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ISLIP RESOURCE RECOVERY AGENCY

REMEDIAL INVESTIGATION / FEASIBILITY STUDY

QUALITATIVE RISK ASSESSMENT

SONIA ROAD LANDFILL
WEST BRENTWOOD, NEW YORK
SITE REGISTRY NO. 152013

Remediation

Dvirka and Bartilucci
Consulting Engineers

APRIL 1998

QUALITATIVE RISK ASSESSMENT

SONIA ROAD LANDFILL

WEST BRENTWOOD,
SUFFOLK COUNTY, NEW YORK

PREPARED FOR

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BY

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1.0 INTRODUCTION

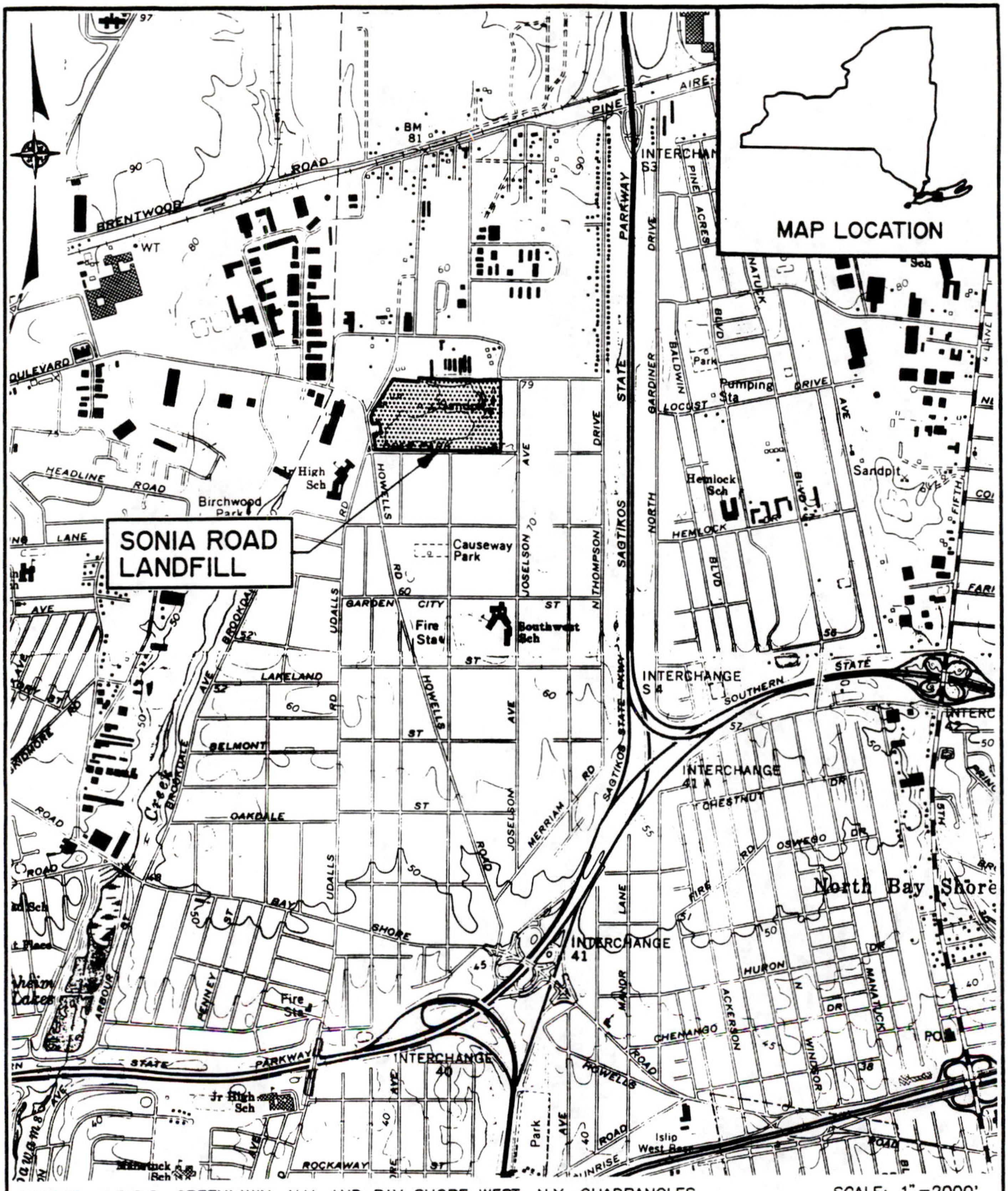
1.1 Project Background

The Sonia Road Landfill is located in West Brentwood in Suffolk County, New York (see Figure 1-1). The 42.2-acre site is an inactive municipal solid waste landfill and currently owned by the Town of Islip. The site is presently vacant. The entire site is fenced and main access to the site is from Corbin Avenue. Another access gate is located along Deer Park Street towards the southeast corner of the site.

The landfill is presently listed as a Class 2 site by the New York State Department of Environmental Conservation (NYSDEC) registry of inactive hazardous waste sites. A Class 2 site is defined by the NYSDEC as posing a significant threat to the public health or environment. The landfill allegedly received 400 cubic yards of hazardous materials from Hooker Chemical Corporation. These wastes reportedly consisted of gravel containing polyvinyl chloride, trimellitate plasticizers, 2-ethylhexanol and other alcohols. In addition, there have been unconfirmed allegations that solvents (trichloroethene) and plating sludge may have been disposed at the landfill.

The site comprises two sections: an eastern section of approximately 19 acres and a western section of about 23 acres (see Figure 1-2). The sections are divided by an earthen berm running north and south through the approximate center of the landfill. The eastern section was filled first and later converted to sports fields, while the western half continued to accept wastes for a period of time. The western portion was never developed. Figure 1-2 shows the property boundary of the Sonia Road Landfill.

Although the eastern half of the landfill was used as a park, it is now closed due to differential settling of waste and because some waste, primarily tires, has risen to the surface. The western half was rezoned for industrial use. A roadbed was built from crushed stone to allow the western section of the property to be subdivided and sold. However, the property remains



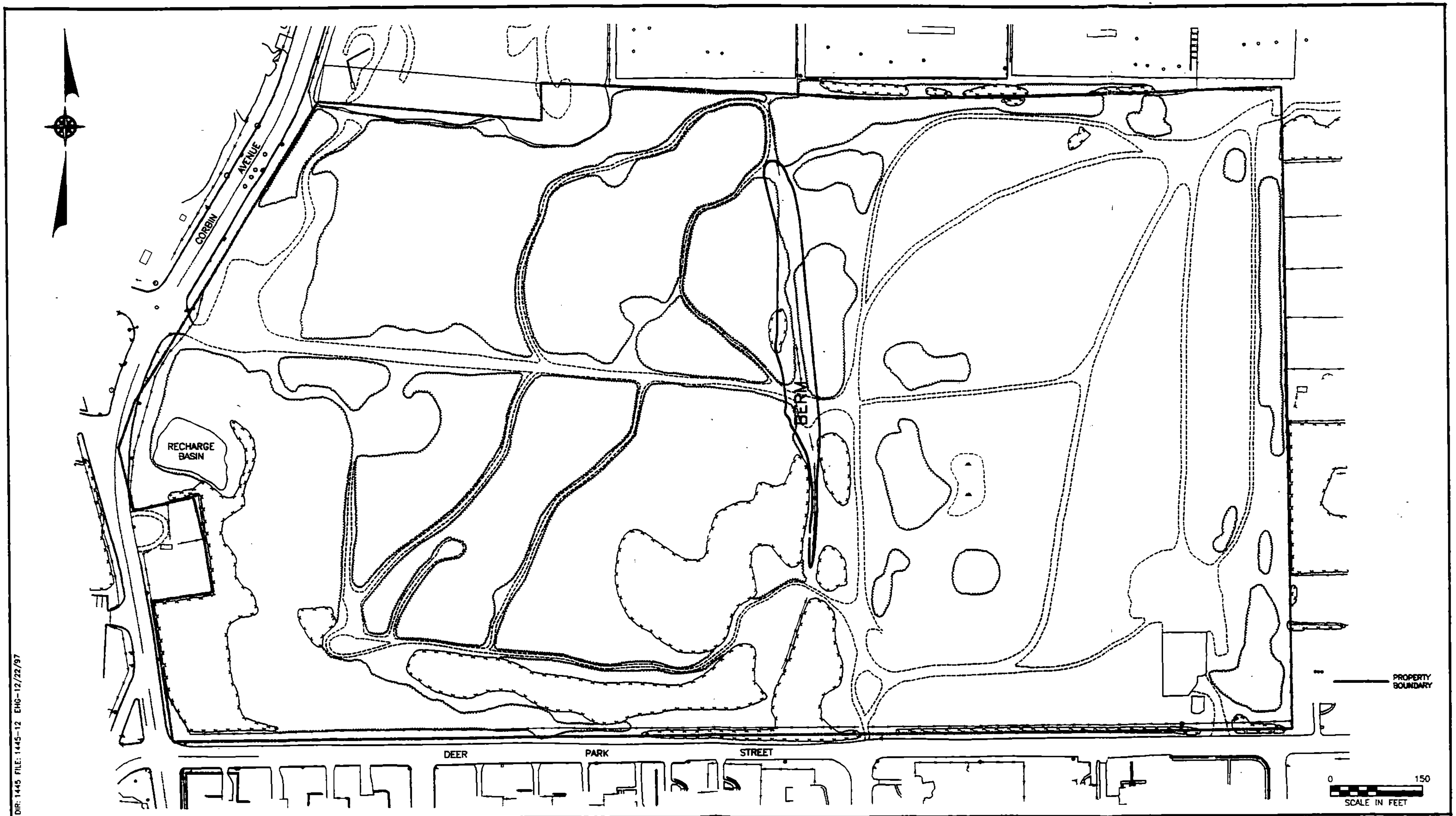
SOURCE: U.S.G.S. GREENLAWN, N.Y. AND BAY SHORE WEST, N.Y. QUADRANGLES

SCALE: 1" = 2000'

SONIA ROAD LANDFILL

SITE LOCATION MAP

FIGURE 1–1



SONIA ROAD LANDFILL

SITE PLAN

FIGURE 1-2

undeveloped. Several dirt paths exist throughout the site. Tall weeds, phragmites and young trees cover most of the western section, with more mature trees lining the southern border. The flatter and more sparsely vegetated eastern section of the site contains low vegetation and young trees.

Based on information from the Town of Islip, the western section of the Sonia Road Landfill is currently zoned for industrial use with outdoor activity and storage permitted (Zone I2), and the eastern section of the landfill is currently zoned for manufacture and wholesaling (limited to indoor activity) and is designated as Zone I1. Previously, the eastern section was utilized for recreation sports fields, and therefore, characterized as park use, while still designated as Industrial I1.

With regard to future use, the Town of Islip is planning to lease a portion of the western section of the site for construction of a tower for cellular communications. The Town intends to designate the entire site Zone I2.

The landfill is bordered on the north and west by industrial areas and on the east and south by residential areas. One residential property is adjacent to the site on Corbin Avenue, and the landfill surrounds this property on the northern, eastern and southern sides (see Figure 1-2). Southwest of the site, along Udalls Road, is the Brentwood West Junior High School. The headwaters of Sampawams Creek is located approximately 1,000 feet southwest of the landfill.

1.2 Risk Assessment Methodology

The goals of the qualitative health risk and environmental assessment are to:

- Provide a qualitative analysis of human health risks under the current site conditions;
- Identify the qualitative potential impacts to flora and fauna posed by existing contamination at the site; and
- Provide a basis for determining what chemical concentrations can remain on the site while maintaining adequate protection of human health and the environment.

The human health and environmental assessment will:

- Identify contaminants of concern;
- Define migration pathways;
- Identify routes of exposure and potential receptors; and
- Provide a qualitative assessment of risk.

The qualitative risk assessment serves as a basis for the feasibility study which will evaluate alternatives for the remedial approach to be taken at the site.

2.0 IDENTIFICATION OF CHEMICALS OF CONCERN

2.1 Criteria Used To Identify Chemicals of Concern

Determination of chemicals of concern for each medium was based on analyses performed during the Sonia Road Landfill Remedial Investigation (February 1998), as follows:

- *Soil Vapor Gas*—Six soil vapor gas samples were analyzed for target compound list volatile organics.
- *Surface Soil*—Six on-site and three off-site surface soil samples were analyzed for target compound list organics, target analyte list metals and cyanide.
- *Shallow Subsurface Soil*—One subsurface soil sample collected at 21 feet was analyzed for target compound list organics, target analyte list metals and cyanide.
- *Deep Subsurface Soil*—One subsurface soil sample collected at 45 feet was analyzed for target compound list organics, target analyte list metals and cyanide.
- *Groundwater*—Thirty-six groundwater monitoring well samples were analyzed for target compound list organics, target analyte list metals, cyanide and leachate parameters. Seven hydropunch groundwater samples were analyzed for select volatile organics.

As part of the risk assessment, screening levels, that is, risk-based concentrations (RBCs), were obtained from the United States Environmental Protection Agency (EPA, 1997) for chemicals detected in soil vapor gases, soil and groundwater to characterize the nature and extent of contamination, and to identify a preliminary list of chemicals of concern (see Appendix A for the EPA Risk-Based Concentration Table).

For soils, since the landfill is zoned industrial, the industrial land use RBC was used to make comparisons. For groundwater (including monitoring well sampling data and hydropunch confirmatory laboratory sampling data), since the groundwater is classified for use as a water supply, the tap (drinking) water RBC was used to make comparisons. For soil vapor gases, the ambient air RBC was used to make comparisons as estimates to determine whether concentrations in the soil would exceed acceptable concentrations if they existed in the ambient air. Actually, these vapors exist in the soil and not in the ambient air, and concentrations of these volatile organics would be less if they did exist in the ambient air.

The RBCs are presented in Section 3 of this risk assessment. Another screen was used to evaluate the preliminary list of chemicals of concern to determine whether any of these chemicals could be eliminated from the list. This screen included the standards and guidance values provided by NYSDEC for Class GA groundwater and by EPA (as described below for lead), both of which are for drinking water supply. EPA recommends that the preliminary list of chemicals of concern be additionally screened with applicable or relevant and appropriate requirements (ARARs) (EPA, 1989, 1993), which in this case, would be the NYSDEC standards and guidance values for groundwater. These screening levels for chemical concentrations in each medium were established as follows:

- *Soil*—EPA's Office of Solid Waste released a directive on risk assessment and cleanup of lead (which is not on the risk-based concentration table) in soils used for residential purposes. The directive recommended that soil with lead levels below 400 ppm be considered safe for residential use. For the risk-based screening approach used in this qualitative risk assessment, the *de facto* residential soil concentration would be 400 mg/kg (EPA, 1997).
- *Groundwater*—Screening levels were obtained from the NYSDEC Technical and Operational Guidance Series (TOGS)—Ambient Water Quality Standards and Guidance Values (New York State, October 1993). As previously mentioned for soils and for the risk-based screen approach for lead, EPA recommended using 15 ppb (equivalent to 15 ug/L, from the national EPA Action Level) (EPA, 1997) as a groundwater lead level that would be safe for residential water use.

Chemicals that exceeded the EPA RBC screening levels were identified as potential chemicals of concern for the purposes of this risk assessment (EPA, 1997). The following chemicals of concern are present in one or more media, including soil vapor, surface soil, subsurface soil and groundwater:

- 1,1-dichloroethene
- chloroethane

- 1,2-dichloroethene (total)
- trichloroethene
- tetrachloroethene
- vinyl chloride
- benzene
- bis(2-ethylhexyl)phthalate
- arsenic
- beryllium
- iron
- manganese
- chloroform
- bromodichloromethane
- 1,1,2,2-tetrachloroethane
- ammonia

In considering these potential chemicals of concern and whether to reduce their number, exceptional toxicity, mobility, persistence or bioaccumulation, as well as other factors, such as comparison to ARARs, frequency of detection, background comparison of samples, and field and trip blank comparisons were assessed (EPA, 1993). Field and trip blanks were compared to the environmental samples to determine if there was contamination introduced in the field or during sample shipping.

Chemicals were not eliminated if they are either human and/or animal carcinogens because of their toxicity (Olson, 1998). Therefore, 1,1-dichloroethene, trichloroethene, tetrachloroethene, vinyl chloride, benzene, bis(2-ethylhexyl)phthalate, arsenic, chloroform, 1,1,2,2-tetrachloroethane, bromodichloromethane and beryllium were not eliminated. Additionally, even though bis(2-ethylhexyl)phthalate is a common laboratory contaminant, it was not found in the laboratory controls, so it could not be eliminated based on validation methods (Petrella, 1998). Bis(2-ethylhexyl)phthalate could not be eliminated based on comparison to blank samples because there were no blank samples for comparison. For common laboratory contaminants, such as bis(2-ethylhexyl)phthalate, EPA uses a 10-fold rule as a test to eliminate chemicals from the preliminary list of chemicals of concern. For this rule, sample results should be considered positive only if the concentration in the sample is greater than ten times the maximum amount detected in any blank (EPA, 1989). Since there were no blank samples for comparison with the samples containing bis(2-ethylhexyl)phthalate, bis(2-ethylhexyl)phthalate remains on the list as a chemical of concern.

Benzene is a human carcinogen, and as such, it could not be eliminated due to possible field contamination in soil vapor. Therefore, benzene remained a chemical of concern. Benzene could not be eliminated as a chemical of concern because no field blank was taken the same day the sample was taken (May 28, 1997), even though the site sample did not exceed five times the maximum amount detected in any blank. There was a field blank taken that contained benzene, but it was taken on March 6, 1997. EPA (1989) considers site sample results as positive only if the concentration in the sample is greater than five times the maximum amount detected in any blank. Normally, the benzene concentration of 1.6 ug/m^3 in the sample would have been assumed to be due to field contamination because the benzene concentration in the field blank was 6.39 ug/m^3. The difference between the field blank and the site sample was not greater than five-fold. Benzene also was present in one groundwater sample.

1,1-Dichloroethene remained as a chemical of concern because it is a carcinogen. Concentrations in the samples (23.79 ug/m^3) exceeded five times the concentration in the field blank (2.78 ug/m^3). As previously stated for benzene, EPA (1989) considers site sample results as positive only if the concentration of the chemical in the site sample is greater than five times the maximum amount detected in any blank. For this case, 23.79 ug/m^3 was more than five times 2.78 ug/m^3. This meant that concentrations of 1,1-dichloroethene in the sample could not be due to field contamination.

The level of chloroethane in groundwater exceeded ARARs. It also was detected at a frequency rate of 27.8% (10 detections/36 total samples) in the groundwater monitoring wells, 8.3% (3 detections/36 total samples) in the groundwater hydropunch samples, and 16.6% (1 detection/6 total samples) in the soil vapor samples. Since chloroethane is detected at a high frequency and levels exceeded ARARs, it is retained on the list as a chemical of concern. EPA (1989) reported that "chemicals with ARARs usually are not appropriate for exclusion from the quantitative risk assessment."

The level of 1,2-dichloroethene (total) in the groundwater exceeded ARARs. It was detected at a frequency rate of 19% (7 detections/36 total samples) in the groundwater. Therefore, 1,2-dichloroethene (total) was retained on the list as a chemical of concern.

The level of iron in the groundwater exceeded ARARs. It was detected at a frequency rate of 97.2% (35 detections/36 total samples) in the groundwater. Therefore, iron was retained on the list as a chemical of concern.

The level of manganese in the groundwater exceeded ARARs It was detected at a frequency rate of 100% (36 detections/36 total samples) in the groundwater. Therefore, manganese was retained on the list as a chemical of concern.

The level of bromodichloromethane in the groundwater did not exceed ARARs It was detected at a frequency rate of 0% (0 detections/36 total samples) in the monitoring well samples and 14.3% in the hydropunch confirmatory samples. The overall rate in all groundwater samples was 2.3% (1 detection/43 samples). The rate of detection for bromodichloromethane was low. It was found in only 1 sample at 1 ug/l. However, bromodichloromethane could not be eliminated as a chemical of concern because it is an animal carcinogen (ATSDR, 1998). Carcinogens should be kept on the list of chemicals of concern because of their toxicity (EPA, 1993).

The level of ammonia in the groundwater exceeded ARARs. It was detected at a high frequency rate of 94.45% (34 detections/36 total samples) in the monitoring well samples. Therefore, ammonia is retained on the list as a chemical of concern.

2.2 Toxicity Information for Chemicals of Concern

Toxicity information was compiled from the Hazardous Substances Fact Sheets (New Jersey Department of Health, 1986), Hazardous Substances Database (ATSDR) printouts (ATSDR, 1998) and International Agency for Research on Cancer (IARC, 1998). The maximum contaminant levels (MCLs) were obtained from EPA (1996). See Appendix B for all toxicity information for the chemicals of concern.

3.0 QUALITATIVE RISK ASSESSMENT

This risk assessment qualitatively evaluates chemicals of concern and the affected media with respect to potential exposure pathways and receptors. For the Sonia Road Landfill site as a whole, potential pathways for human and wildlife exposure include ingestion directly from soil, ingestion of contaminated groundwater, inhalation of dust, and dermal contact with contaminated soil and fugitive dusts. Potential human receptors include (a) workers in industries north and west of the landfill; (b) children, teenagers and others who frequent the landfill or who ride bikes onto the landfill; (c) residents who live in the area, specifically east and south of the landfill; and (d) remedial construction workers who will "cap" the landfill. Since this area is highly developed, there is little wildlife that could be impacted by chemical contamination (Maher, 1998a).

On the basis on this information, the following assumptions were made in the qualitative exposure pathway analyses:

- Contaminated soil is in contact with groundwater, and dissolved contaminants in the soil may be released to groundwater;
- Individuals who pass through the landfill may come in contact with soil in the landfill, which may be contaminated;
- Soil in the landfill, which may be contaminated, is potentially subject to wind, and particulate-bound contaminants and vapors may be released to the air on windy days;
- Surface runoff carrying soil, which may be contaminated, may migrate off the landfill; and
- Excavation on the landfill may expose waste and/or contaminated soils.

3.1 Exposure and Pathway Overview for the Site

To qualitatively assess the exposures related to the site, various exposure scenarios can be classified in terms of the following general release mechanisms:

- Infiltration from soil moisture to groundwater;
- Volatilization;
- Wind erosion (dust);
- Direct contact; and
- Runoff.

Direct exposures to the chemicals of concern from the above five release mechanisms can occur in the following ways:

- Ingestion of contaminated groundwater;
- Ingestion of soil which may contain dissolved or particulate-bound contaminants;
- Dermal absorption of via direct contact with vapors, waste, groundwater and soil which may be contaminated;
- Inhalation of vapors or airborne particulate-bound soil which may be contaminated; and
- Direct contact with runoff which may be contaminated.

Potential exposure pathways are examined for functionality and completeness, as follows:

- *Functional Exposure Pathways.*—A functional pathway requires that a contaminant source, release mechanism and transport mechanism be present. If any one of these components is missing, the pathway is considered nonfunctional. Functional pathways for this site are listed in Table 3-1.
- *Complete Pathway.*—A complete pathway requires a functional pathway, potential receptors to the exposure and an exposure/uptake route. If one or more of these components is missing, an exposure is incomplete and poses a low risk.

Table 3-1

SUMMARY OF POTENTIAL EXPOSURE ROUTES FOR THE SONIA ROAD LANDFILL SITE

Media	Chemicals of Concern	Potential Exposure	Route of Migration	Potential Receptors
Groundwater	1,1-Dichloroethene Chloroethane 1,2-Dichloroethene (total) Trichloroethene Tetrachloroethene Vinyl chloride Benzene Bis(2-ethylhexyl)phthalate Arsenic Beryllium Iron Manganese Chloroform Bromodichloromethane 1,1,2,2-Tetrachloroethane Ammonia Chloroform Bromodichloromethane 1,1,2,2-Tetrachloroethane	Dermal contact, ingestion and inhalation	Ingestion of contaminated groundwater, and dermal contact with and inhalation of vapors released from contaminated groundwater during cooking, bathing, showering and irrigation through use of private wells	Off-site
Soil Vapor	1,1-Dichloroethene Benzene Chloroethane	Inhalation of and dermal contact with vapors	Inhalation of and dermal contact with vapors, especially during remedial construction activities	On-site and off-site, especially on-site workers

3.2 Exposure and Pathway Assessment for the Study Area

Currently, access to the Sonia Road Landfill is restricted since the landfill has a fence around it; however, children still get access to and play on the site. Also, children and adults have had access to the landfill in the past because the eastern section of the landfill was used as sports fields for a time (Dvirka and Bartilucci Consulting Engineers, 1997). Several dirt paths exist throughout the site. The sports fields are now closed because some wastes (tires) have risen to the surface. However, even though the landfill is closed, people still gain unauthorized access to the site.

In the future, the landfill is <u>not</u> expected to be used for residential or recreational purposes. It is zoned for industrial purposes and adult workers will have access to the site (Maher, 1998b). A cap, including 1 foot of uncontaminated soil under a geomembrane liner and 2½ feet above the liner, vegetative cover and a 60 mil high-density polyethylene (HDPE) geomembrane, will be placed on top of the landfill. An asphalt or stone/recycled concrete aggregate surface may also be constructed in the area (Maher, 1998b). These changes will eliminate the direct contact pathway; but vapors (methane) and perhaps low levels of volatile organic compounds will still be generated by the landfill because the landfill will have to be vented to allow gas to escape (Maher, 1998b). This will mean that in the future, adults will be exposed to the landfill and contaminants, not by direct contact (i.e., by ingestion and dermal absorption), but by the volatilization pathway. However, the volatile organic vapor level is expected to be low (Maher, 1998b). In addition, the landfill gas will be collected at a central location and treated, if necessary.

Wildlife are not expected to be impacted by contamination since this is a highly developed area and there is little wildlife (Maher, 1998a).

The following sections summarize the chemicals of concern in each medium and assess the completeness of the exposure pathways for the contaminants of concern in each of the site areas, based on the potential receptors and exposure routes.

Chemicals of concern that exceeded screening levels in samples from the Sonia Road Landfill are summarized in Table 3-2. In groundwater, the following chemicals exceeded the industrial RBC screening level: 1,1-dichloroethene, chloroethane, 1,2-dichloroethene (total), trichloroethene, tetrachloroethene, vinyl chloride, benzene, bis(2-ethylhexyl)phthalate, arsenic, beryllium, iron, manganese, ammonia, chloroform, bromodichloromethane and 1,1,2,2-tetrachloroethane. In soil gas, the following chemicals exceeded the RBC: 1,1-dichloroethene, benzene and chloroethane.

Note that soil is not included in Table 3-2, since none of the sample results for surface and subsurface soils exceeded the RBCs for industrial site use, and therefore, soil is not a medium of concern at the Sonia Road Landfill as discussed below.

3.3 Surface Soil

Currently, access to the landfill is restricted to a large degree because there is a fence around the landfill. In the past, individuals had access to the landfill because the eastern section was converted to sports fields for a period of time (Dvirka and Bartilucci Consulting Engineers, 1997). Thus, people have used the site in the past. Several dirt paths currently exist throughout the site. The sports fields are now closed, but people still gain access to the landfill (Maher, 1998b).

There were no chemicals in the soils that exceeded the industrial RBCs; therefore, there are no chemicals of concern in the soils, including soils in the area of stressed vegetation. When the concentration of benzo-a-pyrene (the most potent polyaromatic hydrocarbon) in the soil was compared with the residential RBC, the concentration in both surface soils (including the area of stressed vegetation) and subsurface soils exceeded the residential RBC. However, the residential RBC does not really apply in this situation, since this RBC is based on a residential setting in which people are essentially continuously exposed to this contamination over a long period of

Table 3-2

CHEMICALS OF CONCERN* IN THE SONIA ROAD LANDFILL**

Media	Total Samples (no. above RBC)	Chemicals of Concern	RBC Screening Level (ug/L)	Samples Above RBC (ug/L)	Concentration Range (ug/L)
Monitoring Well Sampling Data					
Ground-water	69 (43)	1,1-Dichloroethene	0.04	5	2–9
		Chloroethane	3.6	7	1–20
		1,2-Dichloroethene (total)	55	2	4–480
		Trichloroethene	1.6	6	1–45
		Tetrachloroethene	1.1	5	1–21
		Vinyl chloride	0.02	5	1–19
		Benzene	0.36	1	4
	37 (6)	Bis(2-ethylhexyl) phthalate	4.8	6	1–41
	105 (51)	Arsenic	11.0[1] 0.05[2]	6[1] 15[2]	2.5–30.5
		Beryllium	0.02	19	0.1–0.8
		Iron	11,000	8	153–58,700
		Manganese	840	18	5.6–36,100
	107 (13)	Ammonia	1,000	13	80–9,300
Hydropunch Confirmatory Laboratory Sampling Data					
Ground-water	32 (8)	Chloroethane	3.6	3	4–360
		Chloroform	0.15	2	1–2
		Bromodichloromethane	0.17	1	1
		Tetrachloroethene	1.1	1	11
		1,1,2,2-Tetrachloroethane	0.05	1	2
Soil Vapor					
Soil vapor	12 (4)	1,1-Dichloroethene	0.04	3	2.38–23.79
		Benzene	0.22	2	1.6–6.39
		Chloroethane	2.2	1	7.9

*Chemical found on RBC table (EPA, 1997).

**Data is for the first round of sample results for groundwater.

[1] noncarcinogenic effects

[2] carcinogenic effects

time. In addition, the levels of compounds detected in on-site soils were comparable to or less than levels detected in off-site samples. The pathway for direct contact of soils is complete; however, people played ball and had access to the landfill in the past on an infrequent basis and exposure was of short duration. Additionally, the area of stressed vegetation is not in the area formerly used for sports fields. People do not live on the landfill or have frequent contact with the soils on a long-term basis. Although the direct pathway to soils is complete, the exposure is not expected to be of concern. This includes previous, current and anticipated future exposure.

In the future, the landfill is planned to be capped with 3 1/2 feet of uncontaminated soil, a vegetative cover, a geomembrane, and possibly a stone/recycled concrete aggregate or asphalt surface. This would minimize direct contact exposure (dermal absorption and ingestion) to contaminants through the soils (Maher, 1998b). While it would still allow the volatilization pathway to exist, the landfill gases will be controlled and treated if necessary. Therefore, the exposure pathway is by volatilization, but the exposure to gases is expected to be low (Maher, 1998b). In the future, the landfill is not expected to be used for residential and/or recreational purposes; however, it is zoned for industrial purposes and adult workers are expected to gain access to the site (Maher, 1998b). For the exposure pathway to be considered complete, a receptor and an exposure route must be present. The landfill is zoned for industrial purposes and adults are expected to frequent the area in the future. A future-use plan that involves capping the landfill, as described above, would render the exposure pathway incomplete regarding direct contact with contaminated soils (see Section 3.5 for further discussion).

