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The Vermont Department of Health (Health Department) maintains a list of chemical-specific guidance values that may be used in the evaluation of drinking water supplies. This list is referred to as the Drinking Water Guidance document (Guidance). Chemicals are added at the request of other State of Vermont offices, in response to public concerns or as deemed appropriate by the Health Department.

This memo provides an overview of the source of values in the Guidance, the approach used by the Health Department to develop values, and how the Guidance is currently employed by other State of Vermont programs. The current Guidance in its entirety is included as Attachment 1a.

Each guidance value is based upon the best available information at the time of derivation thus is subject to change as updated information and risk assessment methodologies become available.

Source of Drinking Water Guidance Values

Three types of values are included in the Guidance. Collectively, these provide critical information for use in the evaluation of potential health implications that may be associated with exposure to chemicals in tap water.

- Primary Maximum Contaminant Levels (**MCL**s) are legally enforceable standards promulgated by the United States Environmental Protection Agency (U.S. EPA) for use in the regulation of public water systems. Each value represents the highest level of a chemical that is allowed in a public drinking water supply. An MCL reflects consideration of public health concerns due to exposure via ingestion as drinking water and potentially other factors such as cost-benefit analysis, detection limit, and best available treatment technology. MCLs are derived for chemicals with carcinogenic and adverse non-carcinogenic health endpoints. For each chemical with an MCL, that value is used as the drinking water guidance value except in limited cases described below.

- Vermont Health Advisories (**VHA**s) are numeric guidelines researched and derived by the Health Department for chemicals that do not have an MCL. A VHA reflects consideration of public health concerns and analytical laboratory reporting limits. VHAs consider ingestion exposure for all chemicals as well as potential exposure via inhalation of vapors due to household water use for those chemicals that may easily volatilize. VHAs are derived for chemicals with carcinogenic and adverse non-carcinogenic health endpoints. If a VHA is exceeded it does not necessarily follow that that adverse health effects may occur, but exposure should be minimized while further evaluation of the water supply is conducted.

- Vermont Action Levels (**VAL**s) are numeric guidelines researched and derived by the Health Department for a small number of chemicals that have MCLs but are of specific public health interest for Vermont Public Water Systems. Thus, these few chemicals have both a U.S. EPA MCL and a Health Department derived value. The latter is always the more restrictive. The term VAL is used to distinguish these values from those derived by the Health Department for chemicals that do not have an MCL. VALs are concentrations at or above which a specific (priority) procedure will be followed in order to provide adequate protection of public health. Per a 2014 Memorandum of Agreement (MOA) (Attachment 2), the Health Department may derive VALs for benzene, carbon tetrachloride, dibromochloropropane, 1,2-dichloroethane, 1,2-dichloropropane, hexachlorobenzene, pentachlorophenol, tetrachloroethylene, trichloroethylene and vinyl chloride. The process employed to derive VALs is the same as that for VHAs.

In addition, U.S. EPA has also established non-mandatory National Secondary Drinking Water Regulations, referred to as secondary maximum contaminant levels (SMCLs), for 15 contaminants. These values, included in Attachment 1c, are non-enforceable guidelines that may assist public water systems in managing their drinking water for aesthetic considerations (such as taste, color, and odor) and/or cosmetic effects (such as tooth or skin discoloration) (EPA 2018; EPA 2024a).

Health Department VHA/VAL Derivation Process

In general, drinking water guidance values derived by the Health Department (VHAs and VALs) are generated by combining current toxicity values (*e.g.*, oral reference doses, inhalation reference concentrations, oral cancer slope factors and inhalation unit risks) with a hypothetical residential exposure scenario using standard point estimate risk assessment procedures to derive an estimate of the concentration of **each** individual chemical or in limited instances, group of chemicals, in tap water that corresponds to a fixed level of risk i.e., a target hazard quotient (HQ) of one for noncarcinogenic (systemic) effects or an incremental lifetime cancer risk (ILCR) of one-in-one million (1×10^{-6}). Where a chemical is known to have both noncarcinogenic and carcinogenic effects and toxicity values are available, a value is derived based on each endpoint with the most appropriate reported as the guidance.

Direct exposure via ingestion as drinking water is considered for all chemicals. In addition, inhalation of volatiles due to routine household water use is considered for those chemicals with a vapor pressure greater than one millimeter of mercury or a Henry's Law constant greater than or equal to 1×10^{-5} atmosphere-cubic meter/mole (atm-m^3/mol) as these may easily volatilize. Similar criteria are used in current EPA practice (EPA 2024b).

Ingestion of drinking water is an appropriate pathway for all chemicals. The inhalation exposure route is only calculated for volatile compounds. Activities such as showering, laundering, and dish washing contribute to contaminants in the air for inhalation.

To estimate inhalation exposure due to household water use an upper bound volatilization factor of 0.5 Liters/cubic meter (L/m^3) is used. This value was developed using several assumptions including: volume of water used in a residence for a family of four is 720 L/day, volume of dwelling is 150,000 L, air exchange rate is 0.25 m^3/hour, and average transfer efficiency weighted by water use is 50 percent, i.e., 50 percent of the concentration of a volatile chemical present in water will be transferred into air by all household uses (Andelman 1990, as presented in EPA 1991). Review of the Andelman work and extensive conversations with local water use authorities indicates the resulting factor is reasonable and appropriate for use.

Estimates of chemical-specific physical properties, such as Henry's Law constant and vapor pressure, are primarily obtained using the sources and hierarchy defined in the RSL Users Guide (EPA 2024b).

For most chemicals, each chemical or group of chemicals is evaluated in isolation. Simultaneous exposure to more than one chemical or group of chemicals in water, exposure via other viable pathways (e.g., dermal), and exposure to other chemicals in other environmental media are not considered. Existing background concentrations of naturally occurring inorganics are generally not taken into account. When found in drinking water, the per and polyfluoroalkylated substances (PFAS) are also evaluated as a cumulative exposure using the hazard index (HI) approach. Vermont has described implementation of the HI approach for PFAS in drinking water in "Vermont Health-Based Water Concentrations for PFAS", Health 2024 (Attachment 1d).

In some cases, it is possible that the Health Department derived value may be below naturally occurring levels. In the event a derived value is found to be less than a reasonable analytical laboratory reporting limit, the guidance is set equal to the reporting limit.

Toxicity

Toxicity information and oral and inhalation toxicity values are obtained from appropriate sources including:

- U.S. EPA Integrated Risk Information System
- U.S. EPA Office of Pesticide Programs
- U.S. EPA Office of Research and Development/National Center for Environmental Assessment/Superfund Health Risk Technical Support Center (STSC) Provisional Peer Reviewed Toxicity Values
- International Agency for Research on Cancer
- National Toxicology Program
- California EPA Office of Environmental Health Hazard Assessment
- California Department of Pesticide Regulation
- Agency for Toxic Substances and Disease Registry

In limited instances where no peer reviewed toxicity value is available, the open literature and/or studies provided directly to the Health Department may be considered in the development of a noncancer (threshold based) oral toxicity value for use in the derivation of a guidance value.

Mutagenic Mode of Action

Consistent with U.S. EPA guidance (EPA, 2005a), multipliers termed Age Dependent Adjustment Factors (ADAFs) are used in the evaluation of carcinogens identified by U.S. EPA to operate via a mutagenic mode of action. Per the guidance, ADAFs "…reflect the potential for early-life exposure to make a greater contribution to the cancers appearing later in life."

Chemical-specific ADAFs are used if available, otherwise, the following default adjustments provided by U.S. EPA are used:

- A 10-fold increase for exposures between the day of birth up until the second birthday.
- A 3-fold increase for exposures between the second birthday up until the sixteenth birthday.
- No adjustment is made for exposures occurring after turning 16 years of age.

Food Quality Protection Act Safety Factor

The Food Quality Protection Act (FQPA) of 1996 amended the Federal Insecticide, Fungicide and Rodenticide Act and the Federal Food, Drugs and Cosmetic Act and significantly revised the way in which pesticides are evaluated by the U.S. EPA. The FQPA mandates that "in the case of threshold effects, an additional tenfold margin of safety for the pesticide chemical residue and other sources of exposure shall be applied for infants and children to take into account potential pre- and post-natal toxicity and completeness of data with respect to exposure and toxicity to infants and children. Notwithstanding such requirement for an additional margin of safety, the Administrator [of the U.S. EPA] may use a different margin of safety for the pesticide chemical residue only if, on the basis of reliable data, such margin will be safe for infants and children" (FQPA, 1996).

Drinking water guidance values derived by the Health Department for pesticides with threshold type effects may reflect incorporation of a U.S. EPA derived FQPA Safety Factor (SF). The magnitude of the FQPA SF employed is noted in Attachment 1b.

Drinking Water Exposure

Several conservative assumptions are made in estimating the potential intake of a chemical in tap water. The magnitude and frequency of exposure will vary depending on individual circumstances. The use of health protective assumptions, which tend to represent reasonable upper bound estimates for longer-term exposures, adds additional conservatism to the guidance values derived.

A summary of the exposure assumptions and factors employed in the development of VHAs and VALs is presented in Table 1. A 70-year age-weighted approach (birth to age 70 years) is employed in the assessment of carcinogens while a hypothetical young child is generally the focus of noncarcinogenic evaluations. All chemical specific inputs are presented in Attachment 1b.

Body Weight Adjusted Water Ingestion Rate (BW_AIR)

Consistent with EPA risk assessment guidance, the 95th percentile per capita BW_AIR for each age group is the combined direct and indirect water intake from community water supplies (consumers only). The BW_AIR that corresponds to the age group of interest for a particular chemical is used in the development of the guidance value, as presented in Attachment 1b.

- The default BW_AIR is for the infant of zero to less than one year old; 0.190 liters of water per kilogram of body weight per day (L/kg-d). The 95th percentile intake rate from EPA Exposure Factor Handbook Chapter 3 Drinking Water Ingestion 2019 Update Table 3.5 Recommended Values for Water Ingestion Rates of Community Water for Formula-Fed Infants (consumers only).

- If the chemical has a quantitative background intake level reported by EPA, then the intake rate for the corresponding age group with the highest background exposure is used.

- For estimation of exposure for cancer causing chemicals with a non-threshold, non-mutagenic mode of action the lifetime BW_AIR of 0.044 L/kg-day is used. This represents the 95th percentile for all ages for direct and indirect water ingestion from community water (consumers only), (EPA 2019).

Relative Source Contribution

Consistent with U.S. EPA guidance (EPA 2000), a Relative Source Contribution (RSC) is incorporated in the development of a VHA or VAL for chemicals with noncarcinogenic health effects. The RSC represents the portion of an individual's total daily exposure to a specific chemical that is attributed to drinking water. In keeping with the established methodology, a factor generally ranging between 20 and 80 percent is used.

Additionally, the EPA Office of Pesticide Programs (OPP) has conducted extensive modeling efforts and derived conservative, age group specific, quantitative estimates of dietary exposure (and in some cases other significant sources of exposure) for many pesticides. In such instances, the chemical-specific oral toxicity value may be adjusted and an RSC employed that reflects this consideration. Overall, use of this approach which incorporates more refined, realistic estimates of potential exposure while providing adequate protection of public health was deemed preferable to using a standard default RSC of 20 percent.

