified. Potential sources of environmental release data are summarized in Table 2-5below:

Table 2-5 Categories and Sources of Environmental Release Data

U.S. EPA TRI Data
U.S. EPA Generic Scenarios
OECD Emission Scenario Documents
EU Risk Assessment Reports
Discharge Monitoring Report (DMR) surface water discharge data for *o*-dichlorobenzene from NPDES-permitted facilities

2) **Review reasonably available chemical-specific release data, including measured or estimated release data (e.g., data from risk assessments by other environmental agencies).**
   EPA has reviewed key release data sources including the Toxics Release Inventory (TRI), and the data from this source is summarized in Section 2.3.3. EPA plans to continue to review relevant data sources during risk evaluation. EPA plans to match identified data to applicable conditions of use and identify data gaps where no data are found for particular conditions of use. EPA plans to attempt to address data gaps identified as described in steps 3 and 4 below by considering potential surrogate data and models.

Additionally, for conditions of use where no measured data on releases are available, EPA may use a variety of methods including release estimation approaches and assumptions in the Chemical Screening Tool for Occupational Exposures and Releases ChemSTEER (U.S. EPA, 2013).

3) **Review reasonably available release data for surrogate chemicals that have similar uses and physical properties.**
EPA plans to review literature sources identified and if surrogate data are found, these data will be matched to applicable conditions of use for potentially filling data gaps.

4) **Review reasonably available data that may be used in developing, adapting or applying release models to the particular risk evaluation.**
This item will be performed after completion of #2 and #3 above. EPA plans to evaluate relevant data to determine whether the data can be used to develop, adapt or apply models for specific conditions of use (and corresponding release scenarios). EPA has identified information from various EPA statutes (including, for example, regulatory limits, reporting thresholds or disposal requirements) that may be relevant to release estimation. EPA plans to further consider relevant regulatory requirements in estimating releases during risk evaluation.

5) **Review and determine applicability of OECD Emission Scenario Documents (ESDs) and EPA Generic Scenarios to estimation of environmental releases.**
EPA has identified potentially relevant OECD Emission Scenario Documents (ESDs) and EPA Generic Scenarios (GS) that correspond to some conditions of use; for example, the July 2009 ESD on Plastics Additives (OECD, 2009) and the September 2011 ESD on Chemical Industry (OECD, 2011) may be useful. EPA plans to need to critically review these generic scenarios and ESDs to determine their applicability to the conditions of use assessed.

EPA Generic Scenarios are available at the following: https://www.epa.gov/tsca-screening-tools/using-predictive-methods-assess-exposure-and-fate-under-tsca#fate.

OECD Emission Scenario Documents are available at the following: http://www.oecd.org/chemicalsafety/risk-assessment/emissionscenariodocuments.htm

6) **Map or group each condition of use to a release assessment scenario(s).**
EPA has identified release scenarios and mapped (i.e. grouped) them to relevant conditions of use as shown in Appendix F. EPA was not able to identify release scenarios corresponding to some conditions of use (e.g. recycling, construction and demolition). EPA plans to perform targeted research to understand those uses, which may inform identification of release scenarios. EPA may further refine the mapping/grouping of release scenarios based on factors (e.g., process equipment and handling, magnitude of production volume used, and exposure/release sources) corresponding to conditions of use as additional information is identified during risk evaluation.

7) **Evaluate the weight of the scientific evidence of environmental release data.**
   During risk evaluation, EPA plans to evaluate and integrate the environmental release evidence identified in the literature inventory using the methods described in the systematic review documentation that EPA plans to publish prior to finalizing the scope document. The data integration strategy will be designed to be fit-for-purpose in which EPA plans to use systematic review methods to assemble the relevant data, evaluate the data for quality and relevance, including strengths and limitations, followed by synthesis and integration of the evidence.

2.7.2.2 Environmental Exposures

EPA plans to analyze the following in developing its environmental exposure assessment of *o*-dichlorobenzene:

1) **Review reasonably available environmental and biological monitoring data for all media relevant to environmental exposure.**
   For *o*-dichlorobenzene, environmental media which will be analyzed are sediment, soil, air and water.
2) **Review reasonably available information on releases to determine how modeled estimates of concentrations near industrial point sources compare with available monitoring data.**
   Available environmental exposure models that meet the TSCA Science Standards and that estimate surface water, sediment, and soil concentrations will be analyzed and considered alongside available surface water, sediment, and soil monitoring data to characterize environmental exposures. Modeling approaches to estimate surface water concentrations, sediment concentrations and soil concentrations generally consider the following inputs: direct release into surface water, sediment, or soil, indirect release into surface water, sediment, or soil (i.e., air deposition), fate and transport (partitioning within media) and characteristics of the environment (e.g., river flow, volume of lake, meteorological data).

3) **Determine applicability of existing additional contextualizing information for any monitored data or modeled estimates during risk evaluation.**
   There have been changes to use patterns of *o*-dichlorobenzene over the last few years. Monitoring data or modeled estimates will be reviewed to determine how representative they are of ongoing use patterns.

   Any studies which relate levels of *o*-dichlorobenzene in the environment or biota with specific sources or groups of sources will be evaluated.

4) **Group each condition(s) of use to environmental assessment scenario(s).**
   Refine and finalize exposure scenarios for environmental receptors by considering combinations of sources (use descriptors), exposure pathways including routes, and populations exposed. For *o*-dichlorobenzene, the following are noteworthy considerations in constructing exposure scenarios for environmental receptors:

- Estimates of surface water concentrations, sediment concentrations and soil concentrations near industrial point sources based on available monitoring data.
- Generally, consider the following modeling inputs: release into the media of interest, fate and transport and characteristics of the environment.
- Reasonably available biomonitoring data. Monitoring data could be used to compare with species or taxa-specific toxicological benchmarks.
- Applicability of existing additional contextualizing information for any monitored data or modeled estimates during risk evaluation. Review and characterize the spatial and temporal variability, to the extent that data are available, and characterize exposed aquatic and terrestrial populations.
- Weight of the scientific evidence of environmental occurrence data and modeled estimates.

5) **Evaluate the weight of the scientific evidence of environmental occurrence data and modeled estimates.**
   During risk evaluation, EPA plans to evaluate and integrate the exposure evidence identified in the literature inventory using the methods described in the systematic review documentation that EPA plans to publish prior to finalizing the scope document.

2.7.2.3 Occupational Exposures

EPA expects to analyze both worker and occupational non-user exposures as follows:

1) **Review reasonably available exposure monitoring data for specific condition(s) of use.**
   EPA expects to review exposure data including workplace monitoring data collected by government agencies such as the Occupational Safety and Health Administration (OSHA) and the National Institute of Occupational Safety and Health (NIOSH), and monitoring data found in published literature. These workplace monitoring data include personal exposure monitoring data (direct exposures) and area monitoring data (indirect exposures). EPA has preliminarily reviewed available monitoring data collected by OSHA and NIOSH and will match these data to applicable conditions of use.

   OSHA has established a permissible exposure limit (PEL) for *o*-dichlorobenzene. EPA plans to consider the influence of such limits on occupational exposures in the occupational exposure assessment. The following are some data sources identified thus far:

Table 2-6 Potential Sources of Occupational Exposure Data

2012 ATSDR Toxicological Profile
U.S. OSHA Chemical Exposure Health Data (CEHD) program data
U.S. NIOSH Health Hazard Evaluation (HHE) Program reports

2) **Review reasonably available exposure data for surrogate chemicals that have uses, volatility and chemical and physical properties similar to *o*-dichlorobenzene.**

EPA plans to review literature sources identified and if surrogate data are found, these data will be matched to applicable conditions of use for potentially filling data gaps.

3) **For conditions of use where data are limited or not available, review existing exposure models that may be applicable in estimating exposure levels.**
EPA has identified potentially relevant OECD ESDs and EPA GS corresponding to some conditions of use. For example, the April 2004 Spray Coatings in the Furniture Industry GS (EPA, 2004) and the September 2001 Manufacture and Use of Printing Ink GS (EPA, 2001) are some of the ESDs and GS's that EPA may use to estimate occupational exposures. EPA plans to critically review these generic scenarios and ESDs to determine their applicability to the conditions of use. EPA plans to perform additional targeted research to understand those conditions of use, which may inform identification of exposure scenarios. EPA may also need to perform targeted research to identify applicable models that EPA may use to estimate exposures for certain conditions of use.

4) **Review reasonably available data that may be used in developing, adapting or applying exposure models to a particular risk evaluation scenario.**
This step will be performed after Steps #1 and #2 are completed. Based on information developed from Steps #2 and #3, EPA plans to evaluate relevant data to determine whether the data can be used to develop, adapt, or apply models for specific conditions of use (and corresponding exposure scenarios). EPA may utilize existing, peer-reviewed exposure models developed by EPA/OPPT, other government agencies, or available in the scientific literature, or EPA may elect to develop additional models to assess specific condition(s) of use. Inhalation exposure models may be simple box models or two-zone (near-field/far-field) models. In two-zone models, the near-field exposure represents potential inhalation exposures to workers, and the far-field exposure represents potential inhalation exposures to ONUs.

5) **Consider and incorporate applicable engineering controls and/or personal protective equipment into exposure scenarios.**
EPA plans to review potentially relevant data sources on EC and PPE to determine their applicability and incorporation into exposure scenarios during risk evaluation. EPA plans to assess worker exposure pre- and post-implementation of engineering controls, using reasonably available information on control technologies and control effectiveness. For example, EPA may assess worker exposure in industrial use scenarios before and after implementation of local exhaust ventilation.

6) **Map or group each condition of use to occupational exposure assessment scenario(s).**
EPA may group occupational exposure scenarios based on factors (e.g., process equipment and handling, magnitude of production volume used, and exposure/release sources) corresponding to conditions of use as additional information is identified during risk evaluation.

7) **Evaluate the weight of the scientific evidence of occupational exposure data, which may include qualitative and quantitative sources of information.**
During risk evaluation, EPA plans to evaluate and integrate the exposure evidence identified in the literature inventory using the methods described in the systematic review documentation that EPA plans to publish prior to finalizing the scope document. EPA plans to rely on the weight of the scientific evidence when evaluating and integrating occupational data. The data integration strategy will be designed to be fit-for-purpose in which EPA plans to use systematic review methods to assemble the relevant data, evaluate the data for quality and relevance, including strengths and limitations, followed by synthesis and integration of the evidence.

2.7.2.4 Consumer Exposures

EPA plans to analyze both consumers using a consumer product and bystanders associated with the consumer using the product as follows:

1) **Group each condition of use to consumer exposure assessment scenario(s).**
Refine and finalize exposure scenarios for consumers by considering combinations of sources (ongoing consumer uses), exposure pathways including routes, and exposed populations.

   For *o*-dichlorobenzene, the following are noteworthy considerations in constructing consumer exposure scenarios:
   - Conditions of use
   - Duration of exposure
   - Weight fraction of chemical in products
   - Amount of chemical used

2) **Evaluate the relative potential of indoor exposure pathways based on available data.**
Indoor exposure pathways expected to be relatively higher include inhalation of vapors and mists from indoor air during *o*-dichlorobenzene use and disposal. Indoor exposure pathways expected to be relatively lower include dermal contact to solid and liquid *o*-dichlorobenzene. The data sources associated with these respective pathways have not been comprehensively evaluated, so quantitative comparisons across exposure pathways or in relation to toxicity thresholds are not yet available.

3) **Review existing indoor exposure models that may be applicable in estimating indoor air.**
Indoor exposure models that estimate emission and migration of SVOCs into the indoor environment are available. These models generally consider mass transfer as informed by the gas-phase mass transfer coefficient, the solid-phase diffusion coefficient, and the material-air partition coefficient. These properties vary based on physical-chemical properties and properties of the material. The OPPT's Indoor Environmental Concentrations in Buildings with Conditioned and Unconditioned Zones (IECCU) model and other similar models can be used to estimate indoor air and dust exposures from indoor sources.

4) **Review reasonably available empirical data that may be used in developing, adapting or applying exposure models to a particular risk evaluation scenario. For example, existing models developed for a chemical assessment may be applicable to another chemical assessment if model parameter data are available.**
To the extent other organizations have already modeled a *o*-dichlorobenzene consumer exposure scenario that is relevant to the OPPT's assessment, EPA plans to evaluate those modeled estimates. In addition, if other chemicals similar to *o*-dichlorobenzene have been modeled for similar uses, those modeled estimates will also be evaluated. The underlying parameters and assumptions of the models will also be evaluated.

5) **Review reasonably available consumer product-specific sources to determine how those exposure estimates compare with each other and with indoor monitoring data reporting *o*-dichlorobenzene in specific media (e.g., indoor air).**
The availability of *o*-dichlorobenzene concentration for various ongoing uses will be evaluated. This data provides the source term for any subsequent indoor modeling. Source attribution between overall indoor air and dust levels and various indoor sources will be analyzed.

6) **Review reasonably available population- or subpopulation-specific exposure factors and activity patterns to determine if potentially exposed or susceptible subpopulations need to be further refined.**
During risk evaluation, EPA plans to evaluate and integrate the exposure evidence identified in the literature inventory using the methods described in the systematic review documentation that EPA plans to publish prior to finalizing the scope document.

7) **Evaluate the weight of the scientific evidence of consumer exposure estimates based on different approaches.**
EPA plans to rely on the weight of the scientific evidence when evaluating and integrating data related to consumer exposure. The weight of the scientific evidence may include qualitative and quantitative sources of information. The data integration strategy will be designed to be fit-for-purpose in which EPA plans to use systematic review methods to assemble the relevant data, evaluate the data for quality and relevance, including strengths and limitations, followed by synthesis and integration of the evidence.

