



United States
Environmental Protection Agency

Office of Chemical Safety and
Pollution Prevention

**Proposed Designation of
Formaldehyde
(CASRN 50-00-0)
as High-Priority Substance
for Risk Evaluation**

August 22, 2019

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Acronyms and Abbreviations

Term	Description
ACA	American Coatings Association
ACGIH	American Conference of Governmental Industrial Hygienists
AIA	Aerospace Industries Association
ARMA	Asphalt Roofing Manufacturers Association
B	Billion
BOD	Biological Oxygen Demand
BP	Boiling Point
CAA	Clean Water Act
CASRN	Chemical Abstracts Service Registry Number
CBI	Confidential Business Information
CDR	Chemical Data Reporting
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CPD	Consumer Product Database
CWA	Clean Water Act
ECHA	European Chemicals Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
HPLC	high performance liquid chromatography
IARC	International Agency for Research on Cancer
IRIS	Integrated Risk Information System
IUR	Inventory Update Rule
K _{OC}	Organic Carbon-Water Partitioning Coefficient
K _{OW}	Octanol-Water Partitioning Coefficient
MITI	Ministry of International Trade and Industry, Japan
MP	Melting Point
NAIMA	North American Insulation Manufacturers Association
NIOSH	National Institute for Occupational Safety and Health
NOC	Not Otherwise Categorized

Term	Description
OECD	Organisation for Economic Co-operation and Development
·OH	Hydroxyl Radical
OSHA	Occupational Safety and Health Administration
POTW	Publicly Owned Treatment Works
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act of 1986
SDWA	Safe Drinking Water Act
SMILES	Simplified Molecular-Input Line-Entry System
STEL	Short-Term Exposure Limit
TLV	Threshold Limit Value
TRI	Toxics Release Inventory
TSCA	Toxic Substances Control Act
TWA	Time-weighted Average
VP	Vapor Pressure
WS	Water Solubility

1. Introduction

In section 6(b)(1)(B) of the Toxic Substances Control Act (TSCA), as amended, and in the U.S. Environmental Protection Agency's (EPA) implementing regulations (40 CFR 702.3)¹, a high-priority substance for risk evaluation is defined as a chemical substance that EPA determines, without consideration of costs or other non-risk factors, may present an unreasonable risk of injury to health or the environment because of a potential hazard and a potential route of exposure under the conditions of use, including an unreasonable risk to potentially exposed or susceptible subpopulations identified as relevant by EPA.

Before designating prioritization status, under EPA's regulations at 40 CFR 702.9 and pursuant to TSCA section 6(b)(1)(A), EPA will generally use reasonably available information to screen the candidate chemical substances under its conditions of use against the following criteria and considerations:

- the hazard and exposure potential of the chemical substance;
- persistence and bioaccumulation;
- potentially exposed or susceptible subpopulations;
- storage near significant sources of drinking water;
- conditions of use or significant changes in the conditions of use of the chemical substance;
- the chemical substance's production volume or significant changes in production volume; and
- other risk-based criteria that EPA determines to be relevant to the designation of the chemical substance's priority.

This document presents the review of the candidate chemical substance against the criteria and considerations set forth in 40 CFR 702.9 for a may present risk finding. The information sources used are relevant to the criteria and considerations and consistent with the scientific standards of TSCA section 26(h), including, as appropriate, sources for hazard and exposure data listed in Appendices A and B of the *TSCA Work Plan Chemicals: Methods Document* (February 2012) (40 CFR 702.9(b)). EPA uses scientific information that is consistent with the best available science. Final designation of the chemical substance as a high-priority chemical substance would immediately initiate the risk evaluation process as described in the EPA's final rule, *Procedures for Chemical Risk Evaluation Under the Amended Toxic Substances Control Act* (40 CFR 702).

Formaldehyde is one of the 40 chemical substances initiated for prioritization as referenced in the March 21, 2019 notice (84 FR 10491)¹. EPA has determined that formaldehyde is a suitable candidate for the proposed designation as a high-priority chemical substance. The proposed designation is based on the results of the review against the aforementioned criteria and considerations as well as review of the reasonably available information on formaldehyde, including relevant information received from the public and other information as appropriate.

¹ NOTE: For all 40 CFR 702 citations, please refer to: <https://www.govinfo.gov/content/pkg/CFR-2018-title40-vol33/xml/CFR-2018-title40-vol33-part702.xml> and <https://www.federalregister.gov/documents/2019/03/21/2019-05404/initiation-of-prioritization-under-the-toxic-substances-control-act-tsca>

EPA will take comment on this proposed designation for 90 days before finalizing its designation of formaldehyde. The docket number for providing comments on formaldehyde is EPA-HQ-OPPT-2018-0438 and is available at www.regulations.gov.

The information, analysis and basis used for the review of the chemical is organized as follows:

- *Section 1 (Introduction):* This section explains the requirements of the amended TSCA and implementing regulations – including the criteria and considerations - pertinent to the prioritization and designation of high-priority chemical substances.
- *Section 2 (Production volume or significant changes in production volume):* This section presents information and analysis on national aggregate production volume of the chemical substance.
- *Section 3 (Conditions of use or significant changes in conditions of use):* This section presents information and analysis regarding the chemical substance's conditions of use under TSCA.
- *Section 4 (Potentially exposed or susceptible subpopulations):* This section presents information and analysis regarding potentially exposed or susceptible subpopulations, including children, women of reproductive age, and workers, with respect to the chemical substance.
- *Section 5 (Persistence and bioaccumulation):* This section presents information and analysis regarding the physical and chemical properties of the chemical substance and the chemical's fate characteristics.
- *Section 6 (Storage near significant sources of drinking water):* This section presents information and analysis considered regarding the risk from the storage of the chemical substance near significant sources of drinking water.
- *Section 7 (Hazard Potential):* This section presents the hazard information relevant to the chemical substance.
- *Section 8 (Exposure Potential):* This section presents information and analysis regarding the exposures to the chemical substance.
- *Section 9 (Other risk-based criteria):* This section presents the extent to which EPA identified other risk-based criteria that are relevant to the designation of the chemical substance's priority.
- *Section 10 (Proposed designation):* Based on the results of the review performed and the information and analysis presented, this section describes the basis used by EPA to support the proposed designation.

2. Production volume or significant changes in production volume

Approach

EPA considered current volume or significant changes in volume of the chemical substance using information reported by manufacturers (including importers). EPA assembled reported information for years 1986 through 2015 on the production volume for formaldehyde reported under the Inventory Update Reporting (IUR) rule and Chemical Data Reporting (CDR) rule².

Results and Discussion

The national aggregate production volume, which is presented as a range to protect individual site production volumes that are confidential business information (CBI), is presented in Table 1.

Table 1. 1986–2015 National Aggregate Production Volume Data (Production Volume in Pounds)

Chemical ID	1986	1990	1994	1998	2002	2006	2011	2012	2013	2014	2015
Formaldehyde (50-00-0)	>1B	>1B	>1B	>1B	>1B	>1B	3,942,831,539	1B to 5B	1B to 5B	1B to 5B	1B to 5B

Note: B = billion

Reference: U.S. EPA (2013) and U.S. EPA (2017)

One commenter (EPA-HQ-OPPT-2018-0438-0010) submitted a public comment to the docket for this proposed designation that indicated they overreported their CDR volumes for at least the 2015 reporting period. The Agency does not believe this will have a significant effect on the production volume for the 2015 reporting period.

Production volume of formaldehyde in 2015, as reported to CDR, was greater than 1 billion pounds, but less than 5 billion pounds. Production volume of formaldehyde as reported to EPA has not changed from 1986 to 2016 (Table 1 1).

Although Table 1 shows an apparent increase in formaldehyde production beginning in 2011 and the years following, the reported volumes in CDR are consistent and do not show a substantial increase in production. The Agency changed its reporting ranges in or around 2011 and the

² Over time, the requirements for reporting frequency, production volume thresholds, and chemical substances under the Chemical Data Reporting (CDR) rule have changed. CDR was formerly known as the Inventory Update Rule (IUR). The first IUR collection occurred in 1986 and continued every four years through 2006. As part of two rulemakings in 2003 and 2005, EPA made a variety of changes to the IUR, including to change the reporting frequency to every five years to address burdens associated with new reporting requirements. Additional changes to reporting requirements were made in 2011, including to suspend and replace the 2011 submission period with a 2012 submission period, return to reporting every four years, and require the reporting of all years beginning with 2011 production volumes. The reporting of production volumes for all years was added because of the mounting evidence that many chemical substances, even larger production volume chemical substances, often experience wide fluctuations in production volume from year to year. In addition, also as part of the 2011 IUR Modifications final rule (76 FR 50816, Aug 16, 2011), EPA changed the name of the regulation from IUR to CDR to better reflect the distinction between this data collection (which includes exposure-related data) and the TSCA Inventory itself (which only involves chemical identification information).

updated ranges include volumes that are between 1 and 5 billion pounds, where the same category was reported historically as greater than 1 billion pounds.

3. Conditions of use or significant changes in conditions of use

Approach

EPA assembled information to determine conditions of use or significant changes in conditions of use of the chemical substance. TSCA section 3(4) defines the term “conditions of use” to mean the circumstances, as determined by the EPA Administrator, under which a chemical substance is intended, known, or reasonably foreseen to be manufactured, processed, distributed in commerce, used, or disposed of.

A key source of reasonably available information that EPA considered for determining the conditions of use for formaldehyde was submitted by manufacturers (including importers) under the 2012 and 2016 reporting cycles ([U.S. EPA 2019a](#)). CDR requires manufacturers (including importers) to report information on the chemical substances they produce domestically or import into the United States greater than 25,000 pounds per site, except if certain TSCA actions apply (in which case the reporting requirement is greater than 2,500 pounds per site). CDR includes information on the manufacturing, processing, and use of chemical substances. Based on the known manufacturing, processing and uses of this chemical substance, EPA assumes distribution in commerce. CDR may not provide information on other life-cycle phases such as distribution or chemical end-of-life after use in products (i.e., disposal). While EPA may be aware of additional uses, CDR submitters are not required to provide information on chemical uses that are not regulated under TSCA.

For chemical substances under review that are included on the Toxics Release Inventory (TRI) chemical list, information disclosed by reporting facilities in Part II Section 3 (“Activities and Uses of the Toxic Chemical at the Facility”) of their TRI Form R reports was used to supplement the CDR information on conditions of use Tables 4, 5 and 6. There is not a one-to-one correlation between conditions of use reported under CDR and information reported in Part II Section 3 of the TRI Form R because facilities are not required to disclose in their Form R submissions the specific uses of TRI chemical substances they manufactured on-site or imported. In addition to the information disclosed in Part II Section 3 of the TRI Form R, the information pertaining to waste management activities (i.e., disposal/releases, energy recovery, recycling, and treatment) disclosed in other sections of the Form R was also used to supplement the CDR information on conditions of use as shown in Tables 4, 5 and 6. For purposes of this proposed prioritization designation, EPA assumed end-of-life pathways that include releases to air, wastewater, and solid and liquid waste based on the conditions of use.

CDR and TRI Tables

Based on the publicly available³ manufacturing information, industrial processing and use information, and consumer and commercial use information reported under CDR, EPA developed a list of conditions of use for the 2016 and 2012 reporting cycles (Tables 2 and 3, respectively).

³ Some specific chemical uses may be claimed by CDR submitters as confidential business information (CBI) under section 14 of TSCA. In these cases, EPA has indicated that the information is CBI.

Table 2. Formaldehyde (50-00-0) Categories and Subcategories of Conditions of Use⁴ (2016 Reporting Cycle)

Life-Cycle Stage	Category	Subcategory	Reference
Manufacturing	Domestic manufacturing	Domestic manufacturing	U.S. EPA (2019a)
	Import	Import	U.S. EPA (2019a)
Processing	Reactant	Adhesives and sealant chemicals in: <ul style="list-style-type: none"> - Plastic and resin manufacturing - Wood product manufacturing - All other basic organic chemical manufacturing 	U.S. EPA (2019a)
	Reactant	Intermediate in: <ul style="list-style-type: none"> - Pesticide, fertilizer, and other agricultural chemical manufacturing - Petrochemical manufacturing - Soap, cleaning compound, and toilet preparation manufacturing - All other basic organic chemical manufacturing - Plastic materials and resin manufacturing - Adhesive manufacturing - All other chemical product and preparation manufacturing - Paper manufacturing - Plastic products manufacturing - Wood product manufacturing - Construction 	U.S. EPA (2019a)
	Reactant	Functional fluid in: <ul style="list-style-type: none"> - Oil and gas drilling, extraction, and support activities 	U.S. EPA (2019a)
	Reactant	Agricultural chemicals (non-pesticidal) in: <ul style="list-style-type: none"> - Plastic and resin manufacturing - Agriculture, forestry, fishing, and hunting 	U.S. EPA (2019a)
	Reactant	Processing aids not otherwise listed in: <ul style="list-style-type: none"> - Plastic and resin manufacturing 	U.S. EPA (2019a)
	Reactant	Paint additives and coating adhesives not described by other categories in: <ul style="list-style-type: none"> - All other basic organic chemical manufacturing - Paint and coating manufacturing 	U.S. EPA (2019a)

⁴ Uses listed but excluded from TSCA such as personal care products will not be included in the risk evaluation. Certain other uses that are excluded from TSCA may not be captured in this table.