3.4 Groundwater

Groundwater flows to the southeast from the Sonia Road Landfill. Sixteen chemicals of concern were found in the groundwater: benzene, tetrachloroethene, trichloroethene, vinyl chloride, 1,1-dichloroethene, chloroethane, 1,2-dichloroethene (total), bis(2-ethylhexyl)phthalate, arsenic, beryllium, iron, manganese, chloroform, bromodichloromethane, 1,1,2,2-tetrachloroethane and ammonia. Of these sixteen chemicals, eleven are carcinogens, and their presence in the groundwater is an important human health concern from a toxicological point of view.

It should be noted that there are two plumes of contaminated groundwater in the vicinity of the Sonia Road Landfill. One plume contains leachate constituents, such as iron, manganese and ammonia, that migrate from the landfill, and the other plume contains volatile organic chemicals, such as tetrachloroethene, trichloroethene and vinyl chloride, that originate from industrial sources located upgradient of the landfill.

For the groundwater pathway to be considered complete, a receptor and exposure route must be present. One possible way in which humans may be impacted by contaminated groundwater is through ingesting or using contaminated groundwater obtained from private wells. Information obtained from a public and private well survey conducted for this remedial investigation/feasibility study (Dvirka and Bartilucci, 1997) did not indicate the existence of private wells approximately 1 1/2 miles downgradient from the landfill.

Another important consideration is that the contaminated water from the downgradient monitoring wells was obtained at a depth of about 100 feet below ground surface while the private wells will likely be more shallow (perhaps 50 feet below ground surface). Considering the direction of groundwater flow, the location of public and private wells, and the fact that people do not use private wells for drinking water or washing, it is not likely that private wells will be impacted by contaminated groundwater.

Another way people could be impacted from contaminated groundwater is through the public water supply (Maher, 1998b). There is little likelihood that any public water supply wells will be impacted because the closest downgradient public water supply well is located 2 miles from the site and more than 400 feet deep and beneath the Gardiners Clay. As a result, there is very little potential that the public water supply will be impacted (Maher, 1998b).

Another way in which people could potentially be impacted from contaminated groundwater is through the surface water. The northern end of the Sampawams Creek is located approximately 1,000 feet southwest of the landfill (Dvirka and Bartilucci, 1997). The groundwater flows southeast. It is not expected that the creek will be impacted since the groundwater flows away from it (Maher, 1998b).

The plume of contaminated groundwater is sufficiently deep (detected at 20-foot depths in the monitoring wells at the landfill and 100-foot depths in the monitoring wells downgradient from the landfill), and therefore, not sufficiently near the ground surface to allow direct uptake of contaminated groundwater by plants or animals (Maher, 1998a). Therefore, the contaminated groundwater is not expected to impact plants or animals.

Overall, there is little potential that private wells, public water supply, surface water, or plants and animals in the area will be impacted by contaminated groundwater. For the groundwater pathway to be considered complete, a receptor and an exposure route must be present. Considering the information from the public and private well survey, the 100-foot depth of the monitoring wells in which the contamination was identified downgradient, the 50-foot depth of potential private wells, the direction of groundwater flow to the southeast, and the lack of existence of downgradient private wells (Maher, 1998b), the groundwater pathway is considered incomplete because a receptor and an exposure route have not been identified. The groundwater pathway for the landfill is not considered complete for humans (or ecological receptors) under current site conditions.

As long as groundwater is not extracted or exposed for any purpose (e.g., constructing a well), the pathway for human exposure to chemicals of concern in the groundwater is not likely to become complete under future-use scenarios as long as the current situation remains unchanged.

3.5 Air

No ambient air environmental samples were collected for this remedial investigation/ feasibility study to characterize air contaminants (Maher, 1998b). However, soil vapor gas samples were obtained and compared to screening levels (RBCs) for ambient air to determine what would be the chemicals of concern if contaminants did exist in the air. Benzene, 1,1-dichloroethene, and chloroethane were identified as chemicals of concern in the soil vapor gas because levels exceeded RBCs (ambient air). Actually, contaminant levels in the ambient air would be even less than those measured in the soil because contaminants measured in soil gas would tend to dissipate in the ambient air. (It should also be noted that ambient air monitoring for total volatile organic vapors during the remedial investigation with field instrumentation did not indicate levels above background [<1 part per million].)

At present, people can gain access to the landfill even though a fence encloses the site. Since people can gain access to the site and the chemicals in the soil (benzene, 1,1-dichloroethene, and chloroethane) can volatilize, people could potentially be exposed to chemicals in the soil and air. Their route of exposure would be by inhalation, ingestion and direct dermal contact. Therefore, <u>at present, the air pathway is complete because people sometimes gain unauthorized access to the landfill and the volatile chemicals would tend to vaporize into the atmosphere</u>. However, based on the low concentrations of volatile organic compounds detected in soil vapor, the reasonable amount of soil cover over the waste and the time period the waste has been in place, release to ambient air and potential exposure to these contaminants is not a concern.

In the future, workers who move soil on the landfill or are involved in capping the landfill will be exposed to the volatile contaminants on or near the landfill. The receptors are present and the exposure pathway is complete. However, their exposure time period is expected to be short, lasting only as long as it takes to cap the landfill. In addition, air monitoring will be performed during construction and proper health and safety measures and emission controls will be implemented to mitigate exposure.

In the future, the landfill will be capped with a 3 1/2-foot-thick layer of uncontaminated soil, a vegetative cover, a geomembrane, and possibly a stone or paved surface. This will mitigate direct contact (i.e., ingestion and dermal exposure pathways) with contaminants for people who live or work in the surrounding area. While it will not eliminate the volatilization pathway, because the landfill will have to be vented to allow gases (methane) that are generated in the landfill to escape after construction of the cap, the landfill gases will be collected at a central location and treated if necessary. Also, it is expected that adults will frequent the site in the future because the landfill is zoned for industrial purposes. Therefore, the air pathway is considered complete because a receptor (adult) is present and an exposure route (inhalation) has been identified. However, inhalation exposure is expected to be low and not of concern (Maher, 1998b). Table 3-3 provides a summary of exposure pathways for the Sonia Road Landfill.

Table 3-3
SUMMARY OF EXPOSURE PATHWAYS FOR THE SONIA ROAD LANDFILL

Source	Release Mechanism	Transport Mechanism	Exposure/ Uptake	Potential Receptors	Status*	Rationale
Contaminants in Groundwater 1,1-Dichloroethene Chloroethane 1,2-Dichloroethene (total) Trichloroethene Tetrachloroethene Vinyl chloride Benzene Bis(2-ethylhexyl) phthalate Arsenic Beryllium Iron Manganese Chloroform Bromodichloromethane 1,1,2,2-Tetrachloroethane Ammonia	Leaching to groundwater from soils and waste	Groundwater	Inhalation, ingestion and dermal absorption	Humans	Incomplete	No information that any private wells exist downgradient; minimal chance that contaminated groundwater will reach surface water; minimal chance that public water supply will be impacted
Contaminants in Soil Vapor 1,1-Dichloroethene Benzene Chloroethane	Volatilization to air from soils and waste	Air	Inhalation and dermal absorption	Humans	Complete	Workers will be exposed to potentially volatile contaminants while capping the landfill

*Based on current use of the site and downgradient conditions.

4.0 SUMMARY AND CONCLUSIONS

The objective of the qualitative risk assessment is to identify potential human and wildlife exposure pathways that may be of concern at the Sonia Road Landfill site. Each exposure pathway was evaluated for functionality and completeness. Functional pathways were identified based on the potential existence of a physical mechanism by which contaminants can be transported into the environment. From among those pathways considered functional, complete pathways were identified on the basis of a potential receptor population and a potential exposure and uptake mechanism. Table 3-3 lists the contaminants present in the area (i.e., chemicals of concern in each media), potential receptors, and pathway status. Based on the criteria used to identify chemicals of concern that may pose health risks and the analysis of functional and complete pathways at the site, a number of concerns are presented and discussed below and in Section 3.

4.1 Soils

The soils at the Sonia Road Landfill pose low/little risk to residents now because people gain only limited unauthorized access to the fenced landfill. Exposure is infrequent and on a short-term basis. In the past, soils posed low/little risk to children and adults who visited the sports fields on the landfill because their exposure was infrequent and of short duration. Exposure was additionally minimized because the sports fields were distant to the area of stressed vegetation. In the future, there will be no risk to residents because the landfill will be capped and they will have no direct contact with soils or waste.

4.2 Groundwater

Current levels of contaminants in the groundwater pose a health risk to humans in the area if they are exposed because levels of contaminants exceed the risk-based concentration for drinking water. Since the concentration of the chemicals in the groundwater exceeded the RBC, the lifetime excess cancer risk of 10^{-6} was exceeded (EPA, 1997). This is the basis upon which the RBC was calculated, assuming "standard" exposure scenarios to calculate RBCs (EPA, 1997). Excess cancer risk of 10^{-6} means that there is one additional cancer in a population of a million people due to the presence of the carcinogen at a given concentration in the environmental medium. Therefore, the carcinogens in the groundwater do pose excess cancer risk and are, in fact, an important human health concern, especially if people will be exposed to these contaminants.

Sixteen chemicals of concern were found in the groundwater: benzene, tetrachloroethene, trichloroethene, vinyl chloride, 1,1-dichloroethene, chloroethane, 1,2-dichloroethene (total), bis(2-ethylhexyl)phthalate, arsenic, beryllium, iron, manganese, chloroform, bromodichloromethane, 1,1,2,2-tetrachloroethane, and ammonia. Of these sixteen chemicals, eleven are carcinogens and their presence in the groundwater presents an important human health concern from a toxicological point of view. Benzene and vinyl chloride (Group 1 carcinogens) have been proven to produce cancers in humans (IARC, 1998). Other carcinogens (those in Groups 2A and 2B) have been shown to produce cancers in animals. Additionally, the excess cancer risk for all the carcinogens in the groundwater is even greater than 10^{-6} because the excess cancer risk for each chemical is additive in determining the total excess cancer risk for the entire group of compounds. Total excess cancer risks between 10^{-7} and 10^{-4} serve as action levels for EPA. If the computed total excess cancer risk for an exposure route is greater than 10^{-4}, it suggests a remedial action (EPA, 1988).

As described in Section 3.4, there are two plumes of contaminated groundwater in the vicinity of the Sonia Road Landfill, one of which contains landfill leachate constituents (such as iron, manganese and ammonia), and the other which contains volatile organic chemicals (such as benzene, vinyl chloride and trichloroethene). The source of the volatile organic chemicals is primarily the industrial areas located upgradient of the landfill. The chemicals which pose the greatest risk to human health, such as the Group 1 carcinogens, are likely the result of the upgradient sources.

Under current site conditions, chemicals of concern detected in the groundwater pose a high risk to the health of humans who are exposed, but because the groundwater pathway is now considered incomplete, due to the absence of potential receptors, the contaminated groundwater currently poses a low overall risk to humans due to low potential for exposure.

In the future, if people become exposed to the contaminated groundwater (i.e., it is ingested or used in the future for gardening or recreational purposes), the situation should be re-assessed under actual exposure scenarios and remediation of groundwater should be considered because the groundwater contains carcinogens that pose a high human health risk and noncarcinogens.

4.3 Air

For the air, levels of benzene, 1,1-dichloroethene, and chloroethane detected in the soil vapor gases at the Sonia Road Landfill pose a low human health risk (see Section 3). Therefore, under current site conditions, chemicals of concern detected in the soil vapor pose a low human health risk to those people who gain unauthorized access to the landfill and to residents and workers surrounding area and are exposed to these chemicals.

In the future, the landfill will be capped. During construction of the landfill cap, workers will be exposed to contaminants; however, their exposure is expected to be low and of short duration, and the human health risk will be low. In addition, before commencing any excavation or other activities that may cause exposure to contaminants at the site (both vapors and soil), involved parties should be informed of the appropriate safety precautions and personal protection requirements. This is especially recommended because two of the chemicals (benzene and 1,1-dichloroethene) detected in the soil vapor gas at the landfill are carcinogens.

For residents and workers who live and work around the landfill, future capping of the landfill will maintain the volatilization exposure pathway, but the vapor level in ambient air is expected to be very low and the landfill gases will be controlled and treated if necessary. People will still frequent the landfill site in the future because the site is zoned for industrial purposes and is planned to be developed. For residents who live and work around the area, the human health risk after capping the landfill is not expected to be of concern because exposure to gases is expected to be very low.

5.0 REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR). 1998. *Hazardous Substances Database (ATSDR) Printouts: 1998.* EPA, Region III, Hazardous Waste Management Division.

Dvirka and Bartilucci Consulting Engineers. 1998. *Remedial Investigation Report.* February.

Environmental Protection Agency. 1988. *Guidance for Providing Alternative Water Supplies.* Prepared by CDM for the Office of Emergency and Remedial Response. Washington, DC. February.

———. 1989. *Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part A.* Interim Final. OSWER Directive 9285.701A. EPA/540/1-89/002. Volume 1. Solid Waste and Emergency Response (OS-230), pp. 5-17 to 5-23.

———. 1993. *Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening.* EPA, Region III. January.

———. 1996. *Drinking Water Regulations and Health Advisories.* EPA 822-B-96-002. Washington, DC: EPA, Office of Water. October.

———. 1997. *Risk-Based Concentration Table.* Available from EPA, Region III, Superfund Technical Support Section. December 22.

International Agency for Research on Cancer (IARC). 1998. List of IARC Evaluations. Internet address: http://193.51.164.11/monoeval/grlist.html, pp. 1–30.

Lacetti, Geoff. 1998. Personal communication (telephone). New York State Department of Health, Albany, New York. January.

Maher, Thomas. 1998a. Habitat Survey..

Maher, Thomas, 1998b. Personal communication (telephone). January.

New Jersey Department of Health. 1986. *Hazardous Substance Fact Sheets.* Trenton, NJ: New Jersey Department of Health. March.

New York State Department of Environmental Conservation (NYSDEC). 1993. *Technical and Operational Guidance Series (TOGS) – Ambient Water Quality Standards and Guidance Values.* October.

Olson, Marion. 1998. Personal communication (telephone). Toxicologist, EPA Region III. January.

Petrella, Robbin. 1998. Personal communication (telephone). Lab validator for Dvirka and Bartilucci. January.

Sittig, M. 1991. *Handbook of Toxic and Hazardous Chemicals.* 3rd ed. Westwood, NJ: Noyes Data Corp/Noyes Publications.

Petrella, Robbin. 1998. Personal communication (telephone). Lab validator for Dvirka and Bartilucci. January.

Sittig, M. 1991. *Handbook of Toxic and Hazardous Chemicals*. 3rd ed. Westwood, NJ: Noyes Data Corp/Noyes Publications.

APPENDIX A

RISK-BASED CONCENTRATION TABLE

Attachment 2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region III
841 Chestnut Street
Philadelphia, Pennsylvania 19107

October 22, 1997

SUBJECT: Risk-Based Concentration Table
FROM: Eric W. Johnson, Chief
Technical Support Section (3HW41)
TO: RBC Table Recipients

Attached is the EPA Region III Risk-Based Concentration (RBC) table, which we distribute periodically to all interested parties.

CONTENTS, USES, AND LIMITATIONS OF THE RBC TABLE

The Table contains reference doses and carcinogenic potency slopes (obtained from IRIS through September 1, 1997, HEAST through July 1997, the EPA-NCEA Superfund Health Risk Technical Support Center, and other EPA sources) for about 600 chemicals. These toxicity constants have been combined with "standard" exposure scenarios to calculate RBCs--chemical concentrations corresponding to fixed levels of risk (i.e., a hazard quotient of one, or lifetime cancer risk of 10^{-6} whichever occurs at a lower concentration) in water, air, fish tissue, and soil.

The RBC table formerly included soil screening levels (SSLs) for protection of groundwater and air. We have discontinued these to avoid conflicts with EPA/OSWER's SSL guidance document, now in general use. To consider intermedia transfers of contaminants at the screening stage of risk assessment, we suggest that you use this guidance (available from NTIS as document numbers 9355.4-1, PB95-965530, or EPA540/R-94/105).

The Region III toxicologists use RBCs to screen sites not yet on the NPL, respond rapidly to citizen inquiries, and spot-check formal baseline risk assessments. The background materials provide the complete basis for all the calculations, with the intent of showing users exactly how the RBCs were developed. Simply put, RBCs are risk assessments run in reverse. For a single contaminant in a single medium, under standard default exposure assumptions, the RBC corresponds to the target risk or hazard quotient.

RBCs also have several important limitations. Specifically excluded from consideration are (1) transfers from soil to air and groundwater, and (2) cumulative risk from multiple contaminants or media. Also, the toxicity information in the table has been assembled by hand, and (despite extensive checking and years of use) may contain errors. It's advisable to cross-check before relying on any RfDs or CPSs in the table. If you find any errors, please send me a note.

Many users want to know if the risk-based concentrations can be used as valid no-action levels or cleanup levels, especially for soils. The answer is a bit complex. First, it is important to realize that the RBC table does not constitute regulation or guidance, and should not be viewed as a substitute for a site-specific risk assessment. For sites where:

1. *A single medium is contaminated;*
2. *A single contaminant contributes nearly all of the health risk;*
3. *Volatilization or leaching of that contaminant from soil is expected not to be significant;*
4. *The exposure scenarios used in the RBC table are appropriate for the site;*
5. *The fixed risk levels used in the RBC table are appropriate for the site; and*
6. *Risk to ecological receptors is expected not to be significant;*

the risk-based concentrations would probably be protective as no-action levels or cleanup goals. However, to the extent that a site deviates from this description, as most do, the RBCs would not necessarily be appropriate.

To summarize, the table should generally not be used to (1) set cleanup or no-action levels at CERCLA sites or RCRA Corrective Action sites, (2) substitute for EPA guidance for preparing baseline risk assessments, or (3) determine if a waste is hazardous under RCRA.

ANSWERS TO FREQUENTLY ASKED QUESTIONS

To help you better understand the RBC table, here are answers to our most often-asked questions:

1. *How can the age-adjusted inhalation factor (11.66) be less than the inhalation rate for either a child (12) or an adult (20)?*

Age-adjusted factors are not intake rates, but rather partial calculations which have different units than intake rates do. The fact that these partial calculations have values similar to intake rates is really coincidental, an artifact of the similar magnitude of years of exposure and time-averaged body weight.

2. *Why does arsenic appear in the RBC table separately as a carcinogen and a non-carcinogen, while other contaminants do not?*

Arsenic is double-entered to ensure that the risk assessor realizes that non-carcinogenic concerns are significant for arsenic. Otherwise, it might be tempting to accept a 1e-4 risk (43 ppm in residential soil), when the oral reference dose would be exceeded at 23 ppm. Also, EPA has a little-known risk management policy for arsenic (dating from 1988) that suggests that arsenic-related cancer risks of up to 1e-3 can be accepted because the cancers are squamous cell carcinomas with a low mortality rate. Thus, non-carcinogenic RBCs represent an important limitation on acceptable arsenic concentrations.

3. *Many contaminants have no inhaled reference dose or carcinogenic potency slope in IRIS, yet these numbers appear in the RBC table with IRIS given as the source. Where did the numbers come from?*

Most inhaled reference doses and potency slopes in the RBC table are converted from reference concentrations and unit risk values which do appear in IRIS. These conversions assume 70-kg persons inhaling 20 m /d. For example, the inhalation unit risk for arsenic (4.3e-3 risk per $\mu g/m^3$) is divided by 20 m /d and multiplied by 70 kg times 1000 µg/mg, yielding a CPSi of 15.1 risk per mg/kg/d.

4. *Why does the RBC table base soil RBCs for cadmium on a reference dose that applies only to drinking water?*

The RBC table's use of the drinking water RfDs for cadmium reflects (1) the limited space available in the already-crowded table, and (2) the intended use of the table as a screening tool rather than a source of cleanup levels (thereby making false positives acceptable). For a formal risk assessment, Region III would use the food RfD for soil ingestion.

At this time, only cadmium(as far as we know) has distinct oral RfDs for water and food.

Adding the food RfD to the table would require an entire column, which would be about 99.9% blank. The table has become so crowded that it would be difficult to accommodate another column. Also, we've given this problem a relatively low priority because the table's primary purpose is to identify environmental problems needing further study. RBCs were never intended for uncritical use as cleanup levels, merely to identify potential problems which need a closer look.

5. *For manganese, IRIS shows an oral reference dose of 0.14 mg/kg/d, but the RBC table uses 2.3e-2 mg/kg/d. Why?*

The IRIS RfD includes manganese from all sources, including diet. The explanatory text in IRIS recommends using a modifying factor of 3 when calculating risks associated with ingesting soil or drinking water, and the table follows this recommendation. I have also incorporated a factor of 2 for relative source contribution on the assumption that a typical individual will obtain half of the RfD (5 mg/d, or 0.07 mg/kg/d) from her diet, thereby limiting the acceptablecontribution from soil and water to only half of the IRIS RfD. Thus, the IRIS RfD has been lowered by a factor of 2x3, or 6.

7. *What is the source of the child's inhalation rate of 12 m3/d?*

The calculation comes from basic physiology. It's a scaling of the mass-specific 20 m3/d rate for adults from a body mass of 70 kg to 15 kg, using the two-thirds power of mass, as follows:

Let: IRcm = mass-specific child inhalation rate (m3/kg/d)
IRc = child inhalation rate (m3/d)

$20 \text{ m3/d} \div 70\text{kg} = 0.286 \text{ m3/kg/d}$ (mass-specific adult inhalation rate)
$0.286 \text{ m3/kg/d} \times (70^{.67}) = (\text{IRcm}) \times (15^{.67})$.
$\text{IRcm} = (0.286) \times (70^{.67}) \div (15^{.67}) = 0.286 \times 2.807 = 0.803 \text{ m3/kg/d}$.
$\text{IRc} = \text{IRcm} \times 15\text{kg} = 0.803 \text{ m3/kg/d} \times 15\text{kg} = 12.04 \text{ m3/d}$

A short (but algebraically equivalent) way to do the conversion:

$20 \times (15 \div 70)^{.333} = 11.97$ (different from, but actually more correct than, 12:04 because of rounding error in calculating by the long form).

8. *Can the oral RfDs in the RBC table be applied to dermal exposure?*

Not directly. EPA's Office of Research and Development is working on dermal RfDs for some substances, but has not yet produced any final values. When dermal RfDs do appear, they will undoubtedly be based on absorbed dose rather than administered dose. Oral RfDs are (usually) based on administered dose and therefore tacitly include a GI absorption factor. Thus, any use of oral RfDs in dermal risk calculations would have to involve removing this absorption factor. Consult the *Risk Assessment Guidance for Superfund, Part A, Appendix A*, for further details on how to do this.

*9. The exposure variables table in the RBC background document lists the averaging time for non-carcinogens as "ED*365". What does that mean?*

ED is exposure duration, in years, and '*' is the computer-ese symbol for multiplication. Multiplying ED by 365 simply converts the duration to days. In fact, the ED term is included in both the numerator and denominator of the RBC algorithms for non-cancer risk, canceling it altogether. We expressed the algorithm this way to allow users to realize this. The total exposure is really adjusted only by EF (days exposed per year) divided by 365. (Note that this explanation applies to non-carcinogenic risk only; for carcinogens, exposure is pro-rated over the number of days in a 70- year life span.)

10. Why is inorganic lead not included in the RBC table?

The reason that lead is missing from the RBC table is simple, and fundamental: EPA has no reference dose or potency slope for inorganic lead, so it wasn't possible to calculate risk-based concentrations. EPA considers lead a special case because:

(1) Lead is ubiquitous in all media, so human exposure comes from multiple sources. Comparing single-medium exposures with a reference dose would be misleading.

(2) If EPA did develop a reference dose for lead by the same methods other reference doses, we would probably find that most people already exceed it. Since EPA already knows this and is moving aggressively to lower lead releases nationally, such findings at individual sites would be irrelevant and unduly alarming.

(3) EPA decided to take a new approach to distinguish important lead exposures from trivial ones. EPA developed a computer model (the IEUBK model) which predicts children's blood lead concentrations using lead levels in various media as inputs. The idea is to evaluate a child's entire environment, and reduce lead exposures in the most cost-effective way.

On the practical side, there are several EPA policies on lead which effectively substitute for RBCs. The EPA Office of Solid Waste has released a detailed directive on risk assessment and cleanup of residential soil lead. The directive recommends that soil lead levels less than 400 ppm be considered safe for residential use. Above that level, the document suggests collecting certain types of data and modeling children's blood lead with the IEUBK model. For the purposes of the RBC table, the de facto residential soil number would be 400 mg/kg. For water, we suggest 15 ppb (from the national EPA Action Level), and for air, the National Ambient Air Quality Standard.

11. Where did the potency slopes for carcinogenic PAHs come from?

The source of the potency slopes for PAHs is "Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons," Final Draft, EPA Environmental Criteria and Assessment Office, Cincinnati, OH. It's available from NTIS as document number ECAO-CIN-842 (March, 1993). The slopes are expressed in terms of order-of-magnitude equivalence factors relating the compounds to benzo[a]pyrene; we have converted these TEQs to potency slopes to fit the format of the table.

12. May I please have a copy of the January 1991 RBC table?

We're sorry, but no. The RBC table doesn't represent regulation or guidance, so past issues have no legal importance. Each time we update the table we destroy all obsolete copies, electronic and paper. We do this to ensure that only one set of RBCs, the one based on current information, exists at any time.

13. I've noticed that some soil RBCs are one million parts per million. Since some of these substances are liquids, that's obviously ridiculous. What is that basis for these calculations?

A soil RBC of one million parts per million means that no amount of the contaminant in soil will cause a receptor to exceed the oral reference dose by incidental ingestion of soil. In fact, some contaminants would have RBCs of more than one million ppm, but the algorithms cap concentrations at 100%. The reason we retain these admittedly impossible numbers is to let users see that the contaminant is not a threat via soil ingestion.

However, it's important to realize that the RBC calculations do not consider the potential of soil contaminants to leach to groundwater or escape to air by volatilization or dust entrainment. To consider these inter-media transfers, it's necessary to either monitor air and groundwater, or to use a mathematical model. Measured or modeled air and groundwater concentrations ahould then be compared to the RBCs for air and tap water.

Inter-media transfers are considered more fully in the soil screening level (SSL) guidance. The SSL guidance also incorporates sampling recommendations and statistical application of the SSLs. However, EPA Headquarters has proposed only about a hundred SSLs so far, so the list is still rather short.

14. Please elaborate on the meaning of the 'W' source code in the table.

The " W" code means that a reference dose of potency slope for a contaminant is currently not present on either IRIS or HEAST, but that it once was present on either IRIS or HEAST and was removed. Such withdrawl usually indicates that consensus on the number no longer exists among EPA scientists, but not that EPA believes the contaminant to be unimportant. Older versions of the RBC table had separate codes for IRIS and HEAST withdrawls, but we changed to a single code for both because, after all, it hardly moves.

We retain withdrawn numbers in the table because we still need to deal with these contaminants during the sometimes very long delays before replacement numbers are ready. We take the position that for the purpose of screening an obslete RBC is better that none at all. The " W" code should serve as a clear warning that before making any serious decision involving that contaminant you will need to develop an interim value based on current scientific understanding.

If you are assessing risks at a site where a major contaminant is coded " W," consider working with your Regional EPA risk assessor to develop a current toxicity constant. If the site is being studied under CERCLA, the EPA-NCEA Regional Technical Support group may be able to assist.

15. Can I get copies of supporting documents for interim toxicity constants which are coded "E" in the RBC table?

Unfortunately, Region 3 does not have a complete set of supporting documents. The EPA-NCEA Superfund Health Risk Technical Support Center prepares these interim toxicity contants in response to site-specific requests from Regional risk assessors, and sends the documentation only to the requestor. The RBC tables contain only the interim values (those with "E" codes) that we've either requested ourselves or otherwise obtained copies of. There may be many more interim values of which we are unaware. Also, we don't receive automatic updates when NCEA revisits a contaminant, so it's likely that some interim values in the RBC table are obsolete.

It has been NCEA's policy to deny requests for documentation of interim toxicity constants when the documentation is more than two years old. Furthermore, since NCEA's Superfund Technical Support Center is mainly for the support of Superfund, it usually cannot develop new toxicity criteria unless authorized to do so for a specific Superfund project. Although Region 3 has sometimes provided documentation to support numbers we use in risk assessments, for the above-stated reasons we have no assurance that the assessments, or even the interim numbers, are current. We've decided to discontinue distributing information that may be misleading. If an "E"-coded contaminant is a major risk contributor at your site, we strongly suggest that you work with EPA to develop an up-to-date reference dose or slope factor.

CHANGES IN THIS ISSUE OF THE RBC TABLE

Substances having new or revised EPA toxicity constants that result in a change in a revised RBC are now flagged marked with "**" before the contaminant name. This is to help users quickly pick out substances with new RBCs.

QUESTIONS, COMMENTS AND ADVICE

If you have a question about the RBC Table, please call EPA Region III's Superfund Technical Support Section at 215-566-3041. We'll do our best to answer your questions about how the Table was prepared and what the numbers mean. If you have a question about applying the RBC Table to a specific site, please contact the EPA Regional Office handling the project. Thanks for your help and cooperation, and we hope that the RBC Table continues to be a useful resource.