2.7.2.5 General Population

EPA plans to analyze general population exposures as follows:

1) **Refine and finalize exposure scenarios for general population by considering sources and uses, exposure pathways including routes, and exposed populations.**
For *o*-dichlorobenzene, the following are noteworthy considerations in constructing exposure scenarios for the general population:
   - Review reasonably available environmental and biological monitoring data for media to which general population exposures are expected.
   - For exposure pathways where data are not available, review existing exposure models that may be applicable in estimating exposure levels.

- Consider and incorporate applicable media-specific regulations into exposure scenarios or modeling.
- Review reasonably available data that may be used in developing, adapting or applying exposure models to the particular risk evaluation. For example, existing models developed for a chemical assessment may be applicable to another chemical assessment if model parameter data are available.
- Review reasonably available information on releases to determine how modeled estimates of concentrations near industrial point sources compare with available monitoring data.
- Review reasonably available population- or subpopulation-specific exposure factors and activity patterns to determine if potentially exposed or susceptible subpopulations need be further defined.
- Evaluate the weight of the scientific evidence of general population exposure data.
- Map or group each condition of use to general population exposure assessment scenario(s).
- Environmental Exposure pathways regulated by non-TSCA EPA laws and regulations will be excluded from analysis

EPA plans to evaluate a variety of data types to determine which types are most appropriate when quantifying exposure scenarios. Environmental monitoring data, biomonitoring data, modeled estimates, experimental data, epidemiological data, and survey-based data can all be used to quantify exposure scenarios. In an effort to associate exposure estimates with sources of exposure and/or conditions of use, EPA plans to consider source apportionment across exposure scenarios during risk evaluation. EPA anticipates that there will be a wide range in the relative exposure potential of the exposure scenarios identified in Section 2.6. Source apportionment characterizes the relative contribution of any of the following: a use/source toward a total media concentration, a media concentration toward a total exposure route, or an exposure route toward a total external or internal dose. This consideration may be qualitative, semi-quantitative, or quantitative, and is dependent upon available data and approaches. For example, EPA may consider the co-location of TSCA industrial facilities with available monitoring data or modeled estimates. EPA may compare modeled estimates for discrete outdoor and indoor sources/uses that apply to unique receptor groups. If available, EPA plans to compare multiple scenario-specific and background exposure doses estimated from media-specific concentrations and exposure factors with available biomonitoring data. The forward-calculated and back-calculated exposures could be compared to characterize the relative contribution from defined exposure scenarios.

After refining and finalizing exposure scenarios, EPA plans to quantify concentrations and/or doses for these scenarios. The number of scenarios will depend on how unique combinations of uses, exposure pathways, and receptors are characterized. The number of scenarios is also dependent upon the available data and approaches to quantify scenarios. When quantifying exposure scenarios, EPA plans to use a tiered approach. First-tier analysis is based on data that is readily available without a significant number of additional inputs or assumptions, and may be qualitative, semi-quantitative, or

quantitative. The results of first tier analyses inform whether scenarios require more refined analysis. Refined analyses will be iterative and require careful consideration of variability and uncertainty. Should data become available that summarily alters the overall conclusion of a scenario through iterative tiering, EPA can refine its analysis during risk evaluation.

2) **For exposure pathways where empirical data is not available, review existing exposure models that may be applicable in estimating exposure levels.**
For *o*-dichlorobenzene, media where exposure models will be considered for general population exposure include models that estimate ambient air concentrations, surface water concentrations, sediment concentrations, soil concentrations, and uptake from aquatic and terrestrial environments into edible aquatic and terrestrial organisms.

3) **Review available exposure modeled estimates. For example, existing models developed for a previous *o*-dichlorobenzene chemical assessment may be applicable to EPA's assessment. In addition, another chemical's assessment may also be applicable if model parameter data are available.**
To the extent other organizations have already modeled *o*-dichlorobenzene general population exposure scenario that is relevant to the OPPT's assessment, EPA plans to evaluate those modeled estimates. In addition, if modeled estimates for other chemicals with similar physical chemical properties and similar uses are available, those modeled estimates will also be evaluated. The underlying parameters and assumptions of the models will also be evaluated.

4) **Review reasonably available information on releases to determine how modeled estimates of concentrations near industrial point sources compare with available monitoring data.**
The expected releases from industrial facilities are changing over time. Any modeled concentrations based on recent release estimates will be carefully compared with available monitoring data to determine representativeness.

5) **Review reasonably available information about population- or subpopulation-specific exposure factors and activity patterns to determine if potentially exposed or susceptible subpopulations need to be further defined (e.g., early life and/or puberty as a potential critical window of exposure).**
For *o*-dichlorobenzene, exposure scenarios that involve potentially exposed or susceptible subpopulations will consider age-specific behaviors, activity patterns, and exposure factors unique to those subpopulations. For example, children will have different intake rates for dust, soil, and diet than adults.

6) **Evaluate the weight of the scientific evidence of general population exposure estimates based on different approaches.**
During risk evaluation, EPA plans to evaluate and integrate the exposure evidence identified in the literature inventory using the methods described in the systematic review documentation that EPA plans to publish prior to finalizing the scope document.

2.7.3 Hazards (Effects)

2.7.3.1 Environmental Hazards

EPA plans to conduct an environmental hazard assessment of *o*-dichlorobenzene as follows:

1) **Review reasonably available environmental hazard data, including data from alternative test methods (e.g., computational toxicology and bioinformatics; high-throughput screening methods; data on categories and read-across; *in vitro* studies).** EPA plans to analyze the hazards of *o*-dichlorobenzene to aquatic and/or terrestrial organisms, including plants, invertebrates (e.g., insects, arachnids, mollusks, crustaceans), and vertebrates (e.g., mammals, birds, amphibians, fish, reptiles) across exposure durations and conditions if potential environmental hazards are identified through systematic review results and public comments. Additional types of environmental hazard information will also be considered (i.e., analogue and read-across data) when characterizing the potential hazards of *o*-dichlorobenzene to aquatic and/or terrestrial organisms.

   Environmental hazard data will be evaluated using the environmental toxicity data quality criteria outlined in the systematic review documentation that EPA plans to publish prior to finalizing the scope document. The study evaluation results will be documented in the risk evaluation phase and data from suitable studies will be extracted and integrated in the risk evaluation process.

2) **Derive hazard thresholds for aquatic and/or terrestrial organisms.** Depending on the robustness of the evaluated data for a particular organism or taxa (e.g., aquatic invertebrates), environmental hazard values (e.g., EC_x. LC_x, NOEC, LOEC) may be derived and used to further understand the hazard characteristics of p-dichlorobenzene to aquatic and/or terrestrial species. Identified environmental hazard thresholds may be used to derive concentrations of concern (COC), based on endpoints that may affect populations of organisms or taxa analyzed.

3) **Evaluate the weight of the scientific evidence of environmental hazard data.** During risk evaluation, EPA plans to evaluate and integrate the environmental hazard evidence identified in the literature inventory using the methods described in the systematic review documentation that EPA plans to publish prior to finalizing the scope document.

4) **Consider the route(s) of exposure, based on available monitoring and modeling data and other available approaches to integrate exposure and hazard assessments.** EPA plans to consider aquatic (e.g., water and sediment exposures) and terrestrial pathways in the *o*-dichlorobenzene conceptual model. These organisms may be exposed to p-dichlorobenzene via a number of environmental pathways (e.g., surface water, sediment, soil, diet).

5) **Conduct an environmental risk characterization of *o*-dichlorobenzene.**
EPA plans to conduct a risk characterization of *o*-dichlorobenzene to identify if there are risks to the aquatic and/or terrestrial environments from the measured and/or predicted concentrations of chemical name in environmental media (i.e., water, sediment, soil). Risk quotients (RQs) may be derived by the application of hazard and exposure benchmarks to characterize environmental risk (U.S. EPA, 1998; Barnthouse et al., 1982).

6) **Consider a Persistent, Bioaccumulative, and Toxic (PBT) Assessment of *o*-dichlorobenzene.**
EPA plans to consider the persistence, bioaccumulation, and toxic (PBT) potential of *o*-dichlorobenzene after reviewing relevant physical-chemical properties and exposure pathways. EPA plans to assess the available studies collected from the systematic review process relating to bioaccumulation and bioconcentration (e.g., BAF, BCF) of *o*-dichlorobenzene. In addition, EPA plans to integrate traditional environmental hazard endpoint values (e.g., LC_{50}, LOEC) and exposure concentrations (e.g., surface water concentrations, tissue concentrations) for p-dichlorobenzene with the fate parameters (e.g., BAF, BCF, BMF, TMF).

2.7.3.2 Human Health Hazards

EPA plans to analyze human health hazards as follows:

1) **Review reasonably available human health hazard data, including data from alternative test methods (e.g., computational toxicology and bioinformatics; high-throughput screening methods; data on categories and read-across; *in vitro* studies; systems biology).**
Human health studies will be evaluated using the evaluation strategies laid out in the systematic review documentation that EPA plans to publish prior to finalizing the scope document.

   Mechanistic data may include analyses of alternative test data such as novel *in vitro* test methods and high throughput screening. The association between acute and chronic exposure scenarios to the agent and each health outcome will also be integrated. Study results will be extracted and presented in evidence tables or another appropriate format by organ/system

2) **In evaluating reasonably available data, determine whether particular human receptor groups may have greater susceptibility to the chemical's hazard(s) than the general population.**
Reasonably available human health hazard data will be evaluated to ascertain whether some human receptor groups may have greater susceptibility than the general population to *o*-dichlorobenzene hazard(s). Susceptibility of particular human receptor groups to *o*-dichlorobenzene will be determined by evaluating information on factors that influence susceptibility.

EPA has reviewed some sources containing hazard information associated with susceptible populations and lifestages such as pregnant women and infants. Pregnancy (i.e., gestation) and childhood are potential susceptible lifestages for *o*-dichlorobenzene exposure. Pregnancy (i.e., gestation) and childhood are potential susceptible lifestages for *o*-dichlorobenzene exposure. EPA plans to review the current state of the literature in order to potentially quantify these differences for risk evaluation purposes.

3) **Conduct hazard identification (the qualitative process of identifying non-cancer and cancer endpoints) and dose-response assessment (the quantitative relationship between hazard and exposure) for identified human health hazard endpoints.**
Human health hazards from acute and chronic exposures will be identified by evaluating the human and animal data that meet the systematic review data quality criteria described in the systematic review documentation that EPA plans to publish prior to finalizing the scope document. Hazards identified by studies meeting data quality criteria will be grouped by routes of exposure relevant to humans (oral, dermal, inhalation) and by cancer and noncancer endpoints.

   Dose-response assessment will be performed in accordance with EPA guidance (U.S. EPA, 2012a, 2011, 1994). Dose-response analyses may be used if the data meet data quality criteria and if additional information on the identified hazard endpoints are not available or would not alter the analysis.

   The cancer mode of action (MOA) determines how cancer risks can be quantitatively evaluated. If cancer hazard is determined to be applicable to *o*-dichlorobenzene, EPA plans to evaluate information on genotoxicity and the mode of action for all cancer endpoints to determine the appropriate approach for quantitative cancer assessment in accordance with the U.S. EPA Guidelines for Carcinogen Risk Assessment (U.S. EPA, 2005).

4) **Derive points of departure (PODs) where appropriate; conduct benchmark dose modeling depending on the available data. Adjust the PODs as appropriate to conform (e.g., adjust for duration of exposure) to the specific exposure scenarios evaluated.**
Hazard data will be evaluated to determine the type of dose-response modeling that is applicable. Where modeling is feasible, a set of dose-response models that are consistent with a variety of potentially underlying biological processes will be applied to empirically model the dose-response relationships in the range of the observed data consistent with EPA's *Benchmark Dose Technical Guidance Document*. Where dose-response modeling is not feasible, NOAELs or LOAELs will be identified. Non-quantitative data will also be evaluated for contribution to weight of the scientific evidence or for evaluation of qualitative endpoints that are not appropriate for dose-response assessment.

   EPA plans to evaluate whether the available PBPK and empirical kinetic models are adequate for route-to-route and interspecies extrapolation of the POD, or for extrapolation of the POD to standard exposure durations (e.g., lifetime continuous

exposure). If application of the PBPK model is not possible, oral PODs may be adjusted by $BW^{3/4}$ scaling in accordance with U.S. EPA (2011), and inhalation PODs may be adjusted by exposure duration and chemical properties in accordance with U.S. EPA (1994).

5) **Evaluate the weight of the scientific evidence of human health hazard data.**
During risk evaluation, EPA plans to evaluate and integrate the human health hazard evidence identified in the literature inventory under acute and chronic exposure conditions using the methods described in the systematic review documentation that EPA plans to publish prior to finalizing the scope document.

6) **Consider the route(s) of exposure (oral, inhalation, dermal), available route-to-route extrapolation approaches, available biomonitoring data and available approaches to correlate internal and external exposures to integrate exposure and hazard assessment.**
At this stage of review, EPA believes there will be sufficient data to conduct dose-response analysis and/or benchmark dose modeling for the oral route of exposure. EPA plans to also evaluate any potential human health hazards following dermal and inhalation exposure to *o*-dichlorobenzene, which could be important for worker, consumer, and general population risk analysis. Available data will be assessed to determine whether or not a point of departure can be identified for the dermal and inhalation routes. This may include using route-to-route extrapolation methods where appropriate and depending on the nature of available data.