Life-Cycle Stage	Category	Subcategory	Reference
	Reactant	Processing aids, specific to petroleum production in: <ul style="list-style-type: none"> - All other basic chemical manufacturing 	U.S. EPA (2019a)
	Incorporation into an article	Finishing agents in: <ul style="list-style-type: none"> - Textiles, apparel, and leather manufacturing 	U.S. EPA (2019a)
	Incorporation into an article	Paint additives and coating additives not described by other categories in: <ul style="list-style-type: none"> - Transportation equipment manufacturing 	U.S. EPA (2019a)
	Incorporation into an article	Adhesives and sealant chemicals in: <ul style="list-style-type: none"> - Wood product manufacturing - Plastic material and resin manufacturing - Construction 	U.S. EPA (2019a)
	Incorporation into a formulation, mixture, or reaction product	Processing aids, specific to petroleum production in: <ul style="list-style-type: none"> - Oil and gas drilling, extraction, and support activities - All other basic organic chemical manufacturing 	U.S. EPA (2019a)
	Incorporation into a formulation, mixture, or reaction product	Paint additives and coating additives not described by other categories in: <ul style="list-style-type: none"> - Paint and coating manufacturing - Plastic material and resin manufacturing 	U.S. EPA (2019a)
	Incorporation into a formulation, mixture, or reaction product	Intermediate in: <ul style="list-style-type: none"> - All other basic chemical manufacturing - Plastic material and resin manufacturing - Oil and gas drilling, extraction, and support activities - Wholesale and retail trade 	U.S. EPA (2019a)
	Incorporation into a formulation, mixture, or reaction product	Other: Preservative in: <ul style="list-style-type: none"> - All other chemical product and preparation manufacturing 	U.S. EPA (2019a)
	Incorporation into a formulation, mixture, or reaction product	Solid separation agents in: <ul style="list-style-type: none"> - Miscellaneous manufacturing 	U.S. EPA (2019a)
	Incorporation into a formulation,	Agricultural chemicals (non-pesticidal) in:	U.S. EPA (2019a)

Life-Cycle Stage	Category	Subcategory	Reference
	mixture, or reaction product	– Pesticide, fertilizer, and other agricultural chemical manufacturing	
	Incorporation into a formulation, mixture, or reaction product	Surface active agents in: – Plastic material and resin manufacturing	U.S. EPA (2019a)
	Incorporation into a formulation, mixture, or reaction product	Adhesive and sealant chemical in: – Adhesive manufacturing	U.S. EPA (2019a)
	Incorporation into a formulation, mixture, or reaction product	Bleaching agents in: – Textile, apparel, and leather manufacturing	U.S. EPA (2019a)
	Repackaging	Laboratory chemicals in: – Other: Sales to distributors	U.S. EPA (2019a)
	Recycling	Recycling	U.S. EPA (2019a)
Distribution in commerce ^{a,b}	Distribution in commerce		
Industrial Use	Non-incorporative activities	Process aid in: – Oil and gas drilling, extraction, and support activities	U.S. EPA (2019a)
	Non-incorporative activities	Used in: – Construction – Unknown uses in agriculture, forestry, fishing, and hunting	U.S. EPA (2019a)
Consumer Uses	Fabric, textile, and leather products	Furniture	U.S. EPA (2019a)
	Paint and coatings	Coatings and paints, thinners, paint removers	U.S. EPA (2019a)
Commercial and Consumer Uses	Fabric, textile, and leather products	Furniture	U.S. EPA (2019a)
	Furniture and furnishings	Furniture	U.S. EPA (2019a)
	Paints and coatings	Coatings and paints, thinners, paint removers	U.S. EPA (2019a)
	Building and construction materials including engineered wood products	Wood articles	U.S. EPA (2019a)

Life-Cycle Stage	Category	Subcategory	Reference
	Electrical and electronic products (semiconductors)	Machinery, mechanical appliances, electrical/electronic articles, electrical batteries, and accumulators	U.S. EPA (2019a)
	Foam seating and bedding products	Vehicles	U.S. EPA (2019a)
	Plastic and rubber products	Polymer preparations and compounds	U.S. EPA (2019a)
	Personal care products	Cosmetics, personal care	U.S. EPA (2019a)
Commercial Uses	Agricultural products; non-pesticidal	Fertilizers	U.S. EPA (2019a)
	Building and construction materials	Stone, plaster, and cement	U.S. EPA (2019a)
	Adhesives and sealants	Adhesives and sealants	U.S. EPA (2019a)
	Laboratory use		U.S. EPA (2019a)
	Automotive care products	Anti-freeze and de-icing products, fuels, lubricants, greases, and release products	U.S. EPA (2019a)
	Explosives	Explosives	U.S. EPA (2019a)
	Fuels	Fuels	U.S. EPA (2019a)
	Water treatment products	pH regulators, flocculants, precipitants, neutralization agents, water softeners, water treatment chemicals	U.S. EPA (2019a)
Paper products	Paper articles, scented paper articles, packaging material for metal parts, releasing grease/corrosion inhibitors	U.S. EPA (2019a)	
Disposal ^a	Disposal		

^a CDR includes information on the manufacturing, processing, and use of chemical substances. CDR may not provide information on other life-cycle phases such as distribution or chemical end-of-life after use in products (i.e., disposal). The table row is highlighted in gray to indicate that no information is provided for this life-cycle stage.

^b **EPA is particularly interested in information from the public on distribution in commerce.**

Table 3. Formaldehyde (50-00-0) Categories and Subcategories of Conditions of Use (2012 Reporting Cycle)

Life-Cycle Stage	Category	Subcategory	Reference
Manufacturing	Domestic manufacturing	Domestic manufacturing	U.S. EPA (2019a)
	Import	Import	U.S. EPA (2019a)
Processing	Reactant	Intermediate in: <ul style="list-style-type: none"> - Pesticide, fertilizer, and other agricultural chemical manufacturing - Petrochemical manufacturing - Soap, cleaning compound, and toilet preparation manufacturing - All other basic organic chemical manufacturing - All other basic inorganic chemical manufacturing - Plastic material and resin manufacturing - Adhesive manufacturing - All other chemical product and preparation manufacturing - Paper manufacturing - Plastic product manufacturing - Wood product manufacturing - Construction 	U.S. EPA (2019a)
	Reactant	Agricultural chemicals (non-pesticidal) in: <ul style="list-style-type: none"> - Agriculture, forestry, fishing, and hunting 	U.S. EPA (2019a)
	Reactant	Functional fluids (closed systems) in: <ul style="list-style-type: none"> - Oil and gas drilling, extraction, and support activities 	U.S. EPA (2019a)
	Reactant	Adhesive and sealant chemicals in: <ul style="list-style-type: none"> - Plastic material and resin manufacturing - Wood product manufacturing - Adhesive manufacturing 	U.S. EPA (2019a)
	Reactant	Bleaching agent in: <ul style="list-style-type: none"> - Wood product manufacturing 	U.S. EPA (2019a)
	Incorporation into a formulation, mixture, or reaction product	Solvents (which become part of a product formulation or mixture) in: <ul style="list-style-type: none"> - Paint and coating manufacturing 	U.S. EPA (2019a)
	Incorporation into a formulation, mixture, or reaction product	Adhesive and sealant chemicals in: <ul style="list-style-type: none"> - Wood product manufacturing - Plastic material and resin manufacturing 	U.S. EPA (2019a)

Life-Cycle Stage	Category	Subcategory	Reference
	Incorporation into a formulation, mixture, or reaction product	Intermediate in: <ul style="list-style-type: none"> - All other basic organic chemical manufacturing - Plastic material and resin manufacturing 	U.S. EPA (2019a)
	Incorporation into a formulation, mixture, or reaction product	Other in: <ul style="list-style-type: none"> - All other chemical product and preparation manufacturing 	U.S. EPA (2019a)
	Incorporation into a formulation, mixture, or reaction product	Agricultural chemicals (non-pesticidal) in: <ul style="list-style-type: none"> - Agriculture, forestry, fishing, and hunting 	U.S. EPA (2019a)
	Incorporation into a formulation, mixture, or reaction product	Ion exchange agents in: <ul style="list-style-type: none"> - Adhesive manufacturing - Paint and coating manufacturing 	U.S. EPA (2019a)
	Incorporation into a formulation, mixture, or reaction product	Lubricant and lubricant additive in: <ul style="list-style-type: none"> - Adhesive manufacturing 	U.S. EPA (2019a)
	Incorporation into a formulation, mixture, or reaction product	Plating agents and surface treating agents in: <ul style="list-style-type: none"> - All other chemical product and preparation manufacturing 	U.S. EPA (2019a)
	Incorporation into a formulation, mixture, or reaction product	Functional fluids (closed system) in: <ul style="list-style-type: none"> - Soap, cleaning compound, and toilet preparation manufacturing 	U.S. EPA (2019a)
	Incorporation into a formulation, mixture, or reaction product	Laboratory chemicals in: <ul style="list-style-type: none"> - Other 	U.S. EPA (2019a)
	Repackaging	Laboratory chemicals in: <ul style="list-style-type: none"> - Other 	U.S. EPA (2019a)
	Recycling	Recycling	U.S. EPA (2019a)
Distribution in commerce ^{a,b}	Distribution in commerce	Distribution in commerce	
Commercial Uses	Floor coverings	Fabrics, textiles, and apparel – rubber articles, and wood articles	U.S. EPA (2019a)
	Adhesives and sealants	Adhesives and sealants	U.S. EPA (2019a)
	Agricultural products (non-pesticidal)	Fertilizers	U.S. EPA (2019a)
	Laboratory use	Laboratory use	U.S. EPA (2019a)
	Paints and coatings	Coatings and paints, thinners, paint removers	U.S. EPA (2019a)
	Building/construction materials – wood and	Wood articles	U.S. EPA (2019a)

Life-Cycle Stage	Category	Subcategory	Reference
	engineered wood products		
	Electrical and electronic products (semiconductors)	Machinery, mechanical appliances, electrical/electronic articles, electrical batteries, and accumulators	U.S. EPA (2019a)
	Paper products	Paper articles, scented paper articles, packaging materials for metal parts, releasing grease/corrosion inhibitors	U.S. EPA (2019a)
	Building/construction materials	Stone, plaster, cement, glass, ceramic, and metal articles	U.S. EPA (2019a)
Consumer Uses	Water treatment products	Products such as pH regulators, flocculants, precipitants, neutralization agents, water softeners, water treatment chemicals	U.S. EPA (2019a)
Commercial and Consumer Uses	Personal care products	Cosmetics, personal care products	U.S. EPA (2019a)
Disposal ^a	Disposal		

^a CDR includes information on the manufacturing, processing, and use of chemical substances. CDR may not provide information on other life-cycle phases such as distribution or chemical end-of-life after use in products (i.e., disposal). The table row is highlighted in gray to indicate that no information is provided for this life-cycle stage.

^b EPA is particularly interested in information from the public on distribution in commerce.

EPA used TRI data to identify additional conditions of use and to supplement CDR information about conditions of use. In addition, TRI information from 2017 is useful for demonstrating that a condition of use reported to CDR in 2015 is still ongoing.

Table 4. Activities and Uses Reported to TRI for Formaldehyde, Reporting Year 2011

Activity Type	Activity	Industry Group	NAICS Code
Manufacture	Produce	Electric power generation, transmission, and distribution	2211
		Grain and oilseed milling	3112
		Sugar and confectionery product manufacturing	3113
		Beverage manufacturing	3121
		Fabric mills	3132
		Textile and fabric finishing and fabric coating mills	3133
		Other textile product mills	3149
		Sawmills and wood preservation	3211
		Veneer, plywood, and engineered wood product manufacturing	3212

Activity Type	Activity	Industry Group	NAICS Code		
		Other wood product manufacturing	3219		
		Pulp, paper, and paperboard mills	3221		
		Petroleum and coal products manufacturing	3241		
		Basic chemical manufacturing	3251		
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252		
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253		
		Pharmaceutical and medicine manufacturing	3254		
		Other chemical product and preparation manufacturing	3259		
		Clay product and refractory manufacturing	3271		
		Glass and glass product manufacturing	3272		
		Cement and concrete product manufacturing	3273		
		Other nonmetallic mineral product manufacturing	3279		
		Foundries	3315		
		Boiler, tank, and shipping container manufacturing	3324		
		Semiconductor and other electronic component manufacturing	3344		
		Motor vehicle manufacturing	3361		
		Other miscellaneous manufacturing	3399		
		Waste treatment and disposal	5622		
		Import	Building finishing contractors		2383
			Veneer, plywood, and engineered wood product manufacturing		3212
	Pulp, paper, and paperboard mills			3221	
	Petroleum and coal products manufacturing			3241	
	Basic chemical manufacturing			3251	
	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing			3252	
	Pesticide, fertilizer, and other agricultural chemical manufacturing			3253	
Paint, coating, and adhesive manufacturing			3255		
Other chemical product and preparation manufacturing			3259		
Plastics product manufacturing			3261		

Activity Type	Activity	Industry Group	NAICS Code
		Other nonmetallic mineral product manufacturing	3279
		Foundries	3315
		Semiconductor and other electronic component manufacturing	3344
		Motor vehicle manufacturing	3361
		Medical equipment and supplies manufacturing	3391
		Waste treatment and disposal	5622
	Produce or import for on-site use/processing	Building finishing contractors	2383
		Textile and fabric finishing and fabric coating mills	3133
		Veneer, plywood, and engineered wood product manufacturing	3212
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Foundries	3315
	Semiconductor and other electronic component manufacturing	3344	
	Medical equipment and supplies manufacturing	3391	
	Produce or import for sale/distribution	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255

Activity Type	Activity	Industry Group	NAICS Code
		Other chemical product and preparation manufacturing	3259
	Produce or import as a byproduct	Electric power generation, transmission, and distribution	2211
		Grain and oilseed milling	3112
		Sugar and confectionery product manufacturing	3113
		Beverage manufacturing	3121
		Fabric mills	3132
		Other textile product mills	3149
		Sawmills and wood preservation	3211
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Pulp, paper, and paperboard mills	3221
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Other chemical product and preparation manufacturing	3259
		Clay product and refractory manufacturing	3271
		Glass and glass product manufacturing	3272
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
	Foundries	3315	
	Boiler, tank, and shipping container manufacturing	3324	
	Semiconductor and other electronic component manufacturing	3344	
	Motor vehicle manufacturing	3361	
	Other miscellaneous manufacturing	3399	
	Produce or import as an impurity	Grain and oilseed milling	3112
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219

Activity Type	Activity	Industry Group	NAICS Code
		Pulp, paper, and paperboard mills	3221
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Other miscellaneous manufacturing	3399
		Waste treatment and disposal	5622
Process	Process as a reactant	Animal food manufacturing	3111
		Grain and oilseed milling	3112
		Fiber, yarn, and thread mills	3131
		Fabric mills	3132
		Textile and fabric finishing and fabric coating mills	3133
		Other textile product mills	3149
		Sawmills and wood preservation	3211
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Converted paper product manufacturing	3222
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Soap, cleaning compound, and toilet preparation manufacturing	3256
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Glass and glass product manufacturing	3272
		Other nonmetallic mineral product manufacturing	3279