Equations

Endpoint and exposure route specific equations used in development of Health Department derived guidance values are presented in Figure 1. These equations combine chemical-specific toxicity information with scenario-specific exposure assumptions to estimate a level in tap water that corresponds to a fixed level of risk i.e., a target HQ of 1.0 or ILCR of 1×10^{-6}.

Interagency Application

As of this writing, the Vermont Agency of Natural Resources (ANR) Environmental Protection Rules (Rules) dictate that Groundwater Quality Standards be adopted. Values presented in the Health Department's Drinking Water Guidance serve as the basis of the ANR Primary Groundwater Quality Standards.

In Chapter 12 of the Rules, entitled the Groundwater Protection Rule and Strategy (VGPRS 2019), it is specified that the Primary Groundwater Quality Standard (a.k.a. Primary Groundwater Quality Enforcement Standard henceforth Enforcement Standard) for a chemical will be set equal to the U.S. MCL, or if one does not exist, equal to a Health Department derived VHA.

As previously described, a small group of chemicals may have both a U.S. EPA MCL and a Health Department derived value termed a VAL. Per the December 2014 MOA (Attachment 2), in such cases, the VAL is to be used as the Enforcement Standard.

The GPRS also requires that a Preventive Action Level (PAL) be established for each chemical. A PAL is established "in order to provide early warning of a potential exceedance of the groundwater enforcement standards, a preventive action level contained in Appendix One has been adopted and established for each groundwater enforcement standard". It is specified that the PAL be set equal to one-tenth the groundwater enforcement standard for those chemicals deemed to possess carcinogenic, mutagenic, or developmental toxicity properties, and to one-half for all other chemicals. In those instances where a calculated PAL is below the analytical laboratory reporting limit for the chemical in question, the PAL will be established as the reporting limit. The Health Department provides ANR with recommended PALs. Section 12-607 details responses that may be taken when a PAL is reached or exceeded. Enforcement Standards and corresponding PALs are listed in Appendix One, Table 1 of the GPRS.

Per Section 12-103, Applicability, provisions of the GPRS apply to all ANR permit and regulatory programs that control activities which may affect groundwater. This helps ensure that an adequate and consistent level of public health protection is provided across state programs.

For example, in Chapter 21 of the Rules, entitled, the Vermont Water Supply Rule (VWSR 2024), Chapter 21-6.15 provides that the Secretary of ANR may adopt a Health Department derived VHA for a contaminant which may be detected in a public water system and for which no U.S. EPA MCL has been established.

Additionally, Section IV Vermont Agency of Agriculture, Food and Markets Regulations for Control of Pesticides in Accordance with 5 V.S.A. § 1104 (VAAFM 2023) which specifies restrictions on the use of pesticides in the state of Vermont. All pesticide applicators and licensed companies shall use pesticides so as not to exceed the primary groundwater quality enforcement standards identified in Appendix One of the GPRS in accordance with 10 V.S.A. Chapter 48, and shall manage the use of pesticides to reduce the concentration of pesticides in groundwater to the PAL established in Section 5.02 of the GPRS when monitoring indicates the presence of pesticide concentrations in groundwater that exceed the PALs.

Table 1
Vermont Department of Health Derived Values
Exposure Assumptions, Parameter Values and Factors

SYMBOL	DEFINITION (units)	VALUE
VV	Vermont Value [Vermont Health Advisory (VHA) or Vermont Action Level (VAL)]	Chemical-Specific
VV_{ING}	Value based on ingestion	Chemical-Specific
VV_{INH}	Value based on inhalation of vapors (due to routine household water use)	Chemical-Specific
$VV_{ING,INH}$	Value based on ingestion and inhalation combined	Chemical-Specific
K	Andelman Volatilization Factor (L/m^3)	0.5
ET	Exposure Time (inhalation) (hours/24 hours)	24
EF	Exposure Frequency (days/365 days)	365
ED	Exposure Duration (years):	
ED_c	Carcinogens (nonthreshold)	70
ED_n	Noncarcinogens (threshold toxicants)	Age Group Specific
AT	Averaging Time (years):	
AT_c	Carcinogens (nonthreshold; lifetime)	70
AT_n	Noncarcinogens (threshold toxicants)	Age Group Specific
BW_AIR	Body Weight Adjusted Water Ingestion Rate (L/kg-d):	
	Over All Ages	0.044
	Women of Childbearing Age (15 – 44 years)	0.045
	Infant (Birth -<1 year)	0.190
ADAF	Age Dependent Adjustment Factors (EPA default values):	
	Birth - < 2 years	10
	2 - < 16 years	3
	16 years$^+$	1
RSC	Relative Source Contribution (unitless)	Chemical-Specific
RfD_o	Chronic Oral Reference Dose (mg/kg-d)	Chemical-Specific
RfC	Chronic Inhalation Reference Concentration (mg/m^3)	Chemical-Specific
CSF_o	Oral Cancer Slope Factor $(mg/kg\text{-}d)^{-1}$	Chemical-Specific
IUR	Inhalation Unit Risk $(\mu g/m^3)^{-1}$	Chemical-Specific
TR	Target Incremental Lifetime Cancer Risk (unitless)	1×10^{-6}
THQ	Target Hazard Quotient (unitless)	1

Figure 1. Endpoint and exposure route specific Vermont Value equations.

1. Carcinogenic Endpoint

Ingestion

$$VV_{ING}\left(\frac{\mu g}{L}\right) = \frac{TR \times AT_c(70\ yrs) \times 10^3 \frac{\mu g}{mg}}{BW_A IR\left(\frac{L}{kg-d}\right) \times EF\left(\frac{365d}{365d}\right) \times ED_c\ (70\ yrs) \times CSF_0\left(\frac{mg}{kg-day}\right)^{-1}}$$

simplifies to $\frac{TR \times 10^3 \frac{\mu g}{mg}}{BW_A IR\left(\frac{L}{kg-d}\right) \times CSF_0\left(\frac{mg}{kg-day}\right)^{-1}}$

Inhalation

$$VV_{INH}\left(\frac{\mu g}{L}\right) = \frac{TR \times AT_c(70\ yrs)}{EF\left(\frac{365d}{365d}\right) \times ET\left(\frac{24hrs}{24hrs}\right) \times ED_c(70\ yrs) \times K\left(0.5\ \frac{L}{m^3}\right) \times IUR\left(\frac{\mu g}{m^3}\right)^{-1}}$$

simplifies to $\frac{TR}{K(0.5\frac{L}{m^3}) \times IUR\left(\frac{\mu g}{m^3}\right)^{-1}}$

Combined Routes of Exposure

$$VV_{ING,INH}\left(\frac{\mu g}{L}\right) = \frac{1}{\frac{1}{VV_{ING}} + \frac{1}{VV_{INH}}}$$

2. Carcinogenic via Mutagenic Mode of Action and EPA Default ADAFs used

Ingestion

$$VV_{ING} = \frac{TR \times AT(70yrs \times 365\frac{d}{yr}) \times 1000 \mu g/mg}{CSF_o(\frac{mg}{kg-d})^{-1} \times EF(365\frac{d}{yr}) \times IFWM_{ADJ}(6.598\frac{L-yr}{kg-d})}$$

where $IFWM_{ADJ}$ (L-yr/kg-d) =

$$\left(ED_{0-<2yr} \times BW_A IR_{0-<2yr} \frac{L}{kg-d} \times 10\right) +$$
$$\left(ED_{2-<6yrs} \times BW_A IR_{2-<6yrs} \frac{L}{kg-d} \times 3\right) +$$
$$\left(ED_{6-<16yrs} \times BW_A IR_{6-<16yrs} \frac{L}{kg-d} \times 3\right) +$$
$$\left(ED_{16-<70yrs} \times BW_A IR_{16-<70yrs} \frac{L}{kg-d} \times 1\right)$$

Inhalation

$VV_{INH=}$

$$\frac{TR \times AT(70yrs \times 365\frac{d}{yr})}{EF(365\frac{d}{yr}) \times K(0.5\frac{L}{m^3}) \times ET(\frac{24hrs}{24hrs}) \times [(ED_{0-<2yr} \times IUR(\frac{\mu g}{m^3})^{-1} \times 10) + (ED_{2-<6yrs} \times IUR(\frac{\mu g}{m^3})^{-1} \times 3) + (ED_{6-<16yrs} \times IUR(\frac{\mu g}{m^3})^{-1} \times 3) + (ED_{16-<70yrs} \times IUR(\frac{\mu g}{m^3})^{-1} \times 1)]}$$

Combined Routes of Exposure

$$VV_{ING,INH}\left(\frac{\mu g}{L}\right) = \frac{1}{\frac{1}{VV_{ING}} + \frac{1}{VV_{INH}}}$$

3. Noncarcinogenic Endpoint

Ingestion

$$VV_{ING}\left(\frac{\mu g}{L}\right) = \frac{THQ \times AT_n\,(yrs) \times RfD_o\left(\frac{mg}{kg-d}\right) \times 1000\ \frac{\mu g}{mg}}{BW_A IR\left(\frac{L}{kg-d}\right) \times EF\left(\frac{365d}{365d}\right) \times ED_n\,(yrs)} \times RSC^*$$

simplifies to $\frac{THQ \times RfD_o(\frac{mg}{kg-d}) \times 10^3\ \frac{\mu g}{mg}}{BW_A IR\left(\frac{L}{kg-d}\right)} \times RSC^*$

*RSC applied only here If VV is based solely on ingestion

Inhalation

$$VV_{INH}\left(\frac{\mu g}{L}\right) = \frac{THQ \times AT_n\,(yrs) \times RfC(\frac{mg}{m^3}) \times 10^3\ \frac{\mu g}{mg}}{EF\left(\frac{365d}{365d}\right) \times ED_n\,(yrs) * K(0.5\frac{L}{m^3})} \times RSC^*$$

simplifies to $\frac{THQ \times RfC(\frac{mg}{m^3}) \times 10^3\ \frac{\mu g}{mg}}{K\left(0.5\frac{L}{m^3}\right)} \times RSC^*$

*RSC applied only here If VV is based solely on inhalation of vapors due to routine household water use

Combined Routes of Exposure

$$VV_{ING,INH}\left(\frac{\mu g}{L}\right) = \frac{1}{\frac{1}{VV_{ING}} + \frac{1}{VV_{INH}}} \times RSC^*$$

*RSC applied only here if VV is based on combined routes of exposure

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Attachments

Attachment 1a Drinking Water Guidance
Attachment 1b Calculations with Chemical Specific Inputs
Attachment 1c USEPA Secondary MCLs
Attachment 1d Vermont Health Based Water Concentrations for PFAS
Attachment 2 2014 Health DEC MOA