   If sufficient toxicity studies are not identified in the literature search to assess risks from dermal and inhalation exposures, then a route-to-route extrapolation from oral toxicity studies would be needed to assess systemic risks from dermal or inhalation exposures. Without an adequate PBPK model, the approaches described in EPA guidance document *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)* (U.S. EPA, 2004) could be applied to extrapolate from oral to dermal exposure. These approaches may be able to further inform the relative importance of dermal exposures compared with other routes of exposure. Similar methodology may also be used for assessing inhalation exposures

2.7.4 Summary of Risk Approaches for Characterization

Risk characterization is an integral component of the risk assessment process for both environmental and human health risks. EPA plans to derive the risk characterization in accordance with EPA's *Risk Characterization Handbook* (U.S. EPA, 2000). As defined in EPA's Risk Characterization Policy, "the risk characterization integrates information from the preceding components of the risk evaluation and synthesizes an overall conclusion about risk that is complete, informative and useful for decision makers." Risk characterization is considered to be a conscious and deliberate process to bring all important considerations about risk, not only the likelihood of the risk but also the strengths and limitations of the assessment, and a description of how others have assessed the risk into an integrated picture.

The level of information contained in each risk characterization varies according to the type of assessment for which the characterization is written. Regardless of the level of complexity or information, the risk characterization for TSCA risk evaluations will be prepared in a manner that is transparent, clear, consistent, and reasonable (U.S. EPA, 2000) and consistent with the requirements of the *Procedures for Chemical Risk Evaluation Under the Amended Toxic Substances Control Act* (82 FR 33726). For instance, in the risk characterization summary, EPA plans to further carry out the obligations under TSCA section 26; for example, by identifying and assessing uncertainty and variability in each step of the risk evaluation, discussing considerations of data quality such as the reliability, relevance and whether the methods utilized were reasonable and consistent, explaining any assumptions used, and discussing information generated from independent peer review.

EPA plans to also be guided by EPA's Information Quality Guidelines (U.S EPA, 2002) as it provides guidance for presenting risk information. Consistent with those guidelines, in the risk characterization, EPA plans to also identify: (1) Each population addressed by an estimate of applicable risk effects; (2) the expected risk or central estimate of risk for the potentially exposed or susceptible subpopulations affected; (3) each appropriate upper-bound or lower bound estimate of risk; (4) each significant uncertainty identified in the process of the assessment of risk effects and the studies that would assist in resolving the uncertainty; and (5) peer reviewed studies known to the Agency that support, are directly relevant to, or fail to support any estimate of risk effects and the methodology used to reconcile inconsistencies in the scientific information.

2.8 Peer Review

Peer review will be conducted in accordance with EPA's regulatory procedures for chemical risk evaluations, including using EPA's Peer Review Handbook and other methods consistent with section 26 of TSCA (See 40 CFR 702.45). As explained in the Risk Evaluation Rule, the purpose of peer review is for the independent review of the science underlying the risk assessment. Peer review will therefore address aspects of the underlying science as outlined in the charge to the peer review panel such as hazard assessment, assessment of dose-response, exposure assessment, and risk characterization. The draft risk evaluation for *o*-dichlorobenzene will be peer reviewed).

REFERENCES

ACGIH (American Conferences of Governmental Industrial Hygienists). (2007). Documentation of the TLVs and BEIs with Other Worldwide Occupational Exposure Values. Cincinnati, OH: American Conferences of Governmental Industrial Hygienists. HERO ID: 5077337

Atkinson, R. (1989). Kinetics and mechanisms of the gas-phase reactions of the hydroxyl radical with organic compounds. Monograph No. 1. 66. HERO ID: 3688777

ATSDR (Agency for Toxic Substances and Disease Registry). (2006). Toxicological profile for dichlorobenzenes. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. https://www.atsdr.cdc.gov/ToxProfiles/tp10.pdf. HERO ID: 5160103

Barnthouse, LW;DeAngelis, DL;Gardner, RH;O'Neill, RV;Suter, GW;Vaughan, DS. (1982). Methodology for Environmental Risk Analysis. (ORNL/TM-8167). Oak Ridge, TN: Oak Ridge National Laboratory. HERO ID: 4417716

Barrows, ME;Petrocelli, SR;Macek, KJ;Carroll, JJ. (1980). Bioconcentration and elimination of selected water pollutants by bluegill sunfish (Lepomis macrochirus). In R Haque (Ed.), (pp. 379-392). Ann Arbor, MI: Ann Arbor Science. HERO ID: 18050

CARB. (2005). California Air Resources Board (CARB): Indoor air pollution in California [Database]. https://www.arb.ca.gov/research/apr/reports/l3041.pdf. HERO ID: 4571350

CDC (Centers for Disease Control and Prevention). (2013). National Health and Nutrition Examination Survey Data (NHANES). Atlanta, Georgia: Centers for Disease Control, National Center for Health Statistics. https://www.cdc.gov/nchs/nhanes/index.htm. HERO ID: 6124532

Cherrie, JW., Semple, S. Christopher, Y., Saleem, A., Hughson, G.W., Phillips, A. (2006). How important is inadvertent ingestion of hazardous substances at work? Ann Occup Hyg. 50(7):693-704. HERO ID: 460308

Chiou, CT;Peters, LJ;Freed, VH. (1979). A physical concept of soil-water equilibria for nonionic organic compounds. Science 206: 831-832. http://dx.doi.org/10.1126/science.206.4420.831. HERO ID: 18016

CPID (Consumer Product Information Database). (2020). What's in it? *o*-Dichlorobenzene. https://www.whatsinproducts.com/chemicals/view/1/2516. HERO ID: 6305208

Curtis, M;Copeland, TL;Ward, C. (1978). Aquatic toxicity of substances proposed for spill prevention regulation. 99-103. HERO ID: 5353117

Daubert, TE;Danner, RP. (1989). Physical and thermodynamic properties of pure chemicals: Data compilation. Washington, DC: Taylor & Francis. HERO ID: 3827242

DeLima Associates. (2014). Bowl Fresh Toilet Bowl Deodorizer. https://whatsinproducts.com/files/brands_pdf/1418825638.pdf. HERO ID: 6280693

Duncan Enterprises. (2014). Duncan OA 901 Essence. https://www.aardvarkclay.com/pdf/duncan_sds/SDS%20Duncan%20OA%20901%20Essence%200113.pdf. HERO ID: 6305229

Duncan Enterprises. (2015). Duncan OG 803 Mother of Pearl. https://tuckerspotteryeshop.com/wp-content/uploads/msds/Duncan_Luster_Products/Duncan%20OG%20803%20Mother%20of%20Pearl-SDS.pdf. HERO ID: 6305231

EC. (2018). Information Platform for Chemical Monitoring Data [Database]. https://ipchem.jrc.ec.europa.eu/RDSIdiscovery/ipchem/index.html. HERO ID: 4571684

ECHA (European Chemicals Agency). (2019). Registration dossier: 1,2-dichlorobenzene (95-50-1). Helsinki, Finland. https://echa.europa.eu/de/registration-dossier/-/registered-dossier/13734/3/1/4. HERO ID: 6280757

Environment Canada. (1993). Priority substances list assessment report: 1,2-dichlorobenzene (pp. 31). Ottawa, Ontario: Government of Canada, Environment Canada, Health Canada. https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/contaminants/psl1-lsp1/1_2_dichlorobenzene/1_2_dichlorobenzene-eng.pdf. HERO ID: 5160038

Environment Canada. (2003). Follow-up report on five PSL1 substances for which there was insufficient information to conclude whether the substances constitute a danger to the environment: 1,2-dichlorobenzene; 1,4-dichlorobenzene; trichlorobenzenes; tetrachlorobenzenes; pentachlorobenzene. Ottawa, Ontario: Government of Canada, Environment Canada, Health Canada. https://www.ec.gc.ca/ese-ees/002284A7-A3AD-4F3B-8DB1-3D74EB83434A/PSL1_chlorobenzenes_followup_EN.pdf. HERO ID: 5176389

EPA-HQ-OPPT-2018-0444-0004 https://www.regulations.gov/document?D=EPA-HQ-OPPT-2018-0444-0004

EPA-HQ-OPPT-2018-0444-0013 https://www.regulations.gov/document?D=EPA-HQ-OPPT-2018-0444-0013

EPA-HQ-OPPT-2018-0444-0022 https://www.regulations.gov/document?D=EPA-HQ-OPPT-2019-0131-0022

FDA (U.S. Food and Drug Administration). (1991). FDA Total Diet Study [Database]. http://www.fda.gov/Food/FoodScienceResearch/TotalDietStudy/ucm184293.htm. HERO ID: 4571554

Haider, K;Jagnow, G;Kohnen, R;Lim, SU. (1974). Degradation of chlorinated benzenes, phenols and cyclohexane derivatives by benzene and phenol utilizing soil bacteria under aerobic conditions. Arch Microbiol 9: 183-200. http://dx.doi.org/10.1007/BF00590175. HERO ID: 2720884

Hansch, C;Leo, A;Hoekman, D. (1995). Exploring QSAR: Hydrophobic, electronic, and steric constants. In Exploring QSAR: Hydrophobic, Electronic, and Steric Constants. Washington, DC: American Chemical Society. HERO ID: 51424

Heiniger. (2016). Safety data sheet: CRG SI-RO-MARK sheep branding fluid. Heiniger. http://www.heinigerhg.com.au/MSDS/CRG%20SI-RO-MARK%20SHEEP%20BRANDING%20FLUID%20SDS%2020161017%20SDS.pdf. HERO ID: 6328960

Home Depot. (2019). 3 oz. Para Toilet Bowl Deodorizer Wire Hanger. https://www.homedepot.com/p/Bowl-Fresh-3-oz-Para-Toilet-Bowl-Deodorizer-Wire-Hanger-18-Pack-P203-18/206732587. HERO ID: 6289708

HSDB (Hazardous Substances Data Bank). (2014). 1,4-dichlorobenzene: CASRN: 106-46-7. National Library of Medicine. https://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB. HERO ID: 5180908

Kirk-Othmer. (1993). Kirk-Othmer Encyclopedia of Chemical Technology (4th ed.). New York, NY: John Wiley and Sons. HERO ID: 5348450

Kirk-Othmer Encyclopedia of Chemical Technology. 2001. Chlorinated Benzenes. https://onlinelibrary.wiley.com/doi/abs/10.1002/0471238961.0308121502182501.a01.pub2

Lewis, RJ. (1999). Sax's dangerous properties of industrial materials. In Sax's Dangerous Properties of Industrial Materials (10th ed.). New York, NY: John Wiley & Sons, Inc. HERO ID: 625540

Ma, Y-J;Wang, X-L;Yu, W-J;Zhang, L-J;Sun, H-Z. (1997). Toxicity of chlorinated benzenes to marine algae. Chinese Journal of Oceanology and Limnology 15: 308-313. http://dx.doi.org/10.1007/bf02850564. HERO ID: 5243980

Marvel Oil Company. (2017). Marvel Mystery Oil. (Revision 12). https://www.marvelmysteryoil.com/media/1256/marvel-mystery-oil.pdf. HERO ID: 6305345

MEMA (Motor & Equipment Manufacturers Association). (2019). Comment submitted by Catherine M. Wilmarth, Attorney, Alliance of Automobile Manufacturers and Laurie Holmes, Senior Director, Environmental Policy, Motor & Equipment Manufacturers Association (MEMA) regarding o-Dichlorobenzene. (EPA-HQ-OPPT-2019-0131-0022). Wilmarth, CM. https://www.regulations.gov/document?D=EPA-HQ-OPPT-2019-0131-0022. HERO ID: 6305256

NICNAS (National Industrial Chemicals Notification and Assessment Scheme). (2001). Priority existing chemical assessment report no. 14: *Ortho*-dichlorobenzene. Sydney, Australia: Australian Department of Health, National Industrial Chemicals Notification and Assessment Scheme. https://www.nicnas.gov.au/__data/assets/word_doc/0018/34821/PEC14-*ortho*-dichlorobenzene.docx#cas-A_95-50-1;%20Benzene,%201,2-dichloro-. HERO ID: 5155563

NIOSH (National Institute for Occupational Safety and Health). (2005). NIOSH pocket guide to chemical hazards & other databases CD-ROM. (DHHS-2005-151). Cincinnati, OH. https://www.cdc.gov/niosh/npg/npgd0189.html. HERO ID: 3827401

NITE (National Institute of Technology and Evaluation). (2019). Chemical Risk Information Platform (CHRIP). Japan. http://www.safe.nite.go.jp/english/sougou/view/ComprehensiveInfoDisplay_en.faces. HERO ID: 6305771

NTP (National Toxicology Program). (1985). NTP technical report on the toxicology and carcinogenesis studies of 1,2-dichlorobenzene (*o*-dichlorobenzene) (CAS no. 95-50-1) in F344/N rats and B6C3F1 mice (gavage studies) (NTP TR 255/NIH Publication No. 86-2511). Research Triangle Park, NC: U.S. Department of Health and Human Services, National Institutes of Health, National Toxicology Program. https://ntp.niehs.nih.gov/ntp/htdocs/lt_rpts/tr255.pdf. HERO ID: 5160109

OECD (Organisation for Economic Cooperation and Development). (2001). SIDS dossier: CAS no. 95-50-1: *o*-Dichlorobenzene. Organisation for Economic Cooperation and Development/Screening Information Data Set. http://www.inchem.org/documents/sids/sids/95501.pdf. HERO ID: 5185286

OECD (Organisation for Economic Co-operation and Development). (2001). SIDS initial assessment report for 13th SIAM: 1,2-dichloroethane. (RISKLINE/1996100028). Nairobi, Kenya: Organisation for Economic Co-operation and Development, United Nations Environment Programme. http://www.oecd.org/chemicalsafety/risk-ssessment/publishedassessments.htm. HERO ID: 5185293

OECD (Organisation for Economic Co-operation and Development). (2001). SIDS initial assessment report: 1,2-dichlorobenzene (pp. 203). Paris, France. https://hpvchemicals.oecd.org/ui/handler.axd?id=40127CF8-F9A5-4437-BC08-0E1199DF65C7. HERO ID: 5160045