Attachment 3

EPA Region III Risk-Based Concentration Table

Background Information

U. S. E P A -- Region III
Superfund Technical Support Section

October 22, 1997 Development of Risk-Based Concentrations

General

Separate carcinogenic and non-carcinogenic risk-based concentrations were calculated for each compound for each pathway. The concentration in the table is the lower of the two, rounded to two significant figures. The following terms and values were used in the calculations:

Exposure variables	**Value**	**Symbol**
General:		
Carcinogenic potency slope oral (risk per mg/kg/d):	*	CPSo
Carcinogenic potency slope inhaled (risk per mg/kg/d):	*	CPSi
Reference dose oral (mg/kg/d):	*	RfDo
Reference dose inhaled (mg/kg/d):	*	RfDi
Target cancer risk:	1e-06	TR
Target hazard quotient:	1	THQ
Body weight, adult (kg):	70	BWa
Body weight, age 1-6 (kg):	15	BWc
Averaging time carcinogens (d):	25550	ATc
Averaging time non-carcinogens (d):	ED*365	ATn
Inhalation, adult (m3/d):	20	IRAa
Inhalation, child (m3/d):	12	IRAc
Inhalation factor, age-adjusted (m3-y/kg-d):	11.66	IFAadj
Tap water ingestion, adult (L/d):	2	IRWa
Tap water ingestion, age 1-6 (L/d):	1	IRWc
Tap water ingestion factor, age-adjusted (L-y/kg-d):	1.09	IFWadj
Fish ingestion (g/d):	54	IRF
Soil ingestion, adult (mg/d):	100	IRSa
Soil ingestion, age 1-6 (mg/d):	200	IRSc
Soil ingestion factor, age adjusted (mg-y/kg-d):	114.29	IFSadj
Residential:		
Exposure frequency (d/y):	350	EFr
Exposure duration, total (y):	30	EDtot
Exposure duration, age 1-6 (y):	6	EDc
Volatilization factor (L/m3):	0.5	K
Exposure frequency (d/y)	250	Efo
Exposure duration	25	Edo
Fraction of Contaminated soil ingested (unitless)	0.5	FC

*: Contaminant-specific toxicological constants. The priority among sources of toxicological constants was as follows: (1) IRIS, (2) HEAST, (3)EPA-NCEA Superfund Health Risk Technical Support Center, (4)

HEAST alternative method, (5) withdrawn from IRIS or HEAST, and (6) other EPA documents. Each source was used only if numbers from higher-priority sources were unavailable. The EPA Superfund Health Risk Technical Support Center, part of the EPA National Center for Environmental Assessment in Cincinnati, develops provisional RfDs and CPSs on request for contaminants not in IRIS or HEAST. These provisional values are labeled "E = EPA-NCEA provisional" in the table. It is possible they may be obsolete. If one of the "E" constants is important to a Superfund risk assessment, consider requesting, through a Regional risk assessor, a new provisional value.

Age-adjusted factors

Because contact rates with tap water, ambient air, and residential soil are different for children and adults, carcinogenic risks during the first 30 years of life were calculated using age-adjusted factors. These factors approximated the integrated exposure from birth until age 30 by combining contact rates, body weights, and exposure durations for two age groups - small children and adults. The age-adjusted factor for soil was obtained from RAGS IB; the others were developed by analogy.

Air inhalation

$$IFAadj\ \frac{m^3 \cdot y}{kg \cdot d} = \frac{EDc \cdot IRAc}{BWc} + \frac{(EDtot - EDc) \cdot IRAa}{BWa}$$

Tap water ingestion

$$IFWadj\ \frac{L \cdot y}{kg \cdot d} = \frac{EDc \cdot IRWc}{BWc} + \frac{(EDtot - EDc) \cdot IRWa}{BWa}$$

Soil ingestion

$$IFSadj\ \frac{mg \cdot y}{kg \cdot d} = \frac{EDc \cdot IRSc}{BWc} + \frac{(EDtot - EDc) \cdot IRSa}{BWa}$$

Residential water

Volatilization terms were calculated only for compounds with a mark in the "VOC" column. Compounds having a Henry's Law constant greater than 10^{-5} were considered volatile. The list may be incomplete, but is unlikely to include false positives. The equations and the volatilization factor (K, above) were obtained from RAGS IB. Oral potency slopes and reference doses were used for both oral and inhaled exposures for volatile compounds lacking inhalation values. Inhaled potency slopes were substituted for unavailable oral potency slopes only for volatile compounds; inhaled RfDs were substituted for unavailable oral RfDs for both volatile and non-volatile compounds. RBCs for carcinogens were based on combined childhood and adult exposure; for non-carcinogens RBCs were based on adult exposure.

Carcinogens

$$\mathrm{RBC}\ \frac{\mu g}{L} = \frac{TR \cdot ATc \cdot 1000_{\mu g/\,mg}}{EFr \cdot (\,[K \cdot IFAadj \cdot CPSi]\ +\ [IFWadj \cdot CPSo]\,)}$$

Non-carcinogens

$$\mathrm{RBC}\ \frac{\mu g}{L} = \frac{THQ \cdot BWa \cdot ATn \cdot 1000_{\mu g/mg}}{EFr \cdot EDtot \cdot \left(\frac{K\,.\,IRAa}{RfDi} + \frac{IRWa}{RfDo}\right)}$$

Ambient air

Oral potency slopes and references were used where inhalation values were not available. RBCs for carcinogens were based on combined childhood and adult exposure; for non-carcinogens RBCs were based on adult exposure.

Carcinogens

$$\mathrm{RBC}\ \frac{\mu g}{m^3} = \frac{TR \cdot ATc \cdot 1000_{\mu g/\,mg}}{EFr \cdot IFAadj \cdot CPSi}$$

Non-carcinogens

$$\mathrm{RBC}\ \frac{\mu g}{m^3} = \frac{THQ \cdot RfDi \cdot BWa \cdot Atn \cdot 1000_{\mu g/mg}}{EFr \cdot EDtot \cdot IRAa}$$

Commercial/industrial soil ingestion

RBCs were based on adult occupational exposure, including an assumption that only 50% of total soil ingestion is work-related.

Carcinogens

$$\mathrm{RBC}_{\ mg/kg} = \frac{TR \cdot BWa \cdot ATc}{EFo \cdot EDo \cdot \frac{IRSa}{10^6\ mg/kg} \cdot FC \cdot CPSo}$$

Non-carcinogens

$$\mathrm{RBC}_{\ mg/kg} = \frac{THQ \cdot RfDo \cdot BWa \cdot ATn}{EFo \cdot EDo \cdot \frac{IRSa}{10^6\ mg/kg} \cdot FC}$$

Residential soil ingestion

RBCs for carcinogens were based on combined childhood and adult exposure; RBCs for non-carcinogens were based on childhood exposure only.

Carcinogens

$$\text{RBC}_{\text{mg/kg}} = \frac{\text{TR} \cdot \text{ATc}}{\text{EFr} \cdot \dfrac{\text{IFSadj}}{10^{6}\ \text{mg/kg}} \cdot \text{CPSo}}$$

Non-carcinogens

$$\text{RBC}_{\text{mg/kg}} = \frac{\text{THQ} \cdot \text{RfDo} \cdot \text{BWc} \cdot \text{ATn}}{\text{EFr} \cdot \text{EDc} \cdot \dfrac{\text{IRSc}}{10^{6}\ \text{mg/kg}}}$$

Sources: I = IRIS A = HEAST alternate W = Withdrawn from IRIS or Heast
E = EPA - NCEA Regioanl Support provisional value O = Other EPA documents

Basis: C = Carcinigenic Effects
N = non-carcinogenic effects

Contaminant	CAS	RfDo	RfDi	CPSo	CPSi	V O C	Risk-Based Concentrations				
							Tap Water	Ambient Air	Fish	Soil Ingestion	
										Industrial	Residential
		mg/kg/d	mg/kg/d	Kg d/mg	kg d/mg		ug/L	ug/m³	mg/kg	mg/kg	mg/kg
Acephate	30560191	4.00E-03 I		8.70E-03 I			7.70E+00 C	7.20E-01 C	3.60E-01 C	6.60E+02 C	7.30E+01 C
Acetaldehyde	75070		2.57E-03 I		7.70E-03 I		9.40E+01 N	8.10E-01 C	0.00E+00	0.00E+00	0.00E+00
Acetochlor	34256821	2.00E-02 I					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Acetone	67641	1.00E-01 I					3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
**Acetone cyanohydrin	75865	8.00E-04 H	2.86E-03 A				2.90E+01 N	1.00E+01 N	1.10E+00 N	1.60E+03 N	6.30E+01 N
Acetonitrile	75078	6.00E-03 I	1.43E-02 A				2.20E+02 N	5.20E+01 N	8.10E+00 N	1.20E+04 N	4.70E+02 N
Acetophenone	98862	1.00E-01 I	5.71E-06 W			☒	4.20E-02 N	2.10E-02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
Acifluorfen	62476599	1.30E-02 I					4.70E+02 N	4.70E+01 N	1.80E+01 N	2.70E+04 N	1.00E+03 N
Acrolein	107028	2.00E-02 H	5.71E-06 I				7.30E+02 N	2.10E-02 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Acrylamide	79061	2.00E-04 I		4.50E+00 I	4.55E+00 I		1.50E-02 C	1.40E-03 C	7.00E-04 C	1.30E+00 C	1.40E-01 C
Acrylic acid	79107	5.00E-01 I	2.86E-04 I				1.80E+04 N	1.00E+00 N	6.80E+02 N	1.00E+06 N	3.90E+04 N
Acrylonitrile	107131	1.00E-03 H	5.71E-04 I	5.40E-01 I	2.38E-01 I		1.20E-01 C	2.60E-02 C	5.80E-03 C	1.10E+01 C	1.20E+00 C
Alachlor	15972608	1.00E-02 I		8.00E-02 H			8.40E-01 C	7.80E-02 C	3.90E-02 C	7.20E+01 C	8.00E+00 C
Alar	1596845	1.50E-01 I					5.50E+03 N	5.50E+02 N	2.00E+02 N	3.10E+05 N	1.20E+04 N
Aldicarb	116063	1.00E-03 I					3.70E+01 N	3.70E+00 N	1.40E+00 N	2.00E+03 N	7.80E+01 N
Aldicarb sulfone	1646884	1.00E-03 I					3.70E+01 N	3.70E+00 N	1.40E+00 N	2.00E+03 N	7.80E+01 N
Aldrin	309002	3.00E-05 I		1.70E+01 I	1.71E+01 I		4.00E-03 C	3.70E-04 C	1.90E-04 C	3.40E-01 C	3.80E-02 C
Ally	74223646	2.50E-01 I					9.10E+03 N	9.10E+02 N	3.40E+02 N	5.10E+05 N	2.00E+04 N
Allyl alcohol	107186	5.00E-03 I					1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
Allyl chloride	107051	5.00E-02 W	2.86E-04 I				1.80E+03 N	1.00E+00 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
**Aluminum	7429905	1.00E+00 E	1.00E-03 E				3.70E+04 N	3.70E+00 N	1.40E+03 N	1.00E+06 N	7.80E+04 N
Aluminum phosphide	20859738	4.00E-04 I					1.50E+01 N	1.50E+00 N	5.40E-01 N	8.20E+02 N	3.10E+01 N
Amdro	67485294	3.00E-04 I					1.10E+01 N	1.10E+00 N	4.10E-01 N	6.10E+02 N	2.30E+01 N
Ametryn	834128	9.00E-03 I					3.30E+02 N	3.30E+01 N	1.20E+01 N	1.80E+04 N	7.00E+02 N
**Aminodinitrotoluenes	0	6.00E-05 E					2.20E+00 N	2.20E-01 N	8.10E-02 N	1.20E+02 N	4.70E+00 N
m-Aminophenol	591275	7.00E-02 H					2.60E+03 N	2.60E+02 N	9.50E+01 N	1.40E+05 N	5.50E+03 N
4-Aminopyridine	504245	2.00E-05 H					7.30E-01 N	7.30E-02 N	2.70E-02 N	4.10E+01 N	1.60E+00 N
Amitraz	33089611	2.50E-03 I					9.10E+01 N	9.10E+00 N	3.40E+00 N	5.10E+03 N	2.00E+02 N
Ammonia	7664417		2.86E-02 I				1.00E+03 N	1.00E+02 N	0.00E+00	0.00E+00	0.00E+00
Ammonium sulfamate	7773060	2.00E-01 I					7.30E+03 N	7.30E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N
Aniline	62533		2.86E-04 I	5.70E-03 I			1.00E+01 N	1.00E+00 N	5.50E-01 C	1.00E+03 C	1.10E+02 C
Antimony and compounds	7440360	4.00E-04 I					1.50E+01 N	1.50E+00 N	5.40E-01 N	8.20E+02 N	3.10E+01 N
Antimony pentoxide	1314609	5.00E-04 H					1.80E+01 N	1.80E+00 N	6.80E-01 N	1.00E+03 N	3.90E+01 N
Antimony potassium tartrate	304610	9.00E-04 H					3.30E+01 N	3.30E+00 N	1.20E+00 N	1.80E+03 N	7.00E+01 N
Antimony tetroxide	1332316	4.00E-04 H					1.50E+01 N	1.50E+00 N	5.40E-01 N	8.20E+02 N	3.10E+01 N
**Antimony trioxide	1309644	4.00E-04 H	5.71E-05 I				1.50E+01 N	2.10E-01 N	5.40E-01 N	8.20E+02 N	3.10E+01 N
Apollo	74115245	1.30E-02 I					4.70E+02 N	4.70E+01 N	1.80E+01 N	2.70E+04 N	1.00E+03 N
Aramite	140578	5.00E-02 H		2.50E-02 I	2.49E-02 I		2.70E+00 C	2.50E-01 C	1.30E-01 C	2.30E+02 C	2.60E+01 C
Arsenic	7440382	3.00E-04 I					1.10E+01 N	1.10E+00 N	4.10E-01 N	6.10E+02 N	2.30E+01 N
Arsenic (as carcinogen)	7440382			1.50E+00 I	1.51E+01 I		4.50E-02 C	4.10E-04 C	2.10E-03 C	3.80E+00 C	4.30E-01 C
Arsine	7784421		1.43E-05 I				5.20E-01 N	5.20E-02 N	0.00E+00	0.00E+00	0.00E+00

EPA Region III Risk-Based Concentrations, October 22, 1997

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E = EPA - NCEA Regioanl Support provisional value O = Other EPA documents

Basis: C = Carcinigenic Effects
N = non-carcinogenic effects

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg d/mg	CPSi kg d/mg	VOC	Risk-Based Concentrations: Tap Water ug/L	Ambient Air ug/m³	Fish mg/kg	Soil Ingestion: Industrial mg/kg	Soil Ingestion: Residential mg/kg
Assure	76578148	9.00E-03 I					3.30E+02 N	3.30E+01 N	1.20E+01 N	1.80E+04 N	7.00E+02 N
Asulam	3337711	5.00E-02 I					1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
Atrazine	1912249	3.50E-02 I		2.22E-01 H			3.00E-01 C	2.80E-02 C	1.40E-02 C	2.60E+01 C	2.90E+00 C
Avermectin B1	65195553	4.00E-04 I					1.50E+01 N	1.50E+00 N	5.40E-01 N	8.20E+02 N	3.10E+01 N
Azobenzene	103333			1.10E-01 I	1.08E-01 I		6.10E-01 C	5.80E-02 C	2.90E-02 C	5.20E+01 C	5.80E+00 C
Barium and compounds	7440393	7.00E-02 I	1.43E-04 A				2.60E+03 N	5.20E-01 N	9.50E+01 N	1.40E+05 N	5.50E+03 N
Baygon	114261	4.00E-03 I					1.50E+02 N	1.50E+01 N	5.40E+00 N	8.20E+03 N	3.10E+02 N
Bayleton	43121433	3.00E-02 I					1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N
Baythroid	68359375	2.50E-02 I					9.10E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N
Benefin	1861401	3.00E-01 I					1.10E+04 N	1.10E+03 N	4.10E+02 N	6.10E+05 N	2.30E+04 N
Benomyl	17804352	5.00E-02 I					1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
Bentazon	25057890	2.50E-03 I					9.10E+01 N	9.10E+00 N	3.40E+00 N	5.10E+03 N	2.00E+02 N
Benzaldehyde	100527	1.00E-01 I				☒	6.10E+02 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
Benzene	71432	3.00E-03 E	1.71E-03 E	2.90E-02 I	2.90E-02 I	☒	3.60E-01 C	2.20E-01 C	1.10E-01 C	2.00E+02 C	2.20E+01 C
Benzenethiol	108985	1.00E-05 H					3.70E-01 N	3.70E-02 N	1.40E-02 N	2.00E+01 N	7.80E-01 N
Benzidine	92875	3.00E-03 I		2.30E+02 I	2.35E+02 I		2.90E-04 C	2.70E-05 C	1.40E-05 C	2.50E-02 C	2.80E-03 C
Benzoic acid	65850	4.00E+00 I					1.50E+05 N	1.50E+04 N	5.40E+03 N	1.00E+06 N	3.10E+05 N
Benzotrichloride	98077			1.30E+01 I			5.20E-03 C	4.80E-04 C	2.40E-04 C	4.40E-01 C	4.90E-02 C
Benzyl alcohol	100516	3.00E-01 H					1.10E+04 N	1.10E+03 N	4.10E+02 N	6.10E+05 N	2.30E+04 N
Benzyl chloride	100447			1.70E-01 I		☒	6.20E-02 C	3.70E-02 C	1.90E-02 C	3.40E+01 C	3.80E+00 C
Beryllium and compounds	7440417	5.00E-03 I		4.30E+00 I	8.40E+00 I		1.60E-02 C	7.50E-04 C	7.30E-04 C	1.30E+00 C	1.50E-01 C
Bidrin	141662	1.00E-04 I					3.70E+00 N	3.70E-01 N	1.40E-01 N	2.00E+02 N	7.80E+00 N
Biphenthrin (Talstar)	82657043	1.50E-02 I					5.50E+02 N	5.50E+01 N	2.00E+01 N	3.10E+04 N	1.20E+03 N
1,1-Biphenyl	92524	5.00E-02 I					1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
Bis(2-chloroethyl)ether	111444			1.10E+00 I	1.16E+00 I	☒	9.20E-03 C	5.40E-03 C	2.90E-03 C	5.20E+00 C	5.80E-01 C
Bis(2-chloroisopropyl)ether	39638329	4.00E-02 I		7.00E-02 W	3.50E-02 W	☒	2.60E-01 C	1.80E-01 C	4.50E-02 C	8.20E+01 C	9.10E+00 C
Bis(chloromethyl)ether	542881			2.20E+02 I	2.17E+02 I	☒	4.90E-05 C	2.90E-05 C	1.40E-05 C	2.60E-02 C	2.90E-03 C
**Bis(2-chloro-1-methylethyl)ether	0			7.00E-02 H	3.50E-02 H		9.60E-01 C	1.80E-01 C	4.50E-02 C	8.20E+01 C	9.10E+00 C
Bis(2-ethylhexyl)phthalate (DEHP)	117817	2.00E-02 I		1.40E-02 I	1.40E-02 E		4.80E+00 C	4.50E-01 C	2.30E-01 C	4.10E+02 C	4.60E+01 C
Bisphenol A	80057	5.00E-02 I					1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
Boron (and borates)	7440428	9.00E-02 I	5.71E-03 H				3.30E+03 N	2.10E+01 N	1.20E+02 N	1.80E+05 N	7.00E+03 N
Boron trifluoride	7637072		2.00E-04 H				7.30E+00 N	7.30E-01 N	0.00E+00	0.00E+00	0.00E+00
Bromodichloromethane	75274	2.00E-02 I		6.20E-02 I		☒	1.70E-01 C	1.00E-01 C	5.10E-02 C	9.20E+01 C	1.00E+01 C
Bromoethene	593602				1.10E-01 H	☒	9.60E-02 C	5.70E-02 C	0.00E+00	0.00E+00	0.00E+00
Bromoform (tribromomethane)	75252	2.00E-02 I		7.90E-03 I	3.85E-03 I	☒	2.40E+00 C	1.60E+00 C	4.00E-01 C	7.20E+02 C	8.10E+01 C
Bromomethane	74839	1.40E-03 I	1.43E-03 I			☒	8.70E+00 N	5.20E+00 N	1.90E+00 N	2.90E+03 N	1.10E+02 N
4-Bromophenyl phenyl ether	101553	5.80E-02 O					2.10E+03 N	2.10E+02 N	7.80E+01 N	1.20E+05 N	4.50E+03 N
Bromophos	2104963	5.00E-03 H					1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
Bromoxynil	1689845	2.00E-02 I					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Bromoxynil octanoate	1689992	2.00E-02 I					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
1,3-Butadiene	106990				9.80E-01 I	☒	1.10E-02 C	6.40E-03 C	0.00E+00	0.00E+00	0.00E+00

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Basis: C = Carcinigenic Effects
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Contaminant	CAS	RfDo	RfDi	CPSo	CPSi	VOC	Risk-Based Concentrations				
							Tap Water	Ambient Air	Fish	Soil Ingestion	
										Industrial	Residential
		mg/kg/d	mg/kg/d	Kg d/mg	kg d/mg		ug/L	ug/m3	mg/kg	mg/kg	mg/kg
1-Butanol	71363	1.00E-01 I					3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
Butyl benzyl phthalate	85687	2.00E-01 I					7.30E+03 N	7.30E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N
Butylate	2008415	5.00E-02 I					1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
**n-Butylbenzene	104518	1.00E-02 E				☒	6.10E+01 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
sec-Butylbenzene	135988	1.00E-02 E				☒	6.10E+01 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
tert-Butylbenzene	104518	1.00E-02 E				☒	6.10E+01 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
Butylphthalyl butylglycolate	85701	1.00E+00 I					3.70E+04 N	3.70E+03 N	1.40E+03 N	1.00E+06 N	7.80E+04 N
Cacodylic acid	75605	3.00E-03 H					1.10E+02 N	1.10E+01 N	4.10E+00 N	6.10E+03 N	2.30E+02 N
Cadmium and compounds	7440439	5.00E-04 I	5.71E-05 W		6.30E+00 I		1.80E+01 N	9.90E-04 C	6.80E-01 N	1.00E+03 N	3.90E+01 N
Caprolactam	105602	5.00E-01 I					1.80E+04 N	1.80E+03 N	6.80E+02 N	1.00E+06 N	3.90E+04 N
Captafol	2425061	2.00E-03 I		8.60E-03 H			7.80E+00 C	7.30E-01 C	3.70E-01 C	6.70E+02 C	7.40E+01 C
Captan	133062	1.30E-01 I		3.50E-03 H			1.90E+01 C	1.80E+00 C	9.00E-01 C	1.60E+03 C	1.80E+02 C
Carbaryl	63252	1.00E-01 I					3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
Carbofuran	1563662	5.00E-03 I					1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
Carbon disulfide	75150	1.00E-01 I	2.00E-01 I			☒	1.00E+03 N	7.30E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
Carbon tetrachloride	56235	7.00E-04 I	5.71E-04 E	1.30E-01 I	5.25E-02 I	☒	1.60E-01 C	1.20E-01 C	2.40E-02 C	4.40E+01 C	4.90E+00 C
Carbosulfan	55285148	1.00E-02 I					3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
Carboxin	5234684	1.00E-01 I					3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
Chloral	75876	2.00E-03 I					7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N
Chloramben	133904	1.50E-02 I					5.50E+02 N	5.50E+01 N	2.00E+01 N	3.10E+04 N	1.20E+03 N
Chloranil	118752			4.03E-01 H			1.70E-01 C	1.60E-02 C	7.80E-03 C	1.40E+01 C	1.60E+00 C
**Chlordane	57749	5.00E-04 I		3.50E-01 I	3.50E-01 I		1.90E-01 C	1.80E-02 C	9.00E-03 C	1.60E+01 C	1.80E+00 C
Chlorimuron-ethyl	90982324	2.00E-02 I					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Chlorine	7782505	1.00E-01 I					3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
Chlorine dioxide	10049044		5.71E-05 I				2.10E+00 N	2.10E-01 N	0.00E+00	0.00E+00	0.00E+00
Chloroacetaldehyde	107200	6.90E-03 O					2.50E+02 N	2.50E+01 N	9.30E+00 N	1.40E+04 N	5.40E+02 N
Chloroacetic acid	79118	2.00E-03 H					7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N
2-Chloroacetophenone	532274		8.57E-06 I				3.10E-01 N	3.10E-02 N	0.00E+00	0.00E+00	0.00E+00
4-Chloroaniline	106478	4.00E-03 I					1.50E+02 N	1.50E+01 N	5.40E+00 N	8.20E+03 N	3.10E+02 N
Chlorobenzene	108907	2.00E-02 I	5.71E-03 A			☒	3.90E+01 N	2.10E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Chlorobenzilate	510156	2.00E-02 I		2.70E-01 H	2.70E-01 H		2.50E-01 C	2.30E-02 C	1.20E-02 C	2.10E+01 C	2.40E+00 C
p-Chlorobenzoic acid	74113	2.00E-01 H					7.30E+03 N	7.30E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N
4-Chlorobenzotrifluoride	98566	2.00E-02 H					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
2-Chloro-1,3-butadiene (chloroprene)	126998	2.00E-02 A	2.00E-03 H			☒	1.40E+01 N	7.30E+00 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
1-Chlorobutane	109693	4.00E-01 H				☒	2.40E+03 N	1.50E+03 N	5.40E+02 N	8.20E+05 N	3.10E+04 N
Chlorodibromomethane	124481	2.00E-02 I		8.40E-02 I		☒	1.30E-01 C	7.50E-02 C	3.80E-02 C	6.80E+01 C	7.60E+00 C
1-Chloro-1,1-difluoroethane	75683		1.43E+01 I			☒	8.70E+04 N	5.20E+04 N	0.00E+00	0.00E+00	0.00E+00
Chlorodifluoromethane	75456		1.43e+01 I			☒	8.70E+04 N	5.20E+04 N	0.00E+00	0.00E+00	0.00E+00
**Chloroethane	75003	4.00E-01 E	2.86E+00 I	2.90E-03 E		☒	3.60E+00 C	2.20E+00 C	1.10E+00 C	2.00E+03 C	2.20E+02 C
2-Chloroethyl vinyl ether	110758	2.50E-02 O				☒	1.50E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N
Chloroform	67663	1.00E-02 I		6.10E-03 I	8.05E-02 I	☒	1.50E-01 C	7.80E-02 C	5.20E-01 C	9.40E+02 C	1.00E+02 C

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg-d/mg	CPSi kg-d/mg	VOC	Risk-Based Concentrations			Soil Ingestion	
							Tap water ug/L	Ambient Air ug/m3	Fish mg/kg	Industrial mg/kg	Residential mg/kg
Chloromethane	74873			1.30E-02 H	6.30E-03 H	☒	1.40E+00 C	9.90E-01 C	2.40E-01 C	4.40E+02 C	4.90E+01 C
4-Chloro-2-methylaniline hydrochloride	3165933			4.60E-01 H			1.50E-01 C	1.40E-02 C	6.90E-03 C	1.20E+01 C	1.40E+00 C
4-Chloro-2-methylaniline	95692			5.80E-01 H			1.20E-01 C	1.10E-02 C	5.40E-03 C	9.90E+00 C	1.10E+00 C
beta-Chloronaphthalene	91587	8.00E-02 I					2.90E+03 N	2.90E+02 N	1.10E+02 N	1.60E+05 N	6.30E+03 N
o-Chloronitrobenzene	88733			2.50E-02 H		☒	4.20E-01 C	2.50E-01 C	1.30E-01 C	2.30E+02 C	2.60E+01 C
p-Chloronitrobenzene	100005			1.80E-02 H		☒	5.90E-01 C	3.50E-01 C	1.80E-01 C	3.20E+02 C	3.50E+01 C
2-Chlorophenol	95578	5.00E-03 I					1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
2-Chloropropane	75296		2.86E-02 H			☒	1.70E+02 N	1.00E+02 N	0.00E+00	0.00E+00	0.00E+00
Chlorothalonil	1897456	1.50E-02 I		1.10E-02 H			6.10E+00 C	5.70E-01 C	2.90E-01 C	5.20E+02 C	5.80E+01 C
o-Chlorotoluene	95498	2.00E-02 I				☒	1.20E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Chlorpropham	101213	2.00E-01 I					7.30E+03 N	7.30E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N
Chlorpyrifos	2921882	3.00E-03 I					1.10E+02 N	1.10E+01 N	4.10E+00 N	6.10E+03 N	2.30E+02 N
Chlorpyrifos-methyl	5598130	1.00E-02 H					3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
Chlorsulfuron	64902723	5.00E-02 I					1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
Chlorthiophos	60238564	8.00E-04 H					2.90E+01 N	2.90E+00 N	1.10E+00 N	1.60E+03 N	6.30E+01 N
Chromium III and compounds	16065831	1.00E+00 I	5.71E-07 W				3.70E+04 N	2.10E-03 N	1.40E+03 N	1.00E+06 N	7.80E+04 N
Chromium VI and compounds	18540299	5.00E-03 I			4.20E+01 I		1.80E+02 N	1.50E-04 C	6.80E+00 N	1.00E+04 N	3.90E+02 N
Coal tar	8001589				2.20E+00 W		0.00E+00	2.80E-03 C	0.00E+00	0.00E+00	0.00E+00
Cobalt	7440484	6.00E-02 E					2.20E+03 N	2.20E+02 N	8.10E+01 N	1.20E+05 N	4.70E+03 N
Coke Oven Emissions	8007452				2.17E+00 I		0.00E+00	2.90E-03 C	0.00E+00	0.00E+00	0.00E+00
**Copper and compounds	7440508	3.50E-00 H					1.30E+05 N	1.30E+04 N	4.70E+03 N	1.00E+06 N	2.70E+05 N
Crotonaldehyde	123739	1.00E-02 W		1.90E+00 H	1.90E+00 W		3.50E-02 C	3.30E-03 C	1.70E-03 C	3.00E+00 C	3.40E-01 C
**Cumene	98828	1.00E-01 I	1.14E-01 I				3.70E+03 N	4.20E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
Cyanides:	0						0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium cyanide	542621	1.00E-01 W					3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
Calcium cyanide	592018	4.00E-02 I					1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N
Chlorine cyanide	506774	5.00E-02 I					1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
Copper cyanide	544923	5.00E-03 I					1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
Cyanazine	21725462	2.00E-03 H		8.40E-01 H			8.00E-02 C	7.50E-03 C	3.80E-03 C	6.80E+00 C	7.60E-01 C
Cyanogen	460195	4.00E-02 I					1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N
Cyanogen bromide	506683	9.00E-02 I					3.30E+03 N	3.30E+02 N	1.20E+02 N	1.80E+05 N	7.00E+03 N
Cyanogen chloride	506774	5.00E-02 I					1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
Free cyanide	57125	2.00E-02 I					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Hydrogen cyanide	74908	2.00E-02 I	8.57E-04 I				7.30E+02 N	3.10E+00 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Potassium cyanide	151508	5.00E-02 I					1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
Potassium silver cyanide	506616	2.00E-01 I					7.30E+03 N	7.30E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N
Silver cyanide	506649	1.00E-01 I					3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
Sodium cyanide	143339	4.00E-02 I					1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N
**Thiocyanate	0	1.00E-01 E					3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
Zinc cyanide	557211	5.00E-02 I					1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
Cyclohexanone	108941	5.00E+00 I				☒	3.00E+04 N	1.80E+04 N	6.80E+03 N	1.00E+06 N	3.90E+05 N