DRINKING WATER GUIDANCE

Chemical Name	CAS No.	VHA (µg/L)[a]	VAL (µg/L)[a]	MCL (µg/L)[a]
Acetone	67-64-1	880		
Acifluorfen, sodium	62476-59-9	4.6		
Alachlor	15972-60-8			2
Aldicarb	116-06-3	1(b)		
Aldicarb sulfone	1646-88-4	1(b)		
Aldicarb sulfoxide	1646-87-3	1(b)		
Aldrin	309-00-2	0.10		
Ametryn	834-12-8	227		
Aminoethyl ethanolamine (AEEA)	111-41-1	4.2		
Ammonium sulfamate	7773-06-0	842		
Anatoxin-a	64285-06-9	0.50		
Anthracene	120-12-7	316		
Antimony	7440-36-0			6
Arsenic	7440-38-2			10
Asbestos	1332-21-4			7E+6 fibers/L (longer than 10µm)
Atrazine	1912-24-9			3
Azoxystrobin	131860-33-8	514		
Barium	7440-39-3			2000
Bendiocarb	22781-23-3	1.5		
Benefin (Benfluralin)	1861-40-1	5.1		
Benomyl	17804-35-2	9.5		
Bensulide	741-58-2	14		
Bentazon	25057-89-0	417		
Benzene	71-43-2		0.5	5
Benzo(a)pyrene	50-32-8			0.2
Beryllium	7440-41-7			4
Bis(2-chloro-1-methyl ethyl) ether	108-60-1	42		
Bispyribac sodium	125401-92-5	276		
Boron	7440-42-8	211		
Boscalid	188425-85-6	513		
Bromacil	314-40-9	102		
Bromate	15541-45-4			10
Bromochloromethane	74-97-5	7.4		
Bromomethane (Methyl bromide)	74-83-9	4.7		
Bromoxynil	1689-84-5	1.0		
Butylate	2008-41-5	105		
Cadmium	7440-43-9			5
Carbaryl	63-25-2	26		
Carbofuran	1563-66-2			40
Carbon tetrachloride	56-23-5		0.5	5
Carboxin	5234-68-4	21		
Carfentrazone ethyl	128639-02-1	44		
Chloramben	133-90-4	63		
Chlorantraniliprole	500008-45-7	4797		
Chlordane	12789-03-6			2
Chlorflurenol	2536-31-4	421		
Chlorine	7782-50-5			4000(c)
Chlorite	7758-19-2			1000
Chlorobenzene	108-90-7			100
Chlorothalonil	1897-45-6	10		
Chlorpyrifos	2921-88-2	20		
Chromium (total)	7440-47-3			100
Copper (at tap)	7440-50-8			
Cyanazine	21725-46-2	0.02		
Cyanide	143-33-9			200
Cylindrospermopsin	NA	0.42		
Dalapon	75-99-0			200
Dazomet	533-74-4	3.0		
Di(2-ethylhexyl)adipate	103-23-1			400
Di(2-ethylhexyl)phthalate	117-81-7			6
Diazinon	333-41-5	0.71		
Dibromochloropropane	96-12-8		0.02	0.2
Dichlorobenzene (meta)	541-73-1	600(e)		
Dichlorobenzene (ortho)	95-50-1			600
Dichlorobenzene (para)	106-46-7			75
Dichloroethane (1,1)	75-34-3	1.0		
Dichloroethane (1,2)	107-06-2		0.5	5
Dichloroethene (1,1)	75-35-4			7
Dichloroethene (cis-1,2)	156-59-2			70
Dichloroethene (trans-1,2)	156-60-5			100
Dichlorophenoxyacetic acid (2,4)	94-75-7			70
Dichloroprop	120-36-5	133		
Dichloropropane (1,2)	78-87-5		0.5	5
Dieldrin	60-57-1	0.02		
Diethylenetriamine (DETA)	111-40-0	1248		
Dimethrin	70-38-2			2000(k)

Chemical Name	CAS No.	VHA (µg/L)[a]	VAL (µg/L)[a]	MCL (µg/L)[a]
Dinoseb	88-85-7			7
Dioxane (1,4)	123-91-1	0.30		
Diphenamid	957-51-7			200(k)
Diquat	85-00-7			20
Disulfoton	298-04-4	0.30		
Diuron	330-54-1	1.2		
Endothall	145-73-3			100
Endrin	72-20-8			2
Erioglaucine	2650-18-2	6642		
Ethylbenzene	100-41-4			700
Ethylene dibromide	106-93-4			0.05
Fenamiphos	22224-92-6	0.20		
Fluoranthene	206-44-0	42		
Fluorene	86-73-7	42		
Fluoride	7681-49-4			4000
Fluxapyroxad	907204-31-3	41		
Fonofos	944-22-9			10(k)
Formaldehyde	50-00-0			1000(k)
Glyphosate	1071-83-6			700
Gross Alpha (adjusted)	NA			15 pCi/L(f)
Haloacetic acids (total)	NA			60
Halofenozide	112226-61-6	42		
Heptachlor	76-44-8			0.4
Heptachlor epoxide	1024-57-3			0.2
Hexachlorobenzene	118-74-1		0.1	1
Hexachlorocyclopentadiene	77-47-4			50
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	0.30		
Hexafluoropropylene oxide dimer acid (HFPO-DA) (GenX)	13252-13-6			0.01
Lead (at tap)	7439-92-1	15(d)		
Lead	7439-92-1	1.0		
Lindane	58-89-9			0.2
Maneb	12427-38-2	0.50		
Manganese	7439-96-5			300
Mercury (inorganic)	7487-94-7			2
Methoxychlor	72-43-5			40
Methyl ethyl ketone	78-93-3	480		
Methyl parathion	298-00-0	1.1		
Methyl tert butyl ether (MTBE)	1634-04-4	4.8		
Methylene chloride	75-09-2			5
Metolachlor	51218-45-2	274		
Microcystin	NA	0.30		
Molybdenum	7439-98-7	5.3		
Monochloramine	10599-90-3			4000(c)
Naphthalene	91-20-3	0.50		
Nickel	7440-02-0	21		
Nitrate (as N)	14797-55-8			10000
Nitrates/Nitrites (total)	NA			10000
Nitrite (as N)	14797-65-0			1000
o-Phenylphenol (OPP)	90-43-7	764		
Octahydro-1,3,5,7-tetranitro-1,2,3,5,7-tetrazocine (HMX)	2691-41-0	53		
Oxamyl	23135-22-0			200
Paraquat	1910-42-5	30		
Pentachlorophenol	87-86-5		0.1	1
Pentaerythriol tetranitrate (PETN)	78-11-5	2.1		
Perchlorate	1479-73-0	2.2		
PFAS Hazard Index VHA	see Attachment 1d			
Perfluorohexanesulfonic acid (PFHxS)	355-46-4			0.01
Perfluorononanoic acid (PFNA)	375-95-1			0.01
Perfluorooctanesulfonic acid (PFOS)	1763-23-1			0.004
Perfluorooctanoic acid (PFOA)	335-67-1			0.004
Picloram	1918-02-1			500
Polychlorinated Biphenyls	1336-36-3			0.5
Propachlor	1918-16-7	0.71		
Propham	122-42-9			100(k)
Propoxur (Baygon)	114-26-1	4.2		
Radium$^{226\ \&\ 228}$	7440-14-4			5 pCi/L
Radon	010043-92-2	4000 pCi/L (g)		
Selenium	7782-49-2			50
Simazine	122-34-9			4
Styrene	100-42-5			100
Tall oil hydroxyethyl imidazoline	61791-39-7	119		
Tartrazine	1934-21-0	1754		
Tetrachlorodibenzo-p-dioxin (2,3,7,8)	1746-01-6			0.00003
Tetrachloroethane (1,1,1,2)	630-20-6	0.21		
Tetrachloroethylene	127-18-4		1	5
Thallium	7440-28-0			2
Toluene	108-88-3			1000
Toxaphene	8001-35-2			3
Triazole (1,2,4)	288-88-0	20		

Chemical Name	CAS No.	VHA (µg/L)[(a)]	VAL (µg/L)[(a)]	MCL (µg/L)[(a)]
Triazole metabolites (Conjugated)	NA	94.7(h)		
Trichlorobenzene (1,2,3)	87-61-6	0.84		
Trichlorobenzene (1,2,4)	120-82-1			70
Trichloroethane (1,1,1)	71-55-6			200
Trichloroethane (1,1,2)	79-00-5			5
Trichloroethylene	79-01-6		0.5	5
Trichlorophenoxyacetic acid (2,4,5)	93-76-5			70(k)
Trichlorophenoxypropionic acid (2,4,5)	93-72-1			50
Trichloropropane (1,2,3)	96-18-4	0.02		
Triclopyr	55335-06-3	152		
3-Trifluoromethyl-4-nitrophenol (TFM)	88-30-2	95		50
Trihalomethanes (total)	NA			80
Trimethyl benzene (1,2,3)	526-73-8	22.0(i)		
Trimethyl benzene (1,2,4)	95-63-6	22.0(i)		
Trimethyl benzene (1,3,5)	108-67-8	22.0(i)		
Trinitrotoluene (2,4,6) (TNT)	118-96-7	0.53		
Triticonazole	131983-72-7	179		
Uranium	7440-61-1			20(j)
Vinyl chloride	75-01-4		0.5	2
Xylenes	1330-20-7			10000
Zineb	142-14-3	53		

Notes:

NA - Not Applicable

(a) - All units are micrograms per Liter (µg/L) [parts per billion (ppb)] unless otherwise noted.

(b) - Sum of of Aldicarb, Aldicarb sulfone and Aldicarb sulfoxide not to exceed 1 µg/L.

(c) - EPA 1998 Final Rule for Disinfectants and Disinfection By-products Maximum Residual Disinfection (MRDL).

(d) - Copper and Lead are regulated using "Action Levels" (40CFR141.8).

(e) - Value for meta based on data for ortho dichlorobenzene.

(f) - Adjusted excludes Uranium and Radon.

(g)- Water results should be interepreted after air results are obtained.

(h) - Sum of conjugated triazole metabolites (Triazolylalanine, Triazolylacetic acid, and Triazolylpyruvic acid) not to exceed 94.7 µg/L.

(i) - Sum of 1,2,3-TMB, 1,2,4-TMB and 1,3,5-TMB isomers not exceed 22.0 µg/L for VHA.

(j) - Uranium MCL is the Vermont MCL. Federal MCL is 30 µg/L.

(k) - EPA Health Advisory.