OECD (Organisation for Economic Co-operation and Development). (2009). Emission scenario document on plastic additives. Paris: OECD Environmental Health and Safety Publications. http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=env/jm/mono(2004)8/rev1&doclanguage=en. HERO ID: 5079084

OECD (Organisation for Economic Co-operation and Development). (2009). Emission scenario documents on coating industry (paints, lacquers and varnishes). (JT03267833). Paris, France. HERO ID: 3827298

OECD. (2018). OECD Monitoring Database [Database]. HERO ID: 4571754

Oliver, BG;Niimi, AJ. (1983). Bioconcentration of chlorobenzenes from water by rainbow trout: correlations with partition coefficients and environmental residues. Environ Sci Technol 17: 287-291. HERO ID: 4159607

Oliver, BG;Niimi, AJ. (1985). Bioconcentration factors of some halogenated organics for rainbow trout: limitations in their use for prediction of environmental residues. Environ Sci Technol 19: 842-849. http://dx.doi.org/10.1021/es00139a013. HERO ID: 1443873

O'Neil, MJ;Heckelman, PE;Koch, CB. (2006). The Merck index: An encyclopedia of chemicals, drugs, and biologicals (14th ed.). Whitehouse Station, NJ: Merck & Co. HERO ID: 737461

OSHA (Occupational Safety and Health Administration). (2019). Permissible exposure limits: OSHA annotated table Z-1 https://www.osha.gov/dsg/annotated-pels/tablez-1.html. HERO ID: 5353123

RIVM (National Institute for Public Health and the Environment (Netherlands)). (2001). Re-evaluation of human-toxicological maximum permissible risk levels. (711701025). Bilthoven, Netherlands: National Institute for Public Health and the Environment (RIVM). https://www.rivm.nl/bibliotheek/rapporten/711701025.pdf. HERO ID: 5159898

SPIN (Substances in Preparation in Nordic Countries). (2019). 1,2-DICHLOROBENZEN. http://www.spin2000.net/spinmyphp/?pid=95501. HERO ID: 6280293

Staudinger, J;Roberts, PV. (1996). A critical review of henry's law constants for environmental applications. Crit Rev Environ Sci Tech 26: 205-297. HERO ID: 5095487

Stauffer TB, AT, Boggs JM, Macintyre WG. (1994). A natural gradient tracer experiment in a heterogeneous aquifer with measured in situ biodegradation rates: a case for natural attenuation. (EPA/540/R-94 515). U.S. Environmental Protection Agency.

Syracuse Research Corp. (1978). Results of continuous exposure of fathead minnow embryo to 21 priority pollutants (pp. 46 p. (NTIS/OTS0511060) (Publ in Part as 0515175, 0515184, 0515590, 0519607, 0519953, 0510366, 0510427, 0120941)). (OTS#0511060). Springfield, VA. HERO ID: 3808969

Tomer, A; Kane, J. (2015). The great port mismatch. U.S. goods trade and international transportation. Brookings/JPMorgan Chase (Washington D.C.).URL: https://www.brookings.edu/wp-content/uploads/2015/06/brgkssrvygcifreightnetworks.pdf HERO ID: 5018559

Turtle Wax Limited. (2009). Marvel Mystery Oil. (Revision 0). https://ottertailcountymn.us/wp-content/uploads/sds/Solid-Waste/Turtle%20Wax%20Marvel%20Mystery%20Oil.pdf. HERO ID: 6305321

U.S. EPA (U.S. Environmental Protection Agency). (1981). An exposure and risk assessment for dichlorobenzenes. (EPA-440/4-81-019). HERO ID: 1482344

U.S. EPA. (U.S. Environmental Protection Agency). (1990). EPA Ambient Monitoring Technology Information Center: Air toxics data [Database]. https://www3.epa.gov/ttnamti1/toxdat.html. HERO ID: 4571427

U.S. EPA. (U.S. Environmental Protection Agency). (1996). EPA Unregulated Contaminant Monitoring Rule [Database]. https://www.epa.gov/dwucmr. HERO ID: 4571553

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

U.S. EPA (U.S. Environmental Protection Agency). (2006). A framework for assessing health risk of environmental exposures to children (pp. 1-145). (EPA/600/R-05/093F). Washington, DC: U.S. Environmental Protection Agency, Office of Research and Development, National Center for Environmental Assessment. http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=158363. HERO ID: 194567

U.S. EPA. (U.S. Environmental Protection Agency). (2007). EPA Discharge Monitoring Report Data [Database]. https://cfpub.epa.gov/dmr/. HERO ID: 4571528

U.S. EPA (U.S. Environmental Protection Agency). (2009). Initial risk-based prioritization of high production volume (HPV) chemicals: Chlorobenzenes category: Sponsored chemicals: Monochlorobenzene (CASRN 108-90-7) (CA Index Name: Benzene, chloro-); 1,2-Dichlorobenzene (CASRN 95-50-1) (CA Index Name: Benzene, 1,2-dichloro-); 1,3-Dichlorobenzene (CASRN 541-73-1) (CA Index Name: Benzene, 1,3-dichloro-); 1,2,3-Trichlorobenzene (CASRN 87-61-6) (CA Index Name: Benzene, 1,2,3-trichloro-). Washington, DC: U.S. Environmental Protection Agency, Office of Pollution Prevention and Toxics. https://chemview.epa.gov/chemview/proxy?filename=HC95501.pdf. HERO ID: 5113349

U.S. EPA (U.S. Environmental Protection Agency). (2012a). Benchmark dose technical guidance. (EPA/100/R-12/001). Washington, DC: U.S. Environmental Protection Agency, Risk Assessment Forum. https://www.epa.gov/risk/benchmark-dose-technical-guidance. HERO ID: 1239433

U.S. EPA (U.S. Environmental Protection Agency). (2012b). PhysProp database. Estimation Programs Interface Suite™ for Microsoft® Windows, v 4.11: CASRN 95-50-1. Washington, DC. https://www.epa.gov/tsca-screening-tools/epi-suitetm-estimation-program-interface. HERO ID: 5185288

U.S. EPA. (U.S. Environmental Protection Agency). (2013). 1986-2002 inventory update reporting rule data (non-confidential production volume in pounds). Washington, DC: Washington, DC. U.S. Environmental Protection Agency, Office of Pollution Prevention and Toxics. HERO ID: 6114854

U.S. EPA (United States Environmental Protection Agency). (2015). Form R Reports. https://enviro.epa.gov/enviro/tri_formr_partone_v2.get_thisone?rpt_year=2015&dcn_num=1315213902543&ban_flag=Y. HERO ID: 6305399

U.S. EPA. (2017). Procedures for chemical risk evaluation under the amended Toxic Substances Control Act. Final Rule Federal Registrar 82: 33726-33753. Fed Reg 82. HERO ID: 6128248

U.S. EPA (U.S. Environmental Protection Agency). (2017). Chemical Data Reporting (2012 and 2016 Public CDR database) [Database]. Washington, DC: U.S. Environmental Protection Agency, Office of Pollution Prevention and Toxics. Retrieved from ChemView: June 2019. https://chemview.epa.gov/chemview HERO ID: 6275311

U.S. EPA (U.S. Environmental Protection Agency). (2018). 40 CFR 702.3: Procedures for prioritization of chemical substances for risk evaluation: Definitions. Washington, DC. HERO ID: 5165395

U.S. EPA (U.S. Environmental Protection Agency). (2018). 40 CFR 702.41: Procedures for Chemical Substance Risk Evaluations: Evaluation requirements. Washington, DC. HERO ID: 6302779

U.S. EPA (U.S. Environmental Protection Agency). (2018). 40 CFR 702.45: Procedures for Chemical Substance Risk Evaluations: Peer review. Washington, DC. HERO ID: 6302780

U.S. EPA (U.S. Environmental Protection Agency). (2018a). Application of systematic review in TSCA risk evaluations. (740-P1-8001). Washington, DC: U.S. Environmental Protection Agency, Office of Chemical Safety and Pollution Prevention. https://www.epa.gov/sites/production/files/2018-06/documents/final_application_of_sr_in_tsca_05-31-18.pdf. HERO ID: 4532281

U.S. EPA. (U.S. Environmental Protection Agency). (2018b). ECOTOX Knowledgebase. HERO ID: 4263024

U.S. EPA (U.S. Environmental Protection Agency). (2019a). Proposed Designation of *o*-Dichlorobenzene (CASRN 95-50-1) as a High-Priority Substance for Risk Evaluation. Office of Chemical Safety and Pollution Prevention. https://www.epa.gov/sites/production/files/2019-08/documents/*o*-dichlorobenzene_95-50-1_high-priority_proposeddesignation_082319.pdf. HERO ID: 6305350

U.S. EPA (U.S. Environmental Protection Agency) (2019b). Chemical Data Reporting (2012 and 2016 CBI CDR database). Washington, DC. U.S. Environmental Protection Agency, Office of Pollution Prevention and Toxics. Retrieved: April 25, 2019. HERO ID: 6301193

U.S. EPA (U.S. Environmental Protection Agency). (2019c). TRI Explorer (2018 dataset released November 2019). Washington, DC: U.S. Environmental Protection Agency. https://enviro.epa.gov/triexplorer/. (accessed January 17, 2020). HERO ID: 6323208

U.S. EPA. (U.S. Environmental Protection Agency). (2019d). Envirofacts Toxics Release Inventory 2017 Updated Dataset (released April 2019) [Website]. https://www.epa.gov/enviro/tri- customized-search. HERO ID: 6127841

U.S. NLM. (2008). HSDB: 1,2-Dichlorobenzene U.S. National Library of Medicine, Hazardous Substances Data Bank. https://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+95-50-1. HERO ID: 6280758
Ukeles, R. (1962). Growth of pure cultures of marine phytoplankton in the presence of toxicants. Appl Microbiol 10: 532-537. https://www.ncbi.nlm.nih.gov/pubmed/13995259. HERO ID: 5352371

Willert Home Products Inc. (2017). Safety Data Sheet - Enoz Para Moth Balls. https://images.homedepot-static.com/catalog/pdfImages/35/35c4c1c5-ef89-4350-879d-bfcb634a5235.pdf. HERO ID: 6286835

Yalkowsky, SH;He, Y;Jain, P. (2010). Handbook of aqueous solubility data (2nd ed.). Boca Raton, FL: CRC Press. http://dx.doi.org/10.1201/EBK1439802458. HERO ID: 2990992

APPENDICES

Appendix A LIST OF GRAY LITERATURE SOURCES

Table Apx A-1 provides a list of gray literature sources that yielded results for *o*-dichlorobenzene

Table_Apx A-1. Gray Literature Sources That Yielded Results for *o*-Dichlorobenzene

Source/Agency	Source Name	Source Type	Source Category
ATSDR	ATSDR Tox Profile Updates and Addendums	Other US Agency Resources	Assessment or Related Document
ATSDR	ATSDR Toxicological Profiles (original publication)	Other US Agency Resources	Assessment or Related Document
Australian Government; Department of Health	NICNAS Assessments (human health, Tier I, II or III)	International Resources	Assessment or Related Document
CAL EPA	Technical Support Documents for regulations: Drinking Water Public Health Goals	Other US Agency Resources	Assessment or Related Document
CDC	CDC Biomonitoring Tables	Other US Agency Resources	Database
ECHA	ECHA Documents	International Resources	Assessment or Related Document
Env Canada	Priority Substances List Assessment Report; State of Science Report, Environment Canada Assessment	International Resources	Assessment or Related Document
Env Canada	Chemicals at a Glance (fact sheets)	International Resources	Assessment or Related Document
Env Canada	Guidelines, Risk Management, Regulations	International Resources	Assessment or Related Document
EPA	Office of Water: STORET and WQX	US EPA Resources	Database

Source/Agency	Source Name	Source Type	Source Category
EPA	EPA Office of Water: Ambient Water Quality Criteria documents	US EPA Resources	Assessment or Related Document
EPA	Office of Air: TRI	US EPA Resources	Database
EPA	TSCA Data Needs Assessments or Problem Formulation	US EPA Resources	Assessment or Related Document
EPA	TSCA Hazard Characterizations	US EPA Resources	Assessment or Related Document
EPA	Other EPA: Misc sources	US EPA Resources	General Search
EPA	EPA: AP-42	US EPA Resources	Regulatory Document or List
EPA	TRI: Envirofacts Toxics Release Inventory 2017 Updated Dataset	US EPA Resources	Database
EPA	Chemical Data Reporting (2012 and 2016 non-CBI CDR database)	US EPA Resources	Database
EPA	Chemical Data Reporting (2012 and 2016 CBI CDR database)	US EPA Resources	Database
EPA	EPA: Generic Scenario	US EPA Resources	Assessment or Related Document
EPA	EPA Discharge Monitoring Report Data	US EPA Resources	Database
EPA	Office of Water: Drinking Water Standards Health Effects Support Documents	US EPA Resources	Regulatory Document or List
EPA	Office of Air: National Emissions Inventory (NEI) - National Emissions Inventory (NEI) Data (2014, 2011, 2008)	US EPA Resources	Database
EPA	Office of Air: CFRs and Dockets	US EPA Resources	Regulatory Document or List