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo Kg d/mg	CPSi kg d/mg	VOC	Risk-Based Concentrations: Tap Water ug/L	Ambient Air ug/m³	Fish mg/kg	Soil Ingestion: Industrial mg/kg	Residential mg/kg
Cyclohexlamine	108918	2.00E-01 I					7.30E+03 N	7.30E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N
Cyhalothrin/Karate	68085858	5.00E-03 I					1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
Cypermethrin	52315078	1.00E-02 I					3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
Cyromazine	66215278	7.50E-03 I					2.70E+02 N	2.70E+01 N	1.00E+01 N	1.50E+04 N	5.90E+02 N
Dacthal	1861321	1.00E-02 I					3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
Dalapon	75990	3.00E-02 I					1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N
Danitol	39515418	2.50E-02 I					9.10E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N
DDD	72548			2.40E-01 I			2.80E-01 C	2.60E-02 C	1.30E-02 C	2.40E+01 C	2.70E+00 C
DDE	72559			3.40E-01 I			2.00E-01 C	1.80E-02 C	9.30E-03 C	1.70E+01 C	1.90E+00 C
DDT	50293	5.00E-04 I		3.40E-01 I	3.40E-01 I		2.00E-01 C	1.80E-02 C	9.30E-03 C	1.70E+01 C	1.90E+00 C
Decabromodiphenyl ether	1163195	1.00E-02 I				☒	6.10E+01 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
Demeton	8065483	4.00E-05 I					1.50E+00 N	1.50E-01 N	5.40E-02 N	8.20E+01 N	3.10E+00 N
Diallate	2303164			6.10E-02 H		☒	1.70E-01 C	1.00E-01 C	5.20E-02 C	9.40E+01 C	1.00E+01 C
Diazinon	333415	9.00E-04 H					3.30E+01 N	3.30E+00 N	1.20E+00 N	1.80E+03 N	7.00E+01 N
Dibenzofuran	132649	4.00E-03 E					1.50E+02 N	1.50E+01 N	5.40E+00 N	8.20E+03 N	3.10E+02 N
1,4-Dibromobenzene	106376	1.00E-02 I				☒	6.10E+01 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
1,2-Dibromo-3-chloropropane	96128		5.71E-05 I	1.40E+00 H	2.42E-03 H	☒	4.80E-02 C	2.10E-01 N	2.30E-03 C	4.10E+00 C	4.60E-01 C
1,2-Dibromoethane	106934		5.71E-05 H	8.50E+01 I	7.70E-01 I	☒	7.50E-04 C	8.10E-03 C	3.70E-05 C	6.70E-02 C	7.50E-03 C
Dibutyl phthalate	84742	1.00E-01 I					3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
Dicamba	1918009	3.00E-02 I					1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N
**1,2-Dichlorobenzene	95501	9.00E-02 I	9.00E-03 E			☒	6.40E+01 N	3.30E+01 N	1.20E+02 N	1.80E+05 N	7.00E+03 N
1,3-Dichlorobenzene	541731	8.90E-02 O				☒	5.40E+02 N	3.20E+02 N	1.20E+02 N	1.80E+05 N	7.00E+03 N
1,4-Dichlorobenzene	106467		2.29E-01 I	2.40E-02 H		☒	4.40E-01 C	2.60E-01 C	1.30E-01 C	2.40E+02 C	2.70E+01 C
3,3'-Dichlorobenzidine	91941			4.50E-01 I			1.50E-01 C	1.40E-02 C	7.00E-03 C	1.30E+01 C	1.40E+00 C
1,4-Dichloro-2-butene	764410				9.30E+00 H	☒	1.10E-03 C	6.70E-04 C	0.00E+00	0.00E+00	0.00E+00
Dichlorodifluoromethane	75718	2.00E-01 I	5.71E-02 A			☒	3.90E+02 N	2.10E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N
1,1-Dichloroethane	75343	1.00E-01 H	1.43E-01 A			☒	8.10E+02 N	5.20E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
1,2-Dichloroethane (EDC)	107062	3.00E-02 E	1.40E-03 E	9.10E-02 I	9.10E-02 I	☒	1.20E-01 C	6.90E-02 C	3.50E-02 C	6.30E+01 C	7.00E+00 C
1,1-Dichloroethylene	75354	9.00E-03 I		6.00E-01 I	1.75E-01 I	☒	4.40E-02 C	3.60E-02 C	5.30E-03 C	9.50E+00 C	1.10E+00 C
1,2-Dichloroethylene (cis)	156592	1.00E-02 H				☒	6.10E+01 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
1,2-Dichloroethylene (trans)	156605	2.00E-02 I				☒	1.20E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
1,2-Dichloroethylene (mixture)	540590	9.00E-03 H				☒	5.50E+01 N	3.30E+01 N	1.20E+01 N	1.80E+04 N	7.00E+02 N
2,4-Dichlorophenol	120832	3.00E-03 I					1.10E+02 N	1.10E+01 N	4.10E+00 N	6.10E+03 N	2.30E+02 N
2,4-Dichlorophenoxyacetic Acid (2,4-D)	94757	1.00E-02 I				☒	6.10E+01 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
4-(2,4-Dichlorophenoxy)butyric Acid	94826	8.00E-03 I					2.90E+02 N	2.90E+01 N	1.10E+01 N	1.60E+04 N	6.30E+02 N
1,2-Dichloropropane	78875		1.14E-03 I	6.80E-02 H		☒	1.60E-01 C	9.20E-02 C	4.60E-02 C	8.40E+01 C	9.40E+00 C
2,3-Dichloropropanol	616239	3.00E-03 I					1.10E+02 N	1.10E+01 N	4.10E+00 N	6.10E+03 N	2.30E+02 N
1,3-Dichloropropene	542756	3.00E-04 I	5.71E-03 I	1.80E-01 H	1.30E-01 H	☒	7.70E-02 C	4.80E-02 C	1.80E-02 C	3.20E+01 C	3.50E+00 C
Dichlorvos	62737	5.00e-04 I	1.43E-04 I	2.90E-01 I			2.30E-01 C	2.20E-02 C	1.10E-02 C	2.00E+01 C	2.20E+00 C
Dicofol	115322			4.40E-01 W			1.50E-01 C	1.40E-02 C	7.20E-03 C	1.30E+01 C	1.50E+00 C
Dicyclopentadiene	77736	3.00E-02 H	5.71E-05 A			☒	4.20E-01 N	2.10E-01 N	4.10E+01 N	6.10E+04 N	2.30E+03 N

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Dieldrin	60571	5.00E-05 I		1.60E+01 I	1.61E+01 I		4.20E-03 C	3.90E-04 C	2.00E-04 C	3.60E-01 C	4.00E-02 C
Diesel emissions	0		1.43E-03 I				5.20E+01 N	5.20E+00 N	0.00E+00	0.00E+00	0.00E+00
Diethyl phthalate	84662	8.00E-01 I					2.90E+04 N	2.90E+03 N	1.10E+03 N	1.00E+06 N	6.30E+04 N
Diethylene glycol, monobutyl ether	112345		5.71E-03 H				2.10E+02 N	2.10E+01 N	0.00E+00	0.00E+00	0.00E+00
Diethylene glycol, monoethyl ether	111900	2.00E+00 H					7.30E+04 N	7.30E+03 N	2.70E+03 N	1.00E+06 N	1.60E+05 N
Diethylforamide	617845	1.10E-02 H					4.00E+02 N	4.00E+01 N	1.50E+01 N	2.20E+04 N	8.60E+02 N
Di(2-ethylhexyl)adipate	103231	6.00E-01 I		1.20E-03 I			5.60E+01 C	5.20E+00 C	2.60E+00 C	4.80E+03 C	5.30E+02 C
Diethylstilbestrol	56531			4.70E+03 H			1.40E-05 C	1.30E-06 C	7.00E-07 C	1.20E-03 C	1.40E-04 C
Difenzoquat (Avenge)	43222486	8.00E-02 I					2.90E+03 N	2.90E+02 N	1.10E+02 N	1.60E+05 N	6.30E+03 N
Diflubenzuron	35367385	2.00E-02 I					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
1,1-Difluoroethane	75376		1.14E+01 I			☒	6.90E+04 N	4.20E+04 N	0.00E+00	0.00E+00	0.00E+00
Diisopropyl methylphosphonate (DIMP)	1445756	8.00E-02 I					2.90E+03 N	2.90E+02 N	1.10E+02 N	1.60E+05 N	6.30E+03 N
Dimethipin	55290647	2.00E-02 I					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Dimethoate	60515	2.00E-04 I					7.30E+00 N	7.30E-01 N	2.70E-01 N	4.10E+02 N	1.60E+01 N
3,3'-Dimethoxybenzidine	119904			1.40E-02 H			4.80E+00 C	4.50E-01 C	2.30E-01 C	4.10E+02 C	4.60E+01 C
Dimethylamine	124403		5.71E-06 W				2.10E-01 N	2.10E-02 N	0.00E+00	0.00E+00	0.00E+00
2,4-Dimethylaniline hydrochloride	21436964			5.80E-01 H			1.20E-01 C	1.10E-02 C	5.40E-03 C	9.90E+00 C	1.10E+00 C
2,4-Dimethylaniline	95681			7.50E-01 H			9.00E-02 C	8.30E-03 C	4.20E-03 C	7.60E+00 C	8.50E-01 C
N-N-Dimethylaniline	121697	2.00E-03 I					7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N
3,3'-Dimethylbenzidine	119937			9.20E+00 H			7.30E-03 C	6.80E-04 C	3.40E-04 C	6.20E-01 C	6.90E-02 C
N,N-Dimethylformamide	68122	1.00E-01 H	8.57E-03 I				3.70E+03 N	3.10E+01 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
1,1-Dimethylhydrazine	57147			2.60E+00 W	3.50E+00 W		2.60E-02 C	1.80E-03 C	1.20E-03 C	2.20E+00 C	2.50E-01 C
1,2-Dimethylhydrazine	540738			3.70E+01 W	3.70E+01 W		1.80E-03 C	1.70E-04 C	8.50E-05 C	1.50E-01 C	1.70E-02 C
2,4-Dimethylphenol	105679	2.00E-02 I					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
2,6-Dimethylphenol	576261	6.00E-04 I					2.20E+01 N	2.20E+00 N	8.10E-01 N	1.20E+03 N	4.70E+01 N
3,4-Dimethylphenol	95658	1.00E-03 I					3.70E+01 N	3.70E+00 N	1.40E+00 N	2.00E+03 N	7.80E+01 N
Dimethyl phthalate	131113	1.00E+01 W					3.70E+05 N	3.70E+04 N	1.40E+04 N	1.00E+06 N	7.80E+05 N
Dimethyl terephthalate	120616	1.00E-01 I					3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
1,2-Dinitrobenzene	528290	4.00E-04 H					1.50E+01 N	1.50E+00 N	5.40E-01 N	8.20E+02 N	3.10E+01 N
1,3-Dinitrobenzene	99650	1.00E-04 I					3.70E+00 N	3.70E-01 N	1.40E-01 N	2.00E+02 N	7.80E+00 N
1,4-Dinitrobenzene	100254	4.00E-04 H					1.50E+01 N	1.50E+00 N	5.40E-01 N	8.20E+02 N	3.10E+01 N
4,6-Dinitro-o-cyclohexyl phenol	131895	2.00E-03 I					7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N
**4,6-Dinitro-2-methylphenol	534521	1.00E-04 E					3.70E+00 N	3.70E-01 N	1.40E-01 N	2.00E+02 N	7.80E+00 N
2,4-Dinitrophenol	51285	2.00E-03 I					7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N
Dinitrotoluene mixture	0			6.80E-01 I			9.90E-02 C	9.20E-03 C	4.60E-03 C	8.40E+00 C	9.40E-01 C
2,4-Dinitrotoluene	121142	2.00E-03 I					7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N
2,6-Dinitrotoluene	606202	1.00E-03 H					3.70E+01 N	3.70E+00 N	1.40E+00 N	2.00E+03 N	7.80E+01 N
Dinoseb	88857	1.00E-03 I					3.70E+01 N	3.70E+00 N	1.40E+00 N	2.00E+03 N	7.80E+01 N
di-n-Octyl phthalate	117840	2.00E-02 H					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
1,4-Dioxane	123911			1.10E-02 I			6.10E+00 C	5.70E-01 C	2.90E-01 C	5.20E+02 C	5.80E+01 C
	957517	3.00E-02 I					1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N

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Basis: C = Carcinigenic Effects
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Contaminant	CAS	RfDo	RfDi	CPSo	CPSi	VOC	Risk-Based Concentrations				
							Tap Water	Ambient Air	Fish	Soil Ingestion	
										Industrial	Residential
		mg/kg/d	mg/kg/d	Kg·d/mg	kg·d/mg		ug/L	ug/m³	mg/kg	mg/kg	mg/kg
Diphenylamine	122394	2.50E-02 I					9.10E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N
1,2-Diphenylhydrazine	122667			8.00E-01 I	7.70E-01 I		8.40E-02 C	8.10E-03 C	3.90E-03 C	7.20E+00 C	8.00E-01 C
Diquat	85007	2.20E-03 I					8.00E+01 N	8.00E+00 N	3.00E+00 N	4.50E+03 N	1.70E+02 N
Direct black 38	1937377			8.60E+00 H			7.80E-03 C	7.30E-04 C	3.70E-04 C	6.70E-01 C	7.40E-02 C
Direct blue 6	2602462			8.10E+00 H			8.30E-03 C	7.70E-04 C	3.90E-04 C	7.10E-01 C	7.90E-02 C
Direct brown 95	16071866			9.30E+00 H			7.20E-03 C	6.70E-04 C	3.40E-04 C	6.20E-01 C	6.90E-02 C
Disulfoton	298044	4.00E-05 I					1.50E+00 N	1.50E-01 N	5.40E-02 N	8.20E+01 N	3.10E+00 N
1,4-Dithiane	505293	1.00E-02 I					3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
Diuron	330541	2.00E-03 I					7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N
Dodine	2439103	4.00E-03 I					1.50E+02 N	1.50E+01 N	5.40E+00 N	8.20E+03 N	3.10E+02 N
Endosulfan	115297	6.00E-03 I					2.20E+02 N	2.20E+01 N	8.10E+00 N	1.20E+04 N	4.70E+02 N
Endothall	145733	2.00E-02 I					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Endrin	72208	3.00E-04 I					1.10E+01 N	1.10E+00 N	4.10E-01 N	6.10E+02 N	2.30E+01 N
Epichlorohydrin	106898	2.00E-03 H	2.86E-04 I	9.90E-03 I	4.20E-03 I		6.80E+00 C	1.00E+00 N	3.20E-01 C	5.80E+02 C	6.50E+01 C
1,2-Epoxybutane	106887		5.71E-03 I				2.10E+02 N	2.10E+01 N	0.00E+00	0.00E+00	0.00E+00
Ethephon (2-chloroethyl phosphonic acid)	16672870	5.00E-03 I					1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
Ethion	563122	5.00E-04 I					1.80E+01 N	1.80E+00 N	6.80E-01 N	1.00E+03 N	3.90E+01 N
2-Ethoxyethanol acetate	111159	3.00E-01 A					1.10E+04 N	1.10E+03 N	4.10E+02 N	6.10E+05 N	2.30E+04 N
2-Ethoxyethanol	110805	4.00E-01 H	5.71E-02 I				1.50E+04 N	2.10E+02 N	5.40E+02 N	8.20E+05 N	3.10E+04 N
Ethyl acrylate	140885			4.80E-02 H			1.40E+00 C	1.30E-01 C	6.60E-02 C	1.20E+02 C	1.30E+01 C
EPTC (S-Ethyl dipropylthiocarbamate)	759944	2.50E-02 I					9.10E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N
Ethyl acetate	141786	9.00E-01 I					3.30E+04 N	3.30E+03 N	1.20E+03 N	1.00E+06 N	7.00E+04 N
Ethylbenzene	100414	1.00E-01 I	2.86E-01 I			☒	1.30E+03 N	1.00E+03 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
Ethylene cyanohydrin	109784	3.00E-01 H					1.10E+04 N	1.10E+03 N	4.10E+02 N	6.10E+05 N	2.30E+04 N
Ethylene diamine	107153	2.00E-02 H					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Ethylene glycol	107211	2.00E+00 I					7.30E+04 N	7.30E+03 N	2.70E+03 N	1.00E+06 N	1.60E+05 N
Ethylene glycol, monobutyl ether	111762		5.71E-03 H				2.10E+02 N	2.10E+01 N	0.00E+00	0.00E+00	0.00E+00
Ethylene oxide	75218			1.02E+00 H	3.50E-01 H		6.60E-02 C	1.80E-02 C	3.10E-03 C	5.60E+00 C	6.30E-01 C
Ethylene thiourea (ETU)	96457	8.00E-05 I		1.19E-01 H			5.70E-01 C	5.30E-02 C	2.70E-02 C	4.80E+01 C	5.40E+00 C
Ethyl ether	60297	2.00E-01 I				☒	1.20E+03 N	7.30E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N
Ethyl methacrylate	97632	9.00E-02 H					3.30E+03 N	3.30E+02 N	1.20E+02 N	1.80E+05 N	7.00E+03 N
Ethyl p-nitrophenyl phenylphosphorothioat	2104645	1.00E-05 I					3.70E-01 N	3.70E-02 N	1.40E-02 N	2.00E+01 N	7.80E-01 N
Ethylphthalyl ethyl glycolate	84720	3.00E+00 I					1.10E+05 N	1.10E+04 N	4.10E+03 N	1.00E+06 N	2.30E+05 N
Express	10120	8.00E-03 I					2.90E+02 N	2.90E+01 N	1.10E+01 N	1.60E+04 N	6.30E+02 N
Fenamiphos	22224926	2.50E-04 I					9.10E+00 N	9.10E-01 N	3.40E-01 N	5.10E+02 N	2.00E+01 N
Fluometuron	2164172	1.30E-02 I					4.70E+02 N	4.70E+01 N	1.80E+01 N	2.70E+04 N	1.00E+03 N
Fluoride	7782414	6.00E-02 I					2.20E+03 N	2.20E+02 N	8.10E+01 N	1.20E+05 N	4.70E+03 N
Fluoridone	59756604	8.00E-02 I					2.90E+03 N	2.90E+02 N	1.10E+02 N	1.60E+05 N	6.30E+03 N
Flurprimidol	56425913	2.00E-02 I					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Flutolanil	66332965	6.00E-02 I					2.20E+03 N	2.20E+02 N	8.10E+01 N	1.20E+05 N	4.70E+03 N
Fluvalinate	69409945	1.00E-02 I					3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N

EPA Region III Risk-Based Concentrations, October 22, 1997

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Basis: C = Carcinigenic Effects
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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo Kg d/mg	CPSi kg d/mg	V O C	Risk-Based Concentrations Tap Water ug/L	Ambient Air ug/m^3	Fish mg/kg	Soil Ingestion Industrial mg/kg	Residential mg/kg
Folpet	133073	1.00E-01 I		3.50E-03 I			1.90E+01 C	1.80E+00 C	9.00E-01 C	1.60E+03 C	1.80E+02 C
Fomesafen	72178020			1.90E-01 I			3.50E-01 C	3.30E-02 C	1.70E-02 C	3.00E+01 C	3.40E+00 C
Fonofos	944229	2.00E-03 I					7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N
Formaldehyde	50000	2.00E-01 I			4.55E-02 I		7.30E+03 N	1.40E-01 C	2.70E+02 N	4.10E+05 N	1.60E+04 N
Formic Acid	64186	2.00E+00 H					7.30E+04 N	7.30E+03 N	2.70E+03 N	1.00E+06 N	1.60E+05 N
Fosetyl-al	39148248	3.00E+00 I					1.10E+05 N	1.10E+04 N	4.10E+03 N	1.00E+06 N	2.30E+05 N
Furan	110009	1.00E-03 I					3.70E+01 N	3.70E+00 N	1.40E+00 N	2.00E+03 N	7.80E+01 N
Furazolidone	67458			3.80E+00 H			1.80E-02 C	1.60E-03 C	8.30E-04 C	1.50E+00 C	1.70E-01 C
Furfural	98011	3.00E-03 I	1.43E-02 A				1.10E+02 N	5.20E+01 N	4.10E+00 N	6.10E+03 N	2.30E+02 N
Furium	531828			5.00E+01 H			1,30E-03 C	1.30E-04 C	6.30E-05 C	1.10E-01 C	1.30E-02 C
Furmecyclox	60568050			3.00E-02 I			2.20E+00 C	2.10E-01 C	1.10E-01 C	1.90E+02 C	2.10E+01 C
Glufosinate-ammonium	77182822	4.00E-04 I					1.50E+01 N	1.50E+00 N	5.40E-01 N	8.20E+02 N	3.10E+01 N
Glycidaldehyde	765344	4.00E-04 I	2.86E-04 H				1.50E+01 N	1.00E+00 N	5.40E-01 N	8.20E+02 N	3.10E+01 N
Glyphosate	1071836	1.00E-01 I					3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
Haloxyfop-methyl	69806402	5.00E-05 I					1.80E+00 N	1.80E-01 N	6.80E-02 N	1.00E+02 N	3.90E+00 N
Harmony	79277273	1.30E-02 I					4.70E+02 N	4.70E+01 N	1.80E+01 N	2.70E+04 N	1.00E+03 N
HCH (alpha)	319846			6.30E+00 I	6.30E+00 I		1.10E-02 C	9.90E-04 C	5.00E-04 C	9.10E-01 C	1.00E-01 C
HCH (beta)	319857			1.80E+00 I	1.80E+00 I		3.70E-02 C	3.50E-03 C	1.80E-03 C	3.20E+00 C	3.50E-01 C
HCH (gamma) Lindane	58899	3.00E-04 I		1.30E+00 H			5.20E-02 C	4.80E-03 C	2.40E-03 C	4.40E+00 C	4.90E-01 C
HCH-technical	608731			1.80E+00 I	1.79E+00 I		3.70E-02 C	3.50E-03 C	1.80E-03 C	3.20E+00 C	3.50E-01 C
Heptachlor	76448	5.00E-04 I		4.50E+00 I	4.55E+00 I	☒	2.30E-03 C	1.40E-03 C	7.00E-04 C	1.30E+00 C	1.40E-01 C
Heptachlor epoxide	1024573	1.30E-05 I		9.10E+00 I	9.10E+00 I	☒	1.20E-03 C	6.90E-04 C	3.50E-04 C	6.30E-01 C	7.00E-02 C
Hexabromobenzene	87821	2.00E-03 I				☒	1.20E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N
Hexachlorobenzene	118741	8.00E-04 I		1.60E+00 I	1.61E+00 I	☒	6.60E-03 C	3.90E-03 C	2.00E-03 C	3.60E+00 C	4.00E-01 C
Hexachlorobutadiene	87683	2.00E-04 H		7.80E-02 I	7.70E-02 I	☒	1.40E-01 C	8.10E-02 C	4.00E-02 C	7.30E+01 C	8.20E+00 C
Hexachlorocyclopentadiene	77474	7.00E-03 I	2.00E-05 H			☒	1.50E-01 N	7.30E-02 N	9.50E+00 N	1.40E+04 N	5.50E+02 N
Hexachlorodibenzo-p-dioxin mixture	19408743			6.20E+03 I	4.55E+03 I		1.10E-05 C	1.40E-06 C	5.00E-07 C	9.20E-04 C	1.00E-04 C
Hexachloroethane	67721	1.00E-03 I		1.40E-02 I	1.40E-02 I	☒	7.50E-01 C	4.50E-01 C	2.30E-01 C	4.10E+02 C	4.60E+01 C
Hexachlorophene	70304	3.00E-04 I					1.10E+01 N	1.10E+00 N	4.10E-01 N	6.10E+02 N	2.30E+01 N
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121824	3.00E-03 I		1.10E-01 I			6.10E-01 C	5.70E-02 C	2.90E-02 C	5.20E+01 C	5.80E+00 C
1,6-Hexamethylene diisocyanate	822060'		2.86E-06 I				1.00E-01 N	1.00E-02 N	0.00E+00	0.00E+00	0.00E+00
n-Hexane	110543	6.00E-02 H	5.71E-02 I			☒	3.50E+02 N	2.10E+02 N	8.10E+01 N	1.20E+05 N	4.70E+03 N
**2-Hexanone	73663715	4.00E-02					1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N
Hexazinone	51235042	3.30E-02 I					1.20E+03 N	1.20E+02 N	4.50E+01 N	6.70E+04 N	2.60E+03 N
Hydrazine, hydrazine sulfate	302012			3.00E+00 I	1.71E+01 I		2.20E-02 C	3.70E-04 C	1.10E-03 C	1.90E+00 C	2.10E-01 C
Hydrogen chloride	7647010		5.71E-03 I				2.10E+02 N	2.10E+01 N	0.00E+00	0.00E+00	0.00E+00
Hydrogen sulfide	7783064	3.00E-03 I	2.85E-04 I				1.10E+02 N	1.00E+00 N	4.10E+00 N	6.10E+03 N	2.30E+02 N
Hydroquinone	123319	4.00E-02 H					1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N
Imazalil	35554440	1.30E-02 I					4.70E+02 N	4.70E+01 N	1.80E+01 N	2.70E+04 N	1.00E+03 N
Imazaquin	81335377	2.50E-01 I					9.10E+03 N	9.10E+02 N	3.40E+02 N	5.10E+05 N	2.00E+04 N
Iprodione	36734197	4.00E-02 I					1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N

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							Tap Water ug/L	Ambient Air ug/m³	Fish mg/kg	Industrial mg/kg	Residential mg/kg
Iron	7439896	3.00E-01 E					1.10E+04 N	1.10E+03 N	4.10E+02 N	6.10E+05 N	2.30E+04 N
Isobutanol	78831	3.00E-01 I				☒	1.80E+03 N	1.10E+03 N	4.10E+02 N	6.10E+05 N	2.30E+04 N
Isophorone	78591	2.00E-01 I		9.50E-04 I			7.10E+01 C	6.60E+00 C	3.30E+00 C	6.00E+03 C	6.70E+02 C
Isopropalin	33820530	1.50E-02 I					5.50E+02 N	5.50E+01 N	2.00E+01 N	3.10E+04 N	1.20E+03 N
Isopropyl methyl phosphonic acid	1832548	1.00E-01 I					3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
Isoxaben	82558507	5.00E-02 I					1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
Kepone	143500			1.80E+01 E			3.70E-03 C	3.50E-04 C	1.80E-04 C	3.20E-01 C	3.50E-02 C
Lactofen	77501634	2.00E-03 I					7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N
Linuron	330552	2.00E-03 I					7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N
Lithium	7439932	2.00E-02 E					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Londax	83056996	2.00E-01 I					7.30E+03 N	7.30E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N
Malathion	121755	2.00E-02 I					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Maleic anhydride	108316	1.00E-01 I					3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
Maleic hydrazide	123331	5.00E-01 I					1.80E+04 N	1.80E+03 N	6.80E+02 N	1.00E+06 N	3.90E+04 N
Malononitrile	109773	2.00E-05 H					7.30E-01 N	7.30E-02 N	2.70E-02 N	4.10E+01 N	1.60E+00 N
Mancozeb	8018017	3.00E-02 H					1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N
Maneb	12427382	5.00E-03 I					1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
Manganese and compounds	7439965	2.30E-02 I	1.43e-05 I				8.40E+02 N	5.20E-02 N	3.10E+01 N	4.70E+04 N	1.80E+03 N
Mephosfolan	950107	9.00E-05 H					3.30E+00 N	3.30E-01 N	1.20E-01 N	1.80E+02 N	7.00E+00 N
Mepiquat chloride	24307264	3.00E-02 I					1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N
Mercuric chloride	7487947	3.00E-04 I					1.10E+01 N	1.10E+00 N	4.10E-01 N	6.10E+02 N	2.30E+01 N
Mercury (inorganic)	7439976	3.00E-04 W	8.57E-05 I				1.10E+01 N	3.10E-01 N	4.10E-01 N	6.10E+02 N	2.30E+01 N
Mercury (methyl)	22967926	1.00E-04 I					3.70E+00 N	3.70E-01 N	1.40E-01 N	2.00E+02 N	7.80E+00 N
Merphos	150505	3.00E-05 I					1.10E+00 N	1.10E-01 N	4.10E-02 N	6.10E+01 N	2.30E+00 N
Merphos oxide	78488	3.00E-05 I					1.10E+00 N	1.10E-01 N	4.10E-02 N	6.10E+01 N	2.30E+00 N
Metalaxyl	57837191	6.00E-02 I					2.20E+03 N	2.20E+02 N	8.10E+01 N	1.20E+05 N	4.70E+03 N
Methacrylonitrile	126987	1.00E-04 I	2.00E-04 A				3.70E+00 N	7.30E-01 N	1.40E-01 N	2.00E+02 N	7.80E+00 N
Methamidophos	10265926	5.00E-05 I					1.80E+00 N	1.80E-01 N	6.80E-02 N	1.00E+02 N	3.90E+00 N
Methanol	67561	5.00E-01 I					1.80E+04 N	1.80E+03 N	6.80E+02 N	1.00E+06 N	3.90E+04 N
Methidathion	950378	1.00E-03 I					3.70E+01 N	3.70E+00 N	1.40E+00 N	2.00E+03 N	7.80E+01 N
Methomyl	16752775	2.50E-02 I					9.10E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N
Methoxychlor	72435	5.00E-03 I					1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
2-Methoxyethanol acetate	110496	2.00E-03 A					7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N
2-Methoxyethanol	109864	1.00E-03 A	5.71E-03 I				3.70E+01 N	2.10E+01 N	1.40E+00 N	2.00E+03 N	7.80E+01 N
2-Methoxy-5-nitroaniline	99592			4.60E-02 H			1.50E+00 C	1.40E-01 C	6.90E-02 C	1.20E+02 C	1.40E+01 C
Methyl acetate	79209	1.00E+00 H					3.70E+04 N	3.70E+03 N	1.40E+03 N	1.00E+06 N	7.80E+04 N
Methyl acrylate	96333	3.00E-02 A					1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N
2-Methylaniline hydrochloride	636215			1.80E-01 H			3.70E-01 C	3.50E-02 C	1.80E-02 C	3.20E+01 C	3.50E+00 C
2-Methylaniline	95534			2.40E-01 H			2.80E-01 C	2.60E-02 C	1.30E-02 C	2.40E+01 C	2.70E+00 C
Methyl chlorocarbonate	79221	1.00E+00 W					3.70E+04 N	3.70E+03 N	1.40E+03 N	1.00E+06 N	7.80E+04 N
4-(2-Methyl-4-chlorophenoxy) butyric acid	94815	1.00E-02 I					3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N

EPA Region III Risk-Based Concentrations, October 22, 1997

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Basis: C = Carcinigenic Effects
N = non-carcinogenic effects