Chemical Name	Mutagenic	Reference Dose (RfD) mg/kg-day	Dietary Intake mg/kg-day	Relative Source Contribution (RSC)	Sensitive receptor	Noncancer BWAIR Ingestion rate L/kg-day	Noncancer Ingestion (no RSC) µg/L	Noncancer Ingestion (with RSC) µg/L	Reference Concentration (RfC) mg/m3	Noncancer Inhalation µg/L (no RSC)	Noncancer Combined Routes µg/L
Acetone	No	9.0E-01	-	0.2	Infant 0<1	0.19	4.74E+03	9.47E+02	3.1E+01	6.17E+04	8.80E+02
Acifluorfen, sodium	No	1.4E-03	1.00E-06	0.6	Infant 0<1	0.19	7.60E+00	4.56E+00	-	-	4.56E+00
Alachlor	No	2.1E-03	-	0.2	Infant 0<1	0.19	1.10E+01	2.19E+00	-	-	2.19E+00
Aldicarb	No	2.1E-04	7.30E-05	0.6	Infant 0<1	0.19	7.12E-01	4.27E-01	-	-	4.27E-01
Aldicarb sulfone	No	2.1E-04	7.30E-05	0.6	Infant 0<1	0.19	7.12E-01	4.27E-01	-	-	4.27E-01
Aldicarb sulfoxide	No	2.7E-04	7.30E-05	0.6	Infant 0<1	0.19	1.04E+00	6.22E-01	-	-	6.22E-01
Aldrin	No	3.0E-05	-	0.2	Infant 0<1	0.19	1.58E-01	3.16E-02	-	-	3.16E-02
Ametryn	No	7.2E-02	8.00E-06	0.6	Infant 0<1	0.19	3.79E+02	2.27E+02	-	-	2.27E+02
Aminoethyl ethanolamine (AEEA)	No	1.0E-03	-	0.8	Infant 0<1	0.19	5.26E+00	4.21E+00	-	-	4.21E+00
Ammonium sulfamate	No	2.0E-01	-	0.8	Infant 0<1	0.19	1.05E+03	8.42E+02	-	-	8.42E+02
Anatoxin-a	No	5.0E-05	-	0.8	Infant 0<1	0.19	2.63E-01	2.11E-01	-	-	2.11E-01
Anthracene	No	3.0E-01	-	0.2	Infant 0<1	0.19	1.58E+03	3.16E+02	-	-	3.16E+02
Antimony	No	4.0E-04	-	0.2	Infant 0<1	0.19	2.11E+00	4.21E-01	3.0E-04	6.00E-01	9.34E-02
Arsenic	No	3.0E-04	-	0.2	Infant 0<1	0.19	1.58E+00	3.16E-01	1.5E-05	3.00E-02	5.89E-03
Atrazine	No	3.0E-03	-	0.2	Infant 0<1	0.19	1.58E+01	3.16E+00	-	-	3.16E+00
Azoxystrobin	No	1.8E-01	1.72E-02	0.6	Infant 0<1	0.19	8.57E+02	5.14E+02	-	-	5.14E+02
Barium	No	2.0E-01	-	0.2	Infant 0<1	0.19	1.05E+03	2.11E+02	5.0E-04	1.00E+00	2.00E-01
Bendiocarb	No	4.2E-04	5.46E-05	0.8	Infant 0<1	0.19	1.91E+00	1.52E+00	-	-	1.52E+00
Benefin (Benfluralin)	No	1.7E-03	5.00E-05	0.6	Infant 0<1	0.19	8.51E+00	5.11E+00	-	-	5.11E+00
Benomyl	No	1.3E-02	-	0.2	Infant 0<1	0.19	6.84E+01	1.37E+01	-	-	1.37E+01
Bensulide	No	5.0E-03	4.42E-04	0.6	Infant 0<1	0.19	2.40E+01	1.44E+01	-	-	1.44E+01
Bentazon	No	1.5E-01	1.78E-02	0.6	Infant 0<1	0.19	6.96E+02	4.17E+02	-	-	4.17E+02
Benzene	No	4.0E-03	-	0.2	Infant 0<1	0.19	2.11E+01	4.21E+00	3.0E-02	6.00E+01	3.12E+00
Benzo(a)pyrene	Yes	3.0E-04	-	0.2	Infant 0<1	0.19	1.58E+00	3.16E-01	2.0E-06	4.00E-03	7.98E-04
Beryllium	No	2.0E-03	-	0.2	Infant 0<1	0.19	1.05E+01	2.11E+00	2.0E-05	4.00E-02	7.97E-03
Bis(2-chloro-1-methyl ethyl) ether	No	4.0E-02	-	0.2	Infant 0<1	0.19	2.11E+02	4.21E+01	-	-	4.21E+01
Bispyribac sodium	No	1.0E-01	1.25E-02	0.6	Infant 0<1	0.19	4.61E+02	2.76E+02	-	-	2.76E+02
Boron	No	2.0E-01	-	0.2	Infant 0<1	0.19	1.05E+03	2.11E+02	-	-	2.11E+02
Boscalid	No	2.2E-01	5.55E-02	0.6	Infant 0<1	0.19	8.55E+02	5.13E+02	-	-	5.13E+02
Bromacil	No	3.3E-02	1.00E-03	0.6	Infant 0<1	0.19	1.70E+02	1.02E+02	-	-	1.02E+02
Bromate	No	4.0E-03	-	0.6	Infant 0<1	0.19	2.11E+01	1.26E+01	-	-	1.26E+01
Bromochloromethane	No	1.3E-02	-	0.2	Infant 0<1	0.19	6.84E+01	1.37E+01	4.0E-02	8.00E+01	7.38E+00
Bromomethane (Methyl bromide)	No	7.3E-03	2.47E-04	0.6	Infant 0<1	0.19	3.73E+01	2.24E+01	5.0E-03	1.00E+01	4.73E+00
Bromoxynil	No	1.5E-02	-	0.2	Infant 0<1	0.19	7.89E+01	1.58E+01	-	-	1.58E+01
Butylate	No	5.0E-02	3.10E-04	0.4	Infant 0<1	0.19	2.62E+02	1.05E+02	-	-	1.05E+02
Cadmium	No	5.0E-04	-	0.2	Infant 0<1	0.19	2.63E+00	5.26E-01	1.0E-05	2.00E-02	3.97E-03
Carbaryl	No	1.0E-02	5.50E-05	0.6	Infant 0<1	0.19	5.23E+01	3.14E+01	-	-	3.14E+01
Carbofuran	No	5.0E-03	-	0.2	Infant 0<1	0.19	2.63E+01	5.26E+00	-	-	5.26E+00
Carbon tetrachloride	No	4.0E-03	-	0.2	Infant 0<1	0.19	2.11E+01	4.21E+00	1.0E-01	2.00E+02	3.81E+00
Carboxin	No	8.0E-03	1.50E-03	0.6	Infant 0<1	0.19	3.42E+01	2.05E+01	-	-	2.05E+01
Carfentrazone ethyl	No	3.0E-02	1.60E-02	0.6	Infant 0<1	0.19	7.35E+01	4.41E+01	-	-	4.41E+01
Chloramben	No	1.5E-02	-	0.8	Infant 0<1	0.19	7.89E+01	6.32E+01	-	-	6.32E+01
Chlorantraniliprole	No	1.6E+00	6.08E-02	0.6	Infant 0<1	0.19	8.00E+03	4.80E+03	-	-	4.80E+03
Chlordane	No	5.0E-04	-	0.2	Infant 0<1	0.19	2.63E+00	5.26E-01	7.0E-04	1.40E+00	1.83E-01
Chlorflurenol	No	1.0E-01	-	0.8	Infant 0<1	0.19	5.26E+02	4.21E+02	-	-	4.21E+02
Chlorine	No	1.0E-01	-	0.2	Infant 0<1	0.19	5.26E+02	1.05E+02	1.5E-04	2.90E-01	5.80E-02
Chlorite	No	3.0E-02	-	0.6	Infant 0<1	0.19	1.58E+02	9.47E+01	-	-	9.47E+01
Chlorobenzene	No	2.0E-02	-	0.2	Infant 0<1	0.19	1.05E+02	2.11E+01	5.0E-02	1.00E+02	1.03E+01
Chlorothalonil	No	2.0E-02	1.29E-01	0.6	Infant 0<1	0.19	-5.76E+02	-3.46E+02	-	-	-3.46E+02
Chlorpyrifos	No	2.0E-06	1.86E-04	0.6	Infant 0<1	0.19	-9.68E-01	-5.81E-01	-	-	-5.81E-01
Chromium (total)	No	3.0E-03	-	0.2	Infant 0<1	0.19	1.58E+01	3.16E+00	-	-	3.16E+00
Copper (at tap)	No	4.0E-02	-	0.2	Infant 0<1	0.19	2.11E+02	4.21E+01	-	-	4.21E+01
Cyanazine	No	2.0E-03	-	0.2	Infant 0<1	0.19	1.05E+01	2.11E+00	-	-	2.11E+00
Cyanide	No	1.0E-03	-	0.2	Infant 0<1	0.19	5.26E+00	1.05E+00	9.0E-03	1.80E+01	8.14E-01
Cylindrospermopsin	No	1.0E-04	-	0.8	Infant 0<1	0.19	5.26E-01	4.21E-01	-	-	4.21E-01
Dalapon	No	3.0E-02	-	0.2	Infant 0<1	0.19	1.58E+02	3.16E+01	-	-	3.16E+01
Dazomet	No	-	-	0.8	Infant 0<1	0.19	-	-	1.0E-03	2.00	2.00E+00
Di(2-ethylhexyl)adipate	No	6.0E-01	-	0.2	Infant 0<1	0.19	3.16E+03	6.32E+02	-	-	6.32E+02
Di(2-ethylhexyl)phthalate	No	2.0E-02	-	0.2	Infant 0<1	0.19	1.05E+02	2.11E+01	-	-	2.11E+01
Diazinon	No	3.5E-04	1.25E-04	0.6	Infant 0<1	0.19	1.18E+00	7.11E-01	-	-	7.11E-01
Dibromochloropropane	Yes	2.0E-04	-	0.2	Infant 0<1	0.19	1.05E+00	2.11E-01	2.0E-04	4.00E-01	5.80E-02
Dichlorobenzene (meta)	No	2.0E-03	-	0.2	Infant 0<1	0.19	1.05E+01	2.11E+00	-	-	2.11E+00