Source/Agency	Source Name	Source Type	Source Category
FDA	FDA Market Baskets	Other US Agency Resources	Assessment or Related Document
IARC	IARC Monograph	International Resources	Assessment or Related Document
Japan	Japanese Ministry of the Environment Assessments - Environmental Risk Assessments	International Resources	Assessment or Related Document
Japan	Japanese Ministry of the Environment Assessments - Environmental Risk Assessments (Class I Designated Chemical Substances Summary Table)	International Resources	Regulatory Document or List
KOECT	Kirk-Othmer Encyclopedia of Chemical Technology Journal Article	Other Resource	Encyclopedia
NIOSH	CDC NIOSH - Occupational Health Guideline Documents	Other US Agency Resources	Assessment or Related Document
NIOSH	CDC NIOSH - Pocket Guides	Other US Agency Resources	Database
NIOSH	CDC NIOSH - Health Hazard Evaluations (HHEs)	Other US Agency Resources	Assessment or Related Document
NLM	National Library of Medicine’s Hazardous Substance Databank	Other US Agency Resources	Database
NLM	National Library of Medicine’s HazMap	Other US Agency Resources	Database
NTP	Technical Reports	Other US Agency Resources	Assessment or Related Document
OECD	OECD SIDS	International Resources	Assessment or Related Document
OECD	OECD Emission Scenario Documents	International Resources	Assessment or Related Document

Source/Agency	Source Name	Source Type	Source Category
OECD	OECD: General Site	International Resources	General Search
OSHA	OSHA Chemical Exposure Health Data	Other US Agency Resources	Database
OSHA	U.S. OSHA Chemical Exposure Health Data (CEHD) program data [ERG]	Other US Agency Resources	Database
RIVM	Integrated Critera Documents	International Resources	Assessment or Related Document
RIVM	RIVM Reports: Risk Assessments	International Resources	Assessment or Related Document
TERA	Toxicology Excellence for Risk Assessment	Other Resources	Assessment or Related Document

Appendix B PHYSICAL AND CHEMICAL PROPERTIES OF *o*-DICHLOROBENZENE

This appendix provides p-chem information and data found in preliminary data gathering for *o*-dichlorobenzene. Table_Apx B-1 summarizes the p-chem property values preliminarily selected for use in the risk evaluation from among the range of reported values collected as of March 2020. This table differs from that presented in the *Proposed Designation of o-Dichlorobenzene (CASRN 95-50-1) as a High-Priority Substance for Risk Evaluation* (U.S. EPA, 2019a) and may be updated as EPA collects additional information through systematic review methods. All p-chem property values that were extracted and evaluated as of March 2020 are presented in the supplemental file *Data Extraction and Data Evaluation Tables for Physical Chemical Property Studies* (EPA-HQ-OPPT-2018-0444).

Table_Apx B-1. Physical and Chemical properties of *o*-Dichlorobenzene

Property or Endpoint	Value[a]	Reference	Data Quality Rating
Molecular formula	$C_6H_4Cl_2$	NA	NA
Molecular weight	147.00 g/mol	NA	NA
Physical state	Liquid	Rumble, 2018	High
Physical properties	Pale yellow with pleasant, aromatic odor	RSC, 2019	High
Melting point	-17.03°C	O'Neil, 2013	High
Boiling point	180.2°C	Rumble, 2018	High
Density	1.3009 g/cm³ at 25°C	Baragi, 2005	High
Vapor pressure	1.36 mm Hg at 25°C	NLM, 2014	High
Vapor density	5.05 (air = 1)	NLM, 2014	High
Water solubility	156 mg/L at 25°C	NLM, 2014	High
Log Octanol/water partition coefficient (Log Kow)	3.43	NLM, 2014	High
Henry's Law constant	0.00192 atm·m^3/mol at 25°C	U.S. EPA, 2019	High
Flash point	66°C	O'Neil, 2013	Medium

Auto flammability	Not available		
Viscosity	1.324 cP at 25°C	Baragi, 2005	High
Refractive index	1.5499 at 25°C	Baragi, 2005	High
Dielectric constant	10.36	Elsevier, 2019	High

[a] Measured unless otherwise noted.
NA = Not applicable

Appendix C ENVIRONMENTAL FATE AND TRANSPORT PROPERTIES OF *o*-DICHLOROBENZENE

Table Apx C-1 provides the environmental fate characteristics that EPA identified and considered in developing the scope for *o*-dichlorobenzene.

Table Apx C-1. Environmental Fate and Transport Properties of *o*-Dichlorobenzene

Property or Endpoint	Value[a]	Reference
Direct Photodegradation	Not expected; does not contain chromophores that absorb at wavelengths >290 nm	HSDB (2014) citing Lyman et al. (1990); OECD (2001)
Indirect Photodegradation	$t_{1/2}$ = 38 days (12-hour day; 5 × 10^5 ·OH/cm^3) from OH rate constant 4.2 × 10-13 cm3/molecule-second at 25 ºCb	HSDB (2014) citing Atkinson (1989); Physprop (2012)
	$t_{1/2}$ = 27 days (5 × 10^5 ·OH/cm^3); ·OH rate constant 3 × 10^{-13} cm^3/molecule·second	OECD (2001)
	$t_{1/2}$ = 53 days (1 × 10^5 ·OH/cm^3); ·OH rate constant 3 × 10^{-13} cm^3/molecule·second	OECD (2001)
Hydrolysis	Stable; *o*-dichlorobenzene is not expected to undergo hydrolysis in the environment due to the lack of hydrolysable functional groups	HSDB (2014) citing Lyman et al. (1990)
Biodegradation	0% of theoretical BOD/28 days (Japanese MITI test) with activated sludge (aerobic water)	HSDB (2014) citing CITI (1992)
	25%/300 days removed from an aerobic soil column (closed system) (aerobic soil)	OECD (2001)
	100%/4 months in aerobic Rhine River sediment column (closed system) after 60–100-day lag period (aerobic sediment)	ATSDR (2006)
	$t_{1/2}$ = 37 days (first-order biodegradation rate constant = 0.0188 $days^{-1}$) in acclimated anaerobic sediment slurry obtained from the Tsurumi River, Japan (anaerobic sediment)	HSDB (2014) citing Masunaga et al. (1996)
	6.3%/10 weeks in an alkaline soil sample	HSDB (2014) citing Haider et al. (1974)
	$t_{1/2}$ = 117 days in a heterogeneous aquifer at the Columbus Air Force Base, Mississippi	HSDB (2014) citing Stauffer et al. (1994)
	$t_{1/2}$ = 12 days in pure culture laboratory batch microcosms following a 13-day lag period	HSDB (2014) citing Nielsen et al. (1996)

Wastewater Treatment	Elimination efficiencies from 15% to 53% during infiltration and soil percolation of *o*-dichlorobenzene containing wastewater from a wastewater treatment plant	OECD (2001)
	75% total removal (47% by biodegradation, 7% by sludge, 20% by volatilization to air; estimated)[b]	EPI Suite (U.S. EPA, 2012b)
Bioconcentration Factor	90–260 (carp) and 270–560 (rainbow trout)	HSDB (2014) citing CITI (1992) and Oliver and Niimi (1983)
	6,212–19,700 (*Selenastrum capricornutum*, algae)	HSDB (2014) citing Casserly et al. (1983); OECD (2001)
	66 (whole-body BCF measured in bluegill sunfish)	HSDB (2014) citing Barrows et al. (1980)
Bioaccumulation Factor	240 (estimated)[b]	EPI Suite (U.S. EPA, 2012b)
Soil Organic Carbon:Water	2.45 (in silt loam soil)	HSDB (2014) citing Chiou et al. (1979)

[a] Measured unless otherwise noted

[b] EPI Suite™ physical property inputs: Log K_{OW} = 3.43, BP = 180 ºC, MP = −16.7 ºC, VP = 1.36 mm Hg, WS = 156 mg/L, HLC = 0.00192 atm-m^3/mole, BIOP = 40, BioA = 10 and BioS = 10 SMILES: c(c(ccc1)Cl)(c1)Cl

Notes: ·OH = hydroxyl radical; OECD = Organisation for Economic Cooperation and Development; TG = test guideline; GC = gas chromatography; MITI = Ministry of International Trade and Industry; BCF = bioaccumulation factor; BOD = biochemical oxygen demand

Appendix D REGULATORY HISTORY

The chemical substance, *o*-dichlorobenzene, is subject to federal and state laws and regulations in the United States Table_Apx D-1 and Table D-2. Regulatory actions by other governments, tribes and international agreements applicable to *o*-dichlorobenzene are listed in Table Apx. D-3.

D.1 Federal Laws and Regulations

Table_Apx D-1. Federal Laws and Regulations

Statutes/Regulations	Description of Authority/Regulation	Description of Regulation
EPA 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.	*o*-Dichlorobenzene is one of the 20 chemicals EPA designated as a High-Priority Substance for risk evaluation under TSCA (84 FR 71924, December 30, 2019). Designation of *o*-dichlorobenzene as high-priority substance constitutes the initiation of the risk evaluation on the chemical.
Toxic Substances Control Act (TSCA) – Section 8(a)	The TSCA section 8(a) CDR Rule requires manufacturers (including importers) to give EPA basic exposure-related information on the types, quantities and uses of chemical substances produced domestically and imported into the United States	*o*-Dichlorobenzene manufacturing (including importing), processing and use information is reported under the CDR rule (76 FR 50816, August 16, 2011).
Toxic Substances Control Act (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.	*o*-Dichlorobenzene 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).
Toxic Substances Control Act (TSCA) – Section 4	Provides EPA with authority to issue rules, enforceable consent agreements and orders requiring manufacturers	Four chemical data submissions from test rules were received for *o*-

Statutes/Regulations	Description of Authority/Regulation	Description of Regulation
	(including importers) and processors to test chemical substances and mixtures.	dichlorobenzene including two water studies (persistence and stability), one mutagenicity/genetic toxicity study (1983), and one reproductive toxicity study (1989) (U.S. EPA ChemView. Accessed April 15, 2019).
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 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).	*o*-Dichlorobenzene is a listed substance subject to reporting requirements under 40 CFR 372.65 effective as of January 01, 1987.
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) - Sections 3 and 6	FIFRA governs the sale, distribution and use of pesticides. Section 3 of FIFRA generally requires that pesticide products be registered by EPA prior to distribution or sale. Pesticides may only be registered if, among other things, they do not cause "unreasonable adverse effects on the environment." Section 6 of FIFRA provides EPA with the authority to cancel pesticide registrations if either (1) the pesticide, labeling, or other material does not comply with FIFRA; or (2) when used in accordance with widespread and commonly recognized	*o*-Dichlorobenzene was registered as an antimicrobial and conventional chemical on June 3, 1983. No registration actions have been submitted in support of *o*-dichlorobenzene, for either antimicrobial and conventional chemical uses. No reregistration activities have been conducted. The last products containing *o*-dichlorobenzene were cancelled in November 1992.

Statutes/Regulations	Description of Authority/Regulation	Description of Regulation
	practice, the pesticide generally causes unreasonable adverse effects on the environment.	
Clean Air Act (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.	*o*-Dichlorobenzene 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 and on or before November 7, 2006 (40 CFR Part 60, Subpart VV).
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 *o*-dichlorobenzene, including a recommendation of 1,000 (µg/L) for "Human Health for the consumption of Water + Organism" and 3,000 (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.
Clean Water Act (CWA) – Section 301(b), 304(b), 306, 207(a) and 307(b)	Clean Water Act Section 307(a) establishes a list of toxic pollutants or combination of pollutants under the CWA. The statue specifies a list of families of toxic pollutants also listed in the Code of Federal Regulations at 40 CFR Part 401.15. The "priority pollutants" specified by those families are listed in 40 CFR Part 423 Appendix	*o*-Dichlorobenzene is designated as a toxic pollutant under section 307(a)(1) of the CWA and as such is subject to effluent limitations. (40 CFR 401.15). *o*-Dichlorobenzene is designated as a priority pollutant as well (40 CFR Part 423 Appendix A Under CWA

Statutes/Regulations	Description of Authority/Regulation	Description of Regulation
	A. These are pollutants for which best available technology effluent limitations must be established on either a national basis through rules (Sections 301(b), 304(b), 307(b), 306) or on a case-by-case best professional judgement basis in NPDES permits, see Section 402(a)(1)(B). EPA identifies the best available technology that is economically achievable for that industry after considering statutorily prescribed factors and sets regulatory requirements based on the performance of that technology.	section 304, *o*-dichlorobenzene is included in the list of total toxic organics (TTO) (40 CFR 413.02(i)).
Clean Water Act (CWA) – Section 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.	*o*-Dichlorobenzene is a designated hazardous substance in accordance with Section 311(b)(2)(A) of the Federal Water Pollution Control Act (43 FR 10474, March 13, 1978).
Safe Drinking Water Act (SDWA) – Section 1412	Requires EPA to publish non-enforceable maximum contaminant level goals (MCLGs) for contaminants which 1. may have an adverse effect on the health of persons; 2. are 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	*o*-Dichlorobenzene is subject to NPDWR under the SDWA with a MCLG of 0.6 Public Health Goal and an enforceable MCL of 0.6 $(mg/L)^2$ (Section 1412) (52 FR 25690 January 30, 1991).

Statutes/Regulations	Description of Authority/Regulation	Description of Regulation
	treatment technique. Public water systems are required to comply with NPDWRs.	
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.	*o*-Dichlorobenzene is included on the list of hazardous wastes pursuant to RCRA 3001. RCRA Hazardous Waste Code U070 **(**40 CFR section 261.33**)**
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.	*o*-Dichlorobenzene is a hazardous substance under CERCLA. Releases of *o*-dichlorobenzene 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.	*o*-Dichlorobenzene 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.

Statutes/Regulations	Description of Authority/Regulation	Description of Regulation
Other Federal Regulations		
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 Permissible Exposure Limits (PELs), exposure monitoring, engineering and administrative control measures, and respiratory protection.	OSHA issued occupational safety and health standards for *o*-dichlorobenzene that included a PEL of (C)50 ppm (ceiling limit) (29 CFR 1910.1000).
Federal 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.	*o*-Dichlorobenzene is listed as a hazardous material with regard to transportation and is subject to regulations prescribing requirements applicable to the shipment and transportation of listed hazardous materials (70 FR 34381, June 14 2005).