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg·d/mg	CPSi kg·d/mg	VOC	Risk-Based Concentrations: Tap Water ug/L	Ambient Air ug/m³	Fish mg/kg	Soil Ingestion: Industrial mg/kg	Residential mg/kg
2-Methyl-4-chlorophenoxyacetic acid	94746	5.00E-04 I					1.80E+01 N	1.80E+00 N	6.80E-01 N	1.00E+03 N	3.90E+01 N
2-(2-Methyl-14-chlorophenoxy)propionic a	93652	1.00E-03 I					3.70E+01 N	3.70E+00 N	1.40E+00 N	2.00E+03 N	7.80E+01 N
Methylcyclohexane	108872		8.57E-01 H				3.10E+04 N	3.10E+03 N	0.00E+00	0.00E+00	0.00E+00
Methylene bromide	74953	1.00E-02 A				☒	6.10E+01 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
Methylene chloride	75092	6.00E-02 I	8.57E-01 H	7.50E-03 I	1.64E-03 I	☒	4.10E+00 C	3.80E+00 C	4.20E-01 C	7.60E+02 C	8.50E+01 C
4,4'-Methylene bis(2-chloroaniline)	101144	7.00E-04 H		1.30E-01 H	1.30E-01 H		5.20E-01 C	4.80E-02 C	2.40E-02 C	4.40E+01 C	4.90E+00 C
4,4'-Methylenebisbenzeneamine	101779			2.50E-01 W			2.70E-01 C	2.50E-02 C	1.30E-02 C	2.30E+01 C	2.60E+00 C
4,4'-Methylene bis(N,N'-dimethyl)aniline	101611			4.60E-02 I			1.50E+00 C	1.40E-01 C	6.90E-02 C	1.20E+02 C	1.40E+01 C
4,4'-Methylenediphenyl isocyanate	101688		5.71E-06 I			☒	3.50E-02 N	2.10E-02 N	0.00E+00	0.00E+00	0.00E+00
Methyl ethyl ketone	78933	6.00E-01 I	2.86E-01 I			☒	1.90E+03 N	1.00E+03 N	8.10E+02 N	1.00E+06 N	4.70E+04 N
Methyl hydrazine	60344			1.10E+00 W			6.10E-02 C	5.70E-03 C	2.90E-03 C	5.20E+00 C	5.80E-01 C
Methyl isobutyl ketone	108101	8.00E-02 H	2.29E-02 A				2.90E+03 N	8.40E+01 N	1.10E+02 N	1.60E+05 N	6.30E+03 N
Methyl methacrylate	80626	8.00E-02 H					2.90E+03 N	2.90E+02 N	1.10E+02 N	1.60E+05 N	6.30E+03 N
2-Methyl-5-nitroaniline	99558			3.30E-02 H			2.00E+00 C	1.90E-01 C	9.60E-02 C	1.70E+02 C	1.90E+01 C
Methyl parathion	298000	2.50E-04 I					9.10E+00 N	9.10E-01 N	3.40E-01 N	5.10E+02 N	2.00E+01 N
2-Methylphenol (o-cresol)	95487	5.00E-02 I					1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
3-Methylphenol (m-cresol)	103394	5.00E-02 I					1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
4-Methylphenol (p-cresol)	106445	5.00E-03 H					1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
Methyl styrene (mixture)	25013154	6.00E-03 A	1.14E-02 A			☒	6.00E+01 N	4.20E+01 N	8.10E+00 N	1.20E+04 N	4.70E+02 N
Methyl styrene (alpha)	98839	7.00E-02 A				☒	4.30E+02 N	2.60E+02 N	9.50E+01 N	1.40E+05 N	5.50E+03 N
Methyl tertbutyl ether (MTBE)	1634044	5.00E-03 E	8.57E-01 I			☒	1.80E+02 N	3.10E+03 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
Metolaclor (Dual)	51218452	1.50E-01 H					5.50E+03 N	5.50E+02 N	2.00E+02 N	3.10E+05 N	1.20E+04 N
Metribuzin	21087649	2.50E-02 I					9.10E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N
Mirex	2385855	2.00E-04 I		1.80E+00 W			3.70E-02 C	3.50E-03 C	1.80E-03 C	3.20E+00 C	3.50E-01 C
Molinate	2212671	2.00E-03 I					7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N
Molybdenum	7439987	5.00E-03 I					1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
Monochloramine	10599903	1.00E-01 I					3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
Naled	300765	2.00E-03 I					7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N
2-Naphthylamine	91598			1.30e+02 E			5.20E-04 C	4.80E-05 C	2.40E-05 C	4.40E-02 C	4.90E-03 C
Napropamide	15299997	1.00E-01 I					3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
Nickel refinery dust	0				8.40E-01 I		0.00E+00	7.50E-03 C	0.00E+00	0.00E+00	0.00E+00
Nickel and compounds	7440020	2.00E-02 I					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Nickel subsulfide	12035722				1.70E+00 I		0.00E+00	3.70E-03 C	0.00E+00	0.00E+00	0.00E+00
Nitrapyrin	1929824	1.50E-03 W					5.50E+01 N	5.50E+00 N	2.00E+00 N	3.10E+03 N	1.20E+02 N
Nitrate	14797558	1.60E+00 I					5.80E+04 N	5.80E+03 N	2.20E+03 N	1.00E+06 N	1.30E+05 N
Nitric oxide	10102439	1.00E-01 W					3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
Nitrite	14797650	1.00E-01 I					3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
2-Nitroaniline	88744	6.00E-05 W	5.71E-05 H				2.20E+00 N	2.10E-01 N	8.10E-02 N	1.20E+02 N	4.70E+00 N
3-Nitroaniline	99092	3.00E-03 O					1.10E+02 N	1.10E+01 N	4.10E+00 N	6.10E+03 N	2.30E+02 N
4-Nitroaniline	100016	3.00E-03 O					1.10E+02 N	1.10E+01 N	4.10E+00 N	6.10E+03 N	2.30E+02 N
Nitrobenzene	98953	5.00E-04 I	5.71E-04 A			☒	3.40E+00 N	2.10E+00 N	6.80E-01 N	1.00E+03 N	3.90E+01 N

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Contaminant	CAS	RfDo	RfDi	CPSo	CPSi	V O C	Risk-Based Concentrations				
							Tap Water	Ambient Air	Fish	Soil Ingestion	
										Industrial	Residential
		mg/kg/d	mg/kg/d	Kg d/mg	kg d/mg		ug/L	ug/m^3	mg/kg	mg/kg	mg/kg
Nitrofurantoin	67209	7.00E-02 H					2.60E+03 N	2.60E+02 N	9.50E+01 N	1.40E+05 N	5.50E+03 N
Nitrofurazone	59870			1.50E+00 H	9.40E+00 W		4.50E-02 C	6.70E-04 C	2.10E-03 C	3.80E+00 C	4.30E-01 C
Nitrogen dioxide	10102440	1.00E+00 W					3.70E+04 N	3.70E+03 N	1.40E+03 N	1.00E+06 N	7.80E+04 N
Nitroguanidine	556887	1.00E-01 I					3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
**4-Nitrophenol	100027	8.00E-03 E					2.90E+02 N	2.90E+01 N	1.10E+01 N	1.60E+04 N	6.30E+02 N
2-Nitropropane	79469		5.71E-03 I		9.40E+00 H		2.10E+02 N	6.70E-04 C	0.00E+00	0.00E+00	0.00E+00
N-Nitrosodi-n-butylamine	924163			5.40E+00 I	5.60E+00 I		1.20E-02 C	1.10E-03 C	5.80E-04 C	1.10E+00 C	1.20E-01 C
N-Nitrosodiethanolamine	1116547			2.80E+00 I			2.40E-02 C	2.20E-03 C	1.10E-03 C	2.00E+00 C	2.30E-01 C
N-Nitrosodiethylamine	55185			1.50E+02 I	1.51E+02 I		4.50E-04 C	4.10E-05 C	2.10E-05 C	3.80E-02 C	4.30E-03 C
N-Nitrosodimethylamine	62759			5.10E+01 I	4.90E+01 I		1.30E-03 C	1.30E-04 C	6.20E-05 C	1.10E-01 C	1.30E-02 C
N-Nitrosodiphenylamine	86306			4.90E-03 I			1.40E+01 C	1.30E+00 C	6.40E-01 C	1.20E+03 C	1.30E+02 C
N-Nitroso di-n-propylamine	621647			7.00E+00 I			9.60E-03 C	8.90E-04 C	4.50E-04 C	8.20E-01 C	9.10E-02 C
N-Nitroso-N-ethylurea	759739			1.40E+02 H			4.80E-04 C	4.50E-05 C	2.30E-05 C	4.10E-02 C	4.60E-03 C
N-Nitroso-N-methylethylamine	10595956			2.20E+01 I			3.10E-03 C	2.80E-04 C	1.40E-04 C	2.60E-01 C	2.90E-02 C
N-Nitrosopyrrolidine	930552			2.10E+00 I	2.13E+00 I		3.20E-02 C	2.90E-03 C	1.50E-03 C	2.70E+00 C	3.00E-01 C
m-Nitrotoluene	99081	2.00E-02 H				☒	1.20E+02 N	7.30E+01 N	2.70E+01 N	4.10E+03 N	1.60E+03 N
o-Nitrotoluene	88722	1.00E-02 H				☒	6.10E+01 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
p-Nitrotoluene	99990	1.00E-02 H				☒	6.10E+01 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
Norflurazon	27314132	4.00E-02 I					1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N
NuStar	85509199	7.00E-04 I					2.60E+01 N	2.60E+00 N	9.50E-01 N	1.40E+03 N	5.50E+01 N
Octabromodiphenyl ether	32536520	3.00E-03 I					1.10E+02 N	1.10E+01 N	4.10E+00 N	6.10E+03 N	2.30E+02 N
Octahydro-1357-tetranitro-1357-tetrazocine	2691410	5.00E-02 I					1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
Octamethylpyrophosphoramide	152169	2.00E-03 H					7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N
Oryzalin	19044883	5.00E-02 I					1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
Oxadiazon	19666309	5.00E-03 I					1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
Oxamyl	23135220	2.50E-02 I					9.10E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N
Oxyfluorfen	42874033	3.00E-03 I					1.10E+02 N	1.10E+01 N	4.10E+00 N	6.10E+03 N	2.30E+02 N
Paclobutrazol	76738620	1.30E-02 I					4.70E+02 N	4.70E+01 N	1.80E+01 N	2.70E+04 N	1.00E+03 N
Paraquat	1910425	4.50E-03 I					1.60E+02 N	1.60E+01 N	6.10E+00 N	9.20E+03 N	3.50E+02 N
Parathion	56382	6.00E-03 H					2.20E+02 N	2.20E+01 N	8.10E+00 N	1.20E+04 N	4.70E+02 N
Pebulate	1114712	5.00E-02 H					1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
Pendimethalin	40487421	4.00E-02 I					1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N
Pentabromo-6-chlorocyclohexane	87843	I		2.30E-02 H			2.90E+00 C	2.70E-01 C	1.40E-01 C	2.50E+02 C	2.80E+01 C
Pentabromodiphenyl ether	32534819	2.00E-03 I					7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N
Pentachlorobenzene	608935	8.00E-04 I				☒	4.90E+00 N	2.90E+00 N	1.10E+00 N	1.60E+03 N	6.30E+01 N
Pentachloronitrobenzene	82688	3.00E-03 I		2.60E-01 H		☒	4.10E-02 C	2.40E-02 C	1.20E-02 C	2.20E+01 C	2.50E+00 C
Pentachlorophenol	87865	3.00E-02 I		1.20E-01 I			5.60E-01 C	5.20E-02 C	2.60E-02 C	4.80E+01 C	5.30E+00 C
Permethrin	52645531	5.00E-02 I					1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
Phenmedipham	13684634	2.50E-01 I					9.10E+03 N	9.10E+02 N	3.40E+02 N	5.10E+05 N	2.00E+04 N
Phenol	108952	6.00E-01 I					2.20E+04 N	2.20E+03 N	8.10E+02 N	1.00E+06 N	4.70E+04 N
m-Phenylenediamine	108452	6.00E-03 I					2.20E+02 N	2.20E+01 N	8.10E+00 N	1.20E+04 N	4.70E+02 N

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**o-Phenylenediamine	95545	6.00E-03 E		4.70E-02 H			1.40E+00 C	1.30E-01 C	6.70E-02 C	1.20E+02 C	1.40E+01 C
p-Phenylenediamine	106503	1.90E-01 H					6.90E+03 N	6.90E+02 N	2.60E+02 N	3.90E+05 N	1.50E+04 N
Phenylmercuric acetate	62384	8.00E-05 I					2.90E+00 N	2.90E-01 N	1.10E-01 N	1.60E+02 N	6.30E+00 N
2-Phenylphenol	90437			1.94E-03 H			3.50E+01 C	3.20E+00 C	1.60E+00 C	3.00E+03 C	3.30E+02 C
Phorate	298022	2.00E-04 H					7.30E+00 N	7.30E-01 N	2.70E-01 N	4.10E+02 N	1.60E+01 N
Phosmet	732116	2.00E-02 I					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Phosphine	7803512	3.00E-04 I	8.57E-05 I				1.10E+01 N	3.10E-01 N	4.10E-01 N	6.10E+02 N	2.30E+01 N
Phosphoric acid	7664382		2.86E-03 I				1.00E+02 N	1.00E+01 N	0.00E+00	0.00E+00	0.00E+00
Phosphorus (white)	7723140	2.00E-05 I					7.30E-01 N	7.30E-02 N	2.70E-02 N	4.10E+01 N	1.60E+00 N
p-Phthalic acid	100210	1.00E+00 H					3.70E+04 N	3.70E+03 N	1.40E+03 N	1.00E+06 N	7.80E+04 N
Phthalic anhydride	85449	2.00E+00 I	3.43E-02 H				7.30E+04 N	1.30E+02 N	2.70E+03 N	1.00E+06 N	1.60E+05 N
Picloram	1918021	7.00E-02 I					2.60E+03 N	2.60E+02 N	9.50E+01 N	1.40E+05 N	5.50E+03 N
Pirimiphos-methyl	29232937	1.00E-02 I					3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
Polybrominated biphenyls	0	7.00E-06 H		8.90E+00 H			7.60E-03 C	7.00E-04 C	3.50E-04 C	6.40E-01 C	7.20E-02 C
**Polychlorinated biphenyls (PCBs)	1336363			2.00E+00 I	4.00E-01 I		3.40E-02 C	1.60E-02 C	1.60E-03 C	2.90E+00 C	3.20E-01 C
Aroclor 1016	12674112	7.00E-05 I					2.60E+00 N	2.60E-01 N	9.50E-02 N	1.40E+02 N	5.50E+00 N
Aroclor 1254	11097691	2.00E-05 I					7.30E-01 N	7.30E-02 N	2.70E-02 N	4.10E+01 N	1.60E+00 N
Polychlorinated terphenyls (PCTs)	0			4.50E+00 E			1.50E-02 C	1.40E-03 C	7.00E-04 C	1.30E+00 C	1.40E-01 C
Polynuclear aromatic hydrocarbons	0						0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acenaphthene	83329	6.00E-02 I					2.20E+03 N	2.20E+02 N	8.10E+01 N	1.20E+05 N	4.70E+03 N
Anthracene	120127	3.00E-01 I					1.10E+04 N	1.10E+03 N	4.10E+02 N	6.10E+05 N	2.30E+04 N
**Benz[a]anthracene	56553			7.30E-01 E	3.10E-01 E		9.20E-02 C	2.00E-02 C	4.30E-03 C	7.80E+00 C	8.80E-01 C
**Benzo[b]fluoranthene	205992			7.30E-01 E	3.10E-01 E		9.20E-02 C	2.00E-02 C	4.30E-03 C	7.80E+00 C	8.80E-01 C
**Benzo[k]fluoranthene	207089			7.30E-02 E	3.10E-02 E		9.20E-01 C	2.00E-01 C	4.30E-02 C	7.80E+01 C	8.80E+00 C
**Benzo[a]pyrene	50328			7.30E+00 I	3.10E+00 E		9.20E-03 C	2.00E-03 C	4.30E-04 C	7.80E-01 C	8.80E-02 C
Carbazole	86748			2.00E-02 H			3.40E+00 C	3.10E-01 C	1.60E-01 C	2.90E+02 C	3.20E+01 C
**Chrysene	218019			7.30E-03 E	3.10E-03 E		9.20E+00 C	2.00E+00 C	4.30E-01 C	7.80E+02 C	8.80E+01 C
**Dibenz[ah]anthracene	53703			7.30E+00 E	3.10E+00 E		9.20E-03 C	2.00E-03 C	4.30E-04 C	7.80E-01 C	8.80E-02 C
Fluoranthene	206440	4.00E-02 I					1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N
Fluorene	86737	4.00E-02 I					1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N
**Indeno[1,2,3-cd]pyrene	193395			7.30E-01 E	3.10E-01 E		9.20E-02 C	2.00E-02 C	4.30E-03 C	7.80E+00 C	8.80E-01 C
**2-Methylnaphthalene	91576	4.00E-02 E					1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N
Naphthalene	91203	4.00E-02 W					1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N
Pyrene	129000	3.00E-02 I					1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N
Prochloraz	67747095	9.00E-03 I		1.50E-01 I			4.50E-01 C	4.20E-02 C	2.10E-02 C	3.80E+01 C	4.30E+00 C
Profluralin	26399360	6.00E-03 H					2.20E+02 N	2.20E+01 N	8.10E+00 N	1.20E+04 N	4.70E+02 N
Prometon	1610180	1.50E-02 I					5.50E+02 N	5.50E+01 N	2.00E+01 N	3.10E+04 N	1.20E+03 N
Prometryn	7287196	4.00E-03 I					1.50E+02 N	1.50E+01 N	5.40E+00 N	8.20E+03 N	3.10E+02 N
Pronamide	23950585	7.50E-02 I					2.70E+03 N	2.70E+02 N	1.00E+02 N	1.50E+05 N	5.90E+03 N
Propachlor	1918167	1.30E-02 I					4.70E+02 N	4.70E+01 N	1.80E+01 N	2.70E+04 N	1:00E+03 N
	709988	5.00E-03 I					1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N

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Contaminant	CAS	RfDo	RfDi	CPSo	CPSi	VOC	Risk-Based Concentrations Tap Water	Ambient Air	Fish	Soil Ingestion Industrial	Residential
		mg/kg/d	mg/kg/d	Kg d/mg	kg d/mg		ug/L	ug/m³	mg/kg	mg/kg	mg/kg
Propargite	2312358	2.00E-02 I					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Propargyl alcohol	107197	2.00E-03 I					7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N
Propazine	139402	2.00E-02 I					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Propham	122429	2.00E-02 I					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Propiconazole	60207901	1.30E-02 I					4.70E+02 N	4.70E+01 N	1.80E+01 N	2.70E+04 N	1.00E+03 N
**n-Propylbenzene	98066	1.00E-02 E				☒	6.10E+01 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
Propylene glycol	57556	2.00E+01 H					7.30E+05 N	7.30E+04 N	2.70E+04 N	1.00E+06 N	1.00E+06 N
Propylene glycol, monoethyl ether	52125538	7.00E-01 H					2.60E+04 N	2.60E+03 N	9.50E+02 N	1.00E+06 N	5.50E+04 N
Propylene glycol, monomethyl ether	107982	7.00E-01 H	5.71E-01 I				2.60E+04 N	2.10E+03 N	9.50E+02 N	1.00E+06 N	5.50E+04 N
Propylene oxide	75569		8.57E-03 I	2.40E-01 I	1.29E-02 I		2.80E-01 C	4.90E-01 C	1.30E-02 C	2.40E+01 C	2.70E+00 C
Pursuit	81335775	2.50E-01 I					9.10E+03 N	9.10E+02 N	3.40E+02 N	5.10E+05 N	2.00E+04 N
Pydrin	51630581	2.50E-02 I					9.10E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N
Pyridine	110861	1.00E-03 I					3.70E+01 N	3.70E+00 N	1.40E+00 N	2.00E+03 N	7.80E+01 N
Quinalphos	13593038	5.00E-04 I					1.80E+01 N	1.80E+00 N	6.80E-01 N	1.00E+03 N	3.90E+01 N
Quinoline	91225			1.20E+01 H			5.60E-03 C	5.20E-04 C	2.60E-04 C	4.80E-01 C	5.30E-02 C
Resmethrin	10463868	3.00E-02 I					1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N
Ronnel	299843	5.00E-02 H					1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
Rotenone	83794	4.00E-03 I					1.50E+02 N	1.50E+01 N	5.40E+00 N	8.20E+03 N	3.10E+02 N
Savey	78587050	2.50E-02 I					9.10E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N
Selenious Acid	7783008	5.00E-03 I					1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
Selenium	7782492	5.00E-03 I					1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
Selenourea	630104	5.00E-03 H					1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
Sethoxydim	74051802	9.00E-02 I					3.30E+03 N	3.30E+02 N	1.20E+02 N	1.80E+05 N	7.00E+03 N
Silver and compounds	7440224	5.00E-03 I					1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
Simazine	122349	5.00E-03 I		1.20E-01 H			5.60E-01 C	5.20E-02 C	2.60E-02 C	4.80E+01 C	5.30E+00 C
Sodium azide	26628228	4.00E-03 I					1.50E+02 N	1.50E+01 N	5.40E+00 N	8.20E+03 N	3.10E+02 N
Sodium diethyldithiocarbamate	148185	3.00E-02 I		2.70E-01 H			2.50E-01 C	2.30E-02 C	1.20E-02 C	2.10E+01 C	2.40E+00 C
Sodium fluoroacetate	62748	2.00E-05 I					7.30E-01 N	7.30E-02 N	2.70E-02 N	4.10E+01 N	1.60E+00 N
Sodium metavanadate	13718268	1.00E-03 H					3.70E+01 N	3.70E+00 N	1.40E+00 N	2.00E+03 N	7.80E+01 N
Strontium, stable	7440246	6.00E-01 I					2.20E+04 N	2.20E+03 N	8.10E+02 N	1.00E+06 N	4.70E+04 N
Strychnine	57249	3.00E-04 I					1.10E+01 N	1.10E+00 N	4.10E-01 N	6.10E+02 N	2.30E+01 N
Styrene	100425	2.00E-01 I	2.86E-01 I			☒	1.60E+03 N	1.00E+03 N	2.70E+02 N	4.10E+05 N	1.60E+04 N
Systhane	88671890	2.50E-02 I					9.10E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N
**2,3,7,8-TCDD (dioxin)	1746016			1.50E+05 H	1.50E+05 H		4.50E-07 C	4.20E-08 C	0.00E+00 C	3.80E-05 C	4.30E-06 C
Tebuthiuron	34014181	7.00E-02 I					2.60E+03 N	2.60E+02 N	9.50E+01 N	1.40E+05 N	5.50E+03 N
Temephos	3383968	2.00E-02 H					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Terbacil	5902512	1.30E-02 I					4.70E+02 N	4.70E+01 N	1.80E+01 N	2.70E+04 N	1.00E+03 N
Terbufos	13071799	2.50E-05 H					9.10E-01 N	9.10E-02 N	3.40E-02 N	5.10E+01 N	2.00E+00 N
Terbutryn	886500	1.00E-03 I					3.70E+01 N	3.70E+00 N	1.40E+00 N	2.00E+03 N	7.80E+01 N
1,2,4,5-Tetrachlorobenzene	95943	3.00E-04 I				☒	1.80E+00 N	1.10E+00 N	4.10E-01 N	6.10E+02 N	2.30E+01 N
1,1,1,2-Tetrachloroethane	630206	3.00E-02 I		2.60E-02 I	2.59E-02 I	☒	4.10E-01 C	2.40E-01 C	1.20E-01 C	2.20E+02 C	2.50E+01 C

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Basis: C = Carcinigenic Effects
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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo Kg d/mg	CPSi kg d/mg	VOC	Risk-Based Concentrations: Tap Water ug/L	Ambient Air ug/m³	Fish mg/kg	Soil Ingestion: Industrial mg/kg	Soil Ingestion: Residential mg/kg
1,1,2,2-Tetrachloroethane	79345			2.00E-01 I	2.03E-01 I	☒	5.20E-02 C	3.10E-02 C	1.60E-02 C	2.90E+01 C	3.20E+00 C
Tetrachloroethylene (PCE)	127184	1.00E-02 I		5.20E-02 E	2.03E-03 E	☒	1.10E+00 C	3.10E+00 C	6.10E-02 C	1.10E+02 C	1.20E+01 C
2,3,4,6-Tetrachlorophenol	58902	3.00E-02 I					1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N
p,a,a,a-Tetrachlorotoluene	5216251			2.00E+01 H		☒	5.30E-04 C	3.10E-04 C	1.60E-04 C	2.90E-01 C	3.20E-02 C
Tetrachlorovinphos	961115	3.00E-02 I		2.40E-02 H			2.80E+00 C	2.60E-01 C	1.30E-01 C	2.40E+02 C	2.70E+01 C
Tetraethyldithiopyrophosphate	3689245	5.00E-04 I					1.80E+01 N	1.80E+00 N	6.80E-01 N	1.00E+03 N	3.90E+01 N
Tetraethyl lead	78002	1.00E-07 I					3.70E-03 N	3.70E-04 N	1.40E-04 N	2.00E-01 N	7.80E-03 N
1,1,1,2-Tetrafluoroethane	811972	I	2.29E+01			☒	1.40E+05 N	8.40E+04 N	0.00E+00	0.00E+00	0.00E+00
Thallic oxide	1314325	7.00E-05 W					2.60E+00 N	2.60E-01 N	9.50E-02 N	1.40E+02 N	5.50E+00 N
Thallium	0						0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Thallium acetate	563688	9.00E-05 I					3.30E+00 N	3.30E-01 N	1.20E-01 N	1.80E+02 N	7.00E+00 N
Thallium carbonate	6533739	8.00E-05 I					2.90E+00 N	2.90E-01 N	1.10E-01 N	1.60E+02 N	6.30E+00 N
Thallium chloride	7791120	8.00E-05 I					2.90E+00 N	2.90E-01 N	1.10E-01 N	1.60E+02 N	6.30E+00 N
Thallium nitrate	10102451	9.00E-05 I					3.30E+00 N	3.30E-01 N	1.20E-01 N	1.80E+02 N	7.00E+00 N
Thallium selenite	12039520	9.00E-05 W					3.30E+00 N	3.30E-01 N	1.20E-01 N	1.80E+02 N	7.00E+00 N
Thallium sulfate	7446186	8.00E-05 I					2.90E+00 N	2.90E-01 N	1.10E-01 N	1.60E+02 N	6.30E+00 N
Thiobencarb	28249776	1.00E-02 I					3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
2-(Thiocyanomethylthio)-benzothiazole	21564170	3.00E-02 H					1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N
Thiofanox	39196184	3.00E-04 H					1.10E+01 N	1.10E+00 N	4.10E-01 N	6.10E+02 N	2.30E+01 N
Thiophanate-methyl	23564058	8.00E-02 I					2.90E+03 N	2.90E+02 N	1.10E+02 N	1.60E+05 N	6.30E+03 N
Thiram	137268	5.00E-03 I					1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
Tin and compounds	0	6.00E-01 H					2.20E+04 N	2.20E+03 N	8.10E+02 N	1.00E+06 N	4.70E+04 N
**Titanium	7440326	4.00E+00 E	8.60E-03 E				1.50E+05 N	3.10E+01 N	5.40E+03 N	1.00E+06 N	3.10E+05 N
**Titanium dioxide	13643677	4.00E+00 E	8.60E-03 E				1.50E+05 N	3.10E+01 N	5.40E+03 N	1.00E+06 N	3.10E+05 N
Toluene	108883	2.00E-01 I	1.14E-01 I			☒	7.50E+02 N	4.20E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N
Toluene-2,4-diamine	95807			3.20E+00 H			2.10E-02 C	2.00E-03 C	9.90E-04 C	1.80E+00 C	2.00E-01 C
Toluene-2,5-diamine	95705	6.00E-01 H					2.20E+04 N	2.20E+03 N	8.10E+02 N	1.00E+06 N	4.70E+04 N
Toluene-2,6-diamine	823405	2.00E-01 H					7.30E+03 N	7.30E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N
p-Toluidine	106490			1.90E-01 H			3.50E-01 C	3.30E-02 C	1.70E-02 C	3.00E+01 C	3.40E+00 C
Toxaphene	8001352			1.10E+00 I	1.12E+00 I		6.10E-02 C	5.60E-03 C	2.90E-03 C	5.20E+00 C	5.80E-01 C
Tralomethrin	66841256	7.50E-03 I					2.70E+02 N	2.70E+01 N	1.00E+01 N	1.50E+04 N	5.90E+02 N
Triallate	2303175	1.30E-02 I					4.70E+02 N	4.70E+01 N	1.80E+01 N	2.70E+04 N	1.00E+03 N
Triasulfuron	82097505	1.00E-02 I					3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
1,2,4-Tribromobenzene	615543	5.00E-03 I				☒	3.00E+01 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
Tributyltin oxide (TBTO)	56359	3.00E-04 I					1.10E+01 N	1.10E+00 N	4.10E-01 N	6.10E+02 N	2.30E+01 N
2,4,6-Trichloroaniline hydrochloride	33663502			2.90E-02 H			2.30E+00 C	2.20E-01 C	1.10E-01 C	2.00E+02 C	2.20E+01 C
2,4,6-Trichloroaniline	634935			3.40E-02 H			2.00E+00 C	1.80E-01 C	9.30E-02 C	1.70E+02 C	1.90E+01 C
1,2,4-Trichlorobenzene	120821	1.00E-02 I	5.71e-02 H			☒	1.90E+02 N	2.10E+02 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
**1,1,1-Trichloroethane	71556	2.00E-02 E	2.86E-01 W			☒	5.40E+02 N	1.00E+03 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
1,1,2-Trichloroethane	79005	4.00E-03 I		5.70E-02 I	5.60E-02 I	☒	1.90E-01 C	1.10E-01 C	5.50E-02 C	1.00E+02 C	1.10E+01 C
	79016	6.00E-03 E		1.10E-02 W	6.00E-03 E	☒	1.60E+00 C	1.00E+00 C	2.90E-01 C	5.20E+02 C	5.80E+01 C