Chemical Name	Mutagenic	Reference Dose (RfD) mg/kg-day	Dietary Intake mg/kg-day	Relative Source Contribution (RSC)	Sensitive receptor	Noncancer BWAIR Ingestion rate L/kg-day	Noncancer Ingestion (no RSC) µg/L	Noncancer Ingestion (with RSC) µg/L	Reference Concentration (RfC) mg/m3	Noncancer Inhalation µg/L (no RSC)	Noncancer Combined Routes µg/L
Dichlorobenzene (ortho)	No	9.0E-02	-	0.2	Infant 0<1	0.19	4.74E+02	9.47E+01	2.0E-01	4.00E+02	4.34E+01
Dichlorobenzene (para)	No	7.0E-02	-	0.2	Infant 0<1	0.19	3.68E+02	7.37E+01	8.0E-01	1.60E+03	5.99E+01
Dichloroethane (1,1)	No	2.0E-01	-	0.2	Infant 0<1	0.19	1.05E+03	2.11E+02	-	-	2.11E+02
Dichloroethane (1,2)	No	6.0E-03	-	0.2	Infant 0<1	0.19	3.16E+01	6.32E+00	7.0E-03	1.40E+01	1.94E+00
Dichloroethene (1,1)	No	5.0E-02	-	0.2	Infant 0<1	0.19	2.63E+02	5.26E+01	2.0E-01	4.00E+02	3.17E+01
Dichloroethene (cis-1,2)	No	2.0E-03	-	0.2	Infant 0<1	0.19	1.05E+01	2.11E+00	4.0E-02	8.00E+01	1.86E+00
Dichloroethene (trans-1,2)	No	2.0E-02	-	0.2	Infant 0<1	0.19	1.05E+02	2.11E+01	4.0E-02	8.00E+01	9.09E+00
Dichlorophenoxyacetic acid (2,4)	No	1.0E-02	-	0.2	Infant 0<1	0.19	5.26E+01	1.05E+01	-	-	1.05E+01
Dichloroprop	No	3.6E-02	-	0.7	Infant 0<1	0.19	189.47	1.33E+02	-	-	1.33E+02
Dichloropropane (1,2)	No	4.0E-02	-	0.2	Infant 0<1	0.19	2.11E+02	4.21E+01	4.0E-03	8.00E+00	1.54E+00
Dieldrin	No	5.0E-05	-	0.2	Infant 0<1	0.19	2.63E-01	5.26E-02	-	-	5.26E-02
Diethylenetriamine (DETA)	No	3.0E-01	3.64E-03	0.8	Infant 0<1	0.19	1.56E+03	1.25E+03	-	-	1.25E+03
Dimethrin	No	3.0E-01	-	0.2	Infant 0<1	0.19	1.58E+03	3.16E+02	-	-	3.16E+02
Dinoseb	No	1.0E-03	-	0.2	Infant 0<1	0.19	5.26E+00	1.05E+00	-	-	1.05E+00
Dioxane (1,4)	No	3.0E-02	-	0.2	Infant 0<1	0.19	1.58E+02	3.16E+01	3.0E-02	6.00E+01	8.70E+00
Diphenamid	No	3.0E-02	-	0.2	Infant 0<1	0.19	1.58E+02	3.16E+01	-	-	3.16E+01
Diquat	No	2.2E-03	-	0.2	Infant 0<1	0.19	1.16E+01	2.32E+00	-	-	2.32E+00
Disulfoton	No	1.3E-05	-	0.2	Infant 0<1	0.19	6.84E-02	1.37E-02	-	-	1.37E-02
Diuron	No	3.0E-03	7.70E-05	0.6	Infant 0<1	0.19	1.54E+01	9.23E+00	-	-	9.23E+00
Endothall	No	2.0E-02	-	0.2	Infant 0<1	0.19	1.05E+02	2.11E+01	-	-	2.11E+01
Endrin	No	3.0E-04	-	0.2	Infant 0<1	0.19	1.58E+00	3.16E-01	-	-	3.16E-01
Erioglaucine	No	6.3E+00	-	0.2	Infant 0<1	0.19	3.32E+04	6.64E+03	-	-	6.64E+03
Ethylbenzene	No	5.0E-02	-	0.2	Infant 0<1	0.19	2.63E+02	5.26E+01	1.0E+00	2.00E+03	4.65E+01
Ethylene dibromide	No	9.0E-03	-	0.2	Infant 0<1	0.19	4.74E+01	9.47E+00	9.0E-03	1.80E+01	2.61E+00
Fenamiphos	No	1.0E-05	-	0.2	Infant 0<1	0.19	5.26E-02	1.05E-02	-	-	1.05E-02
Fluoranthene	No	4.0E-02	-	0.2	Infant 0<1	0.19	2.11E+02	4.21E+01	-	-	4.21E+01
Fluorene	No	4.0E-02	-	0.2	Infant 0<1	0.19	2.11E+02	4.21E+01	-	-	4.21E+01
Fluoride	No	5.0E-02	-	0.2	Infant 0<1	0.19	2.63E+02	5.26E+01	1.4E-02	2.80E+01	5.06E+00
Fluxapyroxad	No	2.1E-02	8.06E-03	0.6	Infant 0<1	0.19	6.81E+01	4.09E+01	-	-	4.09E+01
Fonofos	No	2.0E-03	-	0.2	Infant 0<1	0.19	1.05E+01	2.11E+00	-	-	2.11E+00
Formaldehyde	No	2.0E-01	-	0.2	Infant 0<1	0.19	1.05E+03	2.11E+02	9.0E-03	1.80E+01	3.54E+00
Glyphosate	No	1.0E-01	-	0.2	Infant 0<1	0.19	5.26E+02	1.05E+02	-	-	1.05E+02
Halofenozide	No	1.0E-02	-	0.8	Infant 0<1	0.19	5.26E+01	4.21E+01	-	-	4.21E+01
Heptachlor	No	1.0E-04	-	0.2	Infant 0<1	0.19	5.26E-01	1.05E-01	-	-	1.05E-01
Heptachlor epoxide	No	1.3E-05	-	0.2	Infant 0<1	0.19	6.84E-02	1.37E-02	-	-	1.37E-02
Hexachlorobenzene	No	1.0E-05	-	0.2	Infant 0<1	0.19	5.26E-02	1.05E-02	-	-	1.05E-02
Hexachlorocyclopentadiene	No	6.0E-03	-	0.2	Infant 0<1	0.19	3.16E+01	6.32E+00	2.0E-04	4.00E-01	7.90E-02
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	No	4.0E-03	-	0.2	Infant 0<1	0.19	2.11E+01	4.21E+00	-	-	4.21E+00
Hexafluoropropylene oxide dimer acid (HFPO-DA) (GenX)	No	3.0E-06		0.2	Infant 0<1	0.19	1.58E-02	3.16E-03	-	-	3.16E-03
Lindane	No	3.0E-04	-	0.2	Infant 0<1	0.19	1.58E+00	3.16E-01	-	-	3.16E-01
Manganese	No	4.7E-02	-	0.2	Infant 0<1	0.19	2.46E+02	4.91E+01	5.0E-05	1.00E-01	2.00E-02
Mercury (inorganic)	No	3.0E-04	-	0.2	Infant 0<1	0.19	1.58E+00	3.16E-01	3.0E-04	6.00E-01	8.70E-02
Methoxychlor	No	5.0E-03	-	0.2	Infant 0<1	0.19	2.63E+01	5.26E+00	-	-	5.26E+00
Methyl ethyl ketone	No	6.0E-01	-	0.2	Infant 0<1	0.19	3.16E+03	6.32E+02	5.0E+00	1.00E+04	4.80E+02
Maneb	No	2.0E-04	1.80E-04	0.6	Infant 0<1	0.19	0.11	0.06	3.0E-03	6.00E+00	6.21E-02
Methyl parathion	No	2.5E-04	-	0.8	Infant 0<1	0.19	1.32E+00	1.05E+00	-	-	1.05E+00
Methyl tert butyl ether (MTBE)	No	3.6E-02	-	0.2	Infant 0<1	0.19	1.89E+02	3.79E+01	3.0E+00	6.00E+03	3.67E+01
Methylene chloride	Yes	6.0E-03	-	0.2	Infant 0<1	0.19	3.16E+01	6.32E+00	6.0E-01	1.20E+03	6.15E+00
Metolachlor	No	2.6E-01	-	0.2	Infant 0<1	0.19	1.37E+03	2.74E+02	-	-	2.74E+02
Microcystin	No	5.0E-05	-	0.8	Infant 0<1	0.19	2.63E-01	2.11E-01	-	-	2.11E-01
Molybdenum	No	5.0E-03	-	0.2	Infant 0<1	0.19	2.63E+01	5.26E+00	-	-	5.26E+00
Monochloramine	No	1.0E-01	-	0.2	Infant 0<1	0.19	5.26E+02	1.05E+02	-	-	1.05E+02
Naphthalene	No	2.0E-02	-	0.2	Infant 0<1	0.19	1.05E+02	2.11E+01	3.0E-03	6.00E+00	1.14E+00
Nickel	No	2.0E-02	-	0.2	Infant 0<1	0.19	1.05E+02	2.11E+01	-	-	2.11E+01
Nitrate (as N)	No	1.6E+00	-	0.2	Infant 0<1	0.19	8.42E+03	1.68E+03	-	-	1.68E+03
Nitrates/Nitrites (total)	No	1.0E-01	-	0.2	Infant 0<1	0.19	5.26E+02	1.05E+02	-	-	1.05E+02
Nitrite (as N)	No	1.0E-01	-	0.2	Infant 0<1	0.19	5.26E+02	1.05E+02	-	-	1.05E+02
Octahydro-1,3,5,7-tetranitro-1,2,3,5,7-tetrazocine (HMX)	No	5.0E-02	-	0.2	Infant 0<1	0.19	2.63E+02	5.26E+01	-	-	5.26E+01
o-Phenylphenol (OPP)	No	3.9E-01	3.15E-01	0.7	Child 1<3	0.0685	1.09E+03	7.64E+02	-	-	7.64E+02
Oxamyl	No	2.5E-02	-	0.2	Infant 0<1	0.19	1.32E+02	2.63E+01	-	-	2.63E+01
Paraquat	No	5.0E-03	1.25E-03	0.6	Child 1<2	0.075	5.01E+01	3.00E+01	-	-	3.00E+01