Activity Type	Activity	Industry Group	NAICS Code
		Nonferrous metal (except aluminum) production and processing	3314
		Coating, engraving, heat treating, and allied activities	3328
		Semiconductor and other electronic component manufacturing	3344
		Aerospace product and parts manufacturing	3364
		Medical equipment and supplies manufacturing	3391
	Process as an article component	Sawmills and wood preservation	3211
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Pulp, paper, and paperboard mills	3221
		Converted paper product manufacturing	3222
		Basic chemical manufacturing	3251
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Paint, coating, and adhesive manufacturing	3255
		Soap, cleaning compound, and toilet preparation manufacturing	3256
		Plastics product manufacturing	3261
		Other nonmetallic mineral product manufacturing	3279
		Foundries	3315
		Boiler, tank, and shipping container manufacturing	3324
		Other electrical equipment and component manufacturing	3359
	Office furniture (including fixtures) manufacturing	3372	
	Process as an impurity	Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Pulp, paper, and paperboard mills	3221
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253

Activity Type	Activity	Industry Group	NAICS Code
		Plastics product manufacturing	3261
		Agriculture, construction, and mining machinery manufacturing	3331
		Other general purpose machinery manufacturing	3339
		Waste treatment and disposal	5622
	Process as a formulation component	Building finishing contractors	2383
		Animal food manufacturing	3111
		Fiber, yarn, and thread mills	3131
		Fabric mills	3132
		Textile and fabric finishing and fabric coating mills	3133
		Other textile product mills	3149
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Pulp, paper, and paperboard mills	3221
		Converted paper product manufacturing	3222
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255
		Soap, cleaning compound, and toilet preparation manufacturing	3256
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Clay product and refractory manufacturing	3271
		Glass and glass product manufacturing	3272
		Other nonmetallic mineral product manufacturing	3279
		Alumina and aluminum production and processing	3313
		Coating, engraving, heat treating, and allied activities	3328

Activity Type	Activity	Industry Group	NAICS Code
		Other general purpose machinery manufacturing	3339
		Motor vehicle parts manufacturing	3363
		Aerospace product and parts manufacturing	3364
		Office furniture (including fixtures) manufacturing	3372
		Medical equipment and supplies manufacturing	3391
		Other miscellaneous manufacturing	3399
		Chemical and allied products merchant wholesalers	4246
	Process – repackaging	Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pharmaceutical and medicine manufacturing	3254
		Soap, cleaning compound, and toilet preparation manufacturing	3256
		Other chemical product and preparation manufacturing	3259
		Cement and concrete product manufacturing	3273
		Chemical and allied products merchant wholesalers	4246
	Waste treatment and disposal	5622	
Otherwise Use	Otherwise use – as a chemical processing aid	Building finishing contractors	2383
		Fiber, yarn, and thread mills	3131
		Textile and fabric finishing and fabric coating mills	3133
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Pulp, paper, and paperboard mills	3221
		Converted paper product manufacturing	3222
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
Paint, coating, and adhesive manufacturing	3255		

Activity Type	Activity	Industry Group	NAICS Code
		Glass and glass product manufacturing	3272
		Other nonmetallic mineral product manufacturing	3279
		Coating, engraving, heat treating, and allied activities	3328
		Semiconductor and other electronic component manufacturing	3344
		Motor vehicle manufacturing	3361
		Motor vehicle parts manufacturing	3363
		Aerospace product and parts manufacturing	3364
	Otherwise use – as a manufacturing aid	Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Pulp, paper, and paperboard mills	3221
		Petroleum and coal products manufacturing	3241
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Glass and glass product manufacturing	3272
		Other nonmetallic mineral product manufacturing	3279
		Foundries	3315
		Boiler, tank, and shipping container manufacturing	3324
		Coating, engraving, heat treating, and allied activities	3328
		Semiconductor and other electronic component manufacturing	3344
		Office furniture (including fixtures) manufacturing	3372
	Otherwise use – ancillary or other use	Veneer, plywood, and engineered wood product manufacturing	3212
		Pulp, paper, and paperboard mills	3221
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254

Activity Type	Activity	Industry Group	NAICS Code
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Semiconductor and other electronic component manufacturing	3344
		Motor vehicle manufacturing	3361
		Chemical and allied products merchant wholesalers	4246
		Waste treatment and disposal	5622
Waste Management	Disposal/ releases	Electric power generation, transmission, and distribution	2211
		Building finishing contractors	2383
		Animal food manufacturing	3111
		Grain and oilseed milling	3112
		Sugar and confectionery product manufacturing	3113
		Beverage manufacturing	3121
		Fiber, yarn, and thread mills	3131
		Fabric mills	3132
		Textile and fabric finishing and fabric coating mills	3133
		Other textile product mills	3149
		Sawmills and wood preservation	3211
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Pulp, paper, and paperboard mills	3221
		Converted paper product manufacturing	3222
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255

Activity Type	Activity	Industry Group	NAICS Code
		Soap, cleaning compound, and toilet preparation manufacturing	3256
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Clay product and refractory manufacturing	3271
		Glass and glass product manufacturing	3272
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Alumina and aluminum production and processing	3313
		Nonferrous metal (except aluminum) production and processing	3314
		Foundries	3315
		Boiler, tank, and shipping container manufacturing	3324
		Coating, engraving, heat treating, and allied activities	3328
		Agriculture, construction, and mining machinery manufacturing	3331
		Other general purpose machinery manufacturing	3339
		Semiconductor and other electronic component manufacturing	3344
		Other electrical equipment and component manufacturing	3359
		Motor vehicle manufacturing	3361
		Motor vehicle parts manufacturing	3363
		Aerospace product and parts manufacturing	3364
		Office furniture (including fixtures) manufacturing	3372
		Medical equipment and supplies manufacturing	3391
		Other miscellaneous manufacturing	3399
		Chemical and allied products merchant wholesalers	4246
		Waste treatment and disposal	5622
		Energy recovery	Fiber, yarn, and thread mills
Veneer, plywood, and engineered wood product manufacturing	3212		
Pulp, paper, and paperboard mills	3221		
Converted paper product manufacturing	3222		
Basic chemical manufacturing	3251		

Activity Type	Activity	Industry Group	NAICS Code
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255
		Soap, cleaning compound, and toilet preparation manufacturing	3256
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Boiler, tank, and shipping container manufacturing	3324
		Coating, engraving, heat treating, and allied activities	3328
		Motor vehicle parts manufacturing	3363
		Chemical and allied products merchant wholesalers	4246
		Waste treatment and disposal	5622
		Recycling	Beverage manufacturing
	Veneer, plywood, and engineered wood product manufacturing		3212
	Converted paper product manufacturing		3222
	Petroleum and coal products manufacturing		3241
	Basic chemical manufacturing		3251
	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing		3252
	Paint, coating, and adhesive manufacturing		3255
	Soap, cleaning compound, and toilet preparation manufacturing		3256
	Other chemical product and preparation manufacturing		3259
	Other nonmetallic mineral product manufacturing		3279
Alumina and aluminum production and processing	3313		
Coating, engraving, heat treating, and allied activities	3328		
Semiconductor and other electronic component manufacturing	3344		
Motor vehicle parts manufacturing	3363		

Activity Type	Activity	Industry Group	NAICS Code
		Waste treatment and disposal	5622
	Treatment	Grain and oilseed milling	3112
		Beverage manufacturing	3121
		Fiber, yarn, and thread mills	3131
		Fabric mills	3132
		Textile and fabric finishing and fabric coating mills	3133
		Other textile product mills	3149
		Sawmills and wood preservation	3211
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Pulp, paper, and paperboard mills	3221
		Converted paper product manufacturing	3222
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255
		Soap, cleaning compound, and toilet preparation manufacturing	3256
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Glass and glass product manufacturing	3272
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Alumina and aluminum production and processing	3313
		Nonferrous metal (except aluminum) production and processing	3314
		Foundries	3315
		Boiler, tank, and shipping container manufacturing	3324

Activity Type	Activity	Industry Group	NAICS Code
		Coating, engraving, heat treating, and allied activities	3328
		Other general purpose machinery manufacturing	3339
		Semiconductor and other electronic component manufacturing	3344
		Motor vehicle manufacturing	3361
		Motor vehicle parts manufacturing	3363
		Aerospace product and parts manufacturing	3364
		Medical equipment and supplies manufacturing	3391
		Other miscellaneous manufacturing	3399
		Chemical and allied products merchant wholesalers	4246
		Waste treatment and disposal	5622

Reference: [U.S. EPA, 2019b](#)

Table 5. Activities and Uses Reported to TRI for Formaldehyde, Reporting Year 2015

Activity Type	Activity	Industry Group	NAICS Code
Manufacture	Produce	Electric power generation, transmission, and distribution	2211
		Grain and oilseed milling	3112
		Sugar and confectionery product manufacturing	3113
		Beverage manufacturing	3121
		Fabric mills	3132
		Textile and fabric finishing and fabric coating mills	3133
		Other textile product mills	3149
		Sawmills and wood preservation	3211
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Pulp, paper, and paperboard mills	3221
		Converted paper product manufacturing	3222
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252		

Activity Type	Activity	Industry Group	NAICS Code
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Other chemical product and preparation manufacturing	3259
		Clay product and refractory manufacturing	3271
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Foundries	3315
		Forging and stamping	3321
		Boiler, tank, and shipping container manufacturing	3324
		Coating, engraving, heat treating, and allied activities	3328
		Motor vehicle manufacturing	3361
		Motor vehicle parts manufacturing	3363
		Other miscellaneous manufacturing	3399
		Waste treatment and disposal	5622
		Import	Veneer, plywood, and engineered wood product manufacturing
	Basic chemical manufacturing		3251
	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing		3252
	Pesticide, fertilizer, and other agricultural chemical manufacturing		3253
	Pharmaceutical and medicine manufacturing		3254
	Paint, coating, and adhesive manufacturing		3255
	Other chemical product and preparation manufacturing		3259
	Plastics product manufacturing		3261
	Other nonmetallic mineral product manufacturing		3279
	Semiconductor and other electronic component manufacturing		3344
	Motor vehicle manufacturing		3361
	Waste treatment and disposal	5622	
	Produce or import for on-	Textile and fabric finishing and fabric coating mills	3133
		Veneer, plywood, and engineered wood product manufacturing	3212

Activity Type	Activity	Industry Group	NAICS Code
	site use/processing	Converted paper product manufacturing	3222
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Semiconductor and other electronic component manufacturing	3344
	Produce or import for sale/distribution	Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255
	Produce or import as a byproduct	Electric power generation, transmission, and distribution	2211
		Grain and oilseed milling	3112
		Sugar and confectionery product manufacturing	3113
		Fabric mills	3132
		Textile and fabric finishing and fabric coating mills	3133
		Other textile product mills	3149
		Sawmills and wood preservation	3211
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Pulp, paper, and paperboard mills	3221
		Converted paper product manufacturing	3222
		Petroleum and coal products manufacturing	3241

Activity Type	Activity	Industry Group	NAICS Code		
		Basic chemical manufacturing	3251		
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252		
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253		
		Pharmaceutical and medicine manufacturing	3254		
		Other chemical product and preparation manufacturing	3259		
		Clay product and refractory manufacturing	3271		
		Cement and concrete product manufacturing	3273		
		Other nonmetallic mineral product manufacturing	3279		
		Foundries	3315		
		Forging and stamping	3321		
		Boiler, tank, and shipping container manufacturing	3324		
		Coating, engraving, heat treating, and allied activities	3328		
		Motor vehicle manufacturing	3361		
		Motor vehicle parts manufacturing	3363		
		Other miscellaneous manufacturing	3399		
		Waste treatment and disposal	5622		
		Produce or import as an impurity		Grain and oilseed milling	3112
				Beverage manufacturing	3121
				Veneer, plywood, and engineered wood product manufacturing	3212
				Pulp, paper, and paperboard mills	3221
				Petroleum and coal products manufacturing	3241
				Basic chemical manufacturing	3251
				Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
				Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
				Pharmaceutical and medicine manufacturing	3254
				Waste treatment and disposal	5622
Process	Process as a reactant	Animal food manufacturing	3111		
		Grain and oilseed milling	3112		

Activity Type	Activity	Industry Group	NAICS Code	
		Fiber, yarn, and thread mills	3131	
		Textile and fabric finishing and fabric coating mills	3133	
		Other textile product mills	3149	
		Sawmills and wood preservation	3211	
		Veneer, plywood, and engineered wood product manufacturing	3212	
		Other wood product manufacturing	3219	
		Converted paper product manufacturing	3222	
		Petroleum and coal products manufacturing	3241	
		Basic chemical manufacturing	3251	
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252	
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	
		Pharmaceutical and medicine manufacturing	3254	
		Soap, cleaning compound, and toilet preparation manufacturing	3256	
		Other chemical product and preparation manufacturing	3259	
		Plastics product manufacturing	3261	
		Glass and glass product manufacturing	3272	
		Other nonmetallic mineral product manufacturing	3279	
		Nonferrous metal (except aluminum) production and processing	3314	
		Coating, engraving, heat treating, and allied activities	3328	
		Semiconductor and other electronic component manufacturing	3344	
		Aerospace product and parts manufacturing	3364	
		Medical equipment and supplies manufacturing	3391	
		Process as an article component	Electric power generation, transmission, and distribution	2211
			Veneer, plywood, and engineered wood product manufacturing	3212
			Other wood product manufacturing	3219
Pulp, paper, and paperboard mills	3221			
Converted paper product manufacturing	3222			
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253			