D.2 State Laws and Regulations

Table_Apx D-2. State Laws and Regulations

State Actions	Description of Action
State Air Regulations	Allowable Ambient Levels New Hampshire set a 24 hr AAL at 536 mg/m^3 and Annual AAL at 357 mg/m^3 (Env-A 1400: Regulated Toxic Air Pollutants). Rhode Island set a 1 hour AAL at 2000 mg/m^3 and an Annual AAL at 300 mg/m^3 (Air Pollution Regulation No. 22)
State Drinking Water Standards and Guidelines	Arizona set an MCL of 0.6 mg/L and an MCLG of 0.6 mg/L for *o*-dichlorobenzene (14 Ariz. Admin. Register 2978, August 1, 2008). California set an MCL of 0.6 mg/L and a PHG of 0.6 mg/L in 1997 (Cal Code Regs. Title 26, § 22-64444), Delaware (Del. Admin. Code Title 16, § 4462). Connecticut set an MCL of 0.6 mg/L for *o*-dichlorobenzene (Conn. Agencies Regs. § 19-13-B102). Delaware set an MCL of 0.6 mg/L for *o*-dichlorobenzene. Florida set an MCL of 6000 mg/L for *o*-dichlorobenzene (Fla. Admin. Code R. Chap. 62-550), Maine (10 144 Me. Code R. Chap. 231), Maine set an MCL of 0.6 mg/L for *o*-dichlorobenzene. Massachusetts set an MCL of 0.6 mg/L (310 Code Mass. Regs. § 22.00). Michigan set an MCL of 600 mg/L (Mich. Admin. Code r.299.44 and r.299.49, 2017). Minnesota set an MCL of 600 mg/L(chronic) for *o*-dichlorobenzene (Minn R. Chap. 4720). New Jersey set an MCL for 600 mg/L for *o*-dichlorobenzene (7:10 N.J Admin. Code § 5.2). Pennsylvania set an MCL of .6 mg/L for *o*-dichlorobenzene (25 Pa. Code § 109.202). Rhode Island set an MCL of 600 mg/L for *o*-dichlorobenzene (Rules and Regulations Pertaining to Public Drinking Water R46-13-DWQ).
State PELs	California PEL of 25 ppm, 150 mg/M and 50 ppm (Cal Code Regs. Title 8, § 5155) Hawaii PEL: 50 ppm ceiling and 300 mg/M (Hawaii Administrative Rules section 12-60-50).
State Right-to-Know Acts	*o*-Dichlorobenzene is listed on the Massachusetts Substance List Massachusetts (105 Code Mass. Regs. § 670.000 Appendix A). New Jersey lists *o*-dichlorobenzene on their Right-to-Know list (N.J.A.C. 7:1G). Pennsylvania lists *o*-dichlorobenzene on their Right-to-Know list with an Environmental Hazard notation (P.L. 734, No. 159 and 34 Pa. Code § 323).

State Actions	Description of Action
Chemicals of High Concern to Children	Several states have adopted reporting laws for chemicals in children's products containing *o*-dichlorobenzene including Maine (38 MRSA Chapter 16-D).
Other	*o*-Dichlorobenzene is on the MA Toxic Use Reduction Act (TURA) list of April 3, 2019 (301 CMR 41.00).

D.3 International Laws and Regulations

Table_Apx D-3. Regulatory Actions by other Governments, Tribes, and International Agreements

Country/ Organization	Requirements and Restrictions
Canada	*o*-Dichlorobenzene is on the Domestic Substances List (Government of Canada. Managing substances in the environment. Substances Search. Database accessed April 17, 2019). Other regulations include: • Canada's National Pollutant Release Inventory (NPRI)
European Union	*o*-Dichlorobenzene was evaluated under the 2013 Community rolling action plan (CoRAP) under regulation (European Commission [EC]) No1907/2006 - REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) (ECHA database. Accessed April 16, 2019).
Australia	*o*-Dichlorobenzene is subject to secondary notifications when importing or manufacturing the chemical in Australia. In 2001, *o*-dichlorobenzene was assessed. (*o*-Dichlorobenzene. Priority Existing Chemical No. 14. Full Public Report (2001)).
Japan	*o*-Dichlorobenzene is regulated in Japan under the following legislation:

Country/ Organization	Requirements and Restrictions
	• 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 • Industrial Safety and Health Act (ISHA) • Japan Air Pollution Control Law (National Institute of Technology and Evaluation [NITE] Chemical Risk Information Platform [CHRIP]. Accessed April 11, 2019).
Australia, Austria, Belgium, Canada-Ontario, Canada-Quebec, Denmark, European Union, Finland, France, Germany, Ireland, Italy, Japan, Latvia, New Zealand, People's Republic of China, Poland, Romania, Singapore, South Korea, Spain, Sweden, Switzerland, The Netherlands, Turkey, United Kingdom	Occupational exposure limits for *o*-dichlorobenzene (GESTIS International limit values for chemical agents (Occupational exposure limits, OELs) database. Accessed April 15, 2019.

Appendix E PROCESS, RELEASE AND OCCUPATIONAL EXPOSURE INFORMATION

This appendix provides information and data found in preliminary data gathering for *o*-dichlorobenzene.

E.1 Process Information

Process-related information potentially relevant to the risk evaluation may include process diagrams, descriptions and equipment. Such information may inform potential release sources and worker exposure activities.

E.1.1 Manufacture (Including Import)

In the 2016 CDR, three facilities submitted for *o*-dichlorobenzene. One facility identified itself as an importer and the other two facilities claimed their manufacture or import status as confidential business information (CBI). However, one of the two facilities with CBI claims is an office building; therefore, this facility is likely an importer of record and is not a manufacturer. The other facility with a CBI claim reported releases of *o*-dichlorobenzene to TRI for the 2015 reporting year (the same year for which data were reported for the 2016 CDR). However, in its Form R, this facility reported that it neither produces nor imports the *o*-dichlorobenzene, although it does use *o*-dichlorobenzene as a reactant and as a chemical processing aid. This facility reported in this same manner on their Form R for reporting year 2018 (U.S. EPA, 2018b). Therefore, EPA has not confirmed at this time if *o*-dichlorobenzene is manufactured in the United States or if it is only imported into the United States.

E.1.1.1 Manufacture

Chlorinated benzenes are produced by the liquid-phase chlorination of benzene using a catalyst. This reaction produces multiple chlorinated benzenes with hydrogen chloride as a byproduct. The chlorinated benzenes include monochlorobenzene, dichlorobenzenes, trichlorobenzenes, and substitutions up through the fully substituted hexachlorobenzene. The desired degree of chlorine substitution can be controlled by the extent of reaction. The selectivity of the dichlorobenzene structural isomers can be influenced by the choice of catalyst. Ferric chloride, the most common catalyst, produces a *p*-dichlorobenzene to *o*-dichlorobenzene molar ratio of 1.4-to-1. Higher ratios can be achieved with different catalysts. Generally, meta-dichlorobenzene (1,3-dichlorobenzene) is produced in small quantities, and 1,3,5-trichlorobenzene and 1,2,3,5-tetrachlorobenzene are produced at approximately non-detectable levels (Kirk-Othmer, 2001).

Separation of the produced chlorinated benzenes is accomplished through a combination of distillation and crystallization. *Ortho*- and *para*-dichlorobenzenes have similar vapor pressures but different melt temperatures; therefore, they are separated using crystallization. Any unwanted chlorinated benzene isomers may be incinerated on site or dechlorinated using hydrogen and a catalyst to produce benzene and hydrogen chloride (Kirk-Othmer, 2001).

E.1.1.2 Import

In general, chemicals may be imported into the United States in bulk via water, air, land, and intermodal shipments (Tomer and Kane, 2015). These shipments take the form of oceangoing chemical tankers, railcars, tank trucks, and intermodal tank containers. *o*-Dichlorobenzene is a liquid at room temperature and is shipped in bulk in aluminum tank trucks and steel or stainless-steel tank cars (Kirk-Othmer, 2001). Both imported and domestically manufactured commodity chemicals may be repackaged by wholesalers for resale; for example, repackaging bulk packaging into drums or bottles. The type and size of container will vary depending on customer requirement. In some cases, QC samples may be taken at import and repackaging sites for analyses. Some import facilities may only serve as storage and distribution locations, and repackaging/sampling may not occur at all import facilities.

E.2 Processing and Distribution

E.2.1 Processing as a Reactant or Intermediate

Processing as a reactant or intermediate is the use of *o*-dichlorobenzene as a feedstock in the production of another chemical via a chemical reaction in which *o*-dichlorobenzene is consumed to form the product. In the 2016 CDR, one company reported use of *o*-dichlorobenzene as an intermediate in the manufacture and preparation of chemical products (U.S. EPA, 2019b). o-DCB is commonly reacted to form the chemical 3,4-dichloroaniline, which is used in the production of several herbicides and for the production of 3,4,4'-trichlorocarbanilide (TCC), a bacteriostat used in deodorant soaps (Kirk-Othmer, 2001).

Exact operations for the use of *o*-dichlorobenzene as a reactant to produce other chemicals are not known at this time. For using a chemical as a reactant, operations would typically involve unloading the chemical from transport containers and feeding the chemical into a reaction vessel(s), where the chemical would react either fully or to a lesser extent. Following completion of the reaction, the produced substance may be purified further, thus removing unreacted *o*-dichlorobenzene (if any exists).

E.2.2 Incorporated into a Formulation, Mixture or Reaction Product

Incorporation into a formulation, mixture or reaction product refers to the process of mixing or blending of several raw materials to obtain a single product or preparation. In the 2016 CDR, companies reported use of *o*-dichlorobenzene as a pigment in the manufacturing of paint and coating, printing ink, and synthetic dye and pigment, as well as a solvent in the manufacturing of plastic material and resin (U.S. EPA, 2019b). The exact processes used to formulate products containing *o*-dichlorobenzene are not known at this time; however, several ESDs published by the OECD and Generic Scenarios published by EPA have been identified that provide general process descriptions for these types of products.

The formulation of coatings and inks typically involves dispersion, milling, finishing and filling into final packages (OECD, 2009a). In plastics and rubber manufacturing the formulation step usually involves the compounding of the polymer resin with additives and other raw materials to form a masterbatch in either open or closed blending processes (U.S. EPA, 2014; OECD,

2009b). After compounding, the resin is fed to an extruder where is it converted into pellets, sheets, films or pipes (U.S. EPA, 2014).

EPA plans to further investigate processing uses of *o*-dichlorobenzene during risk evaluation.

E.3 Uses

E.3.1 Ink, Toner, and Colorant Products

The 2016 CDR reports use of *o*-dichlorobenzene in ink, toner, and colorant products at concentrations of less than 30% by weight. Public comment from the Aerospace Industries Association (AIA) indicates *o*-dichlorobenzene is a constituent in inks (U.S. EPA, 2019b); EPA-HQ-OPPT-2018-0444-0004). The AIA comment specifically states that *o*-dichlorobenzene's use in inks includes its use as a precious metal ink that can be brushed onto a substrate. At this time, it is unknown what the chemical's specific function is in the ink; EPA plans to further investigate this use in the risk evaluation.

E.3.2 Coatings and paints, thinners, paint removers

The 2016 CDR reports use of *o*-dichlorobenzene in paints and coatings at concentrations of less than 30% by weight (U.S. EPA, 2019b). A public comment from the Aerospace Industries Association (AIA) also indicates *o*-dichlorobenzene is used as a constituent in paint strippers, but does not provide information on the specific function the chemical serves (EPA-HQ-OPPT-2018-0444-0004). EPA plans to further investigate the specific coatings and paints, thinners, and paint removers use activities of *o*-dichlorobenzene during the risk evaluation.

E.3.3 Lubricants and oils

The AIA submitted public comments indicating that *o*-dichlorobenzene is a constituent in oils used in the aerospace industry. These oils include automotive engine oils for vehicle or equipment engine maintenance and oils used to maintain tools (EPA-HQ-OPPT-2018-0444-0004). The Motor and Equipment Manufacturers Association (MEMA) and the Alliance of Automobile Manufacturers (the Alliance) also submitted a public comment stating that various members of the Alliance identified using *o*-dichlorobenzene in the production of various automobile parts and as a lubricant (EPA-HQ-OPPT-2019-0131-0022).

The Consumer Product Information Database (CPID, 2020) identifies one fuel additive product that contains this chemical. A fuel additive from Marvel Oil Company (2017) was found to contain 0.1 to 1 wt% *o*-dichlorobenzene, as per its safety data sheet (SDS) (Marvel Mystery Oil, 2017). Marvel Mystery Oil is sold in small containers and can be added directly to the fuel tank or the crankcase of engines for automobiles, trucks, agricultural and earth moving equipment, marine vehicles, recreational vehicles, small powered landscaping equipment (such as chainsaws, lawn mowers, and snow blowers), and gasoline-powered generators. Marvel Mystery Oil improves oil lubrication and sludge control, improves fuel combustion, and aids engine cleaning (Marvel Mystery Oil. 2017).

E.3.4 Air Care Products

EPA identified various sources describing *o*-dichlorobenzene's use in air care products. GoodGuide's (2011) Pollution Scorecard identifies use of this chemical in non-personal, non-aerosol deodorants and air fresheners. NLM (2008) identifies use of *o*-dichlorobenzene as a garbage and sewage deodorizer, and Kirk-Othmer (2001) identifies use of *o*-dichlorobenzene in garbage treatment in Japan.