Chemical Name	Mutagenic	Reference Dose (RfD) mg/kg-day	Dietary Intake mg/kg-day	Relative Source Contribution (RSC)	Sensitive receptor	Noncancer BWAIR Ingestion rate L/kg-day	Noncancer Ingestion (no RSC) µg/L	Noncancer Ingestion (with RSC) µg/L	Reference Concentration (RfC) mg/m3	Noncancer Inhalation µg/L (no RSC)	Noncancer Combined Routes µg/L
Pentachlorophenol	No	5.0E-03	-	0.2	Infant 0<1	0.19	2.63E+01	5.26E+00	-	-	5.26E+00
Pentaerythriol tetranitrate (PETN)	No	2.0E-03	-	0.2	Infant 0<1	0.19	1.05E+01	2.11E+00	-	-	2.11E+00
Perchlorate	No	7.0E-04	1.00E-04	0.8	Infant 0<6 mo	0.221	2.71E+00	2.17E+00	-	-	2.17E+00
Perfluorohexanesulfonic acid (PFHxS)	No	2.0E-05	-	0.2	Infant 0<1	0.19	1.05E-01	2.11E-02	-	-	2.11E-02
Perfluorononanoic acid (PFNA)	No	3.0E-06	-	0.2	Infant 0<1	0.19	1.58E-02	3.16E-03	-	-	3.16E-03
Perfluorooctanesulfonic acid (PFOS)	No	1.0E-07	-	0.2	Infant 0<1	0.19	5.26E-04	1.05E-04	-	-	1.05E-04
Perfluorooctanoic acid (PFOA)	No	3.0E-08	-	0.2	Infant 0<1	0.19	1.58E-04	3.16E-05	-	-	3.16E-05
Picloram	No	7.0E-02	-	0.2	Infant 0<1	0.19	3.68E+02	7.37E+01	-	-	7.37E+01
Polychlorinated Biphenyls	No	2.0E-05	-	0.2	Infant 0<1	0.19	1.05E-01	2.11E-02	-	-	2.11E-02
Propachlor	No	5.4E-02	7.30E-05	0.6	Infant 0<1	0.19	2.84E+02	170.30	-	-	1.70E+02
Propham	No	2.0E-02	-	0.2	Infant 0<1	0.19	1.05E+02	2.11E+01	-	-	2.11E+01
Propoxur (Baygon)	No	4.0E-03	-	0.2	Infant 0<1	0.19	2.11E+01	4.21E+00	-	-	4.21E+00
Selenium	No	5.0E-03	-	0.2	Infant 0<1	0.19	2.63E+01	5.26E+00	2.0E-02	4.00E+01	3.17E+00
Simazine	No	5.0E-03	-	0.2	Infant 0<1	0.19	2.63E+01	5.26E+00	-	-	5.26E+00
Styrene	No	2.0E-01	-	0.2	Infant 0<1	0.19	1.05E+03	2.11E+02	1.0E+00	2.00E+03	1.38E+02
Tall oil hydroxyethyl imidazoline	No	3.6E-03	2.14E-04	1	Adult 70kg	0.0285	1.19E+02	1.19E+02	-	-	1.19E+02
Tartrazine	No	1.7E+00	-	0.2	Infant 0<1	0.19	8.77E+03	1.75E+03	-	-	1.75E+03
Tetrachlorodibenzo-p-dioxin (2,3,7,8)	No	7.0E-10	-	0.2	Infant 0<1	0.19	3.68E-06	7.37E-07	4.0E-08	8.00E-05	7.04E-07
Tetrachloroethane (1,1,1,2)	No	3.0E-02	-	0.2	Infant 0<1	0.19	1.58E+02	31.58	-	-	3.16E+01
Tetrachloroethylene	No	6.0E-03	-	0.2	Infant 0<1	0.19	3.16E+01	6.32E+00	4.0E-02	8.00E+01	4.53E+00
Thallium	No	1.0E-05	-	0.2	Infant 0<1	0.19	5.26E-02	1.05E-02	-	-	1.05E-02
Toluene	No	8.0E-02	-	0.2	Infant 0<1	0.19	4.21E+02	8.42E+01	5.0E+00	1.00E+04	8.08E+01
Toxaphene	No	9.0E-05	-	0.2	Infant 0<1	0.19	4.74E-01	9.47E-02	-	-	9.47E-02
Triazole (1,2,4)	No	5.0E-03	-	0.6	Infant 0<1	0.19	2.63E+01	1.58E+01	-	-	1.58E+01
Triazole metabolites (Conjugated)	No	9.0E-02	-	0.2	Infant 0<1	0.19	4.74E+02	9.47E+01	-	-	9.47E+01
Trichlorobenzene (1,2,3)	No	8.0E-04	-	0.2	Infant 0<1	0.19	4.21E+00	8.42E-01	-	-	8.42E-01
Trichlorobenzene (1,2,4)	No	1.0E-02	-	0.2	Infant 0<1	0.19	5.26E+01	1.05E+01	2.0E-03	4.00E+00	7.43E-01
Trichloroethane (1,1,1)	No	2.0E+00	-	0.2	Infant 0<1	0.19	1.05E+04	2.11E+03	5.0E+00	1.00E+04	1.03E+03
Trichloroethane (1,1,2)	No	4.0E-03	-	0.2	Infant 0<1	0.19	2.11E+01	4.21E+00	2.0E-04	4.00E-01	7.85E-02
Trichloroethylene	Yes	5.0E-04	-	0.2	Infant 0<1	0.19	2.63E+00	5.26E-01	2.0E-03	4.00E+00	3.17E-01
Trichlorophenoxyacetic acid (2,4,5)	No	1.0E-02	-	0.2	Infant 0<1	0.19	5.26E+01	1.05E+01	-	-	1.05E+01
Trichlorophenoxypropionic acid (2,4,5)	No	8.0E-03	-	0.2	Infant 0<1	0.19	4.21E+01	8.42E+00	-	-	8.42E+00
Trichloropropane (1,2,3)	Yes	4.0E-03	-	0.2	Infant 0<1	0.19	2.11E+01	4.21E+00	3.0E-04	6.00E-01	1.17E-01
Triclopyr	No	5.0E-02	1.80E-03	0.6	Infant 0<1	0.19	2.54E+02	1.52E+02	-	-	1.52E+02
3-Trifluoromethyl-4-nitrophenol (TFM)	No	2.6E-02	-	0.7	Infant 0<1	0.19	1.35E+02	9.48E+01	-	-	9.48E+01
Trihalomethanes (total)	No	1.0E-02	-	0.2	Infant 0<1	0.19	5.26E+01	1.05E+01	-	-	1.05E+01
Trimethyl benzene (1,2,3)	No	1.0E-02	-	0.6	Infant 0<1	0.19	5.26E+01	3.16E+01	6.0E-02	1.20E+02	2.20E+01
Trimethyl benzene (1,2,4)	No	1.0E-02	-	0.6	Infant 0<1	0.19	5.26E+01	3.16E+01	6.0E-02	1.20E+02	2.20E+01
Trimethyl benzene (1,3,5)	No	1.0E-02	-	0.6	Infant 0<1	0.19	5.26E+01	3.16E+01	6.0E-02	1.20E+02	2.20E+01
Trinitrotoluene (2,4,6) (TNT)	No	5.0E-04	-	0.2	Infant 0<1	0.19	2.63E+00	5.26E-01	-	-	5.26E-01
Triticonazole	No	1.7E-01	-	0.2	Infant 0<1	0.19	8.95E+02	1.79E+02	-	-	1.79E+02
Uranium	No	2.0E-04	-	0.2	Infant 0<1	0.19	1.05E+00	2.11E-01	-	-	2.11E-01
Vinyl chloride	Yes	3.0E-03	-	0.2	Infant 0<1	0.19	1.58E+01	3.16E+00	1.0E-01	2.00E+02	2.93E+00
Xylenes	No	2.0E-01	-	0.2	Infant 0<1	0.19	1.05E+03	2.11E+02	1.0E-01	2.00E+02	3.36E+01
Zineb	No	5.0E-02	-	0.2	Infant 0<1	0.19	2.63E+02	5.26E+01	-	-	5.26E+01

Chemical Name	Cancer Slope Factor (CSF) $(mg/kg\text{-}day)^{-1}$	Cancer Ingestion µg/L	Inhalation Unit Risk (UR) $(\mu g/m^3)^{-1}$	Cancer Inhalation µg/L	Cancer Combined Routes µg/L	EPA MCL µg/L	EPA or VT HA µg/L	VHA µg/L	Basis of VHA
Acetone	-	-	-	-	-	-	-	880	NC
Acifluorfen, sodium	-	-	-	-	-	-	-	4.56	NC
Alachlor	5.60E-02	4.1E-01	-	-	4.06E-01	2.0	-		
Aldicarb	-	-	-	-	-	3.0	-	1(b)	
Aldicarb sulfone	-	-	-	-	-	2.0	-	1(b)	
Aldicarb sulfoxide	-	-	-	-	-	-	-	1(b)	MDL
Aldrin	1.70E+01	1.3E-03	4.9E-03	4.08E-04	3.13E-04	-	-	0.10	MDL
Ametryn	-	-	-	-	-	-	-	227	NC
Aminoethyl ethanolamine (AEEA)	-	-	-	-	-	-	-	4.2	NC
Ammonium sulfamate	-	-	-	-	-	-	-	842	NC
Anatoxin-a	-	-	-	-	-	-	-	0.50	MDL
Anthracene	-	-	-	-	-	-	-	316	NC
Antimony	-	-	-	-	-	6.0	-		
Arsenic	1.50E+00	1.5E-02	4.3E-03	4.65E-04	4.51E-04	10	-		
Atrazine	2.30E-01	9.9E-02	-	-	9.88E-02	3.0	-		
Azoxystrobin	-	-	-	-	-	-	-	514	NC
Barium	-	-	-	-	-	2000	-		
Bendiocarb	-	-	-	-	-	-	-	1.5	NC
Benefin (Benfluralin)	-	-	-	-	-	-	-	5.11	NC
Benomyl	2.39E-03	9.5E+00	-	-	9.51E+00	-	-	10	C
Bensulide	-	-	-	-	-	-	-	14.39	NC
Bentazon	-	-	-	-	-	-	-	417	NC
Benzene	5.50E-02	4.1E-01	7.8E-06	2.56E-01	1.58E-01	5.0	-		
Benzo(a)pyrene	1.00E+00	1.1E-02	6.0E-04	2.01E-03	1.69E-03	0.2	-		
Beryllium	-	-	2.4E-03	8.33E-04	8.33E-04	4.0	-		
Bis(2-chloro-1-methyl ethyl) ether	-	-	-	-	-	-	-	42	NC
Bispyribac sodium	-	-	-	-	-	-	-	276	NC
Boron	-	-	-	-	-	-	-	211	NC
Boscalid	-	-	-	-	-	-	-	513	NC
Bromacil	-	-	-	-	-	-	-	102	NC
Bromate	-	-	-	-	-	10	-		
Bromochloromethane	-	-	-	-	-	-	-	7	NC
Bromomethane (Methyl bromide)	-	-	-	-	-	-	-	4.7	NC
Bromoxynil	1.03E-01	2.21E-01	-	-	2.21E-01	-	-	1.00	MDL
Butylate	-	-	-	-	-	-	-	105	NC
Cadmium	-	-	1.8E-03	1.11E-03	1.11E-03	5.0	-		
Carbaryl	8.75E-04	2.6E+01	-	-	2.60E+01	-	-	26	C
Carbofuran	-	-	-	-	-	40	-		
Carbon tetrachloride	7.00E-02	3.2E-01	6.0E-06	3.33E-01	1.64E-01	5.0	-		
Carboxin	-	-	-	-	-	-	-	20.53	NC
Carfentrazone ethyl	-	-	-	-	-	-	-	44.09	NC
Chloramben	-	-	-	-	-	-	-	63	NC
Chlorantraniliprole	-	-	-	-	-	-	-	4797	NC
Chlordane	3.50E-01	6.5E-02	1.0E-04	2.00E-02	1.53E-02	2.0	-		
Chlorflurenol	-	-	-	-	-	-	-	421	NC
Chlorine	-	-	-	-	-	4000	-		
Chlorite	-	-	-	-	-	1000	-		
Chlorobenzene	-	-	-	-	-	100	-		
Chlorothalonil	3.10E-03	7.3E+00	8.9E-07	2.25E+00	1.72E+00	-	-	10	MDL
Chlorpyrifos	-	-	-	-	-	-	-	20	MDL
Chromium (total)	-	-	-	-	-	-	-	3.2	NC
Copper (at tap)	-	-	-	-	-	1300	-		
Cyanazine	1.00E+00	2.3E-02	-	-	2.27E-02	-	-	0.02	C
Cyanide	-	-	-	-	-	200	-		
Cylindrospermopsin	-	-	-	-	-	-	-	0.42	NC
Dalapon	-	-	-	-	-	200	-		
Dazomet	-	-	9.4E-06	2.13E-01	2.13E-01	-	-	3.00	MDL
Di(2-ethylhexyl)adipate	1.20E-03	1.9E+01	-	-	1.89E+01	400	-		
Di(2-ethylhexyl)phthalate	1.40E-02	1.6E+00	2.4E-06	8.33E-01	5.51E-01	6.0	-		
Diazinon	-	-	-	-	-	-	-	0.71	NC
Dibromochloropropane	8.00E-01	1.3E-02	6.0E-03	2.01E-04	1.98E-04	0.2	-		
Dichlorobenzene (meta)	-	-	-	-	-	-	-	600(e)	NC