Activity Type	Activity	Industry Group	NAICS Code
		Paint, coating, and adhesive manufacturing	3255
		Soap, cleaning compound, and toilet preparation manufacturing	3256
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Other nonmetallic mineral product manufacturing	3279
		Foundries	3315
		Boiler, tank, and shipping container manufacturing	3324
		Coating, engraving, heat treating, and allied activities	3328
		Other fabricated metal product manufacturing	3329
		Waste treatment and disposal	5622
	Process as an impurity	Veneer, plywood, and engineered wood product manufacturing	3212
		Pulp, paper, and paperboard mills	3221
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pharmaceutical and medicine manufacturing	3254
		Soap, cleaning compound, and toilet preparation manufacturing	3256
		Plastics product manufacturing	3261
		Agriculture, construction, and mining machinery manufacturing	3331
		Other general purpose machinery manufacturing	3339
		Waste treatment and disposal	5622
	Process as a formulation component	Animal food manufacturing	3111
		Animal slaughtering and processing	3116
		Seafood product preparation and packaging	3117
		Fiber, yarn, and thread mills	3131
		Fabric mills	3132
		Textile and fabric finishing and fabric coating mills	3133
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Pulp, paper, and paperboard mills	3221

Activity Type	Activity	Industry Group	NAICS Code
		Converted paper product manufacturing	3222
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255
		Soap, cleaning compound, and toilet preparation manufacturing	3256
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Glass and glass product manufacturing	3272
		Other nonmetallic mineral product manufacturing	3279
		Architectural and structural metals manufacturing	3323
		Coating, engraving, heat treating, and allied activities	3328
		Other general purpose machinery manufacturing	3339
		Navigational, measuring, electromedical, and control instruments manufacturing	3345
		Aerospace product and parts manufacturing	3364
		Medical equipment and supplies manufacturing	3391
		Other miscellaneous manufacturing	3399
		Chemical and allied products merchant wholesalers	4246
	Process – repackaging	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pharmaceutical and medicine manufacturing	3254
		Soap, cleaning compound, and toilet preparation manufacturing	3256
Other chemical product and preparation manufacturing		3259	
Cement and concrete product manufacturing		3273	

Activity Type	Activity	Industry Group	NAICS Code
		Navigational, measuring, electromedical, and control instruments manufacturing	3345
		Chemical and allied products merchant wholesalers	4246
		Waste treatment and disposal	5622
Otherwise Use	Otherwise use – as a chemical processing aid	Fiber, yarn, and thread mills	3131
		Textile and fabric finishing and fabric coating mills	3133
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Pulp, paper, and paperboard mills	3221
		Converted paper product manufacturing	3222
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Other chemical product and preparation manufacturing	3259
		Other nonmetallic mineral product manufacturing	3279
		Nonferrous metal (except aluminum) production and processing	3314
		Coating, engraving, heat treating, and allied activities	3328
		Semiconductor and other electronic component manufacturing	3344
		Motor vehicle manufacturing	3361
		Motor vehicle parts manufacturing	3363
		Office furniture (including fixtures) manufacturing	3372
	Otherwise use – as a manufacturing aid	Animal food manufacturing	3111
		Grain and oilseed milling	3112
		Textile and fabric finishing and fabric coating mills	3133
		Pulp, paper, and paperboard mills	3221
Basic chemical manufacturing		3251	
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252

Activity Type	Activity	Industry Group	NAICS Code		
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253		
		Pharmaceutical and medicine manufacturing	3254		
		Plastics product manufacturing	3261		
		Other nonmetallic mineral product manufacturing	3279		
		Foundries	3315		
		Boiler, tank, and shipping container manufacturing	3324		
		Coating, engraving, heat treating, and allied activities	3328		
		Semiconductor and other electronic component manufacturing	3344		
	Otherwise use – ancillary or other use	Poultry and egg production	1123		
		Grain and oilseed milling	3112		
		Veneer, plywood, and engineered wood product manufacturing	3212		
		Other wood product manufacturing	3219		
		Pulp, paper, and paperboard mills	3221		
		Petroleum and coal products manufacturing	3241		
		Basic chemical manufacturing	3251		
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252		
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253		
		Pharmaceutical and medicine manufacturing	3254		
		Other chemical product and preparation manufacturing	3259		
		Plastics product manufacturing	3261		
		Cement and concrete product manufacturing	3273		
		Other nonmetallic mineral product manufacturing	3279		
		Iron and steel mills and ferroalloy manufacturing	3311		
		Semiconductor and other electronic component manufacturing	3344		
		Waste treatment and disposal	5622		
		Waste Management	Disposal/ releases	Poultry and egg production	1123
				Electric power generation, transmission, and distribution	2211
Animal food manufacturing	3111				

Activity Type	Activity	Industry Group	NAICS Code
		Grain and oilseed milling	3112
		Sugar and confectionery product manufacturing	3113
		Animal slaughtering and processing	3116
		Seafood product preparation and packaging	3117
		Beverage manufacturing	3121
		Fiber, yarn, and thread mills	3131
		Fabric mills	3132
		Textile and fabric finishing and fabric coating mills	3133
		Other textile product mills	3149
		Sawmills and wood preservation	3211
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Pulp, paper, and paperboard mills	3221
		Converted paper product manufacturing	3222
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255
		Soap, cleaning compound, and toilet preparation manufacturing	3256
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Clay product and refractory manufacturing	3271
		Glass and glass product manufacturing	3272
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Iron and steel mills and ferroalloy manufacturing	3311

Activity Type	Activity	Industry Group	NAICS Code
		Nonferrous metal (except aluminum) production and processing	3314
		Foundries	3315
		Forging and stamping	3321
		Architectural and structural metals manufacturing	3323
		Boiler, tank, and shipping container manufacturing	3324
		Coating, engraving, heat treating, and allied activities	3328
		Other fabricated metal product manufacturing	3329
		Agriculture, construction, and mining machinery manufacturing	3331
		Other general purpose machinery manufacturing	3339
		Semiconductor and other electronic component manufacturing	3344
		Motor vehicle manufacturing	3361
		Motor vehicle parts manufacturing	3363
		Aerospace product and parts manufacturing	3364
		Office furniture (including fixtures) manufacturing	3372
		Medical equipment and supplies manufacturing	3391
		Other miscellaneous manufacturing	3399
		Chemical and allied products merchant wholesalers	4246
		Waste treatment and disposal	5622
	Energy recovery	Other textile product mills	3149
		Veneer, plywood, and engineered wood product manufacturing	3212
		Pulp, paper, and paperboard mills	3221
		Converted paper product manufacturing	3222
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255

Activity Type	Activity	Industry Group	NAICS Code
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Boiler, tank, and shipping container manufacturing	3324
		Coating, engraving, heat treating, and allied activities	3328
		Motor vehicle manufacturing	3361
		Motor vehicle parts manufacturing	3363
		Aerospace product and parts manufacturing	3364
		Office furniture (including fixtures) manufacturing	3372
		Waste treatment and disposal	5622
		Recycling	Veneer, plywood, and engineered wood product manufacturing
	Pulp, paper, and paperboard mills		3221
	Converted paper product manufacturing		3222
	Petroleum and coal products manufacturing		3241
	Basic chemical manufacturing		3251
	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing		3252
	Soap, cleaning compound, and toilet preparation manufacturing		3256
	Other chemical product and preparation manufacturing		3259
	Other nonmetallic mineral product manufacturing		3279
	Architectural and structural metals manufacturing		3323
	Coating, engraving, heat treating, and allied activities		3328
	Semiconductor and other electronic component manufacturing		3344
	Motor vehicle manufacturing		3361
	Motor vehicle parts manufacturing		3363
	Aerospace product and parts manufacturing		3364
	Waste treatment and disposal		5622
	Treatment		Electric power generation, transmission, and distribution
		Grain and oilseed milling	3112

Activity Type	Activity	Industry Group	NAICS Code
		Fiber, yarn, and thread mills	3131
		Fabric mills	3132
		Textile and fabric finishing and fabric coating mills	3133
		Other textile product mills	3149
		Sawmills and wood preservation	3211
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Pulp, paper, and paperboard mills	3221
		Converted paper product manufacturing	3222
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255
		Soap, cleaning compound, and toilet preparation manufacturing	3256
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Glass and glass product manufacturing	3272
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Nonferrous metal (except aluminum) production and processing	3314
		Foundries	3315
		Forging and stamping	3321
		Architectural and structural metals manufacturing	3323
		Boiler, tank, and shipping container manufacturing	3324
		Coating, engraving, heat treating, and allied activities	3328
		Other general purpose machinery manufacturing	3339

Activity Type	Activity	Industry Group	NAICS Code
		Semiconductor and other electronic component manufacturing	3344
		Navigational, measuring, electromedical, and control instruments manufacturing	3345
		Motor vehicle manufacturing	3361
		Motor vehicle parts manufacturing	3363
		Aerospace product and parts manufacturing	3364
		Medical equipment and supplies manufacturing	3391
		Waste treatment and disposal	5622

Reference: [U.S. EPA, 2019b](#)

Table 6. Activities and Uses Reported to TRI for Formaldehyde, Reporting Year 2017

Activity Type	Activity	Industry Group	NAICS Code
Manufacture	Produce	Electric power generation, transmission, and distribution	2211
		Grain and oilseed milling	3112
		Sugar and confectionery product manufacturing	3113
		Other food manufacturing	3119
		Beverage manufacturing	3121
		Fiber, yarn, and thread mills	3131
		Fabric mills	3132
		Textile and fabric finishing and fabric coating mills	3133
		Other textile product mills	3149
		Sawmills and wood preservation	3211
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Pulp, paper, and paperboard mills	3221
		Converted paper product manufacturing	3222
		Petroleum and coal products manufacturing	3241
Basic chemical manufacturing	3251		
Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252		

Activity Type	Activity	Industry Group	NAICS Code
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Clay product and refractory manufacturing	3271
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Foundries	3315
		Forging and stamping	3321
		Boiler, tank, and shipping container manufacturing	3324
		Coating, engraving, heat treating, and allied activities	3328
		Motor vehicle parts manufacturing	3363
		Other miscellaneous manufacturing	3399
		Waste treatment and disposal	5622
	Import	Veneer, plywood, and engineered wood product manufacturing	3212
		Converted paper product manufacturing	3222
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Other nonmetallic mineral product manufacturing	3279
		Semiconductor and other electronic component manufacturing	3344
		Motor vehicle manufacturing	3361
Waste treatment and disposal	5622		
	Textile and fabric finishing and fabric coating mills	3133	

Activity Type	Activity	Industry Group	NAICS Code
	Produce or import for on-site use/ processing	Veneer, plywood, and engineered wood product manufacturing	3212
		Converted paper product manufacturing	3222
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Semiconductor and other electronic component manufacturing	3344
	Produce or import for sale/ distribution	Converted paper product manufacturing	3222
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pharmaceutical and medicine manufacturing	3254
		Waste treatment and disposal	5622
	Produce or import as a byproduct	Electric power generation, transmission, and distribution	2211
		Grain and oilseed milling	3112
		Sugar and confectionery product manufacturing	3113
		Other food manufacturing	3119
		Fiber, yarn, and thread mills	3131
		Fabric mills	3132
		Textile and fabric finishing and fabric coating mills	3133
		Other textile product mills	3149
		Sawmills and wood preservation	3211
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219

Activity Type	Activity	Industry Group	NAICS Code
		Pulp, paper, and paperboard mills	3221
		Converted paper product manufacturing	3222
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Clay product and refractory manufacturing	3271
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Foundries	3315
		Forging and stamping	3321
		Boiler, tank, and shipping container manufacturing	3324
		Coating, engraving, heat treating, and allied activities	3328
		Motor vehicle manufacturing	3361
		Motor vehicle parts manufacturing	3363
		Other miscellaneous manufacturing	3399
		Waste treatment and disposal	5622
Produce or import as an impurity		Grain and oilseed milling	3112
		Beverage manufacturing	3121
		Veneer, plywood, and engineered wood product manufacturing	3212
		Pulp, paper, and paperboard mills	3221
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252

Activity Type	Activity	Industry Group	NAICS Code
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Other chemical product and preparation manufacturing	3259
		Waste treatment and disposal	5622
Process	Process as a reactant	Fiber, yarn, and thread mills	3131
		Textile and fabric finishing and fabric coating mills	3133
		Other textile product mills	3149
		Sawmills and wood preservation	3211
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Converted paper product manufacturing	3222
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Soap, cleaning compound, and toilet preparation manufacturing	3256
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Glass and glass product manufacturing	3272
		Other nonmetallic mineral product manufacturing	3279
		Nonferrous metal (except aluminum) production and processing	3314
		Foundries	3315
		Coating, engraving, heat treating, and allied activities	3328
		Semiconductor and other electronic component manufacturing	3344
Aerospace product and parts manufacturing	3364		
Medical equipment and supplies manufacturing	3391		
	Veneer, plywood, and engineered wood product manufacturing	3212	

Activity Type	Activity	Industry Group	NAICS Code
	Process as an article component	Pulp, paper, and paperboard mills	3221
		Converted paper product manufacturing	3222
		Basic chemical manufacturing	3251
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Paint, coating, and adhesive manufacturing	3255
		Soap, cleaning compound, and toilet preparation manufacturing	3256
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Other nonmetallic mineral product manufacturing	3279
		Foundries	3315
		Boiler, tank, and shipping container manufacturing	3324
		Coating, engraving, heat treating, and allied activities	3328
		Other fabricated metal product manufacturing	3329
	Process as an impurity	Veneer, plywood, and engineered wood product manufacturing	3212
		Pulp, paper, and paperboard mills	3221
		Converted paper product manufacturing	3222
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Soap, cleaning compound, and toilet preparation manufacturing	3256
		Other general purpose machinery manufacturing	3339
		Motor vehicle parts manufacturing	3363
		Chemical and allied products merchant wholesalers	4246
		Waste treatment and disposal	5622
	Process as a formulation component	Animal food manufacturing	3111
		Animal slaughtering and processing	3116
		Seafood product preparation and packaging	3117
		Fiber, yarn, and thread mills	3131