An SDS for deodorizing moth balls produced by Willert Home Products, Inc. shows that the product contains *o*-dichlorobenzene in concentrations between 0.1 – 1% by weight (Willert, 2017). CPID and an SDS identify use of *o*-dichlorobenzene in a toilet bowl deodorizer also in concentrations between 0.1 – 1% by weight (CPID, 2020; Home Depot, 2019). The toilet bowl deodorizer is designed to be attached with a hanger to the interior of the toilet bowl, where it continuously deodorizes (Home Depot, 2019).

E.3.5 Other uses

EPA has identified additional uses of *o*-dichlorobenzene in various other TSCA-covered conditions of use, such as its use in laboratory chemicals (Harrell Industries, 2015). A sheep-branding fluid was found to contain 10 – 30% *o*-dichlorobenzene, per its SDS (Heiniger (2016)). The Substances Prepared in Nordic Countries (SPIN) database identifies use of *o*-dichlorobenzene in cleaning and washing agents in 2000 and the OECD identifies use of the chemical as a cleaning and washing agent (SPIN,2019; OECD,2001).Other uses of *o*-dichlorobenzene that were identified were its use in thinners used to clean brushes and tools used with overglazes, and its use in some ceramics glazes (Johnson Matthet, Inc., 2017; Duncan OA 901 Essence (2014); Duncan OG 803 Mother of Pearl (2015)). EPA plans to further investigate these other use activities of *o*-dichlorobenzene during the risk evaluation.

E.4 Disposal

Each of the conditions of use of *o*-dichlorobenzene may generate waste streams of the chemical that are collected and transported to third-party sites for disposal, treatment, or recycling. Industrial sites that treat or dispose onsite wastes that they themselves generate are assessed in each condition of use assessment. Similarly, point source discharges of *o*-dichlorobenzene to surface water are assessed in each condition of use assessment (point source discharges are exempt as solid wastes under RCRA). Wastes of *o*-dichlorobenzene that are generated during a condition of use and sent to a third-party site for treatment, disposal, or recycling may include the following:

- Wastewater: *o*-dichlorobenzene may be contained in wastewater discharged to POTW or other, non-public treatment works for treatment. Industrial wastewater containing *o*-dichlorobenzene discharged to a POTW may be subject to EPA or authorized NPDES state pretreatment programs. The assessment of wastewater discharges to POTWs and non-public treatment works of *o*-dichlorobenzene is included in each of the condition of use assessments.

- Solid Wastes: Solid wastes are defined under RCRA as any material that is discarded by being: abandoned; inherently waste-like; a discarded military munition; or recycled in

certain ways (certain instances of the generation and legitimate reclamation of secondary materials are exempted as solid wastes under RCRA). Solid wastes may subsequently meet RCRA's definition of hazardous waste by either being listed as a waste at 40 CFR §§ 261.30 to 261.35 or by meeting waste-like characteristics as defined at 40 CFR §§ 261.20 to 261.24. Solid wastes that are hazardous wastes are regulated under the more stringent requirements of Subtitle C of RCRA, whereas non-hazardous solid wastes are regulated under the less stringent requirements of Subtitle D of RCRA.

o-Dichlorobenzene is a U-listed hazardous waste under code U070 under RCRA; therefore, discarded, unused pure and commercial grades of *o*-dichlorobenzene are regulated as a hazardous waste under RCRA (40 CFR § 261.33(f)). Additionally, *o*-dichlorobenzene is included in the non-specific source waste code F002 for spent halogenated solvents. Therefore, spent halogenated solvent streams that contain *o*-dichlorobenzene may be regulated as a hazardous waste under RCRA (40 CFR § 261.31(a)).

- Wastes Exempted as Solid Wastes under RCRA: Certain conditions of use of *o*-dichlorobenzene may generate wastes of *o*-dichlorobenzene that are exempted as solid wastes under 40 CFR § 261.4(a). For example, the generation and legitimate reclamation of hazardous secondary materials of *o*-dichlorobenzene may be exempt as a solid waste.

For the 2018 reporting year of the TRI program, 17 facilities reported in total over 55.3 million pounds of *ortho*-dichlorobenzene waste for 2018. Nearly all (97%) of the *ortho*-dichlorobenzene managed as waste during 2018 was managed on site by recycling. Waste treatment quantities (nearly 1.6 million pounds) accounted for 2.8% of the total. Contributions from quantities burned for energy recovery or released to the environment were very small, amounting to only 0.5% and 0.1%, respectively, of the total quantity of *ortho*-dichlorobenzene managed as waste. Overall, 99.2% of the *ortho*-dichlorobenzene production-related waste was managed as such on site.

E.5 Preliminary Occupational Exposure Data

EPA presents below an example of occupational exposure-related information obtained from preliminary data gathering. EPA plans to consider this information and data in combination with other data and methods for use in the risk evaluation.

Table Apx E-1 summarizes NIOSH Health Hazard Evaluations identified during EPA's preliminary data gathering. The OSHA CEHD did not contain any monitoring data for *o*-dichlorobenzene between the years 2010 and 2019.

Table_Apx E-1. Summary of NIOSH HHEs with Monitoring for *o*-Dichlorobenzene [a]

Year of Publication	Report Number	Facility Description
1981	HETA 81-065-938	Vehicle maintenance facility (METRO Bus Maintenance Shop, Washington, D.C.)

1980	HHE 77-99-726	Chemical manufacturer (DuPont Chambers Works, Deepwater, New Jersey)
1976	74-107-279	Silicone manufacturer (General Electric Company, Silicone Products Department, Waterford, New York)

[a] Table includes HHEs identified to date.

Appendix F SUPPORTING INFORMATION - Conceptual Model for Industrial and Commercial Activities and Uses:

Table_Apx F-1. Worker and Occupational Non-User Exposure Conceptual Model Supporting Table

Life Cycle Stage	Category	Subcategory	Release / Exposure Scenario	Exposure Pathway	Exposure Route	Receptor / Population	Plans to Evaluate	Rationale
Manufacture	Domestic	CBI	Manufacture of o-DCB	Liquid Contact	Dermal	Workers	Yes	The potential for exposures to workers exists during manufacturing, as o-DCB is manufactured as liquid.
				Solid Contact	Dermal	Workers	No	The potential for exposures to workers is not expected as o-DCB is manufactured as liquid.
				Vapor	Inhalation	Workers, Occupational Non-Users (ONUs)	Yes	There is potential for vapor generation based on o-DCB's vapor pressure (VP) (VP = 1.36 mmHg) at room temperature.
				Mist	Inhalation	Workers, ONU	No	Mist generation is not expected during manufacturing.
				Dust	Inhalation/Oral	Workers, ONU	No	Dust generation is not expected as o-DCB is manufactured as liquid.
				Liquid/Solid Contact	Dermal	ONU	No	Exposure is expected to be primarily restricted to workers who are directly involved in working with the chemical. ONUs are not expected to come in direct contact with the chemicals.
	Import	Import	Repackaging of Import Containers	Liquid Contact	Dermal	Workers	Yes	The potential for exposures to workers exists during import, but exposure will only occur

Life Cycle Stage	Category	Subcategory	Release / Exposure Scenario	Exposure Pathway	Exposure Route	Receptor / Population	Plans to Evaluate	Rationale
								in the event the imported material is repackaged.
				Solid Contact	Dermal	Workers	No	The potential for exposures to workers does not exist during import, as o-DCB exists as a liquid at room temperature.
				Vapor	Inhalation	Workers, ONU	Yes	There is potential for vapor generation based on o-DCB's vapor pressure (VP) (VP = 1.36 mmHg) at room temperature.
				Mist	Inhalation	Workers, ONU	No	Mist generation is not expected during import or repackaging.
				Dust	Inhalation/Oral	Workers, ONU	No	Dust generation is not expected during import or repackaging.
				Liquid/Solid Contact	Dermal	ONU	No	Exposures is expected to be primarily restricted to workers who are directly involved in working with the chemical. ONUs are not expected to come in direct contact with the chemicals.
Processing	As a Reactant	Reactants in All other chemical product and preparation manufacturing	Reactants	Liquid Contact	Dermal	Workers	Yes	The potential for exposures to workers exists during processing of o-DCB in liquid form.
				Solid Contact	Dermal	Workers	No	The potential for worker exposures to solids is not expected during processing as o-DCB is in liquid form.

Life Cycle Stage	Category	Subcategory	Release / Exposure Scenario	Exposure Pathway	Exposure Route	Receptor / Population	Plans to Evaluate	Rationale
				Vapor	Inhalation	Workers, ONU	Yes	There is potential for vapor generation based on o-DCB's vapor pressure (VP) (VP = 1.36 mmHg) at room temperature.
				Mist	Inhalation	Workers, ONU	No	Mist generation is not expected during processing as a reactant.
				Dust	Inhalation/Oral	Workers, ONU	No	Dust generation is not expected during processing as a reactant.
				Liquid/Solid Contact	Dermal	ONU	No	Exposures is expected to be primarily restricted to workers who are directly involved in working with the chemical. ONUs are not expected to come in direct contact with the chemicals.
	Incorporated into formulation, mixture, or reaction product	Intermediates in All other chemical product and preparation manufacturing	Intermediates	Liquid Contact	Dermal	Workers	Yes	The potential for exposures to workers exists during processing (incorporation into formulation, mixture, or reaction product), as o-DCB is in liquid form.
				Solid Contact	Dermal	Workers	No	The potential for worker exposures to solids is not expected during processing (incorporation into formulation, mixture, or reaction product), as o-DCB is in liquid form.
				Vapor	Inhalation	Workers, ONU	Yes	There is potential for vapor generation based on o-DCB's vapor pressure (VP) (VP = 1.36 mmHg) at room temperature.

Life Cycle Stage	Category	Subcategory	Release / Exposure Scenario	Exposure Pathway	Exposure Route	Receptor / Population	Plans to Evaluate	Rationale
				Mist	Inhalation	Workers, ONU	No	Mist generation is not expected during processing (incorporation into formulation, mixture, or reaction product).
				Dust	Inhalation/Oral	Workers, ONU	No	Dust generation is not expected during processing (incorporation into formulation, mixture, or reaction product).
				Liquid/Solid Contact	Dermal	ONU	No	Exposures is expected to be primarily restricted to workers who are directly involved in working with the chemical. ONUs are not expected to come in direct contact with the chemicals.
		Solvents (which become part of product formulation or mixture) in Plastic material and resin manufacturing; synthetic rubber manufacturing	Incorporated in solvents in product formulation	Liquid Contact	Dermal	Workers	Yes	The potential for exposures to workers exists during processing (incorporation into formulation, mixture, or reaction product), as o-DCB is in liquid form.
				Solid Contact	Dermal	Workers	Yes	o-DCB may be incorporated into a solid or powder; therefore, exposures to solids for workers are possible.
				Vapor	Inhalation	Workers, ONU	Yes	There is potential for vapor generation based on o-DCB's vapor pressure (VP) (VP = 1.36 mmHg) at room temperature.

Life Cycle Stage	Category	Subcategory	Release / Exposure Scenario	Exposure Pathway	Exposure Route	Receptor / Population	Plans to Evaluate	Rationale
				Dust	Inhalation/Oral	Workers, ONU	Yes	o o-DCB may be incorporated into a solid or powder; therefore, exposures to solids for workers are possible.
				Mist	Inhalation	Workers, ONU	No	Mist generation is not expected during processing.
				Liquid/Solid Contact	Dermal	ONU	No	Exposures is expected to be primarily restricted to workers who are directly involved in working with the chemical. ONUs are not expected to come in direct contact with the chemicals.
		Pigments in: Printing ink manufacturing; Paint and coating manufacturing; Synthetic dye and pigment	Incorporated in pigments in product formulations	Liquid/Solid Contact	Dermal	Workers	Yes	The potential for exposures to workers exists during processing, as o-DCB is in liquid form; o-DCB may be incorporated into a solid or powder; therefore, exposures to solids for workers are possible.
				Vapor	Inhalation	Workers, ONU	Yes	There is potential for vapor generation based on o-DCB's vapor pressure (VP) (VP = 1.36 mmHg) at room temperature.
				Mist	Inhalation	Workers, ONU	No	Mist generation is not expected during processing.
				Dust	Inhalation/Oral	Workers, ONU	Yes	o-DCB may be incorporated into a solid or powder; therefore, exposures to solids for workers are possible.