Chemical Name	Cancer Slope Factor (CSF) $(mg/kg\text{-}day)^{-1}$	Cancer Ingestion µg/L	Inhalation Unit Risk (UR) $(\mu g/m^3)^{-1}$	Cancer Inhalation µg/L	Cancer Combined Routes µg/L	EPA MCL µg/L	EPA or VT HA µg/L	VHA µg/L	Basis of VHA
Dichlorobenzene (ortho)	-	-	-	-	-	600	-		
Dichlorobenzene (para)	5.40E-03	4.2E+00	1.1E-05	1.82E-01	1.74E-01	75	-		
Dichloroethane (1,1)	5.70E-03	3.99E+00	1.6E-06	1.25E+00	9.52E-01	-	-	0.95	C
Dichloroethane (1,2)	9.10E-02	2.50E-01	2.6E-05	7.69E-02	5.88E-02	5.0	-		
Dichloroethene (1,1)	-	-	-	-	-	7.0	-		
Dichloroethene (cis-1,2)	-	-	-	-	-	70	-		
Dichloroethene (trans-1,2)	-	-	-	-	-	100	-		
Dichlorophenoxyacetic acid (2,4)	-	-	-	-	-	70	-		
Dichloroprop	-	-	-	-	-	-	-	133	NC
Dichloropropane (1,2)	3.70E-02	6.14E-01	3.7E-06	5.41E-01	2.88E-01	5.0	-		
Dieldrin	1.60E+01	1.4E-03	4.6E-03	0.00043	3.33E-04	-	-	0.02	MDL
Diethylenetriamine (DETA)	-	-	-	-	-	-	-	1248	NC
Dimethrin	-	-	-	-	-	-	2000		
Dinoseb	-	-	-	-	-	7.0	-		
Dioxane (1,4)	1.00E-01	2.27E-01	5.0E-06	4.00E-01	1.45E-01	-	-	0.30	MDL
Diphenamid	-	-	-	-	-	-	200		
Diquat	-	-	-	-	-	20	-		
Disulfoton	-	-	-	-	-	-	-	0.30	MDL
Diuron	1.91E-02	1.19E+00	-	-	1.19E+00	-	-	1.19	C
Endothall	-	-	-	-	-	100	-		
Endrin	-	-	-	-	-	2.0	-		
Erioglaucine	-	-	-	-	-	-	-	6642	NC
Ethylbenzene	1.10E-02	2.1E+00	2.5E-06	8.00E-01	5.77E-01	700	-		
Ethylene dibromide	2.00E+00	1.1E-02	6.0E-04	3.33E-03	2.58E-03	0.05	-		
Fenamiphos	-	-	-	-	-	-	-	0.20	MDL
Fluoranthene	-	-	-	-	-	-	-	42.11	NC
Fluorene	-	-	-	-	-	-	-	42.11	NC
Fluoride	-	-	-	-	-	4000	-		
Fluxapyroxad	-	-	-	-	-	-	-	40.87	NC
Fonofos	-	-	-	-	-	-	10		
Formaldehyde	-	-	1.3E-05	1.54E-01	1.54E-01	-	1000		
Glyphosate	-	-	-	-	-	700	-		
Halofenozide	-	-	-	-	-	-	-	42.11	NC
Heptachlor	4.50E+00	5.1E-03	1.3E-03	1.54E-03	1.18E-03	0.4	-		
Heptachlor epoxide	9.10E+00	2.5E-03	2.6E-03	7.69E-04	5.88E-04	0.2	-		
Hexachlorobenzene	1.60E+00	1.4E-02	4.6E-04	4.35E-03	3.33E-03	1.0	-		
Hexachlorocyclopentadiene	-	-	-	-	-	50	-		
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	8.00E-02	2.84E-01	-	-	2.84E-01	-	-	0.30	MDL
Hexafluoropropylene oxide dimer acid (HFPO-DA) (GenX)	-	-	-	-	-	0.010	-	0.01	
Lindane	1.10E+00	2.1E-02	3.1E-04	6.45E-03	4.92E-03	0.2	-	0.20	
Manganese	-	-	-	-	-	-	-	0.02	NC
Mercury (inorganic)	-	-	-	-	-	2.0	-	2.0	
Methoxychlor	-	-	-	-	-	40	-	40	
Methyl ethyl ketone	-	-	-	-	-	-	-	480	NC
Maneb	6.01E-02	3.78E-01	-	-	3.78E-01	-	-	0.50	MDL
Methyl parathion	-	-	-	-	-	-	-	1.05	NC
Methyl tert butyl ether (MTBE)	1.80E-03	12.63	2.6E-07	7.69	4.78E+00	-	-	4.8	C
Methylene chloride	2.00E-03	5.3E+00	1.0E-08	1.21E+02	5.08E+00	5.0	-	5.0	
Metolachlor	-	-	-	-	-	-	-	274	NC
Microcystin	-	-	-	-	-	-	-	0.30	MDL
Molybdenum	-	-	-	-	-	-	-	5.3	NC
Monochloramine	-	-	-	-	-	4000	-	4000(c)	
Naphthalene	-	-	3.4E-05	5.88E-02	5.88E-02	-	-	0.50	MDL
Nickel	-	-	-	-	-	-	-	21	NC
Nitrate (as N)	-	-	-	-	-	10000	-	1.00E+04	
Nitrates/Nitrites (total)	-	-	-	-	-	1.000E+04	-	10000.000	
Nitrite (as N)	-	-	-	-	-	1000	-	1000	
Octahydro-1,3,5,7-tetranitro-1,2,3,5,7-tetrazocine (HMX)	-	-	-	-	-	-	-	53	NC
o-Phenylphenol (OPP)	-	-	-	-	-	-	-	764	NC
Oxamyl	-	-	-	-	-	200	-	200	
Paraquat	-	-	-	-	-	-	-	30	NC

Chemical Name	Cancer Slope Factor (CSF) $(mg/kg\text{-}day)^{-1}$	Cancer Ingestion µg/L	Inhalation Unit Risk (UR) $(\mu g/m^3)^{-1}$	Cancer Inhalation µg/L	Cancer Combined Routes µg/L	EPA MCL µg/L	EPA or VT HA µg/L	VHA µg/L	Basis of VHA
Pentachlorophenol	4.00E-01	5.7E-02	5.1E-06	3.92E-01	4.96E-02	1.0	-	1.00	
Pentaerythriol tetranitrate (PETN)	-	-	-	-	-	-	-	2.11	NC
Perchlorate	-	-	-	-	-	-	-	2.17	NC
Perfluorohexanesulfonic acid (PFHxS)	-	-	-	-	-	0.010	-		
Perfluorononanoic acid (PFNA)	-	-	-	-	-	0.010	-		
Perfluorooctanesulfonic acid (PFOS)	3.95E+01	5.8E-04	-	-	5.75E-04	0.0040	-		
Perfluorooctanoic acid (PFOA)	2.93E+04	7.8E-07	-	-	7.76E-07	0.0040	-		
Picloram	-	-	-	-	-	500	-		
Polychlorinated Biphenyls	4.00E-01	5.7E-02	1.0E-04	2.00E-02	1.48E-02	0.5	-		
Propachlor	3.20E-02	7.10E-01	-	-	7.10E-01	-	-	0.71	C
Propham	-	-	-	-	-	-	100		
Propoxur (Baygon)	3.69E-03	6.16E+00	-	-	6.16E+00	-	-	4.2	NC
Selenium	-	-	-	-	-	50	-		
Simazine	1.20E-01	1.9E-01	-	-	1.89E-01	4.0	-		
Styrene	-	-	-	-	-	100	-		
Tall oil hydroxyethyl imidazoline	-	-	-	-	-	-	-	119	NC
Tartrazine	-	-	-	-	-	-	-	1754	NC
Tetrachlorodibenzo-p-dioxin (2,3,7,8)	1.30E+05	1.7E-07	3.8E+01	5.26E-08	4.05E-08	0.00003	-		
Tetrachloroethane (1,1,1,2)	2.60E-02	8.74E-01	7.4E-06	2.70E-01	2.06E-01	-	-	0.21	C
Tetrachloroethylene	1.10E-02	2.1E+00	1.6E-06	1.25E+00	7.79E-01	5.0	-		
Thallium	-	-	-	-	-	2.0	-		
Toluene	-	-	-	-	-	1000	-		
Toxaphene	1.10E+00	2.1E-02	3.2E-04	6.3E-03	4.8E-03	3.0	-		
Triazole (1,2,4)	-	-	-	-	-	-	-	20	MDL
Triazole metabolites (Conjugated)	-	-	-	-	-	-	-	94.7(h)	NC
Trichlorobenzene (1,2,3)	-	-	-	-	-	-	-	0.84	NC
Trichlorobenzene (1,2,4)	2.90E-02	7.8E-01	-	-	7.8E-01	70	-		
Trichloroethane (1,1,1)	-	-	-	-	-	200	-		
Trichloroethane (1,1,2)	5.70E-02	4.0E-01	1.6E-05	1.3E-01	9.5E-02	5.0	-		
Trichloroethylene	4.60E-02	2.3E-01	4.1E-06	2.9E-01	1.3E-01	5.0	-		
Trichlorophenoxyacetic acid (2,4,5)	-	-	-	-	-	-	70		
Trichlorophenoxypropionic acid (2,4,5)	-	-	-	-	-	50	-		
Trichloropropane (1,2,3)	3.00E+01	3.5E-04	-	-	3.5E-04	-	-	0.020	MDL
Triclopyr	-	-	-	-	-	-	-	152	NC
3-Trifluoromethyl-4-nitrophenol (TFM)	-	-	-	-	-	-	-	95	NC
Trihalomethanes (total)	-	-	-	-	-	-	80		
Trimethyl benzene (1,2,3)	-	-	-	-	-	-	-	22.0(i)	NC
Trimethyl benzene (1,2,4)	-	-	-	-	-	-	-	22.0(i)	NC
Trimethyl benzene (1,3,5)	-	-	-	-	-	-	-	22.0(i)	NC
Trinitrotoluene (2,4,6) (TNT)	3.00E-02	7.6E-01	-	-	7.6E-01	-	-	0.5	NC
Triticonazole	-	-	-	-	-	-	-	179	NC
Uranium	-	-	-	-	-	30	20		
Vinyl chloride	1.40E+00	7.6E-03	8.8E-06	1.4E-01	7.2E-03	2.0	-		
Xylenes	-	-	-	-	-	10000	-		
Zineb	-	-	-	-	-	-	-	53	NC

U.S. EPA Secondary Maximum Contaminant Levels[a]

Chemical Name	CAS No.	SMCL (µg/L)[b]
Aluminum	7429-90-5	50-200
Chloride	7647-14-5	250000
Color	NA	15 Color Units
Copper	7440-50-8	1000
Corrosivity	NA	non-corrosive
Fluoride	7681-49-4	2000
Foaming Agents	NA	500
Iron	7439-89-6	300
Manganese	7439-96-5	50
Odor	NA	3 threshold odor number
pH	NA	6.5-8.5[c]
Silver	7440-22-4	100
Sodium	7440-23-5	250000[d]
Sulfate	7757-82-6	250000
Total Dissolved Solids	NA	500000
Zinc	7440-66-6	5000

Notes:

NA - Not Applicable
SMCL - U.S. EPA Secondary Maximum Contaminant Level
(a) - The U.S. EPA MCLs presented in Attachment 1 are Primary Maximum Contaminant Levels.
The U.S. EPA Secondary MCLs above are used in regulation of contaminants in drinking water that primarily affect the aesthetic qualities relating to the public acceptance of drinking water (40CFR§143.3). Refer to Chapter 21, the Water Supply Rule,Subchapter 6.13. SMCLs accessed online 9/03/2024 at https://www.epa.gov/sdwa/secondary-drinking-water-standards-guidance-nuisance-chemicals.
(b) - All units are micrograms per Liter (µg/L) [parts per billion (ppb)] unless otherwise noted.
(c) - pH standard units
(d) - Vermont Secondary Maximum Contaminant Level; Vermont Water Supply Rule 2024,Table 6-3.

Vermont Department of Health
Attachment 1d

Derivation of PFAS Health Advisory

The Department of Health has derived a Vermont Health Advisory (VHA) for PFAS in drinking water, not to exceed a Hazard Index (HI) of 1. This VHA is based on an HI approach and is called the PFAS HI VHA. The science of PFAS is constantly growing. This is an evergreen risk assessment approach to evaluate PFAS in drinking water.

In 2020, the Vermont ANR published a report of whether PFAS could be evaluated as a class in Vermont (ANR 2020). The review team concluded that when chemicals with similar structures exhibit similar toxicological properties, it may be appropriate to evaluate their toxicity based on their structural similarity. At that time, a framework for evaluating PFAS as a class had not been developed by EPA or any other authoritative body.