Activity Type	Activity	Industry Group	NAICS Code	
		Fabric mills	3132	
		Textile and fabric finishing and fabric coating mills	3133	
		Veneer, plywood, and engineered wood product manufacturing	3212	
		Other wood product manufacturing	3219	
		Pulp, paper, and paperboard mills	3221	
		Converted paper product manufacturing	3222	
		Petroleum and coal products manufacturing	3241	
		Basic chemical manufacturing	3251	
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252	
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	
		Pharmaceutical and medicine manufacturing	3254	
		Paint, coating, and adhesive manufacturing	3255	
		Soap, cleaning compound, and toilet preparation manufacturing	3256	
		Other chemical product and preparation manufacturing	3259	
		Plastics product manufacturing	3261	
		Glass and glass product manufacturing	3272	
		Other nonmetallic mineral product manufacturing	3279	
		Architectural and structural metals manufacturing	3323	
		Coating, engraving, heat treating, and allied activities	3328	
		Other general purpose machinery manufacturing	3339	
		Navigational, measuring, electromedical, and control instruments manufacturing	3345	
		Medical equipment and supplies manufacturing	3391	
		Other miscellaneous manufacturing	3399	
		Chemical and allied products merchant wholesalers	4246	
		Process – repackaging	Basic chemical manufacturing	3251
			Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252

Activity Type	Activity	Industry Group	NAICS Code
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Soap, cleaning compound, and toilet preparation manufacturing	3256
		Other chemical product and preparation manufacturing	3259
		Cement and concrete product manufacturing	3273
		Navigational, measuring, electromedical, and control instruments manufacturing	3345
		Chemical and allied products merchant wholesalers	4246
		Petroleum and petroleum products merchant wholesalers	4247
		Waste treatment and disposal	5622
Otherwise Use	Otherwise use – as a chemical processing aid	Fiber, yarn, and thread mills	3131
		Textile and fabric finishing and fabric coating mills	3133
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Pulp, paper, and paperboard mills	3221
		Converted paper product manufacturing	3222
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Other nonmetallic mineral product manufacturing	3279
		Nonferrous metal (except aluminum) production and processing	3314
		Coating, engraving, heat treating, and allied activities	3328
		Semiconductor and other electronic component manufacturing	3344
		Motor vehicle manufacturing	3361
		Motor vehicle parts manufacturing	3363
		Household and institutional furniture and kitchen cabinet manufacturing	3371

Activity Type	Activity	Industry Group	NAICS Code
		Office furniture (including fixtures) manufacturing	3372
	Otherwise use – as a manufacturing aid	Animal food manufacturing	3111
		Grain and oilseed milling	3112
		Textile and fabric finishing and fabric coating mills	3133
		Pulp, paper, and paperboard mills	3221
		Basic chemical manufacturing	3251
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Other nonmetallic mineral product manufacturing	3279
		Alumina and aluminum production and processing	3313
		Foundries	3315
		Boiler, tank, and shipping container manufacturing	3324
		Coating, engraving, heat treating, and allied activities	3328
	Semiconductor and other electronic component manufacturing	3344	
	Otherwise use – ancillary or other use	Electric power generation, transmission, and distribution	2211
		Grain and oilseed milling	3112
		Other textile product mills	3149
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Pulp, paper, and paperboard mills	3221
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
	Pharmaceutical and medicine manufacturing	3254	

Activity Type	Activity	Industry Group	NAICS Code
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Iron and steel mills and ferroalloy manufacturing	3311
		Other fabricated metal product manufacturing	3329
		Waste treatment and disposal	5622
Waste Management	Disposal/ Releases	Electric power generation, transmission, and distribution	2211
		Animal food manufacturing	3111
		Grain and oilseed milling	3112
		Sugar and confectionery product manufacturing	3113
		Animal slaughtering and processing	3116
		Seafood product preparation and packaging	3117
		Other food manufacturing	3119
		Beverage manufacturing	3121
		Fiber, yarn, and thread mills	3131
		Fabric mills	3132
		Textile and fabric finishing and fabric coating mills	3133
		Other textile product mills	3149
		Sawmills and wood preservation	3211
		Veneer, plywood, and engineered wood product manufacturing	3212
		Other wood product manufacturing	3219
		Pulp, paper, and paperboard mills	3221
		Converted paper product manufacturing	3222
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252

Activity Type	Activity	Industry Group	NAICS Code
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255
		Soap, cleaning compound, and toilet preparation manufacturing	3256
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Clay product and refractory manufacturing	3271
		Glass and glass product manufacturing	3272
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Iron and steel mills and ferroalloy manufacturing	3311
		Alumina and aluminum production and processing	3313
		Nonferrous metal (except aluminum) production and processing	3314
		Foundries	3315
		Forging and stamping	3321
		Architectural and structural metals manufacturing	3323
		Boiler, tank, and shipping container manufacturing	3324
		Coating, engraving, heat treating, and allied activities	3328
		Other fabricated metal product manufacturing	3329
		Other general purpose machinery manufacturing	3339
		Semiconductor and other electronic component manufacturing	3344
		Navigational, measuring, electromedical, and control instruments manufacturing	3345
		Motor vehicle manufacturing	3361
		Motor vehicle parts manufacturing	3363
		Aerospace product and parts manufacturing	3364
		Household and institutional furniture and kitchen cabinet manufacturing	3371

Activity Type	Activity	Industry Group	NAICS Code
		Office furniture (including fixtures) manufacturing	3372
		Medical equipment and supplies manufacturing	3391
		Other miscellaneous manufacturing	3399
		Chemical and allied products merchant wholesalers	4246
		Petroleum and petroleum products merchant wholesalers	4247
		Waste treatment and disposal	5622
	Energy recovery	Other textile product mills	3149
		Veneer, plywood, and engineered wood product manufacturing	3212
		Pulp, paper, and paperboard mills	3221
		Converted paper product manufacturing	3222
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255
		Soap, cleaning compound, and toilet preparation manufacturing	3256
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Boiler, tank, and shipping container manufacturing	3324
		Coating, engraving, heat treating, and allied activities	3328
		Motor vehicle manufacturing	3361
		Motor vehicle parts manufacturing	3363
		Household and institutional furniture and kitchen cabinet manufacturing	3371
		Office furniture (including fixtures) manufacturing	3372
		Chemical and allied products merchant wholesalers	4246

Activity Type	Activity	Industry Group	NAICS Code
		Waste treatment and disposal	5622
	Recycling	Veneer, plywood, and engineered wood product manufacturing	3212
		Pulp, paper, and paperboard mills	3221
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Other nonmetallic mineral product manufacturing	3279
		Architectural and structural metals manufacturing	3323
		Coating, engraving, heat treating, and allied activities	3328
		Semiconductor and other electronic component manufacturing	3344
		Motor vehicle manufacturing	3361
		Motor vehicle parts manufacturing	3363
		Waste treatment and disposal	5622
	Treatment	Electric power generation, transmission, and distribution	2211
		Grain and oilseed milling	3112
		Fiber, yarn, and thread mills	3131
		Fabric mills	3132
		Textile and fabric finishing and fabric coating mills	3133
		Other textile product mills	3149
		Sawmills and wood preservation	3211
		Veneer, plywood, and engineered wood product manufacturing	3212

Activity Type	Activity	Industry Group	NAICS Code
		Other wood product manufacturing	3219
		Pulp, paper, and paperboard mills	3221
		Converted paper product manufacturing	3222
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255
		Soap, cleaning compound, and toilet preparation manufacturing	3256
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Glass and glass product manufacturing	3272
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Alumina and aluminum production and processing	3313
		Nonferrous metal (except aluminum) production and processing	3314
		Foundries	3315
		Forging and stamping	3321
		Architectural and structural metals manufacturing	3323
		Boiler, tank, and shipping container manufacturing	3324
		Coating, engraving, heat treating, and allied activities	3328
		Other general purpose machinery manufacturing	3339
		Semiconductor and other electronic component manufacturing	3344
		Navigational, measuring, electromedical, and control instruments manufacturing	3345
		Motor vehicle manufacturing	3361
		Motor vehicle parts manufacturing	3363

Activity Type	Activity	Industry Group	NAICS Code
		Aerospace product and parts manufacturing	3364
		Household and institutional furniture and kitchen cabinet manufacturing	3371
		Waste treatment and disposal	5622

Reference: [U.S. EPA, 2019b](#)

CDR and TRI Summary and Additional Information on Conditions of Use

The 2016 CDR data identified the commercial and consumer use of formaldehyde in furniture; coatings and paints, thinners, and paint removers; stone, plaster, and cement; wood articles; machinery; mechanical appliances; electrical/electronic articles, electrical batteries, and accumulators; vehicles; polymer preparations, and compounds; fertilizers; cosmetics; anti-freeze and de-icing products; fuels; lubricants; greases and release products; water treatment products; explosives; paper articles; scented paper articles; packaging material; and releasing grease/corrosion inhibitors ([U.S. EPA, 2019a](#)). In the data for commercial and consumer uses, there were several additions that were not present, including: furniture; foam seating and bedding products in vehicles; and plastic and rubber products ([U.S. EPA, 2019a](#)). In addition, for solely commercial uses, there were two additions not present in the 2012 data, including explosives and fuels ([U.S. EPA, 2019a](#)).

In the CDR data, formaldehyde was reportedly used in manufacturing through domestic manufacturing, and importing. Formaldehyde was reported for processing as a reactant for use as an adhesive and sealant, functional fluids, non-pesticidal agricultural chemicals, processing aids, paint and adhesives and coating adhesives, recycling and processing aids specific to petroleum production.

In the CDR data, formaldehyde was also reported to be used in processing to be incorporated into an article as a finishing agent, in paint additives and coatings, and in adhesives and sealant chemicals.

The CDR data also indicated that formaldehyde was used in processing to be incorporated into a formulation, mixture, or reaction product in processing aids specific to petroleum production; paint additives and coating additives; intermediates; solid separation agents; non-pesticidal agricultural products; surface active agents; adhesive and sealant chemicals; and bleaching agents.

Additionally, the CDR data indicated that formaldehyde was processed and repackaged for use in laboratory chemicals. As well, CDR reports identified use of formaldehyde in non-incorporative activities associated with process aids in oil and gas drilling, extraction, and support activities and non-incorporative use in construction, as well as agriculture, forestry, fishing, and hunting.

The 2012 CDR data identified the commercial use of formaldehyde in adhesives and sealants; fertilizers; coatings, paint thinners and paint removers; wood articles; machinery; mechanical appliances; electrical/electronic articles, electrical batteries, and accumulators; paper articles; scented paper articles; packaging materials for metal parts; releasing grease/corrosion inhibitors;

and stone, plaster, cement, glass, ceramic, and metal articles. The data identified the consumer use of formaldehyde in water treatment products. The data also identified the commercial and consumer use of formaldehyde in cosmetics. Consumer uses were also identified in additional databases, which are included in the Exposure Potential section (Section 8).

In the CDR data, formaldehyde was reportedly used in manufacturing through domestic manufacturing, importing, and recycling. Formaldehyde was reported for processing as a reactant for use as an adhesive and sealant; intermediates; in pesticides and fertilizers and other agricultural chemical manufacturing; in petrochemical manufacturing; in soap and cleaning compounds; functional fluids; in non-pesticidal agricultural chemicals; and in bleaching agents.

The CDR data also indicated that formaldehyde was used in processing to be incorporated into a formulation, mixture, or reaction product in solvents which become part of a formulation of mixture; intermediates; non-pesticidal agricultural products; adhesive and sealant chemicals; laboratory chemicals; functional fluids (closed system) in soaps and cleaning compounds; plating agents and surface treatment agents; lubricant and lubricant additives; and ion exchange agents. Additionally, the CDR data indicated that formaldehyde was processed and repackaged for use in laboratory chemicals.

In the 2016 CDR data for formaldehyde, there were several new reported uses, including processing as a reactant in the following industrial use categories: basic organic chemical manufacturing; use in non-pesticidal agricultural chemicals in plastic and resin manufacturing; use in processing aids for plastic and resin manufacturing; use in paint and adhesives and coating adhesives manufacturing; and processing aids specific to petroleum. As well, the use of formaldehyde being processed into an article was new in 2016 CDR reporting cycle—no data showed processing into an article in the 2012 CDR reporting cycle.

The 2016 CDR data for formaldehyde also reported the new use of formaldehyde for processing to be incorporated into a formulation, mixture, or reaction product in processing aids specific to petroleum production in oil and gas drilling, extraction, and support activities as well as use – non-incorporative activities. For comparison, the 2012 CDR data only showed the use of formaldehyde processing as a reactant for use as a functional fluid in oil and gas drilling, extraction, and support activities (this was also reported in the 2016 CDR reports). As well, the 2016 CDR data identify the use of formaldehyde for processing to be incorporated into a formulation, mixture, or reaction product as an intermediate in wholesale and retail trade and a solid separation agent in miscellaneous manufacturing—both new uses that were not previously reported in the 2012 CDR reporting cycle.

The only processing related uses that were reported in the 2012 CDR data that were not reported in the 2016 CDR reporting cycle were processing to be incorporated into a formulation, mixture, or reaction product in lubricant and lubricant additives in adhesive manufacturing, as well as ion exchange agents in adhesive manufacturing, paint, and coating manufacturing.

TRI data reported in Part II Section 3 of the TRI Form R (“Activities and Uses of the Toxic Chemical at the Facility”) were compiled for Reporting Year (RY) 2011, RY 2015, and RY 2017. RY 2011, RY 2015, and RY 2017 reflect the chemical activities at reporting facilities in calendar years 2011, 2015, and 2017, respectively. Each facility filing a TRI Form R discloses activities that apply to the TRI chemical at the facility. The TRI data presented above are from

the TRI dataset updated in April 2019. Tables 4, 5 and 6 present the activities and uses reported to TRI by industry group for 2011, 2015, and 2017. Waste management activity type include all industry groups that reported to TRI using each waste management activity for formaldehyde.

During the first public comment period for the draft high priority designation of formaldehyde, the North American Insulation Manufacturers Association (NAIMA) reported that formaldehyde is used in fiberglass, rock, and slag wool insulation/acoustical products as a binder with approximately a 3–6 percent by weight of cured binder (EPA-HQ-OPPT-2018-0438-0008). NAIMA also submitted a September 2018 Fraunhofer WKI journal paper on formaldehyde concentrations and air exchange rates in European housing that reviewed the emissions from household activities associated with formaldehyde emissions from: the burning of candles; incense burning; consumption of conventional and electronic cigarettes; cooking and cooking related activities; ethanol fireplaces; various cleaning, cosmetic/personal care, and household maintenance products; wood combustion; air cleaning devices and paints; textiles; carpets; wallcoverings; surface coatings; solid wood; raw wood-based material; furniture; laminate; windows and doors; and mineral wool (EPA-HQ-OPPT-2018-0438-0008).