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Trichlorofluoromethane	75694	3.00E-01 I	2.00E-01 A			☒	1.30E+03 N	7.30E+02 N	4.10E+02 N	6.10E+05 N	2.30E+04 N
2,4,5-Trichlorophenol	95954	1.00E-01 I					3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N
2,4,6-Trichlorophenol	88062			1.10E-02 I	1.09E-02 I		6.10E+00 C	5.70E-01 C	2.90E-01 C	5.20E+02 C	5.80E+01 C
2,4,5-Trichlorophenoxyacetic acid	93765	1.00E-02 I					3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
2-(2,4,5-Trichlorophenoxy)propionic acid	93721	8.00E-03 I					2.90E+02 N	2.90E+01 N	1.10E+01 N	1.60E+04 N	6.30E+02 N
1,1,2-Trichloropropane	598776	5.00E-03 I				☒	3.00E+01 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
1,2,3-Trichloropropane	96184	6.00E-03 I		7.00E+00 H		☒	1.50E-03 C	8.90E-04 C	4.50E-04 C	8.20E-01 C	9.10E-02 C
1,2,3-Trichloropropene	96195	5.00E-03 H				☒	3.00E+01 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N
1,1,2-Trichloro-1,2,2- trifluoroethane	76131	3.00E+01 I	8.57E+00 H			☒	5.90E+04 N	3.10E+04 N	4.10E+04 N	1.00E+06 N	1.00E+06 N
Tridiphane	58138082	3.00E-03 I					1.10E+02 N	1.10E+01 N	4.10E+00 N	6.10E+03 N	2.30E+02 N
Triethylamine	121448		2.00E-03 I				7.30E+01 N	7.30E+00 N	0.00E+00	0.00E+00	0.00E+00
Trifluralin	1582098	7.50E-03 I		7.70E-03 I			8.70E+00 C	8.10E-01 C	4.10E-01 C	7.40E+02 C	8.30E+01 C
**1,2,4-Trimethylbenzene	95636	5.00E-02 E	1.70E-03 E			☒	1.20E+01 N	6.20E+00 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
**1,3,5-Trimethylbenzene	108678	5.00E-02 E	1.70E-03 E			☒	1.20E+01 N	6.20E+00 N	6.80E+01 N	1.00E+05 N	3.90E+03 N
Trimethyl phosphate	512561			3.70E-02 H			1.80E+00 C	1.70E-01 C	8.50E-02 C	1.50E+02 C	1.70E+01 C
**1,3,5-Trinitrobenzene	99354	3.00E-02 E					1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N
Trinitrophenylmethylnitramine	479458	1.00E-02 H					3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N
2,4,6-Trinitrotoluene	118967	5.00E-04 I		3.00E-02 I			2.20E+00 C	2.10E-01 C	1.10E-01 C	1.90E+02 C	2.10E+01 C
Uranium (soluble salts)	7440611	3.00E-03 I					1.10E+02 N	1.10E+01 N	4.10E+00 N	6.10E+03 N	2.30E+02 N
Vanadium	7440622	7.00E-03 H					2.60E+02 N	2.60E+01 N	9.50E+00 N	1.40E+04 N	5.50E+02 N
Vanadium pentoxide	1314621	9.00E-03 I					3.30E+02 N	3.30E+01 N	1.20E+01 N	1.80E+04 N	7.00E+02 N
Vanadium sulfate	36907423	2.00E-02 H					7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N
Vernam	1929777	1.00E-03 I					3.70E+01 N	3.70E+00 N	1.40E+00 N	2.00E+03 N	7.80E+01 N
Vinclozolin	50471448	2.50E-02 I					9.10E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N
Vinyl acetate	108054	1.00E+00 H	5.71E-02 I				3.70E+04 N	2.10E+02 N	1.40E+03 N	1.00E+06 N	7.80E+04 N
Vinyl bromide	593602		8.57E-04 I			☒	5.20E+00 N	3.10E+00 N	0.00E+00	0.00E+00	0.00E+00
Vinyl chloride	75014			1.90E+00 H	3.00E-01 H	☒	1.90E-02 C	2.10E-02 C	1.70E-03 C	3.00E+00 C	3.40E-01 C
Warfarin	81812	3.00E-04 I					1.10E+01 N	1.10E+00 N	4.10E-01 N	6.10E+02 N	2.30E+01 N
m-Xylene	108323	2.00E+00 H				☒	1.20E+04 N	7.30E+03 N	2.70E+03 N	1.00E+06 N	1.60E+05 N
o-Xylene	95476	2.00E+00 H				☒	1.20E+04 N	7.30E+03 N	2.70E+03 N	1.00E+06 N	1.60E+05 N
p-Xylene	106423					☒	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xylene (mixed)	1330207	2.00E+00 I				☒	1.20E+04 N	7.30E+03 N	2.70E+03 N	1.00E+06 N	1.60E+05 N
Zinc	7440666	3.00E-01 I					1.10E+04 N	1.10E+03 N	4.10E+02 N	6.10E+05 N	2.30E+04 N
Zinc phosphide	1314847	3.00E-04 I					1.10E+01 N	1.10E+00 N	4.10E-01 N	6.10E+02 N	2.30E+01 N
Zineb	12122677	5.00E-02 I					1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N

APPENDIX B

TOXICITY PROFILES FOR CHEMICALS OF CONCERN

APPENDIX B

TOXICITY INFORMATION FOR CHEMICALS OF CONCERN

1,1-Dichloroethene

The following chronic (long-term) health effects can occur at some time after exposure to 1,1-dichloroethene (1,1-DCE; vinylidene chloride) and can last for months or years.

- *Cancer Hazard*—1,1-Dichloroethene may be a cancer-causing agent in humans since it has been shown to cause kidney, liver and skin cancer in animals. It has been classified in Group 2B, a possible human carcinogen (ATSDR, 1998). It is similar to and often found with vinyl chloride, a known carcinogen.
- *Reproductive Hazard*—1,1-Dichloroethene may damage the developing fetus. Exposure also may affect the reproductive ability of males.
- *Other Long-Term Effects*—Repeated exposure may cause liver and kidney damage. 1,1-Dichloroethene may cause bronchitis to develop, with coughing, sputum production and shortness of breath.
- *Environmental Fate.*—1,1-Dichloroethene enters the atmosphere from its production and use in the manufacture of plastics. It is released in wastewater from plastics manufacturing and metal finishing. Releases to water will be lost primarily to the atmosphere through evaporation. Once in the atmosphere, 1,1-dichloroethene will degrade rapidly by photooxidation with a half-life of 11 hours in relatively clean air or under 2 hours in polluted air. If spilled on land, some will evaporate and some will leach into the groundwater where its fate is unknown, but degradation is expected to be slow based upon studies. 1,1-Dichloroethene would not be expected to bioconcentrate into fish. Major human exposure is from occupational atmospheres. The general population may be exposed to low levels of 1,1-dichloroethene in ambient air, indoor air, contaminated drinking water, and food that has come in contact with plastic wrap containing residual monomer (ATSDR, 1998).

  One source of 1,1-dichloroethene is the decomposition of 1,1,1-trichloroethene. 1,1-Dichloroethene may be released into the environment in emissions or in wastewater during its production and use in the manufacture of plastic wrap, adhesives and synthetic fibers. 1,1-Dichloroethene is formed by a minor pathway during the anaerobic biodegradation of trichloroethylene and also by the hydrolysis of 1,1,1-trichloroethane; thus, it has the potential to form in groundwater that has been contaminated by chlorinated solvents.

- *Terrestrial Fate*—When spilled on land, 1,1-dichloroethene will be lost partially by evaporation and partially by percolation into the groundwater. Under anaerobic conditions, such as may occur in groundwater, degradation to 1,1-dichloroethene may occur after many months.
- *Aquatic Fate*—When released into water, 1,1-dichloroethene will primarily be lost by evaporation into the atmosphere with a half-life of 1–6 days. Little of the chemical would be lost by adsorption onto the sediment.
- *Atmospheric Fate*—1,1-Dichloroethene is a photochemically reactive compound. When it is released to the atmosphere, it will degrade by reaction with hydroxyl radicals with a half-life of 11 hours.
- The MCL for 1,2-dichloroethene is 0.007 mg/L (EPA, 1996).

Chloroethane

The following chronic (long-term) health effects can occur at some time after exposure to chloroethane (ethyl chloride) and can last for months or years.

- *Cancer Hazard*—According to the information presently available to the New Jersey Department of Health, chloroethane has not been tested for its ability to cause cancer in animals.
- *Reproductive Hazard*—According to the information presently available to the New Jersey Department of Health, chloroethane has not been tested for its ability to adversely affect reproduction.
- *Other Long-Term Effects*—Chloroethane may damage the liver and kidneys.
- *Environmental Fate*—Environmental emission sources of chloroethane include process and fugitive emissions from its production and use as a chemical intermediate, evaporation from solvent, aerosol and anesthetic applications, stack emissions from plastics and refuse combustion, inadvertent formation during chlorination treatment, leaching from landfills and formation via microbial degradation of other chlorinated solvents. Most releases of chloroethane will eventually reach the atmosphere since it is a gas under ordinary conditions. If released to the atmosphere, the dominant environmental fate process will be reaction with photochemically generated hydroxyl radicals, with an estimated half-life of about 40 days. In groundwater, where volatilization may not occur, hydrolysis may be the most important removal mechanism. If released to soil, chloroethane will evaporate rapidly where release to the air is possible. Chloroethane is susceptible to significant leaching. The general population can be exposed to chloroethane through inhalation

of contaminated ambient air and possibly through consumption of contaminated drinking water. Probable routes of occupational exposure are inhalation and dermal contact (ATSDR, 1998).

- *Terrestrial Fate*—Chloroethane is a gas at room temperature, indicating that evaporation from soil surfaces will be a rapid and major removal process. Chloroethane is highly mobile in soil and susceptible to significant leaching.
- *Aquatic Fate*—The dominant environmental fate process for chloroethane in surface waters is probably volatilization.
- *Atmospheric Fate*—The dominant atmospheric degradation process for chloroethane is probably the vapor-phase reaction with hydroxyl radicals, with an estimated half-life of about 40 days.
- Probable routes of exposure include inhalation of gas, slight percutaneous absorption, ingestion, and eye and skin contact.
- The MCL for chloroethane has not been reported (EPA, 1996).

1,2-Dichloroethene (total)

The following chronic (long-term) health effects can occur at some time after exposure to 1,2-dichloroethene (1,2-dichloroethylene) and can last for months or years.

- *Cancer Hazard*—According to the information presently available to the New Jersey Department of Health, 1,2-dichloroethene has not been tested for its ability to cause cancer in animals.
- *Reproductive Hazard*—According to the information presently available to the New Jersey Department of Health, 1,2-dichloroethene has not been tested for its ability to adversely affect reproduction.
- *Other Long-Term Effects*—Repeated exposure may damage the liver and kidneys. 1,2-Dichloroethene may damage the lungs and cause bronchitis. Repeated exposure may cause a low blood cell count.
- *Environmental Fate*—1,2-Dichloroethene (total) may be released to the environment in emissions and wastewater during its production and use. Under anaerobic conditions that may exist in landfills, aquifers, or sediment, one is likely to find 1,2-dichloroethenes that are formed as breakdown products from the reductive dehalogenation of common industrial solvents such as trichloroethylene, tetrachloroethylene, and 1,1,2,2-tetrachloroethane. The cis-1,2-dichloroethene is

apparently the more common isomer, although it is often mistakenly reported as the trans isomer. The trans isomer, being a priority pollutant, is more commonly analyzed for, and the analytical procedures generally used do not distinguish between isomers. If 1,2-dichloroethene is released to soil, it should evaporate readily and leach in soil very slowly. Biodegradation should occur. If released into water, it will be lost mainly through volatilization with a half-life of 3 hours in a model river. Biodegradation, adsorption to sediment, and bioconcentration to aquatic organisms should not be significant. In the atmosphere, cis- and trans-1,2-dichloroethene will be lost by reaction with photochemically produced hydroxyl radicals, with half-lives of 8 and 3.6 days, respectively, and scavenged by rain. Because 1,2-dichloroethene is relatively long-lived in the atmosphere, considerable dispersal from the source area should occur. The general population is exposed to 1,2-dichloroethene in urban air as well as in contaminated drinking water from groundwater sources.

- *Terrestrial Fate*—If 1,2-dichloroethene is released to soil, it should evaporate readily and it could leach into soil where it should very slowly biodegrade.

- *Aquatic Fate*—If released into water, 1,2-dichloroethene will be lost mainly through volatilization, with a half-life of 3 hours in a model river. Biodegradation and adsorption to sediment should not be significant.

- *Atmospheric Fate*—In the atmosphere, 1,2-dichloroethene will be lost by reaction with photochemically produced hydroxyl radicals, with half-lives of 8 and 3.6 days for the cis and trans isomers, respectively. There is evidence that it will be scavenged by rain, which is to be expected of a water soluble chemical.

- Probable routes of occupational exposure to 1,2-dichloroethene will be via inhalation and dermal contact with the vapor as well as by dermal contact with the liquid during its use as a solvent. The general population is exposed to 1,2-dichloroethene in urban air as well as from contaminated drinking water. Routes of exposure include inhalation of the vapor, ingestion, and skin and eye contact.

- The MCL for 1,2-dichloroethene (total) is not available (EPA, 1996).

Trichloroethene

The following chronic (long-term) health effects can occur at some time after exposure to trichloroethene (trichloroethylene) and can last for months or years:

- *Cancer Hazard*—There is limited evidence for the carcinogenicity of trichloroethene in humans (ATSDR, 1998). However, there is sufficient evidence for the carcinogenicity of trichloroethene in experimental animals (ATSDR, 1998). Trichloroethene may be a cancer-causing agent in humans since it has been shown to cause liver cancer in animals (New Jersey Department of Health, 1986). Overall, trichloroethene is probably carcinogenic to humans and has been classified in Group 2A (ATSDR, 1998).

- *Reproductive Hazard*—There appears to be an association between exposure to various solvents (including trichloroethene and toluene) and birth defects among women in the shoe-making industry. The role of trichloroethene in this association is unclear.

  There is limited evidence that trichloroethene is a teratogen in animals. Until further testing has been done, it should be treated as a possible teratogen in humans.

- *Other Long-Term Effects*—Trichloroethene may cause a skin allergy. If an allergy develops, very low future exposures can cause itching and a skin rash. It can damage the liver and kidneys. Repeated exposure can cause memory loss, headache, intolerance of alcohol, depression and weakness in the arms and legs. Prolonged or repeated contact can cause irritation, blistering, roughening and cracking of the exposed skin. Repeated immersion of the hands in trichloroethene may cause paralysis of the fingers. Exposure can damage the facial nerves resulting in paralysis.

- *Environmental Fate*—Trichloroethene is not known to occur as a natural product. Sources of trichloroethene include air emissions from metal degreasing plants; and wastewater from metal finishing, paint and ink formulation, electrical/electronic component manufacturing, and rubber processing industries. Environmental releases may occur via wastewater, spills and emissions from its production and use (ATSDR, 1998).

  Trichloroethene is not hydrolyzed by water under normal conditions (ATSDR, 1998). It does not adsorb light of less than 290 nm and therefore should not directly photodegrade. However, slow photooxidation in water (half-life = 10.7 months) has been noted. Trichloroethene is relatively reactive under smog conditions with 60% degradation in 140 minutes and 50% degradation in 1–3.5 hours reported. Atmospheric residence time, based on its reaction with the hydroxyl radical, is 5 days, with production of phosgene, dichloroacetyl chloride and formyl chloride.

  Marine monitoring data suggest only moderate bioconcentration (2–25 times). Bioconcentration factors of 17 to 39 have been reported in bluegills, sunfish, and rainbow trout.

- The MCL for trichloroethene is 0.005 mg/L (EPA, 1996).

Tetrachloroethene

The following chronic (long-term) health effects can occur at some time after exposure to tetrachloroethene (tetrachloroethylene; perchloroethylene) and can last for months or years.

- *Cancer Hazard*—There is limited evidence for the carcinogenicity of tetrachloroethene in humans (ATSDR, 1998). However, there is sufficient evidence for the carcinogenicity of tetrachloroethene in experimental animals. Tetrachloroethene may be a carcinogen in humans since it causes liver cancer in animals (New Jersey Department of Health, 1986). Overall, tetrachloroethene is probably carcinogenic to humans and has been classified in Group 2A (ATSDR, 1998).

- *Reproductive Hazard*—Tetrachloroethene may damage the developing fetus.

- *Other Long-Term Effects*—Tetrachloroethene may damage the liver and kidneys with high single exposures or lower repeated exposures. Long-term exposure can cause drying and cracking of the skin. Very irritating substances such as tetrachloroethene may affect the lungs, but it is not known whether tetrachloroethene causes lung damage.

- *Environmental Fate*—Tetrachloroethene is likely to enter the environment by fugitive air emissions from dry cleaning and metal degreasing industries and by spills or accidental releases to air, soil, or water. If tetrachloroethene is released to soil, it will be subject to evaporation into the atmosphere and to leaching to the groundwater. Biodegradation may be an important process in anaerobic soils, based on laboratory tests with methanogenic columns. Slow biodegradation may occur in groundwater where acclimated populations of microorganisms exist. If tetrachloroethene is released to water, it will be subject to rapid volatilization with an estimated half-life ranging from less than 1 day to several weeks. It is not expected to significantly biodegrade, bioconcentrate in aquatic organisms, or adsorb to sediment. Tetrachloroethene is not expected to significantly hydrolyze in soil or water under normal environmental conditions. If tetrachloroethene is released to the atmosphere, it will exist mainly in the gas phase and will be subject to photooxidation, with estimates of degradation time ranging from a half-life of approximately 2 months to complete degradation in 1 hour. Human exposure is primarily from inhaling contaminated urban air near point sources such as dry cleaners, drinking water from contaminated aquifers, drinking water distributed in pipelines with vinyl liners, and inhaling contaminated air in metal degreasing and dry cleaning industries (ATSDR, 1998).

- *Terrestrial Fate*—If tetrachloroethene is released to soil, it will evaporate fairly rapidly into the atmosphere due to its high vapor pressure and low adsorption to soil. It can leach rapidly through sandy soil and therefore may reach groundwater.

- *Aquatic Fate*—If tetrachloroethene is released in water, the primary loss will be by evaporation. The half-life for evaporation from water will depend on wind and mixing conditions and is estimated to range from 3 hours to 14 days in rivers, lakes, and ponds. Chemical and biological degradation are expected to be very slow.

Tetrachloroethene is not expected to significantly bioconcentrate in aquatic organisms or to adsorb to sediment.

- *Atmospheric Fate*—If tetrachloroethene is released to the atmosphere, it will be degraded by reacting with photochemically produced hydroxyl radicals or with chlorine atoms produced by photooxidation of tetrachloroethene. Estimated photooxidation times range from a half-life of approximately 2 months to complete degradation in 1 hour.
- The MCL for tetrachloroethene is 0.005 mg/L (EPA, 1996).

Vinyl Chloride

The following chronic (long-term) health effects can occur at some time after exposure to vinyl chloride and can last for months or years.

Vinyl chloride is a carcinogen in humans (New Jersey Department of Health, 1986; ATSDR, 1998). There is sufficient evidence that vinyl chloride also is carcinogenic in animals (ATSDR, 1998). Overall, vinyl chloride is carcinogenic to humans and has been classified in Group 1 (ATSDR, 1998). It has been shown to cause liver, brain, and lung cancer (New Jersey Department of Health, 1986).

- *Reproductive Hazard*—Vinyl chloride may damage the developing fetus, and there is limited evidence that vinyl chloride is a teratogen in animals. Until further testing has been done, it should be treated as a possible teratogen in humans. An excess of spontaneous abortions has been reported among spouses of workers who had been exposed to vinyl chloride. Increased rates of birth defects have been reported in areas where vinyl chloride processing plants are located. Vinyl chloride's role in this increased risk is unknown at this time.
- *Other Long-Term Effects*—Repeated exposure can cause scleroderma, in which the skin becomes very smooth, tight, and shiny. It causes the bones of the fingers to erode (acro-osteolysis) and damages the blood vessels in the hands (Raynaud's syndrome). This causes the hands (or feet) to become numb or turn pale or blue with even mild exposure to the cold. Repeated exposure to vinyl chloride can permanently damage the liver, kidneys, nervous system, and blood cells. It can cause symptoms similar to those of stomach ulcers. Vinyl chloride also may cause a skin allergy. If allergy develops, very low future exposures can cause itching and a skin rash.

- *Environmental Fate*—Vinyl chloride is produced in large quantities, and almost all of it is used for the production of polyvinyl chloride (PVC) and other polymers. Therefore, its release to the environment will be primarily from emissions and wastewater at these production and manufacturing facilities. If vinyl chloride is released to soil, it will be subject to rapid volatilization with reported half-lives of 0.2 and 0.5 days for evaporation from soil at 1 and 10 cm incorporations, respectively. Any vinyl chloride that does not evaporate is expected to be highly to very highly mobile in soil, and it may leach to the groundwater. It may be subject to biodegradation under the kind of anaerobic conditions that exist in flooded soil and groundwater. If vinyl chloride is released to water, it is not expected to hydrolyze, to bioconcentrate in aquatic organisms, or to adsorb to sediments. It is subject to rapid volatilization with an estimated half-life of 0.805 hour for evaporation from a river 1 m deep with a current of 3 m/sec and a wind velocity of 3 m/sec (ATSDR, 1998).

- *Atmospheric Fate*—If vinyl chloride is released to the atmosphere, it can be expected to exist mainly in the vapor phase in the ambient atmosphere, based on a reported vapor pressure of 2,660 mm Hg at 25°C.

- The MCL for vinyl chloride is 0.002 mg/L (EPA, 1996).

<u>Benzene</u>

The following chronic (long-term) health effects can occur at some time after exposure to benzene and can last for months or years.

- *Cancer Hazard*—Benzene is a <u>carcinogen in humans</u> (New Jersey Department of Health, 1986). There is sufficient evidence in humans and animals to classify benzene as a human carcinogen (ATSDR, 1998). Overall, benzene is carcinogenic to humans and has been classified as Group 1 (ATSDR, 1998). It has been shown to cause leukemia.

- *Reproductive Hazard*—There is limited evidence that benzene is a teratogen in animals. Until further testing has been done, it should be treated as a possible teratogen in humans.

- *Other Long-Term Effects*—Repeated exposure can damage the blood-forming organs causing a condition called aplastic anemia, which can result in death. Long-term exposure may cause drying and scaling of the skin.

- *Environmental Fate*—Benzene will enter the atmosphere primarily from fugitive emissions and exhaust because it is found in gasoline used to fuel combustion engines. Another important source is emissions associated with its production and use as an industrial intermediate. In addition, there are discharges into water from industrial effluents and losses during spills. If benzene is released to soil, it is subject to rapid volatilization near the surface, and that which does not evaporate is highly to very highly mobile in the soil and may leach to groundwater. It may be subject to biodegradation, based on reported biodegradation of 24% and 47% of the initial 20 ppm benzene in a base-rich para-brownish soil in 1 and 10 weeks, respectively. It may be subject to biodegradation in shallow, aerobic groundwaters but probably does not biodegrade under anaerobic conditions. If benzene is released to water, it will be subject to rapid volatilization; the half-life for evaporation in a wind-wave tank with a moderate wind speed of 7.09 m/sec was 5.23 hours; the estimated half-life for volatilization of benzene from a model river 1 meter deep flowing 1 m/sec with a wind velocity of 3 m/sec is estimated to be 2.7 hours at 20°C. It is not expected to significantly adsorb to sediment, bioconcentrate in aquatic organisms, or hydrolyze. It may be subject to biodegradation, based on a reported biodegradation half-life of 16 days in an aerobic river die-away test. If benzene is released to the atmosphere, it will exist predominantly in the vapor phase. The primary routes of exposure are inhalation of contaminated air (found especially in areas with high traffic and in the vicinity of gasoline service stations) and consumption of contaminated drinking water.

Benzene enters the environment from production, storage, transport, venting, and combustion of gasoline and from production, storage, and transport of benzene itself. It also enters the environment from its use as an intermediate in the production of other chemicals and as a solvent; from spills, including oil spills; from its indirect production in coke ovens; from nonferrous metal manufacture; ore mining; wood processing; coal mining; textile manufacture; and from cigarette smoke.

- *Terrestrial Fate*—If benzene is released to soil, it will be subject to rapid volatilization near the surface. That which does not evaporate will be highly to very highly mobile in soil and may leach to groundwater. The effective half-lives for volatilization of benzene uniformly distributed in soil at 1 and 10 cm were 7.2 and 38.4 days, respectively. It may be subject to biodegradation.

- *Aquatic Fate*—If benzene is released to water, it will be subject to rapid volatilization. The half-life for evaporation in a wind-wave tank with a wind speed of 7.09 m/sec was 5.23 hours; the estimated half-life for volatilization of benzene from a model river 1 m deep flowing 1 m/sec with a wind velocity of 3 m/sec is estimated to be 2.7 hours at 20°C. It is not expected to significantly adsorb to sediment, bioconcentrate in aquatic organisms, or hydrolyze.

- *Atmospheric Fate*—If benzene is released to the atmosphere, it will exist predominantly in the vapor phase.

- The MCL for benzene is 0.005 mg/L (EPA, 1996).

Bis(2-ethylhexyl)phthalate

The following chronic (long-term) health effects can occur at some time after exposure to bis(2-ethylhexyl)phthalate (DEHP; di[2-ethylhexyl]phthalate) and can last for months or years.

- *Cancer Hazard*—Bis(2-ethylhexyl)phthalate is a probable cancer-causing agent in humans (New Jersey Department of Health, 1986). It has been classified in Group 2B (possibly carcinogenic to humans; ATSDR, 1998). It has been shown to cause liver cancer in animals.

- *Reproductive Hazard*—Bis(2-ethylhexyl)phthalate is a probable teratogen in humans. It may damage the testes (male reproductive organs).

- *Other Long-Term Effects*—Repeated exposure may affect the kidneys and liver. Some similar compounds may cause numbness and tingling in the arms and legs.

- *Environmental Fate*—Bis(2-ethylhexyl)phthalate is used as a plasticizer for polyvinylchloride (PVC) and other polymers in large quantities and is likely to be released to air and water during production and waste disposal of these products. Bis(2-ethylhexyl)phthalate in water will biodegrade, with a half-life of 2–3 weeks, and will adsorb to sediments and bioconcentrate in aquatic organisms. Atmospheric bis(2-ethylhexyl)phthalate will be carried long distances and be removed by rain. Humans can be exposed in occupational settings by inhaling contaminated air, by consuming drinking water and food (especially fish in which bioconcentration can occur), and by consuming food wrapped in polyvinylchloride (PVC). Humans also can be exposed during blood transfusions from PVC blood bags (ATSDR, 1998).

- *Terrestrial Fate*—Bis(2-ethylhexyl)phthalate released to soil will neither evaporate nor leach into groundwater. Limited data is available to suggest that it may biodegrade in soil under aerobic conditions following acclimation.

- *Aquatic Fate*—Bis(2-ethylhexyl)phthalate released to water systems will biodegrade fairly rapidly, with a half-life of 2–3 weeks following a period of acclimation. It also will strongly adsorb to soil and sediments. Bis(2-ethylhexyl)phthalate has a tendency to bioconcentrate in aquatic organisms.

- *Atmospheric Fate*—Bis(2-ethylhexyl)phthalate released to air will be carried for long distances in the troposphere and has been detected in air over the Atlantic and Pacific Oceans.

  Bis(2-ethylhexyl)phthalate should not evaporate from soil or water since it has a low vapor pressure.

- Probable routes of human exposure include inhalation, ingestion and dermal exposure. Bis(2-ethylhexyl)phthalate has been shown to leach from all plastic components of the equipment employed in plasma donation.

- The MCL for bis(2-ethylhexyl)phthalate is 0.006 mg/L (EPA, 1996).

Arsenic

The following chronic (long-term) health effects can occur at some time after exposure to arsenic and can last for months or years (New Jersey Department of Health, 1986).

- *Cancer Hazard*—Arsenic is a cancer-causing agent in humans. It has been classified in Group 1 (carcinogenic to humans; ATSDR, 1998) and has been shown to cause skin and lung cancer.

- *Reproductive Hazard*—Arsenic may damage the developing fetus. Arsenic should be handled as a potential teratogenic agent since some arsenic compounds are known teratogens.

- *Other Long-Term Effects*—Long-term exposure can cause an ulcer or hole in the bone dividing the inner nose. Hoarseness and sore eyes also occur. High or repeated exposure can cause nerve damage resulting in a "pins and needles" sensation and burning, numbness, and later weakness of arms and legs. Repeated skin contact can cause thickened skin and/or patchy areas of darkening and loss of pigment. Some individuals develop white lines on the nails. Repeated exposure also can damage the liver, cause narrowing of the blood vessels, or interfere with the bone marrow's ability to make red blood cells.

- *Environmental Fate*—Arsenic is found widely in nature and most abundantly in sulfide ores (ATSDR, 1998).

  Arsenic bioconcentrates in animal hair. Livers of fish from the Great Lakes contain 5.6 to 80 ppb arsenic, mainly in the fat. Fish generally contain lower arsenic levels than other aquatic organisms.

  Arsenic may be absorbed by ingestion, inhalation, and permeation of skin or mucous membranes. Heavy metals such as arsenic used as color pigments in paints can be ingested by contamination of hands, fingernails, food, cups, cigarettes and by holding paint brushes in the mouth.

- The MCL for arsenic is 0.05 mg/L (EPA, 1996).

Beryllium

The following chronic (long-term) health effects can occur at some time after exposure to beryllium and can last for months or years (New Jersey Department of Health, 1986).

- *Cancer Hazard*—Beryllium is a cancer-causing agent in humans (Group 1, carcinogenic to humans; ATSDR, 1998). There is some evidence that it causes lung and bone cancer in humans and it has been shown to cause lung and bone cancer in animals.

- *Reproductive Hazard*—The New Jersey Department of Health has no evidence that beryllium adversely affects reproduction, based on test results from published studies.

- *Other Long-Term Effects*—A single high exposure or repeated lower exposures can cause permanent scars in the lungs or in other organs. Symptoms may include fatigue, shortness of breath, weight loss, or poor appetite. These effects may occur months or years after exposure. Severe effects include disability and even heart failure. If beryllium particles get into cuts in the skin, ulcers or lumps can develop. These particles must be removed surgically. Allergic skin rashes with itching and redness also can occur; symptoms abate in the absence of exposure and return when exposure is renewed. Kidney stones can occur from high or repeated exposure.

- *Environmental Fate*—There is no evidence that beryllium moves from soils into food or feed plants in amounts that are detrimental (ATSDR, 1998).

  The probable route of human exposure is mainly through inhalation of beryllium dust or fumes by beryllium ore miners, beryllium alloy makers and fabricators, phosphor manufacturers, ceramic workers, missile technicians, nuclear reactor workers, electrical and electronic equipment workers, and jewelers (Sittig, 1991). Food is not a significant source of human exposure.

- The MCL for beryllium is 0.004 mg/L (EPA, 1996).

2.2.11 Iron

- *Long-Term Effects*—Excessive intake of iron compounds may result in increased accumulation of iron in the body, especially the liver, spleen, and lymphatic system. Inhalation of dusts may cause mottling of the lung (Sittig, 1991).