In April 2024, the US EPA published a framework to estimate noncancer risk from PFAS mixtures, and a Hazard Index (HI) Maximum Contaminant Level (MCL) to evaluate mixtures of 4 PFAS (US EPA 2024a,b). The EPA documents provide a framework that can be used to evaluate PFAS as a class.

Under the US EPA HI MCL approach to regulating PFAS in drinking water, PFAS are evaluated based on noncancer dose additivity. According to the US EPA, dose additivity means "that the combined effect of the component chemicals in the mixture is equal to the sum of the individual doses or concentrations scaled for potency." (US EPA, 2024a). Toxicologically similar chemicals are chemicals that elicit similar observed adverse effects following individual exposure, even if at different levels (US EPA 2024b). PFAS elicit similar adverse noncancer health effects on several of the same biological systems and functions including thyroid hormone signaling, lipid synthesis and metabolism, development, and immune and liver function (US EPA 2024a,b). The National Academies of Science, Engineering and Medicine (NASEM) evaluated the health impact of all PFAS included in the Centers for Disease Control and Prevention's *National Report of Human Exposure to Environmental Chemicals* (NASEM, 2022). The NASEM report notes that "other PFAS may also cause harm…(and) most people are exposed to mixtures of PFAS" (NASEM 2022). This report supports dose additivity of PFAS even when they differ in persistence and potency.

Public water systems in Vermont have been testing for PFAS since 2021, and the testing has included the regulated PFAS as well as unregulated PFAS. Private water systems in Vermont have been tested for PFAS through private testing reported to the Health Department, and through investigations conducted by the Vermont Department of Environmental Conservation.

The following PFAS have been detected in Vermont public and private drinking water:

	CAS No.	Found in Vermont drinking water	Regulated in Vermont
PFOA	335-67-1	X	X
PFOS	1763-23-1	X	X
PFHpA	375-85-9	X	X
PFHxS	355-46-4	X	X
PFNA	375-95-1	X	X
PFBS	375-73-5	X	
HPFO-DA (Gen-X)	13252-13-6	X	
NEtFOSAA	2991-50-6	X	
NMeFOSAA	2355-31-9	X	
PFHxA	307-24-4	X	
PFTA	376-06-7	X	
PFPeA	2706-90-3	X	
PFBA	375-22-4	X	
6:2 FTS	27619-97-2	X	
8:2 FTS	39108-34-4	X	
FBSA	30334-69-1	X	

The following PFAS have not been detected in Vermont drinking water but are included in EPA methods 537.1 and 533.

	CAS No.
11 Cl-PF3OUdS	763051-92-9
4:2 FTS	757124-72-4
9Cl-PF3ONS	756426-58-1
NFDHA	151772-58-6
PFEESA	113507-82-7
PFHpS	375-92-8
PFMBA	863090-89-5
PFMPA	377-73-1
PFPeS	2706-91-4
PFTrDA	72629-94-8

The varied detections of PFAS in public and private water illustrate the need for an assessment approach that encompasses all the PFAS analyzed for using current EPA methods 537.1 and 533.

Toxicity data are available for some of the wide class of PFAS chemicals, and toxicological assessment for every individual PFAS is not technically feasible. Given the potential for PFAS to persist and cause irreversible harm to human health and the environment, the Health Department is providing a health-protective approach to address PFAS in drinking water (Wollin, 2023; Cousins, 2016; Kwiatkowski, 2020; Cordner 2021).

Vermont has established a PFAS HI Vermont Health Advisory (VHA). The Vermont PFAS HI VHA offers a flexible approach to evaluating PFAS drinking water data in Vermont. The Vermont PFAS HI VHA approach follows the US EPA HI MCL approach (US EPA March 2024b) but differs in that the Vermont approach includes all PFAS detected in EPA methods 537.1 and 533. When additional PFAS are added to the analytical method, these additional PFAS can be added to the HI VHA approach.

The Vermont PFAS HI VHA establishes a Vermont Health Based Water Concentration (VT HBWC) for each PFAS analyzed in methods 533 and 537.1 (Equation 1). The VT HBWC is calculated following the US EPA process by dividing the toxicological reference dose (RfD) by the body-weight adjusted water intake rate, and applying a Relative Source Contribution (US EPA, 2024a). For some of the PFAS in EPA methods 537.1 and 533, authoritative sources have established final RfD values. For those that do not have final RfDs, either a draft RfD from an authoritative source or a surrogate RfD is used for risk assessment (ITRC 2015, ECOS 2007).

The concentration of each individual PFAS detected above the reporting level is divided by the VT HBWC to give a unitless ratio. To evaluate PFAS in drinking water the individual ratios for all PFAS present above their respective reporting level are summed to generate the cumulative HI (Equation 2). The HI for the summed PFAS should not exceed 1.

Equation 1:

$$\text{VT HBWC} = \frac{\text{RfD}}{\text{BW}_\text{A}\text{IR}} \text{ x RSC}$$

where:

RfD = Oral reference dose, nanogram/kilogram-day (ng/kg-day)

BW_AIR = Body-weight adjusted water intake rate; 0.19 Liter/kg-day

RSC = Relative Source Contribution; 0.2

Equation 2:

$$\text{HI VHA} = \left(\frac{\text{PFAS 1}_\text{water}}{\text{PFAS 1}_\text{VT HBWC}}\right) + \left(\frac{\text{PFAS 2}_\text{water}}{\text{PFAS 2}_\text{VT HBWC}}\right) + \cdots \left(\frac{\text{PFAS n}_\text{water}}{\text{PFAS n}_\text{VT HBWC}}\right) = 1.0$$

where:

PFAS 1,2 or n_{water} = Concentration of each PFAS above reporting level (ng/L)

PFAS 1, 2 or $n_{VT\text{-}HBWC}$ = VT HBWC for each PFAS; See Equation 1

References:

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ATTACHMENT 2

MOU 03420-6468

MEMORANDUM OF AGREEMENT

Between the

Vermont Department of Health
And
Vermont Department of Environmental Conservation

I. Purpose

The Vermont Department of Environmental Conservation (DEC) is responsible for regulation of public water systems and hazardous site cleanups in the State of Vermont. The Vermont Department of Health (Health) is responsible for overseeing public health in Vermont. In fulfilling these responsibilities, both departments have a role to play in drinking water contamination.

This memorandum of agreement specifies how DEC and Health will jointly respond to certain contamination incidents at Vermont public water systems. Specifically, the agreement concerns detections of chemicals between the Vermont Action Level, as defined below, and the Maximum Contaminant Level (MCL), the enforceable standard under state and federal regulations. Contaminant concentrations lower than the Vermont Action Level or exceeding the MCL are not included in this agreement and will be managed as they have historically been between the departments.

By their signatures below, the respective commissioners agree to follow the procedures described herein.

II. Terms and Agreement

A. Vermont Health Advisories

For chemicals for which there is no U.S. Environmental Protection Agency or DEC MCL, Health may establish or maintain Vermont Health Advisories which may be managed as MCLs for the purpose of public water system regulation. A Vermont Health Advisory means the concentration of a substance in drinking water below which the water does not pose a public health risk, or public health hazard as defined in 18 V.S.A. Chapter 1 .

B. Establishment of Vermont Action Level

Vermont Action Levels are developed by Health for a small number of chemicals that have MCLs but are of specific public health concern. Vermont Action Levels are more restrictive than corresponding MCLs. A Vermont Action Level is defined as the concentration of a substance in drinking water which clearly provides adequate public health protection, as determined by Health. The contaminants listed in the table below will have Vermont Action Levels. Vermont Action Levels and Vermont Health Advisories will be listed in the Drinking

Water Guidance document on the Health Department website, and are used for both public water systems and private (well) water supplies. The Vermont Health Advisories are included as Ground Water Enforcement Standards in Appendix 1 of the Ground Water Protection Rule and Strategy. The Vermont Action Levels shall also be added to Appendix 1 as Ground Water Enforcement Standards.

Chemical Name	CAS number	Vermont Action Level (µg/L)
benzene	71-43-2	0.5
carbon tetrachloride	56-23-5	0.5
dibromochloropropane	96-12-8	0.02
1,2 dichloroethane	107-06-2	0.5
1,2 dichloropropane	78-87-5	0.5
hexachlorobenzene	118-74-1	0.1
pentachlorophenol	87-86-5	0.1
tetrachloroethylene	127-18-4	1
trichloroethylene	79-01-6	0.5
vinyl chloride	75-01-4	0.5

C. Procedures to be Followed if the Vermont Action Level is Exceeded
In the event that routine monitoring by public water systems detects one of the contaminants listed in II B at levels above the Vermont Action Level, the parties agree to perform the following steps.

(1) Immediate Resampling
DEC will insure that the system is resampled immediately and reanalyzed to confirm the initial detection. No action will be required of the public water system until the resampling and analysis is completed, except in unusual circumstances when DEC and Health agree that the results of the first detection warrant immediate action.

(2) Conducting of Risk Assessment
If the resampling and analysis confirms the initial detection, and the concentration reported is between the Vermont Action Level and the MCL, DEC will advise Health and will request in writing that Health conduct a risk assessment based on the information known about the public water system. DEC will provide any additional pertinent information it may have about the system that could assist in performing the risk assessment.

(3) Issuance of Public Notice
Once confirmed, DEC will require the public water system to issue public notice announcing the detection, including any health effects language then available, and stating that DEC is working on the problem in conjunction with the public water system and Health.

(4) Determination of Risk
Health will provide DEC with a written assessment of the risk, as well as in its judgment whether DEC should require a Do Not Drink or other appropriate advisory.

(5) Issuance/Amendment of the Public Water System Operating Permit
In the event that the Secretary of the Agency of Natural Resources, after consultation with Health, determines a significant public health risk exists, DEC will issue or revise the Operating Permit for the system. The permit will contain a schedule for the public water system to address the contamination. The specific schedule would be determined by DEC, taking into account the risk assessment and other public health advice from Health as well as other factors such as the technical feasibility of addressing the source of contamination and/or reducing the level of chemical in finished water, availability of financial support, and the ability of the system and rate payers to pay for the needed improvements.

(6) Issuance of Periodic Public Notice
Until analytical laboratory results indicate that the level of chemical present has been reduced to below the Vermont Action Level, DEC will require the system issue periodic pubic notice to its customers so that they are appropriately informed.

D. Cooperation of Parties
In all matters associated with this agreement, both parties agree to work jointly and in good faith, and that neither party will act unilaterally until the matters have been discussed between them. Nothing in this agreement shall prohibit either of the parties from taking any legally authorized action which such party deems necessary to take in order to protect public health.

E. Other Drinking Water Contamination Incidents
For drinking water contamination incidents not covered by this agreement, the parties agree to work jointly in addressing the incidents. Where feasible, the parties will follow this or a similar process to inform the public water systems' customers and to resolve the problem.

III. Changes or Amendments to this MOA
Any changes to this Memorandum of Agreement may be made only by the mutual written agreement of all parties.

IV. Termination
The parties agree that each has the right to terminate the relationship within 30 days of sending a written notice to the other parties.

V. Effective Date

This Memorandum of Agreement shall be in effect upon signing and shall be reviewed every three years.

By signing this agreement all parties agree upon all the terms as stated above.

Agreed upon by:

Signature: _____

Name/Title: Tracy Dolan, Acting Commissioner of Health

Date: 12/18/14

Signature: _____

Name/Title: David Mears, Commissioner of Department of Environmental Conservation

Date: 12/19/14