The Asphalt Roofing Manufacturers Association (ARMA) reported that their members manufacture fiberglass mats that use urea-formaldehyde binders to bind the fiberglass fibers (EPA-HQ-OPPT-2018-0438-0005). As well, ARMA reported that formaldehyde has been found in emissions from heated storage tanks supplying the hot asphalt to fiberglass mat coating operation (EPA-HQ-OPPT-2018-0438-0005). ARMA also indicated that the processing of oxidized asphalt does not reveal “significant” formaldehyde emissions (EPA-HQ-OPPT-2018-0438-0005).

The American Coatings Association (ACA) reported that formaldehyde is present in trace amounts in most raw materials used in paints, coatings, sealants, and adhesives as well as synthetic latex resins (EPA-HQ-OPPT-2018-0438-0004). ACA also reported formaldehyde at various concentrations in synthetic latex polymers, fluorescent pigments, and the final versions of the aforementioned products (EPA-HQ-OPPT-2018-0438-0004). ACA also reported the possible use of formaldehyde in biocides used in paint and coating products (EPA-HQ-OPPT-2018-0438-0004).

The Aerospace Industries Association (AIA) reported that formaldehyde is used in the manufacture, operations, and maintenance of aerospace products including a broad range of coatings (e.g., primers, topcoats, and specialty coatings), lubricants, sealants, adhesives, hydraulic fluids, and pre-impregnated materials used to make composites (structural and fireworthy aircraft interiors) for use in federal, military, industry, and company proprietary specifications (EPA-HQ-OPPT-2018-0438-0006). AIA also reported that specific aerospace industrial uses include primers, polyurethane topcoats, adhesive bond primers, wash primers, general purpose and fuel tank sealants, dry film lubricants, graphite paste, electrical insulators, adhesives, lubricants, lubricating oil, hydraulic fluids, marking inks, and epoxy and phenolic resins used in pre-impregnated fiber composites (EPA-HQ-OPPT-2018-0438-0006).

BASF corporation reported that formaldehyde is used as a raw material, monomer, and preservative and that it does not domestically manufacture formaldehyde; however, formaldehyde is commercially present in compounds or mixtures and that it incorrectly reported

formaldehyde impurities in its 2016 CDR submission and will update to reflect the accurate calculations (EPA-HQ-OPPT-2018-0438-0010).

Should the Agency decide to make a final decision to designate this chemical substance as a high-priority substance, further characterization of relevant TSCA conditions of use will be undertaken as part of the process of developing the scope of the risk evaluation.

4. Potentially exposed or susceptible subpopulations

Approach

In this review, EPA considered reasonably available information to identify potentially exposed or susceptible subpopulations, such as children, women of reproductive age, consumers, workers, or the elderly. EPA analyzed processing and use information included on the CDR Form U. These data provide an indication about whether children or other susceptible subpopulation may be potentially exposed. EPA also used human health hazard information to identify potentially exposed or susceptible subpopulations.

Results and Discussion

At this stage, EPA identified children, consumers and workers as subpopulations who may be potentially exposed or susceptible subpopulations for formaldehyde.

Children

EPA used data reported to the 2012 and 2016 CDR to identify uses in products and articles intended for children over time for formaldehyde. Table 7 summarizes the non-CBI CDR information regarding commercial and consumer use and notes whether the chemical substance was identified as used in products intended for children.

Table 7. Uses in Children’s Products Information⁵

Chemical	Year	Product Category (Product Concentration, Number of Workers)	Consumer or Commercial	Used in Products Intended for Children
Formaldehyde (50-00-0)	2012	Floor coverings (at least 30% but less than 60% by weight; at least 25, but fewer than 50 workers)	Commercial	Yes
	2016	Furniture and furnishings not covered elsewhere (at least 1% but less than 30% by weight; NKRA) Textiles, apparel, and leather products not covered elsewhere (at least 1% but less than 30% by weight; NKRA)	Consumer	Yes

Note: NKRA = not known or reasonably ascertainable

Reference: [U.S. EPA \(2019a\)](#)

⁵ Certain other uses that are excluded from TSCA are not captured in this table.

Women of reproductive age (e.g., pregnant women per TSCA statute)

EPA identified studies that examined the reproductive and developmental effects following formaldehyde exposure; however, no effects were observed in these studies. Women of reproductive age are therefore not considered a susceptible subpopulation with respect to formaldehyde at this time. During the scoping and risk evaluation process, the issue of potentially exposed or susceptible subpopulations will be considered again after a full systematic review of the literature.

Workers

Please refer to the Exposure Potential section (Section 8) for a summary of potential occupational exposures, which EPA indicates that workers are potentially exposed or susceptible subpopulations based on greater exposure.

Consumers

Please refer to the Exposure Potential section (Section 8) for a summary of potential consumer exposures, which EPA indicates that consumers are potentially exposed or susceptible subpopulations based on greater exposure.

5. Persistence and bioaccumulation

Approach

EPA reviewed reasonably available data, such as physical and chemical properties and environmental fate characteristics, on to understand formaldehyde's persistence and bioaccumulation.

Physical and Chemical Properties and Environmental Fate Tables

Table 8 and 9 summarize the physical and chemical properties and environmental fate characteristics of formaldehyde, respectively.

Table 8. Physical and Chemical Properties of Formaldehyde

Property or Endpoint	Value ^a	Reference
Molecular Formula	CH ₂ O	CRC Handbook (Rumble, 2018)
Molecular Weight	30.026 g/mole	CRC Handbook (Rumble, 2018)
Physical State	Gas	CRC Handbook (Rumble, 2018)
Physical Form	Clear, water-white, very slightly acid (gas or liquid)	HSDB (2015) citing Lewis (2012)
Purity	Formaldehyde in aqueous solution (formalin) contains approximately 10–15% methanol (prevent polymerization)	ATSDR (1999)
Melting Point	–92 °C ^b	Physprop (2012) ; ATSDR (1999) citing Budavari et al. (1989); HSDB (2015) ; CRC Handbook (Rumble, 2018); SYKE (2018)

Property or Endpoint	Value ^a	Reference
	-118 °C	ICPS (1989) ; SYKE (2018)
Boiling Point	-19.1 °C ^b	CRC Handbook (Rumble, 2018); HSDB (2015) citing Flick (1991)
	-19.2 °C	ICPS (1989)
	-19.5 °C	Physprop (2012) ; HSDB (2015) citing CRC Handbook (Haynes, 2014)
	-21 °C	ATSDR (1999) citing ASTER (1996) ; SYKE (2018)
Density	0.815 g/mL at -20 °C	ATSDR (1999) citing CRC Handbook (Lide,1996); CRC Handbook (Rumble, 2018); SYKE (2018)
Vapor Pressure	3,886 mm Hg at 25 °C (extrapolated; rounded value 3,890 in Physprop) ^b	OECD (2002) ; Physprop (2012) citing Boublik et al. (1984)
	3,883 mm Hg at 25 °C	ATSDR (1999) ; SYKE (2018) citing Daubert and Danner (1985)
Vapor Density	1.03 (relative vapor density to air = 1) ^b	SYKE (2018)
	1.04 (relative vapor density to air = 1)	ICPS (1989)
Water Solubility	4.0×10^5 mg/L at 25 °C ^b	Physprop (2012) citing Pickrell et al. (1983)
	1.22×10^6 mg/L at 25 °C	Mackay et al. (1996) citing Dean (1985)
Log K _{ow}	0.350	OECD (2002) ; ATSDR (1999) ; Physprop (2012) citing Hansch et al. (1995) SYKE (2018)
pKa	13.27 at 25 °C	HSDB (2015) ; Physprop (2012) citing Serjeant and Dempsey (1979)
Henry's Law Constant	3.37×10^{-7} atm-m ³ /mol ^b	OECD (2002) ; Physprop (2012) citing Betterton (1988); SYKE (2018)
	2.04×10^{-7} atm-m ³ /mol	ICPS (1989)
Flash Point	60 °C	ATSDR (1999)
Auto Flammability	7–73%	ATSDR (1999)
	12.5–80%	WHO (1989)
Viscosity	0.1421 cP at 25 °C	HSDB (2015) citing Abatjoglou et al. (2011)
Refractive Index	TBD	TBD

Property or Endpoint	Value ^a	Reference
Dielectric Constant	TBD	TBD
Surface Tension	27.3797 dyn/cm at 25 °C	HSDB (2015) citing Abatjoglou et al. (2011)

Notes:

^aMeasured unless otherwise noted

^bSelected value

TBD = to be determined, if reasonably available. **EPA is particularly interested in information from the public on these properties or endpoints.**

Table 9. Environmental Fate Characteristics of Formaldehyde

Property or Endpoint	Value ^a	Reference
Direct Photodegradation	$t_{1/2} = 6$ hours in simulated sunlight	ATSDR (1999) ; Su (1979)
	$t_{1/2} = 1.6$ –19 hours in sunlight; degradation products H ₂ , CO, H ⁺ , HCO ⁻	ATSDR (1999) citing Lewis (1993)
Indirect Photodegradation	45 hours (based on ·OH reaction rate constant 8.5×10^{-12} cm ³ /molecule-second at 25 °C)	HSDB (2015) ; Atkinson (1992); NIST (2013)
	57 days (based on nitrate radicals reaction rate constant 5.6×10^{-16} cm ³ /molecule-second at 25 °C)	
Hydrolysis	Not expected; however, in an aqueous environment, formaldehyde will be fully hydrated to the gem-diol methylene glycol	OECD (2002) citing Betterton (1992); HSDB (2015) ; ATSDR (1999)
Biodegradation (Aerobic)	Water: 100%/30 hours (die-away test) in stagnant lake water	HSDB (2015) ; ATSDR (1999) citing U.S. EPA (1976)
	Sediment: 90%/28 days (OECD 301D) with non-acclimated inoculum	
Biodegradation (Anaerobic)	Water: 100%/48 hours (die-away test) in stagnant lake water	HSDB (2015) ; ATSDR (1999)
Wastewater Treatment	Removal/secondary treatment: 57–99%, removal percentages based upon data from a semi-continuous sewage and continuous activated sludge biological treatment simulator	Howard (1991)
	94% total removal (93% by biodegradation, 0.28% by sludge, 0% by volatilization to air; estimated) ^b	Physprop (2012)
Bioconcentration Factor	Not expected; based on a lack of evidence of bioaccumulation in a variety of fish and shrimp and a log K _{ow} of 0.35; studies suggest that formaldehyde is rapidly metabolized	OECD (2002) ; Hose and Lightner (1980); Sills and Allen (1979)
	3.2 (estimated) ^b	Physprop (2012)

Property or Endpoint	Value ^a	Reference
Bioaccumulation Factor	1.1 (estimated) ^b	Physprop (2012)
Soil organic Carbon:Water Partition Coefficient (Log K _{OC})	Absorbs to clay minerals; used as a soil fumigant 0 (K _{OC} = 1; MCI method); 0.89 (K _{OC} = 7.8; K _{OW} method) (estimated) ^b	HSDB (2015) ; SYKE (2018) citing De and Chandra (1978) Physprop (2012)

Notes: ^a Measured unless otherwise noted; ^b EPI Suite™ physical property inputs: Log K_{OW} = 0.35, BP = -19.5 °C, MP = -92 °C, VP = 3,890 mm Hg, WS = 4 × 10⁵ mg/L, HLC = 3.37 × 10⁻⁷(atm-m³/mole), BIOP = 4, BioA = 1 and BioS = 1 SMILES: O=C; ·OH = hydroxyl radical; K_{OC} = organic carbon-water partitioning coefficient; K_{OW} = octanol-water partition coefficient

Results and Discussion

Pure formaldehyde is a highly water-soluble (4.0 × 10⁵ mg/L) gas with a vapor pressure of 3,886 mm Hg. Despite its high vapor pressure, formaldehyde's measured Henry's Law constant (3.37 × 10⁻⁷ atm-m³/mol) indicates that this chemical will have minimal volatility and has the potential to be persistent in surface waters; however, its high vapor pressure indicates that this chemical will not be persistent in soil as it will likely volatilize upon release. In the atmosphere, formaldehyde is susceptible to direct photolysis with a half-life of 1.6–19 hours to produce hydrogen gas, carbon monoxide, protons (H⁺), and formate anions (HCO⁻). Gaseous formaldehyde may also react with photochemically-produced hydroxyl radicals and nitrate radicals at rates corresponding to half-lives of 45 hours and 57 days, respectively.

In aerobic aquatic environments and sediment, formaldehyde is biodegradable. In water, this chemical reached 100 percent degradation over a 30-hour incubation period using stagnant lake water and the die-away test method. This chemical reached 90 percent degradation over a 28-day incubation period using non-acclimated inoculum and the OECD 301D test method. It is not expected to be susceptible to hydrolysis; however, in an aqueous environment, formaldehyde will be fully hydrated to the gem-diol methylene glycol.

In anaerobic aquatic environments, formaldehyde is biodegradable, reaching 100 percent degradation over a 48-hour incubation period using stagnant lake water and the die-away test method. Therefore, formaldehyde is not likely to persist in subsurface environments or groundwater. Furthermore, this chemical has low potential for bioaccumulation based on lack of evidence of bioaccumulation in various fish and shrimp, a measured log K_{OW} of 0.35, and bioconcentration factor and bioaccumulation factor estimates of 3.2 and 1.1, respectively. Data suggest that formaldehyde is rapidly metabolized.

6. Storage near significant sources of drinking water

Approach

To support the proposed designation, EPA analyzed each chemical substance, under its conditions of use, with respect to the seven criteria in TSCA section 6(b)(1)(A) and 40 CFR 702.9. The statute specifically requires the Agency to consider the chemical substance's storage near significant sources of drinking water, which EPA interprets as direction to focus on the chemical substance's potential human health hazard and exposure.