- An MCL was not reported for iron (EPA, 1996).

Manganese

The following chronic (long-term) health effects can occur at some time after exposure to manganese and can last for months or years (New Jersey Department of Health, 1986).

According to the information from the New Jersey Department of Health, manganese has not been tested for its ability to cause cancer in animals.

- *Reproductive Hazard*—There is limited evidence that manganese may decrease fertility in males.
- *Other Long-Term Effects*—Repeated exposure may cause gradual brain damage. Early effects include sleepiness, weakness, and poor appetite. If exposure is stopped at an early stage, damage may be temporary. Effects of long-term exposure include changes in speech, a loss of facial expression, personality changes, poor muscle coordination, muscle cramps, twitching, and tremors. Some permanent brain damage can result and symptoms are identical to Parkinson's disease. Repeated exposure can cause a variety of changes in the blood count. Liver and/or kidney damage also may occur. High or repeated exposure may damage the lungs. Exposure may cause lung allergy (asthma) to develop with wheezing and shortness of breath. Once allergy develops, even low exposures can cause symptoms.

  Probable routes of human exposure. Aside from parental routes, systemic poisoning may result from chronic inhalation or chronic ingestion. Humans ingest manganese from three main sources including the diet, drinking water, and inhaled particles cleared from the respiratory tract. Manganese toxicity has been observed primarily among workers employed in mining and refining manganese and in manufacturing processes that use manganese (ATSDR, 1998).
- No MCL was reported for manganese (EPA, 1996).

Chloroform

The following chronic (long-term) health effects can occur at some time after exposure to chloroform and can last for months or years (New Jersey Department of Health, 1986).

- *Cancer Hazard*—Chloroform is a probable carcinogen in humans (Group 2B, ATSDR, 1998). It has been shown to cause liver, kidney, and thyroid cancer in animals.

- *Reproductive Hazard*—There is limited evidence that chloroform is a teratogen in animals. Until further testing has been done, it should be treated as a possible teratogen in humans.

- *Other Long-Term Effects*—Chloroform can damage the liver. Repeated skin contact with the liquid may produce skin drying and cracking. Repeated exposure may affect the kidneys and nervous system.

- *Environmental Fate*—Chloroform is likely to enter the environment during its use as an industrial solvent, extractant, and chemical intermediate, as well as from its indirect production in the chlorination of drinking water, municipal sewage, and cooling water. The majority of the environmental releases from industrial uses are to the atmosphere; releases to water and land will be lost primarily by evaporation and will end up in the atmosphere. Chloroform released to the atmosphere may be transported long distances and will photodegrade with a half-life of a few months. Spills and other releases on land also will leach into the groundwater and will reside there for long periods of time. Chloroform is not expected to bioconcentrate into the food chain but contamination of food is likely due to its use as an extractant and its presence in drinking water. Human exposure is primarily from drinking water and from ambient air, particularly in the vicinity of industrial sources (ATSDR, 1998).

- *Terrestrial Fate*—When spilled on land, chloroform is expected to evaporate rapidly into the atmosphere due to its high vapor pressure. It is poorly adsorbed to soil, especially soils with low organic carbon content such as subsoils and can leach into the groundwater.

- *Aquatic Fate*—When released into water, chloroform will be lost primarily by evaporation into the atmosphere. Laboratory experiments have determined that the half-life for evaporation is several hours, and modeling studies suggest that the volatilization half-life is 36 hours in a river, 40 hours in a pond and 9–10 days in a lake.

- *Atmospheric Fate*—Chloroform released to the atmosphere will degrade by reaction with hydroxyl radicals, with a half-life of 80 days. It will be transported long distances and will partially return to earth in precipitation.

  There is little or no tendency for chloroform to bioconcentrate in fish.

  Chloroform is adsorbed most strongly to peat moss, less strongly to clay, very slightly to dolomite and limestone, and not at all to sand.

Four laboratory studies of the evaporation of chloroform found that it volatilizes from soil and water with half-lives of 3–5.6 hours with moderate mixing conditions.

Probable human exposure may be via inhalation, ingestion, or by cutaneous contact (ATSDR, 1998). Humans are exposed to chloroform primarily from compounds for chlorinating drinking water supplies, although exposure from air (in amounts typically one-tenth of those from water) would be comparable in source-dominated areas. Although data from chloroform in food is fragmentary, the data suggest that intake from this source may be substantial.

- The MCL for chloroform is 0.1 mg/L.[1]

Bromodichloromethane

Positive correlations between cancer mortality rates and levels of brominated trihalomethanes in drinking water in epidemiological studies have been reported in ATSDR's Human Toxicity Excerpts (ATSDR, 1998).

- *Cancer Hazard*—There is inadequate evidence for the carcinogenicity of bromodichloromethane in humans, but there is sufficient evidence for the carcinogenicity of bromodichloromethane in experimental animals. Bromodichloromethane is possibly carcinogenic to humans and has been classified in Group 2B, (probable human carcinogen). According to International Agency for research on Cancer (IARC), there is inadequate evidence for the carcinogenicity of bromodichloromethane in humans (as cited in ATSDR, 1998) .
- *Environmental Fate*—The predominant anthropogenic source of bromodichloromethane release to the environment is its formation during chlorination treatment of water. It also is biosynthesized and emitted to the environment by various species of marine macroalgae, which are abundant in certain parts of the ocean. If it is released to surface water, volatilization will be the dominant environmental fate process. The estimated volatilization half-life from rivers and streams ranges from 33 minutes to 12 days with a typical half-life of 35 hours. In aquatic regions where volatilization is not likely, anaerobic biodegradation may be the primary removal process. Aquatic hydrolysis, oxidation, direct photolysis, adsorption, and bioconcentration are not environmentally important pathways of release. If bromodichloromethane is released to soil, volatilization is again likely to be the dominant removal process where exposure to air is possible. Bromodichloromethane is moderately to highly mobile in soil and can therefore leach into groundwaters. If it is released to air, the only

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[1] The 1994 proposed rule for disinfectants and disinfection by-products states that the total for all trihalomethanes (THMs) combined cannot exceed the 0.08 mg/l level. (EPA, 1996).

identifiable transformation process in the troposphere is reaction with hydroxyl radicals. The general population is exposed to bromodichloromethane through consumption of contaminated drinking water, beverages, and food products; through inhalation of contaminated ambient air; and through dermal exposure to chlorinated swimming pool water.

- *Terrestrial Fate*—In soils where exposure to the atmosphere can occur, volatilization is likely to be the dominant environmental fate process due to the high vapor pressure of bromodichloromethane.
- *Aquatic Fate*—Volatilization is the dominant mechanism for removing bromodichloromethane from environmental surface waters.
- *Atmospheric Fate*—Because of its high vapor pressure, bromodichloromethane should exist entirely in the vapor phase in the ambient atmosphere.
- *Probable Routes of Human Exposure*—Humans are exposed through intake of contaminated water or other fluids, ingestion in food and inhalation.
- The MCL for bromodichloromethane is 0.1 mg/L (EPA, 1996).[1]

1,1,2,2-Tetrachloroethane

The following chronic (long-term) health effects can occur at some time after exposure to 1,1,2,2-tetrachloroethane and can last for months or years.

- *Cancer Hazard*—1,1,2,2-Tetrachloroethane may be a carcinogen in humans since it has been shown to cause liver cancer in animals.
- *Reproductive Hazard*—There is limited evidence that 1,1,2,2-tetrachloroethane is a teratogen in animals. Until further testing has been done, it should be treated as a possible teratogen in humans.
- *Other Long-Term Effects*—Long-term exposure may damage the liver, kidneys, blood-forming organs, and nerves.
- *Environmental Fate*—Most of the released 1,1,2,2-tetrachloroethane enters the atmosphere where it is extremely stable. Most of the chemical will eventually diffuse into the stratosphere where it will rapidly photodegrade. 1,1,2,2-Tetrachloroethane that is released into water will be lost primarily by volatilization in a matter of days to

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[1] The 1994 proposed rule for disinfectants and disinfection by products states that the total for the trihalomethanes (THMs) combined cannot exceed the 0.08 mg/l level (EPA, 1996).

weeks. 1,1,2,2-Tetrachloroethane will be highly mobile in soil. When disposed of on soil, part of the 1,1,2,2-tetrachloroethane may leach into groundwater. There is evidence that 1,1,2,2-tetrachloroethane slowly biodegrades. A product of biodegradation under anaerobic conditions is 1,1,2-trichloroethane, a chemical that is resistant to further biodegradation. 1,1,2,2-Tetrachloroethane will not be expected to bioconcentrate into the food chain. The major source of human exposure is from ambient air near industrial sources (ATSDR, 1998).

1,1,2,2-Tetrachloroethane may be released into the atmosphere as a result of its use as a metal degreasing agent; paint, varnish and rust remover; extractant; solvent; and as a chemical intermediate. 1,1,2,2-Tetrachloroethane can be emitted from hazardous waste landfills.

- *Terrestrial Fate*—1,1,2,2-Tetrachloroethane may undergo hydrolysis in alkaline soil. 1,1,2,2-Tetrachloroethane will be highly mobile in soil and therefore can leach into groundwater.

- *Aquatic Fate*—Under alkaline conditions, 1,1,2,2-tetrachloroethane may be expected to hydrolyze.

- *Atmospheric Fate*—1,1,2,2-Tetrachloroethane is expected to exist entirely in the vapor phase in ambient air. 1,1,2,2-Tetrachloroethane is practically inert in the troposphere with a half-life exceeding 800 days. Thus, it will be transported long distances and some of it will return to earth in rain. It is expected to diffuse slowly into the stratosphere where it will degrade rapidly by photodissociation. With continual release, increasing atmospheric concentrations are expected.

  1,1,2,2-Tetrachloroethane is not expected to bioconcentrate in fish.

  1,1,2,2-Tetrachloroethane will be highly mobile in soil because the measured Koc is 79 in silt loam.

  Volatilization of 1,1,2,2-tetrachloroethane from environmental waters may be significant. In natural waters, the half-life for volatilization is expected to be from a few days to several weeks, depending on mixing conditions.

- Humans are exposed to 1,1,2,2-tetrachloroethane primarily from ambient air or from contaminated drinking water. 1,1,2,2-Tetrachloroethane can affect the body if it is inhaled, if it comes in contact with the eyes or skin, or if it is swallowed. It may be absorbed through the skin.

- No MCL was reported for 1,1,2,2-tetrachloroethane (EPA, 1996).

Ammonia

The following chronic (long-term) health effects can occur at some time after exposure to ammonia and can last for months or years.

- *Cancer Hazard*—According to the New Jersey Department of Health, ammonia has not been tested for its ability to cause cancer in animals.
- *Reproductive Hazard*—According to the New Jersey Department of Health, ammonia has not been tested for its ability to adversely affect reproduction.
- *Other Long-Term Effects*—Repeated exposure can cause chronic irritation of the eyes, nose, throat, and airways. Very irritating substances, such as ammonia, may affect the lungs. It is not known whether ammonia causes lung damage.
- *Atmospheric Fate*—It is assumed that ammonia combines with sulfate ion in the atmosphere or is washed out by rainfall, resulting in a rapid return of ammonia to the soil.
- *Environmental Fate*—Ammonia is strongly adsorbed on soil, on sediment particles, and on colloids in water. This adsorption results in high concentrations of sorbed ammonia in oxidized sediments. Under anoxic conditions, the adsorptive capacity of sediments is less, resulting in the release of ammonia to either the water column or an oxidized sediment layer above. The ion tends to be adsorbed on the negative adsorption sites of clay colloids. It may substitute for potassium in the lattice structure of a clay mineral (ATSDR, 1998).

  Probable routes of human exposure are inhalation of gas, ingestion, and skin and eye contact.
- No MCL was reported for ammonia (EPA, 1996).

New Jersey Department of Health

HAZARDOUS SUBSTANCE FACT SHEET

Common Name:	**AMMONIA**
CAS Number:	7664-41-7
DOT Numbers:	UN 1005 UN 2672 (Solution) UN 2073 (Solution)

RTK Substance number: 0084
Date: Aug. 1985 Revision: Aug. 1992

HAZARD SUMMARY

* Ammonia can affect you when breathed in.

* Ammonia is a CORROSIVE CHEMICAL and can severely burn the skin and eyes, leading to permanent damage.

* Ammonia can cause irritation of the eyes, skin, nose, mouth, and throat.

* Breathing **Ammonia** can irritate the lungs, causing coughing and/or shortness of breath. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.

IDENTIFICATION

Ammonia is a colorless gas with a strong odor. It is often used in water solution. It is used in making fertilizer, plastics, dyes and textiles.

REASON FOR CITATION

* Ammonia is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, NFPA, EPA and DEPE.

* This chemical is on the Special Health Hazard Substance List because it is CORROSIVE.

* Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

* Exposure to hazardous substances should be routinely evaluated. This may include collecting air samples. Under OSHA 1910.20, you have a legal right to obtain copies of sampling results from your employer. If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

* **ODOR THRESHOLD = 17 ppm.**

* The odor threshold only serves as a <u>warning</u> of exposure. Not smelling it does not mean you are not being exposed.

WORKPLACE EXPOSURE LIMITS

OSHA:	The legal airborne permissible exposure limit (PEL) is **35 ppm** not to be exceeded during any 15 minute work period. (Final Rule, January 1989).
NIOSH:	The recommended airborne exposure limit is **50 ppm**, which should not be exceeded during any 5-minute work period.
ACGIH:	The recommended airborne exposure limit is **25 ppm** averaged over an 8-hour workshift <u>and</u> **35 ppm** as a STEL (short term exposure limit).

WAYS OF REDUCING EXPOSURE

* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.

* Wear protective work clothing.

* Wash thoroughly <u>immediately</u> after exposure to **Ammonia**.

* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Ammonia** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Ammonia**:

* Contact can cause irritation and severe skin burns.
* **Ammonia** can cause irritation and severe burns of the eyes, leading to permanent damage.
* Breathing **Ammonia** can irritate the mouth, nose and throat.
* Breathing **Ammonia** can irritate the lungs causing coughing and/or shortness of breath. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.
* Exposure can cause headache and loss of sense of smell.
* **Ammonia** can cause nausea and vomiting.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Ammonia** and can last for months or years:

Cancer Hazard

* According to the information presently available to the New Jersey Department of Health, **Ammonia** has not been tested for its ability to cause cancer in animals.

Reproductive Hazard

* According to the information presently available to the New Jersey Department of Health, **Ammonia** has not been tested for its ability to affect reproduction.

Other Long-Term Effects

* Repeated exposure can cause chronic irritation of the eyes, nose and throat.
* Very irritating substances may affect the lungs. It is not known whether **Ammonia** causes lung damage.

MEDICAL

Medical Testing

Before beginning employment and at regular times after that, the following are recommended:

* Lung function tests.

If symptoms develop or overexposure is suspected, the following may be useful:

* Consider chest x-ray after acute overexposure.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, ENGINEERING CONTROLS are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

* Where possible, automatically pump liquid **Ammonia** from drums or other storage containers to process containers.

- Specific engineering controls are recommended for this chemical by NIOSH. Refer to the NIOSH criteria document: *Ammonia # 74-136*.

Good WORK PRACTICES can help to reduce hazardous exposures. The following work practices are recommended:

- Workers whose clothing has been contaminated by **Ammonia** should change into clean clothing promptly.
- Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Ammonia**.
- Eye wash fountains in the immediate work area should be provided for emergency use.
- If there is the possibility of skin exposure, emergency shower facilities should be provided.
- On skin contact with **Ammonia**, immediately wash or shower to remove the chemical.
- Do not eat, smoke, or drink where **Ammonia** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- Avoid skin contact with **Ammonia**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
- Safety equipment manufacturers recommend *Butyl/Neoprene* or *Viton/Neoprene* as protective materials.

Eye Protection

- Wear splash-proof chemical goggles and face shield when working with liquid, unless full facepiece respiratory protection is worn.
- Wear gas-proof goggles and face shield, unless full facepiece respiratory protection is worn.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- Where the potential exists for exposures over 25 ppm, use an MSHA/NIOSH approved full facepiece respirator with an **Ammonia** vapor cartridge/canister. More protection is provided by a powered-air purifying respirator.
- If while wearing a filter, cartridge or canister respirator, you can smell, taste, or otherwise detect **Ammonia**, or in the case of a full facepiece respirator you experience eye irritation, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter, cartridge, or canister. If the seal is no longer good, you may need a new respirator.
- Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters, cartridges, or canisters, to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Where the potential for high exposure exists, use an MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in the positive pressure mode or with a full facepiece, hood, or helmet in the continuous flow mode, or use an MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.

HANDLING AND STORAGE

- * Prior to working with **Ammonia** you should be trained on its proper handling and storage.
- * **Ammonia** reacts violently or produces explosive products when in contact with HALOGENS (such as CHLORINE and BROMINE), BROMINE PENTAFLOURIDE and CHLORINE TRIFLUORIDE.
- * **Ammonia** is not compatible with ACIDS, ACID ANHYDRIDES, ACID CHLORIDES, STRONG OXIDIZERS, CHLOROFORMATES, and GALVANIZED IRON. It may also react with ZINC, COPPER, TIN, and their ALLOYS.
- * Store in tightly closed containers in a cool, well-ventilated area away from MOISTURE, HEAT and direct SUNLIGHT.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?
A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include <u>physical and mechanical processes</u> (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and <u>"confined space" exposures</u> (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?
A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

The following information is available from:

New Jersey Department of Health
Occupational Health Service
Trenton, NJ 08625-0360
(609) 984-1863

<u>Industrial Hygiene Information</u>
Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

<u>Medical Evaluation</u>
If you think you are becoming sick because of exposure to chemicals at your workplace, you may call a Department of Health physician who can help you find the services you need.

<u>Public Presentations</u>
Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

<u>Right to Know Information Resources</u>
The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-5627.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEPE is the New Jersey Department of Environmental Protection and Energy.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<

Common Name: **AMMONIA**
DOT Numbers: UN 1005/UN 2073/UN 2672
DOT Emergency Guide codes: 15 and 60
CAS Number: 7664-41-7

Hazard rating	NJ DOH	NFPA
FLAMMABILITY	-	1
REACTIVITY	-	0
CORROSIVE CONTAINERS MAY EXPLODE IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

- * **Ammonia** gas may burn, but does not readily ignite. To extinguish fire, stop the flow of gas while using an agent suitable for type of surrounding fire.
- * **Ammonia** can form explosive mixtures with AIR.
- * CONTAINERS MAY EXPLODE IN FIRE.
- * If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Ammonia** is spilled or leaked, take the following steps:

- * Restrict persons not wearing protective equipment from areas of spills or leaks until clean-up is complete.
- * Remove all ignition sources.
- * Ventilate area of spill or leak.
- * Stop the flow of gas. If the source of the leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair the leak or allow the cylinder to empty.
- * For small liquid spills, neutralize with *Hydrochloric acid*. Wipe with mop or use water aspirator. Drain into a sewer with sufficient water.
- * It may be necessary to contain and dispose of **Ammonia** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEPE HOTLINE: (609) 292-7172

HANDLING AND STORAGE (See page 4)

FIRST AID

In NJ, POISON INFORMATION 1-800-962-1253

Eye Contact

- * Immediately flush with large amounts of water. Continue without stopping for at least 30 minutes, occasionally lifting upper and lower lids. Seek medical attention immediately.

Skin Contact

- * Quickly remove contaminated clothing. Immediately wash area with large amounts of water. Seek medical attention immediately.

Breathing

- * Remove the person from exposure.
- * Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
- * Transfer promptly to a medical facility.
- * Medical observation is recommended for 24 to 48 hours after breathing overexposure, as pulmonary edema may be delayed.

PHYSICAL DATA

Water Solubility: Highly Soluble

OTHER COMMONLY USED NAMES

Chemical Name:
Ammonia
Other Names:
Anhydrous Ammonia

Not intended to be copied and sold for commercial purposes.

NEW JERSEY DEPARTMENT OF HEALTH
Right to Know Program
CN 368, Trenton, NJ 08625-0368
(609) 984-2202

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Benzene**:

- **Benzene** can cause symptoms of dizziness, lightheadedness, headache and vomiting. Convulsions and coma, or sudden death from irregular heart beat, may follow high exposure.
- Exposure can irritate the nose and throat.
- **Benzene** can irritate the eyes and skin.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Benzene** and can last for months or years:

Cancer Hazard

- **Benzene** is a CARCINOGEN in humans. It has been shown to cause leukemia.
- Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

- There is limited evidence that **Benzene** is a teratogen in animals. Until further testing has been done, it should be treated as a possible teratogen in humans.

Other Long-Term Effects

- Repeated exposure can damage the blood-forming organs causing a condition called aplastic anemia. This may cause death.
- Exposure can cause drying and scaling of the skin.

MEDICAL

Medical Testing

Before beginning employment and at regular times after that, the following is recommended:

- Complete blood count.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

- Where possible, automatically pump liquid **Benzene** from drums or other storage containers to process containers.
- Specific engineering controls are recommended for this chemical by NIOSH. Refer to the NIOSH criteria documents: *Benzene #74-137* and *Refined Petroleum Solvents #77-192.*
- Specific engineering controls are required for this chemical by OSHA. Refer to the OSHA Standard 1910.1028.
- Before entering a confined space where **Benzene** may be present, check to make sure that an explosive concentration does not exist.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- Workers whose clothing has been contaminated by **Benzene** should change into clean clothing promptly.
- Do not take contaminated work clothes home. Family members could be exposed.

- Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Benzene**.
- Eye wash fountains should be provided in the immediate work area for emergency use.
- If there is the possibility of skin exposure, emergency shower facilities should be provided.
- On skin contact with **Benzene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Benzene**, whether or not known skin contact has occurred.
- Do not eat, smoke, or drink where **Benzene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- Avoid skin contact with **Benzene**. Wear solvent-resistant gloves and clothing. Safety equipment suppliers/ manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
- ACGIH recommends *VITON* gloves for short periods of protection.

Eye Protection

- Wear splash-proof chemical goggles and face shield when working with liquid, unless full facepiece respiratory protection is worn.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- Where the potential exists for exposures over **0.1 ppm**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in the positive pressure mode or with a full facepiece, hood, or helmet in the continuous flow mode, or use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
- Exposure to **3,000 ppm** is immediately dangerous to life and health. If the possibility of exposure above **3,000 ppm** exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in continuous flow or other positive pressure mode.

HANDLING AND STORAGE

- Prior to working with **Benzene** you should be trained on its proper handling and storage.
- A regulated, marked area should be established where **Benzene** is handled, used, or stored.
- **Benzene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE), FLUORIDES, and NITRIC ACID.
- Store in tightly closed containers in a cool, well-ventilated area away from HEAT.
- Sources of ignition, such as smoking and open flames, are prohibited where **Benzene** is handled, used, or stored.
- Metal containers involving the transfer of 5 gallons or more of **Benzene** should be grounded and bonded. Drums must be equipped with self-closing valves, pressure vacuum bungs, and flame arresters.
- Wherever **Benzene** is used, handled, manufactured, or stored, use explosion-proof electrical equipment and fittings.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?

A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?

A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?

A: Conditions which increase risk of exposure include physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?

A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

Q: Don't all chemicals cause cancer?

A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Aren't pregnant women at the greatest risk from reproductive hazards?

A: Not necessarily. Pregnant women are at greatest risk from chemicals which harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

Q: Should I be concerned if a chemical is a teratogen in animals?

A: Yes. Although some chemicals may affect humans differently than they affect animals, damage to animals suggests that similar damage can occur in humans.

The following information is available from:

New Jersey Department of Health
Occupational Health Service
Trenton, NJ 08625-0360
(609) 984-1863

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call a Department of Health physician who can help you find the services you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<

Common Name: **BENZENE**
DOT Number: UN 1114
DOT Emergency Guide code: 27
CAS Number: 71-43-2

Hazard rating	NJ DOH	NFPA
FLAMMABILITY	-	3
REACTIVITY	-	0
CARCINOGEN CONTAINERS MAY EXPLODE IN FIRE POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* **Benzene** is a FLAMMABLE LIQUID.
* Use dry chemical, CO_2, or foam extinguishers. Water can be used to keep fire-exposed containers cool.
* POISONOUS GASES ARE PRODUCED IN FIRE.
* CONTAINERS MAY EXPLODE IN FIRE.
* The vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Benzene** is spilled or leaked, take the following steps:

* Restrict persons not wearing protective equipment from area of spill or leak until clean-up is complete.
* Remove all ignition sources.
* Cover liquids with activated carbon absorbent and deposit in sealed containers.
* Ventilate area of spill or leak after clean-up is complete.
* Keep **Benzene** out of a confined space, such as a sewer, because of the possibility of an explosion, unless the sewer is designed to prevent the build-up of explosive concentrations.
* It may be necessary to contain and dispose of **Benzene** as a HAZARDOUS WASTE. Contact the NJ Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

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FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: (609) 292-7172

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HANDLING AND STORAGE (See page 3)

FIRST AID

In NJ, POISON INFORMATION 1-800-962-1253

Eye Contact

* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.

Skin Contact

* Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water. Seek medical attention.

Breathing

* Remove the person from exposure.
* Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.

PHYSICAL DATA

Vapor Pressure: 75 mm Hg at 68°F (20°C)
Flash Point: 12°F (-11°C)
Water Solubility: Slightly soluble

OTHER COMMONLY USED NAMES

Chemical Name:
Benzene
Other Names:
Benzol; Coal Naphtha; Phenyl Hydride

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NEW JERSEY DEPARTMENT OF HEALTH
Right to Know Program
CN 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **BERYLLIUM**

CAS Number: 7440-41-7
DOT Number: UN 1567 (Powder)

RTK Substance number: 0222
Date: Jan. 1986 Revision: Aug. 1992

HAZARDOUS SUMMARY

- * **Beryllium** can affect you when breathed in.
- * **Beryllium** is a CARCINOGEN--HANDLE WITH EXTREME CAUTION.
- * **Beryllium** may damage the developing fetus.
- * Breathing **Beryllium** can irritate the nose, throat and lungs. Bronchitis and/or pneumonia may occur after high exposure.
- * Eye contact can cause irritation.
- * **Beryllium** can irritate the skin causing a rash.
- * Repeated exposures can cause scars to develop in the lungs and other body organs. In severe cases disability and heart failure occur.
- * When particles get under cuts in the skin, ulcers or lumps can develop.
- * **Beryllium** may damage the liver and kidneys.

IDENTIFICATION

Beryllium is a hard, brittle, grey-white metal. It is used in making electrical components, chemicals, ceramics, and x-ray tubes.

REASON FOR CITATION

- * Beryllium is on the Hazardous Substance List because it is regulated by OSHA and cited by NIOSH, ACGIH, IARC, EPA, HHAG, DOT, NFPA, NTP and DEPE.
- * This chemical is on the Special Health Hazard Substance List because it is a CARCINOGEN.
- * Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

- * Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.20.
- * If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) is 0.002 mg/m^3 averaged over an 8-hour workshift; 0.005 mg/m^3 not to be exceeded during any 30 minute work period; and 0.025 mg/m^3 which should never be exceeded. (Final Rule, January 1989).

NIOSH: The recommended airborne exposure limit is 0.0005 mg/m^3, which should not be exceeded at any time.

ACGIH: The recommended airborne exposure limit is 0.002 mg/m^3 averaged over an 8-hour workshift.

- * **Beryllium** is a PROBABLE CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.

WAYS OF REDUCING EXPOSURE

- * Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- * A regulated, marked area should be established where **Beryllium** is handled, used, or stored.
- * Wear protective work clothing.
- * Wash thoroughly immediately after exposure to **Beryllium** and at the end of the workshift.
- * Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Beryllium** to potentially exposed workers.

Printed on Recycled Paper

This Fact Sheet is a summary source of information of <u>all potential</u> and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Metal, metal compounds and alloys are often used in "hot" operations in the workplace. These may include, but are not limited to, welding, brazing, soldering, plating, cutting, and metallizing. At the high temperatures reached in these operations, metals often form metal fumes which have different health effects and exposure standards than the original metal or metal compound and require specialized controls. Your workplace can be evaluated for the presence of particular fumes which may be generated. These results can be used to determine the appropriate NJ Hazardous Substance Fact Sheet that should be available.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to Beryllium:

* Breathing Beryllium can irritate the nose, throat and lungs, causing nasal discharge, tightness in the chest, cough, shortness of breath, and/or fever. Bronchitis and/or pneumonia may occur 1-2 days after high exposure, causing death in severe cases.
* Eye irritation, itching, and burning can occur with contact. Sometimes an eye allergy develops, which reoccurs with future exposure.
* Beryllium can irritate the skin causing a rash.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to Beryllium and can last for months or years:

Cancer Hazard

* Beryllium is a PROBABLE CARCINOGEN in humans. There is some evidence that it causes lung and bone cancer in humans and it has been shown to cause lung and bone cancer in animals.
* Many scientists believe there is no safe level of exposure to a carcinogen. Such substances may also have the potential for causing reproductive damage in humans.

Reproductive Hazard

* Beryllium may damage the developing fetus.

Other Long-Term Effects

* Repeated exposures can cause permanent scars in the lungs or other body organs. Symptoms may include fatigue, shortness of breath, weight loss, and poor appetite. These effects may occur months or years after exposure. In severe cases disability and heart failure occur.
* If chemical particles get under cuts in the skin, ulcers or lumps can develop. In these cases surgery is needed to remove the chemical particles.
* Beryllium may cause a skin allergy. If allergy develops, very low future exposures can cause itching and a skin rash.
* Beryllium may damage the liver and kidneys.

MEDICAL

Medical Testing

Before beginning employment and at regular times after that, for those with frequent or potentially high exposures, the following are recommended:

* Kidney and liver function tests.
* Chest x-ray.
* Lung function tests.
* Evaluation by a qualified allergist, including careful exposure history and special testing, may help diagnose skin allergy.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are <u>not</u> a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

Mixed Exposures

Because smoking can cause heart disease, as well as lung cancer, emphysema, and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

* Where possible, automatically transfer Beryllium from drums or other storage containers to process containers.
* Specific engineering controls are recommended for this chemical by NIOSH. Refer to the NIOSH criteria document: *Occupational Exposure to Beryllium #72-10268*.
* Before entering a confined space where Beryllium dust or powder may be present, check to make sure that an explosive concentration does not exist.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Beryllium** should change into clean clothing promptly.
* Do not take contaminated work clothes home. Family members could be exposed.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Beryllium**.
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with **Beryllium**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Beryllium**, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where **Beryllium** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.
* Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.
* When vacuuming, a high efficiency particulate absolute (HEPA) filter should be used, <u>not</u> a standard shop vacuum.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Beryllium**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

* Wear dust-proof goggles and face shield when working with powders or dust, unless full facepiece respiratory protection is worn.

spiratory Protection

PROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the ployer has a written program that takes to account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as deribed in OSHA 1910.134.