Life Cycle Stage	Category	Subcategory	Release / Exposure Scenario	Exposure Pathway	Exposure Route	Receptor / Population	Plans to Evaluate	Rationale
				Liquid/Solid Contact	Dermal	ONU	No	Exposures is expected to be primarily restricted to workers who are directly involved in working with the chemical. ONUs are not expected to come in direct contact with the chemicals.
Commercial Uses	Ink, toner, and colorant products	Ink and toners	Used in inks and toners	Liquid/Solid Contact	Dermal	Workers	Yes	Inks and toners are in liquid/solid form; therefore, exposures to workers exists for o-DCB used in inks and toners.
				Vapor	Inhalation	Workers, ONU	Yes	There is potential for vapor generation based on o-DCB's vapor pressure (VP) (VP = 1.36 mmHg) at room temperature.
				Mist/Dust	Inhalation/Oral	Workers, ONU	Yes	Mist/dust generation is possible during use of inks and toners.
				Liquid/Solid Contact	Dermal	ONU	No	Exposures is expected to be primarily restricted to workers who are directly involved in working with the chemical. ONUs are not expected to come in direct contact with the chemicals.
	Paints and coatings	Coatings and paints, thinners, paint removers	Used in paints and coatings, thinners, paint removers	Liquid Contact	Dermal	Workers	Yes	The potential for exposures to workers exist during use of paints and coatings, thinners, paint removers.
				Solid Contact	Dermal	Workers	No	The potential for worker exposures to solid o-DCB is not expected during use of liquid paints and

Life Cycle Stage	Category	Subcategory	Release / Exposure Scenario	Exposure Pathway	Exposure Route	Receptor / Population	Plans to Evaluate	Rationale
								coatings, thinners, paint removers.
				Vapor	Inhalation	Workers, ONU	Yes	There is potential for vapor generation based on o-DCB's vapor pressure (VP) (VP = 1.36 mmHg) at room temperature.
				Mist	Inhalation	Workers, ONU	Yes	The potential of exposure due to mist generation exists during the application of paints and coatings, thinners, paint removers.
				Dust	Inhalation/Oral	Workers, ONU	No	Dust generation is not expected during the use of paints and coatings, thinners, paint removers.
				Liquid/Solid Contact	Dermal	ONU	No	Exposures is expected to be primarily restricted to workers who are directly involved in working with the chemical. ONUs are not expected to come in direct contact with the chemicals.
	Lubricants and greases	Lubricants and greases, degreasers	Use in lubricants and greases, degreasers	Liquid Contact	Dermal	Workers	Yes	The potential for exposures to workers exists during use of o-DCB in lubricants, greases, and degreasers as o-DCB is in liquid form.
				Solid Contact	Dermal	Workers	No	The potential for worker exposures to solid o-DCB is not expected during use in lubricants, greases,

Life Cycle Stage	Category	Subcategory	Release / Exposure Scenario	Exposure Pathway	Exposure Route	Receptor / Population	Plans to Evaluate	Rationale
								or degreasers, as o-DCB is in liquid form.
				Vapor	Inhalation	Workers, ONU	Yes	There is potential for vapor generation based on o-DCB's vapor pressure (VP) (VP = 1.36 mmHg) at room temperature.
				Mist/Dust	Inhalation/Oral	Workers, ONU	No	Mist generation is not expected during its use as in lubricants, greases, or degreasers.
				Liquid/Solid Contact	Dermal	ONU	No	Exposures is expected to be primarily restricted to workers who are directly involved in working with the chemical. ONUs are not expected to come in direct contact with the chemicals.
	Air care products	Continuous action air fresheners (including toilet/ urinal deodorizers /fresheners)	Used in air care products	Liquid/Solid Contact	Dermal	Workers	Yes	Air care products can be in solid or liquid form; therefore, exposures to workers exists for o-DCB used in air care products.
				Vapor	Inhalation	Workers, ONU	Yes	There is potential for vapor generation based on o-DCB's vapor pressure (VP) (VP = 1.36 mmHg) at room temperature.
				Dust/Mist	Inhalation/Oral	Workers, ONU	Yes	Dust/mist generation is possible during use of air care products.

Life Cycle Stage	Category	Subcategory	Release / Exposure Scenario	Exposure Pathway	Exposure Route	Receptor / Population	Plans to Evaluate	Rationale
				Liquid/Solid Contact	Dermal	ONU	No	Exposures is expected to be primarily restricted to workers who are directly involved in working with the chemical. ONUs are not expected to come in direct contact with the chemicals.
	Other use	Laboratory chemicals; sheep branding fluid, furniture care products	Used as laboratory chemicals' sheep-branding fluids, and furniture care products	Liquid Contact	Dermal	Workers	Yes	The potential for exposures to workers is expected during use of o-DCB as a laboratory chemical, sheep-branding fluid, or in furniture care products as o-DCB is in liquid form.
				Solid Contact	Dermal	Workers	No	The potential for worker exposures to solid o-DCB is not expected during use as a laboratory chemical, sheep-branding fluid, or in furniture care products as o-DCB is in liquid form.
				Vapor	Inhalation	Workers, ONU	Yes	There is potential for vapor generation based on o-DCB's vapor pressure (VP) (VP = 1.36 mmHg) at room temperature.
				Mist	Inhalation	Workers, ONU	Yes	Mist generation is possible during use of furniture care products if the products are spray-applied
				Dust	Inhalation/Oral	Workers, ONU	No	Dust generation is not expected during its use as a laboratory chemical, sheep-branding fluid, or in furniture care products.

Life Cycle Stage	Category	Subcategory	Release / Exposure Scenario	Exposure Pathway	Exposure Route	Receptor / Population	Plans to Evaluate	Rationale
				Liquid/Solid Contact	Dermal	ONU	No	Exposures is expected to be primarily restricted to workers who are directly involved in working with the chemical. ONUs are not expected to come in direct contact with the chemicals.
Disposal	Disposal	Emissions to air, in wastewater, liquid wastes, and solid wastes	Worker handling wastes	Liquid/Solid Contact	Dermal	Workers	Yes	The potential for exposures to workers exists during this use as liquid/solid formulations may be disposed
				Vapor	Inhalation	Workers, ONU	Yes	There is potential for vapor generation based on o-DCB's vapor pressure (VP) (VP = 1.36 mmHg) at room temperature.
				Mist	Inhalation	Workers, ONU	No	Mist generation is not expected during disposal of liquid wastes.
				Dust	Inhalation/Oral	Workers, ONU	Yes	Dust generation is possible during disposal of solid wastes.
				Liquid/Solid Contact	Dermal	ONU	No	Exposures is expected to be primarily restricted to workers who are directly involved in working with the chemical. ONUs are not expected to come in direct contact with the chemicals.

Appendix G SUPPORTING INFORMATION – CONCEPTUAL MODEL FOR CONSUMER ACTIVITIES AND USES

Table_Apx G-1. Consumer Exposure Conceptual Model Supporting Table

Life Cycle Stage	Category	Subcategory	Release from source	Exposure Pathway	Route	Receptor	Plans to Evaluate	Rationale
Consumer Use	Lubricants and greases	Lubricants and greases, degreasers	Direct contact through application or use of products	Liquid/ Solid Contact	Dermal	Consumers	Yes	Exposure is expected to be primarily restricted to consumers who are directly involved in using the chemical. Bystanders are not expected to come in direct contact with the chemical.
			Long-term emission/mass-transfer through application or use of products	Vapor	Inhalation	Consumers and Bystanders	Yes	o-DCB is volatile at room temperature; inhalation pathway should be further analyzed.
			Direct contact through application or use of products	Mist	Inhalation and Dermal	Consumers and Bystanders	No	The product is not expected to be spray applied; therefore, mist generation is not expected.
Consumer Use	Air care products	Continuous action air fresheners (including toilet/urinal deodorizers/ fresheners)	Direct contact during installation	Liquid/ Solid Contact	Dermal	Consumers	Yes	Exposure is expected to be primarily restricted to consumers who are directly involved in installing the product. Bystanders are not expected to come in direct contact with the chemical.
			Long-term emission/mass-transfer through installation or use of products	Vapor	Inhalation	Consumers and Bystanders	Yes	o-DCB is volatile at room temperature; inhalation pathway should be further analyzed.
			Direct contact through application or use of products	Mist	Inhalation and Dermal	Consumers and Bystanders	No	The product is not expected to be spray applied; therefore, mist generation is not expected.

Life Cycle Stage	Category	Subcategory	Release from source	Exposure Pathway	Route	Receptor	Plans to Evaluate	Rationale
Consumer Use	Other use	Thinners (Products for cleaning brushes and tools used with overglazes)	Direct contact through application or use of products	Liquid/ Solid Contact	Dermal	Consumers	Yes	Exposure is expected to be primarily restricted to consumers who are directly involved in using the chemical. Bystanders are not expected to come in direct contact with the chemical.
			Long-term emission/mass-transfer through application or use of products	Vapor	Inhalation	Consumers and Bystanders	Yes	o-DCB is volatile at room temperature; inhalation pathway should be further analyzed.
			Direct contact through application or use of products	Mist	Inhalation and Dermal	Consumers and Bystanders	No	The product is not expected to be spray applied; therefore, mist generation is not expected.
Consumer Use	Other use	Ceramics glaze	Direct contact through application or use of products	Liquid/ Solid Contact	Dermal	Consumers	Yes	Exposure is expected to be primarily restricted to consumers who are directly involved in using the chemical. Bystanders are not expected to come in direct contact with the chemical.
			Long-term emission/mass-transfer through application or use of products	Vapor	Inhalation	Consumers and Bystanders	Yes	o-DCB is volatile at room temperature; inhalation pathway should be further analyzed.
			Direct contact through application or use of products	Mist	Inhalation and Oral	Consumers and Bystanders	No	The product is not expected to be spray applied; therefore, mist generation is not expected.
Consumer Use	Other use	Sheep-branding fluid	Direct contact through application or use of products	Liquid/ Solid Contact	Dermal	Consumers	Yes	Exposure is expected to be primarily restricted to consumers who are directly involved in using the chemical. Bystanders are not expected to come in direct contact with the chemical.

Life Cycle Stage	Category	Subcategory	Release from source	Exposure Pathway	Route	Receptor	Plans to Evaluate	Rationale
			Long-term emission/mass-transfer through application or use of products	Vapor	Inhalation	Consumers and Bystanders	Yes	o-DCB is volatile at room temperature; inhalation pathway should be further analyzed.
			Direct contact through application or use of products	Mist	Inhalation and Dermal	Consumers and Bystanders	No	The product is not expected to be spray applied; therefore, mist generation is not expected.
Consumer Use	Other use	Cleaning and furniture care products	Direct contact through application or use of products	Liquid/ Solid Contact	Dermal	Consumers	Yes	Exposure is expected to be primarily restricted to consumers who are directly involved in using the chemical. Bystanders are not expected to come in direct contact with the chemical.
			Long-term emission/mass-transfer through application or use of products	Vapor	Inhalation	Consumers and Bystanders	Yes	o-DCB is volatile at room temperature; inhalation pathway should be further analyzed.
			Direct contact through application or use of products	Mist	Inhalation and Dermal	Consumers and Bystanders	Yes	The potential for exposure due to mist generation exists during the application of cleaning and furniture care products.
			Direct contact through handling or disposal of products	Liquid/ Solid Contact	Dermal	Consumers	Yes	Exposure is expected to be primarily restricted to consumers who are directly involved in handling or disposing the chemical. Bystanders are not expected to come in direct contact with the chemical.
Consumer Handling of Disposal and Waste	Wastewater, Liquid wastes and solid wastes	Wastewater, Liquid wastes and solid wastes	Long-term emission/mass-transfer through handling or disposal of products	Vapor	Inhalation	Consumers and Bystanders	Yes	o-DCB is volatile at room temperature; inhalation pathway should be further analyzed.

Life Cycle Stage	Category	Subcategory	Release from source	Exposure Pathway	Route	Receptor	Plans to Evaluate	Rationale
			Direct contact through handling or disposal of products	Mist	Inhalation and Dermal	Consumers and Bystanders	Yes	Mist generation is not expected during handling or disposal.

Appendix H SUPPORTING INFORMATION – CONCEPTUAL MODEL FOR ENVIRONMENTAL RELEASES AND WASTES

Table_Apx H-1. Environmental Exposure Conceptual Model Supporting Table

Life Cycle Stage	Category	Release	Exposure Pathway / Media	Exposure Routes	Receptor / Population	Plans to Evaluate[8]	Rationale
All	Emissions to Air	Emissions to Air	Near facility ambient air concentrations	Inhalation	General Population	Yes	*o*-Dichlorobenzene air and deposition to nearby bodies of water and soil are expected exposure pathways.
			Indirect deposition to nearby bodies of water and soil catchments	Oral Dermal	General Population	Yes	
				TBD	Aquatic and Terrestrial Receptors	Yes	
		Hazardous and Municipal Waste Incinerator	Near facility ambient air concentrations/ Indirect deposition to nearby bodies of water and soil catchments	Inhalation	General Population	No	Stationary source releases of o-dichlorobenzene to ambient air are under the jurisdiction of the RCRA and CAA
				TBD	Aquatic and Terrestrial Species		
		Industrial pre-treatment and wastewater	Direct release into surface water and	TBD	Aquatic and Terrestrial Receptors	Yes	EPA has developed Ambient Water Quality Criteria for

[8] The exposure pathways, exposure routes and hazards that EPA plans to evaluate are subject to change in the final scope, in light of comments received on this draft scope and other reasonably available information. EPA continues to consider whether and how other EPA-administered statutes and any associated regulatory programs address the presence of *o*-dichlorobenzene in exposure pathways falling under the jurisdiction of these EPA statutes.

Life Cycle Stage	Category	Release	Exposure Pathway / Media	Exposure Routes	Receptor / Population	Plans to Evaluate[8]	Rationale
	Wastewater or Liquid Wastes	treatment, or POTW	indirect partitioning to sediment	Oral Dermal	General Population	No	protection of human health for *o*-dichlorobenzene.
			Drinking Water via Surface or Ground Water	Oral Dermal and Inhalation (e.g. showering)	General Population	No	The drinking water exposure pathway for *o*-dichlorobenzene is currently addressed in the SDWA regulatory analytical process for public water systems.
			Biosolids: application to soil and/or migration to groundwater and/or surface water	Oral (e.g. ingestion of soil) Inhalation	General Population	No	Unlikely to be a route to general population since *o*-dichlorobenzene is not expected to sorb onto biosolids.
				TBD	Aquatic and Terrestrial receptors	Yes	
		Underground injection	Migration to groundwater, potential surface/drinking water	Oral Dermal Inhalation	General Population	No	*o*-Dichlorobenzene is released to Class I Underground Injection Wells which are covered by SDWA and RCRA.
					Aquatic and Terrestrial Species		
				TBD			
Disposal	Solid and Liquid Wastes	Hazardous, Municipal landfill and other land disposal	Leachate to soil, ground water and/or mitigation to surface water	Oral Dermal	General Population	No	*o*-Dichlorobenzene is included on the list of hazardous wastes pursuant to RCRA 3001 (40 CFR §§ 261.33).
				TBD	Aquatic and Terrestrial Receptors		