EPA reviewed reasonably available information, specifically looking to identify certain types of existing regulations or protections for the proposed chemical substances. EPA considered the chemical substance's potential human health hazards, including to potentially exposed or susceptible subpopulations, by identifying existing National Primary Drinking Water Regulations under the Safe Drinking Water Act (SDWA; 40 CFR Part 141) and regulations under the CWA (40 CFR 401.15). In addition, EPA considered the consolidated list of chemical substances subject to reporting requirements under EPCRA (Section 302 Extremely Hazardous Substances and Section 313 Toxic Chemicals), CERCLA (Hazardous Substances), and CAA (Section 112(r) Regulated Chemicals for Accidental Release Prevention). Regulation by one of these authorities is an indication that the substance is a potential health or environmental hazard which, if released near a significant source of drinking water, could present unreasonable risk of injury to health or the environment.

Results and Discussion

Formaldehyde is a designated hazardous substance in accordance with Section 311(b) (2)(A) of the Federal Water Pollution Control Act. It was identified on both the Third (2009) and Fourth (2016) Contaminant Candidate Lists (74 FR 51850, October 8, 2009) and (81 FR 81099, November 17, 2016) under SDWA.

Formaldehyde is a listed substance subject to reporting requirements under 40 CFR 372.65 effective as of January 1, 1987 under EPCRA and is considered a CERCLA hazardous substance and releases in quantities equal to or greater than 100 pounds are subject to reporting to the National Response Center under CERCLA.

Formaldehyde is also listed 224 on the priority list of hazardous substances under the Superfund Amendments and Reauthorization Act of 1986. It is included on the list of hazardous wastes pursuant to section 3001 of the Resource Conservation and Recovery Act (RCRA) under hazardous waste number U122. Under the RCRA program, U-listed wastes are pure and commercial grade formulations of unused chemicals that are being disposed. These wastes must contain the chemical listed on the U list, be unused, and must be in the form of a commercial chemical product. EPA defines the commercial chemical product as either 100 percent pure, technical (e.g., commercial) grade, or the sole active ingredient in a chemical formulation. As well, formaldehyde is listed as part of various groups of chemicals in Appendix VII to Part 261 – Basis for Listing Hazardous Waste as K009, K010, K038, K040, K156, and K157. Under the RCRA program, K listed wastes are from common manufacturing and industrial processes from one of the following 13 specific industrial sectors:

- Wood preservation,
- Organic chemicals manufacturing,
- Pesticides manufacturing,
- Petroleum refining,
- Veterinary pharmaceuticals manufacturing,
- Inorganic pigment manufacturing,
- Inorganic chemicals manufacturing,
- Explosives manufacturing,
- Iron and steel production,
- Primary aluminum production,
- Secondary lead processing,
- Ink formulation, and
- Coking (processing of coal to produce coke).

RCRA 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.

Formaldehyde is listed as a regulated toxic substance under the CAA Section 112(r) chemical accident prevention regulation. The threshold quantity for formaldehyde is 15,000 pounds and it is listed based on its vapor pressure being 10 mmHg or greater.

7. Hazard potential

Approach

EPA considered reasonably available information from peer-reviewed assessments and databases to identify potential human health and environmental hazards for formaldehyde (Tables 10 and 11, respectively).

EPA used the infrastructure of ECOTOXicology knowledgebase (ECOTOX) to identify single chemical toxicity data for aquatic and terrestrial life (U.S. EPA, 2018). It uses a comprehensive chemical-specific literature search of the open literature that is conducted according to the Standard Operating Procedures (SOPs)⁶. The environmental hazard information was populated in ECOTOX and is available to the public. In comparison to the approach used to survey human health hazard data, EPA also used a read-across approach to identify additional environmental hazard data for isomers of formaldehyde, if available, to fill in potential data gaps should there not be when there were no reported observed effects for specific taxa exposed to the formaldehyde (Table 11).

Potential Human Health and Environmental Hazard Tables

EPA identified potential human health and environmental hazards based on a review of the reasonably available information for formaldehyde (Tables 10 and 11, respectively).

Table 10. Potential Human Health Hazards Identified for Formaldehyde

Human Health Hazards	Tested for Specific Effect	Effect Observed	Reference
Acute Toxicity	X	X	ATSDR (1999) ; ATSDR (2014) ; CalEPA (2014) ; ECHA (2019) ; Environment Canada (2000) ; NICNAS (2006) ; OECD (2002) ; U.S. EPA (2008a)
Repeated Dose Toxicity	X	X	ATSDR (1999) ; CalEPA (2014) ; ECHA (2019) ; Environment Canada (2000) ; NICNAS (2006) ; NTP (2010) ; OECD (2002)
Genetic Toxicity	X	X	ATSDR (1999) ; ATSDR (2010) ; ATSDR (2014) ; IARC (2012) ; NRC (2011) ; NTP (2010)
Reproductive Toxicity	X		ATSDR (1999) ; ATSDR (2010) ; CalEPA (2014) ;

⁶ The ECOTOX Standard Operating Procedures (SOPs) can be found at: <https://cfpub.epa.gov/ecotox/help.cfm?helptabs=tab4>

Human Health Hazards	Tested for Specific Effect	Effect Observed	Reference
			ECHA (2019); Environment Canada (2000); WHO (2002); NICNAS (2006); NTP (2010); OECD (2002)
Developmental Toxicity	X		ATSDR (1999); ATSDR (2010); CalEPA (2014); ECHA (2019); Environment Canada (2000); WHO (2002); NICNAS (2006); NTP (2010); OECD (2002)
Toxicokinetic	X		ATSDR (1999); ECHA (2019); Environment Canada (2000); IARC (2012); NICNAS (2006); NTP (2010); U.S. EPA (2008a)
Irritation/Corrosion	X	X	ATSDR (1999); ATSDR (2010); ATSDR (2014); CalEPA (2014); CPSC (2016); ECHA (2019); Environment Canada (2000); IARC (2012); WHO (2002); NRC (2011); NICNAS (2006); NTP (2010); OECD (2002); U.S. EPA (2008a)
Dermal Sensitization	X	X	ATSDR (1999); ECHA (2019); Environment Canada (2000); IARC (2012); NICNAS (2006); NTP (2010); OECD (2002); U.S. EPA (2008a)
Respiratory Sensitization	X	X	ATSDR (1999); CalEPA (2014); CPSC (2016); ECHA (2019); Environment Canada (2000); WHO (2002); NTP (2010)
Carcinogenicity	X	X	ATSDR (1999); ATSDR (2010); ATSDR (2016); CalEPA (2011); CPSC (2016); ECHA (2019); Environment Canada (2000); IARC (2012); WHO (2002); NRC (2011); NICNAS (2006); NTP (2016); OECD (2002); U.S. EPA (1989); U.S. EPA (2008a); U.S. EPA (2014)
Immunotoxicity	X		ATSDR (2014); Environment Canada (2000); WHO (2002); NRC (2011); NTP (2010)
Neurotoxicity	X		ATSDR (1999); CPSC (2016); CalEPA (2014); NTP (2010)
Epidemiological Studies or Biomonitoring Studies	X		ATSDR (1999); Environment Canada (2000); NICNAS (2006); NTP (2010)

Note: The “X” in the “Effect Observed” column indicates when a hazard effect was reported by one or more of the referenced studies. Blank rows indicate when information was not identified during EPA’s review of reasonably available information to support the proposed designation.

Table 11. Potential Environmental Hazards Identified for Formaldehyde

Media	Study Duration	Taxa Groups	High-Priority Chemical Candidate Formaldehyde (CASRN 50-00-0)		Isomers of Formaldehyde (CASRN 50-00-0) NONE		Reference
			Number of Studies	Observed Effects	Number of Studies	Observed Effects	
Aquatic	Acute exposure	Vegetation	13	X	–		Brack and Frank (1998); Burridge et al. (1995a); Chen et al. (2005); De Orte et al. (2013); Eisentraeger et al. (2003); Govorunova et al. (2000); Hall and Unestam (1980); Han et al. (2008); Marking et al. (1994); McFeters et al. (1983); Nendza and Wenzel (2006); Tsai and Chen (2007)
		Invertebrate	25	X	–		Balompapung et al. (1997); Carballeira et al. (2012); Castille and Lawrence (1986); Chandler and Marking (1979); De Pedro et al. (2007); Edwards et al. (2000); Espiritu et al. (1995); Forwood et al. (2013); Hakalahti-Siren et al. (2008); Janssen and Persoone (1993); Johnson (1974); Kalcikova et al. (2012); Koncan (1997); Kramer et al. (1983); Lagerspetz et al. (1993) Lahnsteiner and Weismann (2007) Miyoshi et al. (2003); Nazarenko (1960); Phelps (1975); Portmann and Wilson (1971); Portmann (1972); Sahul Hameed and Balasubramanian (2000); Tisler and Zagorc-Koncan (1997); Warne and Schifko (1999)
		Fish	45	X	–		Academy of Natural Sciences (1960); Baldwin et al. (1994); Birdsong and Avault (1971); Brooke (1987); Clemens and Sneed (1958); Cruz and Pitogo (1989); Douillet and Holt (1994); Dureza (1989); Dvorak et al. (1985); Edwards et al. (2000); Fernandez-Tejedor et al. (2007); Forwood et al. (2013); Geiger et al. (1990); Hinton and Eversole (1978); Hinton and Eversole (1979); Hinton and Eversole (1980); Howe et al. (1995); Hughes (1973); Kodama et al. (2004); Madsen et al. (2000); McCorkle et al. (1979); Nilsen et al. (1992); Phelps (1975); Portmann and Wilson (1971); Portmann (1972); Reardon and Harrell (1990); Segner and Lenz (1993); Shumway and Palensky (1973); Taylor and Glenn (2008); Terhaar et al. (1972); Van Heerden et al. (1995); Wellborn (1969); Willford (1966)
		Non-fish vertebrate (i.e., amphibians, reptiles, mammals)	–		–		

Media	Study Duration	Taxa Groups	High-Priority Chemical Candidate Formaldehyde (CASRN 50-00-0)		Isomers of Formaldehyde (CASRN 50-00-0) NONE		Reference
			Number of Studies	Observed Effects	Number of Studies	Observed Effects	
	Chronic exposure	Vegetation	3	X	–		Burrige et al. (1995); Mitchell et al. (2010); Waterstrat and Marking (1995)
		Invertebrate	5	X	–		De Pedro et al. (2007); Gardner and Northam (1997); Hakalahti-Siren et al. (2008); Miyoshi et al. (2003)
		Fish	5	X	–		Jerbi et al. (2011); Kodama et al. (2004); Mitchell et al. (2010); Nazarenko (1960); Waterstrat and Marking (1995)
		Non-fish vertebrate (i.e., amphibians, reptiles, mammals)	–		–		
Terrestrial	Acute exposure	Vegetation	7	X	–		Bilderback (1981); Jayasinghe et al. (1993); Jung et al. (1995) Kappler and Kristen (1987); Neilsen and Yorston (1991); Rank and Nielsen (1994); Shirazi and Muir (1998)
		Invertebrate	3	X	–		Roberts and Dorough (1984); Wang et al. (2012); Willard and Kodras (1967)
		Vertebrate	–		–		
	Chronic exposure	Vegetation	3	X	–		Braithwaite et al. (1994); Rank and Nielsen (1994)
		Invertebrate	2	X	–		Lynch et al. (1991); Samson et al. (1986)
		Vertebrate	4	X	–		Andersen et al. (1984); Botham et al. (2005); Maisey and Miller (1986); Tsuda et al. (1984)

The dash indicates that no studies relevant for environmental hazard were identified during the initial review and thus the “Observed Effects” column is left blank. The X in the Observed Effects column indicates when a hazard effect was reported by one or more of the referenced studies. The N/A in the Observed Effects column indicates when a hazard effect was not reported by one of the referenced studies’ abstract (full reference review has not been conducted).

8. Exposure potential

Approach

EPA considered reasonably available information to identify potential environmental, worker/occupational, consumer exposures, and general population to formaldehyde.

Release potential for environmental and human health exposure

In addition to other required information, a submission of a TRI Form R report must include the quantities of a TRI chemical the facility released on-site to air, water, or land, and the quantities it transferred off-site to another facility for further waste management. On-site release quantities are reported in Part II Section 5 of the TRI Form R, and off-site transfers are reported in Part II Section 6. Waste management activities include: transfers of a TRI chemical in wastewater to a publicly owned treatment works (POTW) facility or to a non-POTW wastewater treatment facility for the purpose of treatment for destruction or removal; combustion for energy recovery; treatment (treatment includes treatment via incineration for destruction and waste stabilization); recycling; and release, including disposal. During treatment, combustion for energy recovery, or recycling activities, it is possible that some of the quantities of the TRI chemical will be released to the environment. An example is the release of a TRI chemical from a POTW as a result of incomplete destruction or removal of the chemical from the waste stream during wastewater treatment at the POTW.

Worker/Occupational and consumer exposure

EPA approach for assessing exposure potential was to review the physical and chemical properties, conditions of use reported in CDR, and information from the National Institutes of Health Consumer Product Database and the Chemical and Products Database (CPDat) for Formaldehyde to inform occupational and consumer exposure potential. The results of this review are detailed in the following tables

General population exposure

EPA identified environmental concentrations and conditions of use to inform formaldehyde's exposure potential to the general population (Table 14).

Results and Discussion

Release potential for environmental and human health exposure

Aggregated quantities of formaldehyde released on-site to air, water, and land, and aggregated quantities of formaldehyde transferred off-site to POTW and other wastewater treatment facilities (non-POTW) are presented in Table 12 for RY 2011, 2015, and 2017. The table does not include any of the reported quantities pertaining to other waste management activities (e.g., recycling, combustion for destruction) that occurred on-site or off-site during RY 2011, 2015, and 2017. The "Number of Facilities" is the count of unique facilities that filed a TRI Form R report for formaldehyde for RY 2011, 2015, and 2017. The TRI data presented were obtained from the TRI dataset following its update in April 2019.

Table 12. The TRI Data on Formaldehyde from Reporting Years 2011, 2015, and 2017 Used in this Document to Assess Exposure Potential

Year	Number of Facilities That Reported	Total Quantities Released On-Site to Air (lbs.)	Total Quantities Released On-Site to Water (lbs.)	Total Quantities Released (Disposed of) On-Site to Land (lbs.)	Total Quantities Transferred to POTW (lbs.)	Total Quantities Transferred to Other (Non-POTW) Wastewater Treatment Facilities (lbs.)
2011	717	4,872,987	181,207	12,431,902	3,433,389	217,596
2015	719	4,735,780	168,084	14,351,030	940,075	3,155,439
2017	714	4,964,880	175,906	14,760,204	888,806	3,495,704

POTW = publicly owned treatment works

Reference: [U.S. EPA, 2019b](#)

For RY 2017, 714 facilities submitted TRI reports for formaldehyde. The total quantities of formaldehyde these facilities released on-site to air (as fugitive and stack emissions), surface water and land are: 4,964,880 pounds; 175,906 pounds; and 14,760,204 pounds, respectively. These facilities reported 888,806 pounds of the chemical transferred to POTW and 3,495,704 pounds transferred off-site to other non-POTW wastewater treatment facilities for the purpose of wastewater treatment. These transfer categories represent two types of off-site transfers for wastewater treatment that may lead to releases from the receiving facilities. They do not include quantities sent off-site for other types of waste management activities that include, or may lead to, releases of the chemical.

Quantities transferred off-site represent the amount of a toxic chemical a facility sent off-site prior to any waste management (e.g., treatment) at a receiving facility. Some of the quantities of formaldehyde received by the non-POTW wastewater treatment facilities may have been released to surface waters or to air during treatment processes at the facilities.

Formaldehyde has a vapor pressure of approximately 3,880 mm Hg at 25 °C. This chemical's vapor pressure indicates potential for air releases from volatilization during manufacturing, processing, and use.

When chemical substances are used as reactants, the industrial releases may be a relatively low percentage of the production volume. Lower percentage releases occur when a high percentage of the chemical reacts without excess loss during its use as an intermediate. The actual percentages, quantities, and media of releases of the reported chemical associated with this processing or use are not known.

When chemical substances are incorporated into formulations, mixtures, or reaction products, the industrial releases may be a relatively low percentage of the production volume. Lower percentage releases occur when a high percentage of the volume is incorporated without significant process losses during its incorporation into a formulation, mixture, or product. The actual percentages, quantities, and media of releases of the reported chemical associated with this processing or use are not known.

When chemical substances are repackaged, the industrial releases may be a relatively low percentage of the production volume. Lower percentage releases occur when a high percentage of the chemical is repackaged without significant process losses during its repackaging. The actual percentages, quantities, and media of releases of the reported chemical associated with this processing or use are not known.

When chemical substances have industrial use as bleaching agents and plating agents and surface treatment agents are used in aqueous processes, they may have releases to aqueous media. The actual percentage and quantity of release of the reported chemical associated with this category are not known.

When chemical substances have industrial use as agricultural chemicals, releases can occur during end use that may be a relatively high percentage of the production volume. Higher percentage releases occur when the product containing the chemical is used in a dispersive pattern on land. The actual percentage and quantity of release of the reported chemical associated with this category are not known but could be high.

When chemical substances have industrial use as chemical intermediates, the industrial releases may be a relatively low percentage of the volume. Lower percentage releases occur when a high percentage of the chemical reacts without excess loss during its use as an intermediate. The actual percentage and quantity of release of the reported chemical associated with this category are not known.

When chemical substances have industrial use as solvents in product formulations or mixtures, the industrial and/or end-use releases may be a relatively high percentage of the production volume. Higher percentage releases occur when the chemical's intended use is as a solvent that may evaporate into the atmosphere or may be collected and disposed to aqueous media. In some cases, some engineering controls or capture for recycle or reclamation may reduce these losses. The actual percentage and quantity of release of the reported chemical associated with this category are not known but could be high.

When chemical substances have commercial or consumer use as adhesive and sealants, and paints and coatings, variable release percentages may occur. If the chemical is used as a solvent, it may evaporate to the air during the drying or curing of the adhesive or sealant or paint or coating. Other additives may be entrained in the dried or cured adhesive or sealant or paint or coating but may be released to the environment due to abrasion of the adhesive or sealant or paint or coating. The actual percentage and quantity of release of the reported chemical associated with this category are not known but could be high.

When chemical substances have commercial or consumer use as agricultural products (non-pesticidal), releases may occur during end use that are a relatively high percentage of the production volume. Higher percentage releases occur when the product containing the chemical is used in a dispersive pattern on land. The actual percentage and quantity of release of the reported chemical associated with this category are not known but could be high.

Worker/Occupational exposure

Worker exposures to this chemical may be affected by many factors, including but not limited to volume produced, processed and used; physical form and concentration; processes of manufacture, processing, and use; chemical properties such as vapor pressure, solubility, and water partition coefficient; local temperature and humidity; and exposure controls such as engineering controls, administrative controls, and the existence of a personal protective equipment (PPE) program.

Formaldehyde has an Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) ([OSHA 2019](#)). The PEL is 0.75 parts per million (ppm) over an 8-hour work day, time weighted average (TWA). Formaldehyde also has an OSHA Short-Term Exposure Limit (STEL) of 2 ppm. This chemical also has a National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL) of 0.016 ppm TWA and 15 minute Ceiling limit of 0.1 ppm ([NIOSH 2018](#)). The American Conference of Governmental Industrial Hygienists (ACGIH) set the Threshold Limit Value (TLV) at 0.1 ppm TWA and 0.3 ppm STEL.

Formaldehyde has a vapor pressure of approximately 3,880 mm Hg at 25 °C and a normal boiling point of -19.1 °C. Formaldehyde is a gas at ambient room temperature conditions and there is the potential for inhalation exposure to the gas. The extent of inhalation exposure could vary from facility to facility depending on many factors including but not limited to engineering controls, type of facility and process design.

Formaldehyde is indicated as being used in adhesives and sealants, and paints and coatings. Products used as adhesive and sealants, and paints and coatings may be applied via spray or roll application methods. These methods may generate mists to which workers may be exposed.

Consumer exposure

CDR reporting and information from the National Institutes of Health Consumer Product Database and the Chemical and Products Database ([CPDat](#)) indicate that formaldehyde is widely used in consumer products (Table 13). Consumers can be exposed to formaldehyde off-gassed from a number of products (e.g., furniture, antiseptics, medicines, dishwashing liquids, fabric softeners, shoe-care agents, carpet cleaners, glues, adhesives, and lacquers, some fabrics (including new carpets and newly cleaned carpets), and cosmetic products, such as nail polish and nail hardeners, or through dermal contact with these products ([ATSDR 1999](#)).

General population exposure

EPA anticipates releases of formaldehyde into the environment because of the conditions of use for formaldehyde, particularly activities associated with the chemical's manufacturing and use in manufacture of formaldehyde-based resins (used in the manufacture of end-use consumer products) and other industrial chemicals, as well as combustion processes (including direct emissions to ambient air by motor vehicle traffic and power generators, and tropospheric oxidation of emitted hydrocarbons), hazardous waste storage, transport and disposal, and indoor releases (mainly from pressed wood products, combustion sources, and new carpets) ([ATSDR 1999](#), [NTP 2010](#), [CalEPA 2014](#), [ECHA 2019](#)).

Table 13. Exposure Information for Consumers

Chemical Identity	Consumer Product Database
	Consumer Uses (List)
Formaldehyde (50-00-0)	Absorbent, adhesive, adsorbent, antiadhesive, anti-freezing, antistatic, antiwrinkle, apparel, apparel care, arts craft paint, automotive polish, automotive, automotive care, automotive component, binding, building material, body cleaner, body wax, candle, caulk/sealant, casting agent, ceramic, cleaner, colorant, detergent, diaper, dishwasher detergent, disinfectant, dry cleaning, electrical insulation, electronics, filler, filler building material, fishing, fixative, floor cleaner, floor polish, flooring, fluid property modulator, fragrance, fur cleaner, furniture, furniture polish, glass, glass building material, glass cleaner, hardener, impregnation, inhibitor, insulation, kitchen cleaner, laundry detergent, leather impregnation, leather polish, lubricant, metal polish, metal surface treatment, paint, paint binding, paint filler, paint hardener, paper, paper impregnation, paper surface treatment, paving, photographic, plastic building material, plastic, plastic filler, plastic hardener, plastic softener, polish, printing, printing ink, propellant, rubber, rubber processing, seal material, softener, solvent, stabilizer, surface treatment, surfactant, textile, textile cleaner, textile furniture chairs, textile impregnation, toilet cleaner, toys, viscous liquid building material, wall building material, wood adhesive, wood building material, wood impregnation, writing ink

Reference: [CPDat](#)

Releases of formaldehyde from certain conditions of use, such as manufacturing, disposal, or waste treatment activities, as well as from off-gassing from pressed wood products in newly constructed homes or homes where these have been recently installed, particularly mobile homes “primarily due to the higher usage of products that emit formaldehyde in these buildings, relatively low ventilation rate and /or small internal volume” ([NICNAS 2006](#)), may result in general population exposures via inhalation from air releases, including potential high short-term exposures, drinking water ingestion, and dermal contact; additional exposure may result from indoor combustion sources and traffic air pollution during commuting, particularly at rush hour ([ATSDR 1999](#)). Oral ingestion of formaldehyde is less common than is inhalation or dermal exposure because the chemical is unstable in aqueous solution; however, formaldehyde is used as a preservative and small amounts may be present in food ([ATSDR 1999](#)).

Based on fate properties, such as water solubility, EPA anticipates possible presence of formaldehyde in ambient air and surface water, whereas fate of formaldehyde in groundwater is unknown and, given its low octanol/water partition coefficient, adsorption to soil is likely low ([ATSDR 1999](#)). A review of monitoring data collected under EPA rules and statutes (e.g., CAA, CWA, SDWA, National Pollutant Discharge Elimination System) indicate that formaldehyde is detected in air water, and other matrices. A review of the available literature suggests that environmental concentrations in air and water are available, but no human or ecological biomonitoring data are available (Table 14). A study from 1994 reported a median formaldehyde concentration of 2.5 ppb in ambient air samples collected at 58 different locations in the United States, whereas studies of urban ambient air conducted in the 1980s reported concentrations between 2.3 ppb in Denver, Colorado, and 19 ppb in Riverside, California ([ATSDR 1999](#)). NATA ambient network estimates of county background concentrations—which consider monitoring data collected in 2010–2012 in 79 U.S. counties—have a median of 1.2 ug/m³,

although the literature reported remote the concentration estimate was 0.43 ug/m³ for 2006 ([U.S. EPA 2015](#)).

Table 14. Exposure Information for the Environment and General Population

Database Name	Env. Concen. ^a Data Present?	Human Biomon. ^b Data Present?	Ecological Biomon. ^b Data Present?	Reference
California Air Resources Board	no	no	no	CARB (2005)
Comparative Toxicogenomics Database	yes	no	no	MDI (2002)
EPA Ambient Monitoring Technology Information Center – Air Toxics Data	yes	no	no	U.S. EPA (1990)
EPA Discharge Monitoring Report Data	yes	no	no	U.S. EPA (2007)
EPA Unregulated Contaminant Monitoring Rule	no	no	no	U.S. EPA (1996b)
FDA Total Diet Study	no	no	no	FDA (1991)
Great Lakes Environmental Database	no	no	no	U.S. EPA (2018)
Information Platform for Chemical Monitoring Data	yes	no	no	EC (2018)
International Council for the Exploration of the Sea	no	no	no	ICES (2018)
OECD Monitoring Database	no	no	no	OECD (2018)
Targeted National Sewage Sludge Survey	no	no	no	U.S. EPA (2006)
The National Health and Nutrition Examination Survey	no	no	no	CDC (2013)
USGS Monitoring Data –National Water Quality Monitoring Council	no	no	no	USGS (1991a)
USGS Monitoring Data –National Water Quality Monitoring Council, Air	no	no	no	USGS (1991b)
USGS Monitoring Data –National Water Quality Monitoring Council, Ground Water	yes	no	no	USGS (1991c)
USGS Monitoring Data –National Water Quality Monitoring Council, Sediment	no	no	no	USGS (1991d)
USGS Monitoring Data –National Water Quality Monitoring Council, Soil	no	no	no	USGS (1991e)
USGS Monitoring Data –National Water Quality Monitoring Council, Surface Water	no	no	no	USGS (1991f)
USGS Monitoring Data –National Water Quality Monitoring Council, Tissue	no	no	no	USGS (1991g)

^a Concen.= concentration

^b Biomon.= biomonitoring

According to [ATSDR \(1999\)](#), concentrations of formaldehyde in indoor air are usually higher than outdoors, but there is uncertainty in current exposures because available studies were conducted before changes in construction methods lead to a reduction in formaldehyde-releasing building materials, and changes in manufacturing methods resulted in decreased formaldehyde emission levels in finished products.

9. Other risk-based criteria that EPA determines to be relevant to the designation of the chemical substance's priority

EPA did not identify other risk-based criteria relevant to the designation of the chemical substance's priority.

10. Proposed designation and Rationale

Proposed designation: High-priority

Rationale: EPA identified and analyzed reasonably available information for exposure and hazard and is proposing to find that formaldehyde may present an unreasonable risk of injury to health and/or the environment, including potentially exposed or susceptible subpopulations, (e.g., workers, consumers and children). This is based on the potential hazard and potential exposure of formaldehyde under the conditions of use described in this document to support the prioritization designation. Specifically, EPA expects that the manufacturing, processing, distribution, use, and disposal of formaldehyde may result in presence of the chemical in surface water and groundwater, ingestion of the chemical in drinking water, inhalation of the chemical from air releases and exposure to workers and exposure to the general population, including exposure to children. In addition, EPA expects potential environmental (e.g., aquatic toxicity, terrestrial toxicity) and human health hazards (e.g., acute toxicity, irritation/corrosion in the upper respiratory tract, eyes and skin; dermal and respiratory sensitization, carcinogenicity, and genetic toxicity).

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Note: All hyperlinked in-text citations are also listed below

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