* Where the potential exists for exposures over 0.0005 mg/m^3, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in the positive pressure mode or with a full facepiece, hood, or helmet in the continuous flow mode, or use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.

* Exposure to 10 mg/m^3 is immediately dangerous to life and health. If the possibility of exposure above 10 mg/m^3 exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in continuous flow or other positive pressure mode.

ESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Can I get long-term effects without ever having short-term effects?
Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

What are my chances of getting sick when I have been exposed to chemicals?
The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

When are higher exposures more likely?
A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?
A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

Q: Don't all chemicals cause cancer?
A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?
A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?
A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

The New Jersey State Department of Health, Occupational Health Service offers multiple services in occupational health. These include: Right to Know Information Resources, Public Presentations, General References, Industrial Hygiene Information, Surveys and Investigations, and Medical Evaluation. Consult another Fact Sheet for a more detailed description of these services or call (609) 984-1863.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEPE is the New Jersey Department of Environmental Protection and Energy.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<

Common Name: **BERYLLIUM**
DOT Number: UN 1567 (Powder)
DOT Emergency Guide code: 32
CAS Number: 7440-41-7

Hazard rating	NJ DOH	NFPA
FLAMMABILITY	-	1
REACTIVITY	-	0
CARCINOGEN COMBUSTIBLE POISONOUS GASES ARE PRODUCED IN FIRE DO NOT USE WATER		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

- Beryllium is a COMBUSTIBLE SOLID.
- Use dry chemical extinguishers.
- Beryllium dust or powder may be an EXPLOSION hazard as it forms explosive mixtures in air.
- POISONOUS GASES ARE PRODUCED IN FIRE.
- DO NOT USE WATER.
- If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If Beryllium is spilled, take the following steps:

- Restrict persons not wearing protective equipment from area of spill until clean-up is complete.
- Remove all ignition sources.
- Collect powdered material in the most convenient and safe manner and deposit in sealed containers.
- Ventilate and wash the area of spill after clean-up.
- It may be necessary to contain and dispose of Beryllium as a HAZARDOUS WASTE. Contact your Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEPE HOTLINE: (609) 292-7172

HANDLING AND STORAGE

- Prior to working with **Beryllium** you should be trained on its proper handling and storage.
- A regulated, marked area should be established where **Beryllium** is handled, used, or stored.
- **Beryllium** is not compatible with OXIDIZERS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES and NITRATES), STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC), CAUSTICS, MOLTEN LITHIUM, and CHLORINATED HYDROCARBONS.
- Store in tightly closed containers in a cool, dry, well-ventilated area away from HEAT.
- Protect storage containers from physical damage.
- Sources of ignition, such as smoking and open flames, are prohibited where Beryllium is handled, used, or stored.

FIRST AID

In NJ, POISON INFORMATION 1-800-962-1253

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention immediately.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Breathing

- Remove the person from exposure.
- Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

PHYSICAL DATA

Water Solubility: Slightly soluble

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NEW JERSEY DEPARTMENT OF HEALTH
Right to Know Program
CN 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **BIS (2-ETHYLHEXYL) PHTHALATE**
CAS Number: 117-81-7
DOT Number: None

RTK Substance number: 0238
Date: Jan. 1986 Revision: Aug. 1992

HAZARD SUMMARY

* Bis (2-Ethylhexyl) Phthalate can affect you when breathed in.
* Bis (2-Ethylhexyl) Phthalate is a CARCINOGEN and a TERATOGEN--HANDLE WITH EXTREME CAUTION.
* Exposure can cause irritation of the eyes, nose and throat.
* It may damage the testes (male reproductive glands).
* Repeated exposure may affect the liver.

IDENTIFICATION

Bis (2-Ethylhexyl) Phthalate is a light-colored liquid. It is used as a plasticizer for resins, in pesticides, and as a solvent for ink.

REASON FOR CITATION

* Bis (2-Ethylhexyl) Phthalate is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DEPE, NFPA, DOT, NIOSH, HHAG and EPA.
* This chemical is on the Special Health Hazard Substance List because it is a CARCINOGEN.
* Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.20.
* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) is 5 mg/m^3 averaged over an 8-hour workshift <u>and</u> 10 mg/m^3 not to be exceeded during any 15 minute work period. (Final Rule, January 1989).

ACGIH: The recommended airborne exposure limit is 5 mg/m^3 averaged over an 8-hour workshift <u>and</u> 10 mg/m^3 as a STEL (short term exposure limit).

* Bis (2-Ethylhexyl) Phthalate is a PROBABLE CARCINOGEN and a TERATOGEN in humans. There may be <u>no</u> safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.

WAYS OF REDUCING EXPOSURE

* Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* A regulated, marked area should be established where Bis (2-Ethylhexyl) Phthalate is handled, used, or stored.
* Wear protective work clothing.
* Wash thoroughly <u>immediately</u> after exposure to Bis (2-Ethylhexyl) Phthalate and at the end of the workshift.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of Bis (2-Ethylhexyl) Phthalate to potentially exposed workers.

This Fact Sheet is a summary source of in rmation of all potential and most severe alth hazards that may result from exposure. Duration of exposure, concentration the substance and other factors will af ct your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

ute Health Effects

e following acute (short-term) health effects may occur immediately or shortly af r exposure to Bis (2-Ethylhexyl) thalate:

* Exposure can cause irritation of the eyes, nose and throat.

Chronic Health Effects

e following chronic (long-term) health fects can occur at some time after exposure to Bis (2-Ethylhexyl) Phthalate and n last for months or years:

Cancer Hazard

* Bis (2-Ethylhexyl) Phthalate is a PROBABLE CARCINOGEN in humans. It has been shown to cause liver cancer in animals.
* Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

* Bis (2-Ethylhexyl) Phthalate is a PROBABLE TERATOGEN in humans.
* Bis (2-Ethylhexyl) Phthalate may damage the testes (male reproductive glands).

ther Long-Term Effects

* Repeated exposures may affect the liver.

EDICAL

edical Testing

symptoms develop or overexposure is suspected, the following may be useful:

* Liver function tests.

Any evaluation should include a careful istory of past and present symptoms with exam. Medical tests that look for damage already done are not a substitute for ntrolling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, ENGINEERING CONTROLS are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

* Where possible, automatically pump liquid Bis (2-Ethylhexyl) Phthalate from drums or other storage containers to process containers.

Good WORK PRACTICES can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by Bis (2-Ethylhexyl) Phthalate should change into clean clothing promptly.
* Do not take contaminated work clothes home. Family members could be exposed.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to Bis (2-Ethylhexyl) Phthalate.
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with Bis (2-Ethylhexyl) Phthalate, immediately wash or shower to

remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted Bis (2-Ethylhexyl) Phthalate, whether or not known skin contact has occurred.

Do not eat, smoke, or drink where Bis (2-Ethylhexyl) Phthalate is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.

RSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PER- NAL PROTECTIVE EQUIPMENT. However, for me jobs (such as outside work, confined space entry, jobs done only once in a ile, or jobs done while workplace con- ols are being installed), personal pro- ctive equipment may be appropriate.

e following recommendations are only idelines and may not apply to every situation.

othing

* Avoid skin contact with Bis (2-Ethylhexyl) Phthalate. Wear protective gloves and clothing. Safety equipment suppliers/ manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
* Safety equipment manufacturers recommend *Butyl Rubber* and *Viton* as protective materials.

Eye Protection

* Wear splash-proof chemical goggles and face shield when working with liquid, unless full facepiece respiratory protection is worn.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. uch equipment should only be used if the employer has a written program that takes into account workplace conditions, re- uirements for worker training, respirator it testing and medical exams, as described in OSHA 1910.134.

* Where the potential exists for exposures over 5 mg/m^3, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in the positive pressure mode or with a full facepiece, hood, or helmet in the continuous flow mode, or use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.

HANDLING AND STORAGE

* Prior to working with Bis (2-Ethylhexyl) Phthalate you should be trained on its proper handling and storage.
* A regulated, marked area should be established where Bis (2-Ethylhexyl) Phthalate is handled, used, or stored.
* Bis (2-Ethylhexyl) Phthalate is not compatible with OXIDIZING MATERIALS (such as PERMANGANATES, NITRATES, PEROXIDES, CHLORATES and PERCHLORATES), STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC), and ALKALIES (such as SODIUM HYDROXIDE).
* Store in tightly closed containers in a cool, well-ventilated area away from HEAT.
* Sources of ignition, such as smoking and open flames, are prohibited where Bis (2-Ethylhexyl) Phthalate is used, handled, or stored in a manner that could create a potential fire or explosion hazard.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?

A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?

A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

When are higher exposures more likely?
Conditions which increase risk of exposure include <u>physical and mechanical processes</u> (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and <u>"confined space" exposures</u> (working inside vats, reactors, boilers, small rooms, etc.).

Is the risk of getting sick higher for workers than for community residents?
Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

Don't all chemicals cause cancer?
No. Most chemicals tested by scientists are not cancer-causing.

Should I be concerned if a chemical causes cancer in animals?
Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

But don't they test animals using much higher levels of a chemical than people usually are exposed to?
Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

Can men as well as women be affected by chemicals that cause reproductive system damage?
Yes. Some chemicals reduce potency or fertility in both men and women. Some damage <u>sperm</u> and <u>eggs</u>, possibly leading to birth defects.

Who is at the greatest risk from reproductive hazards?
A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the <u>ability</u> to have children, so both men and women of child-bearing age are at high risk.

The following information is available from:

New Jersey Department of Health
Occupational Health Service
Trenton, NJ 08625-0360
(609) 984-1863

<u>Industrial Hygiene Information</u>
Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

<u>Medical Evaluation</u>
If you think you are becoming sick because of exposure to chemicals at your workplace, you may call a Department of Health physician who can help you find the services you need.

<u>Public Presentations</u>
Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

<u>Right to Know Information Resources</u>
The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-5627.

EFINITIONS

IH is the American Conference of Gov- rnmental Industrial Hygienists. It recom- ds upper limits (called TLVs) for expo- e to workplace chemicals.

arcinogen is a substance that causes cer.

e **CAS number** is assigned by the Chemical tracts Service to identify a specific mical.

ombustible substance is a solid, liquid gas that will burn.

orrosive substance is a gas, liquid or id that causes irreversible damage to an tissue or containers.

E is the New Jersey Department of Envi- nental Protection and Energy.

is the Department of Transportation, federal agency that regulates the ransportation of chemicals.

is the Environmental Protection Agency, federal agency responsible for regulat- ng environmental hazards.

etus is an unborn human or animal.

lammable substance is a solid, liquid, or or gas that will ignite easily and rn rapidly.

flash point is the temperature at which iquid or solid gives off vapor that can rm a flammable mixture with air.

G is the Human Health Assessment Group f the federal EPA.

C is the International Agency for Re- earch on Cancer, a scientific group that ssifies chemicals according to their cer-causing potential.

miscible substance is a liquid or gas t will evenly dissolve in another.

g/m^3 means milligrams of a chemical in a ic meter of air. It is a measure of centration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<<

Common Name: **BIS (2-ETHYLHEXYL) PHTHALATE**
OT Number: None
DOT Emergency Guide code: No Citation
CAS Number: 117-81-7

Hazard rating	NJ DOH	NFPA
FLAMMABILITY	-	1
REACTIVITY	-	0

CARCINOGEN
COMBUSTIBLE
POISONOUSES GASES ARE PRODUCED IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

Bis (2-Ethylhexyl) Phthalate is a COMBUSTIBLE LIQUID.

* Use dry chemical, CO_2, or foam extinguishers.
* Use water to keep fire exposed containers cool.
* POISONOUS GASES ARE PRODUCED IN FIRE, including *Carbon Dioxide* and *Carbon Monoxide*.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If Bis (2-Ethylhexyl) Phthalate is spilled or leaked, take the following steps:

* Restrict persons not wearing protective equipment from area of spill or leak until clean-up is complete.
* Remove ignition sources.
* Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.
* Ventilate the area of spill or leak after clean-up is complete.
* It may be necessary to contain and dispose of Bis (2-Ethylhexyl) **Phthalate** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEPE HOTLINE: (609) 292-7172

HANDLING AND STORAGE (See page 3)

FIRST AID

In NJ, POISON INFORMATION 1-800-962-1253

Eye Contact

* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention.

Skin Contact

* Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Breathing

* Remove the person from exposure.

PHYSICAL DATA

Vapor Pressure: Less than 0.01 mm Hg at 68°F (20°C)
Flash Point: 425°F (218.3°C)
Water Solubility: Slightly soluble

OTHER COMMONLY USED NAMES

Chemical Name:
1,2-Benzenedicarboxylic Acid, Bis(2-Ethylhexyl) Ester
Other Names:
Di-sec-Octyl Phthalate; DOP; DEHP

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NEW JERSEY DEPARTMENT OF HEALTH
Right to Know Program
CN 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **CHLOROFORM**

CAS Number: 67-66-3
DOT Number: UN 1888

RTK Substance number: 0388
Date: Sept. 1985 Revision: March 1993

HAZARD SUMMARY

- Chloroform can affect you when breathed in and by passing through your skin.
- Chloroform is a CARCINOGEN --HANDLE WITH EXTREME CAUTION.
- Chloroform may damage the developing fetus.
- Exposure can cause you to feel dizzy, lightheaded, nauseated, confused, and to become unconscious. It can cause the heart to beat irregularly or stop.
- Repeated exposure can damage the liver, kidneys and nervous system.
- Exposure can irritate the nose, throat, eyes and skin and can cause eye damage.

IDENTIFICATION

Chloroform is a clear, colorless liquid with a pleasant, sweet odor. It is used as a solvent and to make refrigerants, resins and plastics.

REASON FOR CITATION

- Chloroform is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, IARC, NTP, NFPA, DOT, NIOSH, DEPE, EPA and HHAG.
- This chemical is on the Special Health Hazard Substance List because it is a CARCINOGEN.
- Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

- Exposure to hazardous substances should be routinely evaluated. This may include collecting air samples. Under OSHA 1910.20, you have a legal right to obtain copies of sampling results from your employer. If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
- ODOR THRESHOLD = 133 to 276 ppm.
- The odor threshold only serves as a warning of exposure. Not smelling it does not mean you are not being exposed.

WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) is 2 ppm, not to be exceeded at any time. (Final Rule, January 1989).

NIOSH: The recommended airborne exposure limit is 2 ppm, which should not be exceeded during any 1 hour period.

ACGIH: The recommended airborne exposure limit is 10 ppm averaged over an 8-hour workshift.

- Chloroform is a PROBABLE CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- The above exposure limits are for air levels only. Skin contact may also cause overexposure.

WAYS OF REDUCING EXPOSURE

- Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- A regulated, marked area should be established where Chloroform is handled, used, or stored.
- Wear protective work clothing.
- Wash thoroughly immediately after exposure to Chloroform and at the end of the workshift.
- Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of Chloroform to potentially exposed workers.

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This Fact Sheet is a summary source of information of <u>all potential</u> and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Chloroform**:

* Exposure can cause the heart to beat irregularly or stop. This can cause death.
* Contact can irritate the skin, causing a rash or burning feeling on contact.
* Chloroform can cause severe eye irritation and burns.
* Exposure to the vapor can irritate the nose and throat.
* Exposure can cause you to feel dizzy, lightheaded, nauseated, confused, and to become unconscious.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to Chloroform and can last for months or years:

Cancer Hazard

* Chloroform is a PROBABLE CARCINOGEN in humans. It has been shown to cause liver, kidney, and thyroid cancer in animals.
* Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

* Chloroform may damage the developing fetus.

Other Long-Term Effects

* Chloroform can damage the liver.
* Repeated skin contact with the liquid may produce skin drying and cracking.
* Repeated exposure can affect the kidneys and nervous system.

MEDICAL

Medical Testing

For those with frequent or potentially high exposure (half the TLV or greater, or significant skin contact), the following are recommended before beginning work and at regular times after that:

* Liver and kidney function tests.
* Exam of the nervous system.

If symptoms develop or overexposure is suspected, the following may be useful:

* Special 24 hour EKG (holster monitor) to look for irregular heart beat.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are <u>not</u> a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

Mixed Exposures

Because more than light alcohol consumption can cause liver damage, it can increase the liver damage caused by Chloroform.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, ENGINEERING CONTROLS are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

* Where possible, automatically pump liquid Chloroform from drums or other storage containers to process containers.
* Specific engineering controls are recommended for this chemical by NIOSH. Refer to the NIOSH criteria documents: *Occupational Exposure to Chloroform #75-114 and #78-127.*

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Chloroform** should change into clean clothing promptly.
* Do not take contaminated work clothes home. Family members could be exposed.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Chloroform**.
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with **Chloroform**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted Chloroform, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where Chloroform is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Chloroform**. Wear solvent-resistant gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
* ACGIH and safety equipment manufacturers recommend *Polyvinyl Alcohol* and *VITON* as protective materials.

Eye Protection

* Wear splash-proof chemical goggles and face shield when working with liquid, unless full facepiece respiratory protection is worn.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* Where the potential exists for exposures over 2 ppm, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in the positive pressure mode or with a full facepiece, hood, or helmet in the continuous flow mode, or use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?
A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include <u>physical and mechanical processes</u> (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and <u>"confined space" exposures</u> (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?
A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

Q: Don't all chemicals cause cancer?
A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?
A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?
A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

Q: Aren't pregnant women at the greatest risk from reproductive hazards?
A: Not necessarily. Pregnant women ate at greatest risk from chemicals which harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of child-bearing age are at high risk.

Q: Should I be concerned if a chemical is a teratogen in animals?
A: Yes. Although some chemicals may affect humans differently than they affect animals, damage to animals suggests that similar damage can occur in humans.

The following information is available from:

New Jersey Department of Health
Occupational Health Service
Trenton, NJ 08625-0360
(609) 984-1863

<u>Industrial Hygiene Information</u>
Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

<u>Medical Evaluation</u>
If you think you are becoming sick because of exposure to chemicals at your workplace, you may call a Department of Health physician who can help you find the services you need.

<u>Public Presentations</u>
Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

<u>Right to Know Information Resources</u>
The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-5627.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEPE is the New Jersey Department of Environmental Protection and Energy.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<

Common Name: **CHLOROFORM**
DOT Number: **UN 1888**
DOT Emergency Guide code: 55
CAS Number: **67-66-3**

Hazard rating	NJ DOH	NFPA
FLAMMABILITY	-	0
REACTIVITY	-	0
POISONOUS GASES ARE PRODUCED IN FIRE CONTAINERS MAY EXPLODE IN FIRE CARCINOGEN		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* Extinguish fire using an agent suitable for type of surrounding fire.
* POISONOUS GASES ARE PRODUCED IN FIRE, including *Hydrogen Chloride* and *Phosgene*.
* CONTAINERS MAY EXPLODE IN FIRE.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Chloroform** is spilled or leaked, take the following steps:

* Restrict persons not wearing protective equipment from area of spill or leak until clean-up is complete.
* Collect for reclamation or absorb in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.
* Ventilate the area of spill or leak after clean-up is complete.
* It may be necessary to contain and dispose of **Chloroform** as a HAZARDOUS WASTE. Contact your Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEPE HOTLINE: (609) 292-7172

HANDLING AND STORAGE

* Prior to working with **Chloroform** you should be trained on its proper handling and storage.
* A regulated, marked area should be established where **Chloroform** is handled, used, or stored.
* **Chloroform** is not compatible with STRONG CAUSTICS (such as POTASSIUM HYDROXIDE), STRONG OXIDIZERS (such as CHLORINE, BROMINE and FLUORINE), CHEMICALLY ACTIVE METALS (such as ALUMINUM and MAGNESIUM POWDER, SODIUM, or POTASSIUM).
* Store in tightly closed containers in a cool, well-ventilated area away from LIGHT.

FIRST AID

In NJ, POISON INFORMATION 1-800-962-1253

Eye Contact

* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention immediately.

Skin Contact

* Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water. Seek medical attention immediately.

Breathing

* Remove the person from exposure.
* Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
* Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 160 mm Hg at 68°F (20°C)
Water Solubility: Slightly soluble

OTHER COMMONLY USED NAMES

Chemical Name:
Methane, Trichloro-
Other Names:
Trichloromethane; Formyl Trichloride

Not intended to be copied and sold for commercial purposes

NEW JERSEY DEPARTMENT OF HEALTH
Right to Know Program
CN 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **1,2-DICHLOROETHYLENE**

CAS Number: 540-59-0
DOT Number: UN 1150

RTK Substance number: 0653
Date: September 1986 Revision: September 1996

HAZARD SUMMARY

- **1,2-Dichloroethylene** can affect you when breathed in.
- Contact can irritate the skin causing a rash or burning feeling, and can irritate the eyes.
- Breathing **1,2-Dichloroethylene** can irritate the nose, throat and lungs.
- Exposure to high concentrations can cause you to become dizzy, lightheaded and to pass out.
- Repeated exposure may damage the liver and kidneys.
- **1,2-Dichloroethylene** is a FLAMMABLE and REACTIVE CHEMICAL and is a FIRE and EXPLOSION HAZARD.

IDENTIFICATION

1,2-Dichloroethylene is a colorless liquid with an ether-like odor. It is used as a solvent for organic materials.

REASON FOR CITATION

- **1,2-Dichloroethylene** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, DEP, NFPA and EPA.
- This chemical is on the Special Health Hazard Substance List because it is **FLAMMABLE** and **REACTIVE**.
- Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- Exposure to hazardous substances should be routinely evaluated. This may include collecting air samples. Under OSHA 1910.20, you have a legal right to obtain copies of sampling results from your employer.
- If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
- **ODOR THRESHOLD = 17 ppm.**
- The range of accepted odor threshold values is quite broad. Caution should be used in relying on odor alone as a warning of potentially hazardous exposures.

WORKPLACE EXPOSURE LIMITS

OSHA:	The legal airborne permissible exposure limit (PEL) is **200 ppm** averaged over an 8-hour workshift.
NIOSH:	The recommended airborne exposure limit is **200 ppm** averaged over a 10-hour workshift.
ACGIH:	The recommended airborne exposure limit is **200 ppm** averaged over an 8-hour workshift

WAYS OF REDUCING EXPOSURE

- Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- Wear protective work clothing.
- Wash thoroughly immediately after exposure to **1,2-Dichloroethylene.**
- Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **1,2-Dichloroethylene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **1,2-Dichloroethylene:**

- Contact can irritate the skin causing a rash or burning feeling, and can irritate the eyes.
- Breathing **1,2-Dichloroethylene** can irritate the nose, throat and lungs.
- Exposure to high concentrations can cause you to become dizzy, lightheaded and to pass out.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **1,2-Dichloroethylene** and can last for months or years:

Cancer Hazard

- According to the information presently available to the New Jersey Department of Health, **1,2-Dichloroethylene** has not been tested for its ability to cause cancer in animals.

Reproductive Hazard

- According to the information presently available to the New Jersey Department of Health, **1,2-Dichloroethylene** has not been tested for its ability to affect reproduction.

Other Long-Term Effects

- Repeated exposure may damage the liver and kidneys.

MEDICAL

Medical Testing

For those with frequent or potentially high exposure (half the TLV or greater), the following are recommended before beginning work and at regular times after that:

- Liver and kidney function tests.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

Mixed Exposures

Because smoking can cause heart disease, as well as lung cancer, emphysema and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

- Where possible, automatically pump liquid **1,2-Dichloroethylene** from drums or other storage containers to process containers.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- Workers whose clothing has been contaminated by **1,2-Dichloroethylene** should change into clean clothing promptly.
- Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **1,2-Dichloroethylene.**
- Eye wash fountains should be provided in the immediate work area for emergency use.
- If there is the possibility of skin exposure, emergency shower facilities should be provided.
- On skin contact with **1,2-Dichloroethylene,** immediately wash or shower to remove the chemical.
- Do not eat, smoke, or drink where **1,2-Dichloroethylene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- Avoid skin contact with **1,2-Dichloroethylene**. Wear solvent-resistant gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- All protective clothing suits, gloves, footwear, headgear should be clean, available each day and put on before work.

Eye Protection

- Wear splash-proof chemical goggles and face shield when working with liquid, unless full facepiece respiratory protection is worn.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- Where the potential exists for exposures over **200 ppm**, use a MSHA/NIOSH approved full facepiece respirator with an organic vapor cartridge/canister. Increased protection is obtained from full facepiece powered air purifying respirators.
- If while wearing a filter, cartridge or canister respirator, you can smell, taste, or otherwise detect **1,2-Dichloroethylene**, or in the case of a full facepiece respirator you experience eye irritation, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter, cartridge, or canister. If the seal is no longer good, you may need a new respirator.
- Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters, cartridges, or canisters to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Exposure to **1000 ppm** is immediately dangerous to life and health. If the possibility of exposure above **1000 ppm** exists, use an MSHA/NIOSH approved selfcontained breathing apparatus with a full facepiece operated in continuous flow or other positive pressure mode.

HANDLING AND STORAGE

- Prior to working with **1,2Dichloroethylene** you should be trained on its proper handling and storage.
- **1,2-Dichloroethylene** must be stored to avoid contact with STRONG OXIDIZERS (such as CHLORINE, BROMINE and FLUORINE) since violent reactions occur.
- Store in tightly closed containers in a cool, well-ventilated area away from HEAT.
- Sources of ignition, such as smoking and open flames, are prohibited where **1,2-Dichloroethylene** is used, handled, or stored.
- Metal containers involving the transfer of **1,2-Dichloroethylene** should be grounded and bonded. Drums must be equipped with self-closing valves, pressure vacuum bungs and flame arresters.
- Use only non-sparking tools and equipment, especially when opening and closing containers of **1,2-Dichloroethylene.**
- Wherever **1,2-Dichloroethylene** is used, handled, manufactured, or stored, use explosion-proof electrical equipment and fittings.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?

A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?

A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?

A: Conditions which increase risk of exposure include <u>physical and mechanical processes</u> (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and <u>"confined space" exposures</u> (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?

A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

The following information is available from:

New Jersey Department of Health and
Senior Services
Occupational Disease and Injury Service
Trenton, NJ 08625-0360
(609) 984-1863

Industrial Hygiene Information
Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation
If you think you are becoming sick because of exposure to chemicals at your workplace, you may call a Department of Health and Senior Services physician who can help you find the services you need.

Public Presentations
Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources
The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

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A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

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A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>>>EMERGENCY INFORMATION<<<<<<<<<<<<<<<<<<

Common Name: **1,2-DICHLOROETHYLENE**
DOT Number: **UN 1150**
DOT Emergency Guide code: **132P**
CAS Number: **540-59-0**

Hazard rating	NJ DOH	NFPA
FLAMMABILITY	-	3
REACTIVITY	-	2
POISONOUS GASES ARE PRODUCED IN FIRE CONTAINERS MAY EXPLODE IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

- **1,2-Dichloroethylene** is a FLAMMABLE LIQUID.
- Use dry chemical, CO_2, water spray, or foam extinguishers.
- POISONOUS GASES ARE PRODUCED IN FIRE.
- CONTAINERS MAY EXPLODE IN FIRE.
- If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **1,2-Dichloroethylene** is spilled or leaked, take the following steps:

- Restrict persons not wearing protective equipment from areas of spills or leaks until clean-up is complete.
- Remove all ignition sources.
- Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.
- Keep **1,2-Dichloroethylene** out of a confined space, such as a sewer, because of the possibility of an explosion, unless the sewer is designed to prevent the build-up of explosive concentrations.
- It may be necessary to contain and dispose of **1,2-Dichloroethylene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
- If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

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FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: (609) 292-7172

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HANDLING AND STORAGE (See page 3)

FIRST AID

In NJ, POISON INFORMATION 1-800-962-1253

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water.

Breathing

- Remove the person from exposure.
- Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 180-265 mm Hg at 68°F (20°C)
Flash Point: 36-39°F (2.2-4°C)
Water Solubility: Slightly soluble

OTHER COMMONLY USED NAMES

Chemical Name:

Ethene, 1,2-Dichloro-

Other Names:

Acetylene Dichloride; trans-Dichloroethylene; sym-Dichloroethylene

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NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
CN 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **VINYLIDENE CHLORIDE**

CAS Number: 75-35-4
DOT Number: UN 1303

RTK Substance number: 2006
Date: April 1986 Revision: June 1996

HAZARD SUMMARY

- **Vinylidene Chloride** can affect you when breathed in and by passing through your skin.
- **Vinylidene Chloride** should be handled as a CARCINOGEN--WITH EXTREME CAUTION.
- Contact can irritate and burn the eyes and skin.
- Breathing **Vinylidene Chloride** can irritate the nose and throat causing coughing and/or shortness of breath.
- High levels can cause drowsiness, depression and a "drunken" feeling that can lead to unconsciousness.
- Repeated exposure may damage the liver and kidneys.
- It is a HIGHLY FLAMMABLE and REACTIVE CHEMICAL, and a DANGEROUS FIRE and EXPLOSION HAZARD.

IDENTIFICATION

Vinylidene Chloride is a volatile colorless liquid with a mild, sweet odor. It is used as a chemical intermediate in making plastics, in adhesives and in the synthesis of refrigerant.

REASON FOR CITATION

- **Vinylidene Chloride** is on the Hazardous Substance List because it is cited by ACGIH, NIOSH, DOT, DEP, HHAG, NFPA, IARC and EPA.
- This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN**, a **MUTAGEN, FLAMMABLE** and **REACTIVE**.
- Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.20.
- If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
- **ODOR THRESHOLD = 500 ppm.**
- The range of accepted odor threshold values is quite broad. Caution should be used in relying on odor alone as a warning of potentially hazardous exposures.

WORKPLACE EXPOSURE LIMITS

ACGIH: The recommended airborne exposure limit is **5 ppm** averaged over an 8-hour workshift <u>and</u> **20 ppm** as a STEL (short term exposure limit).

- **Vinylidene Chloride** may be a CARCINOGEN in humans. There may be <u>no</u> safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- The above exposure limits are for <u>air</u> <u>levels</u> <u>only</u>. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

- Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- Wear protective work clothing.
- Wash thoroughly <u>immediately</u> after exposure to **Vinylidene Chloride** and at the end of the workshift.
- Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Vinylidene Chloride** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Vinylidene Chloride**:

- Contact can irritate and burn the skin and eyes.
- Breathing **Vinylidene Chloride** can irritate the nose and throat causing coughing and/or shortness of breath.
- High levels can cause drowsiness, depression and a "drunken" feeling that can lead to unconsciousness.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Vinylidene Chloride** and can last for months or years:

Cancer Hazard

- **Vinylidene Chloride** may be a CARCINOGEN in humans since it has been shown to cause kidney, liver and skin cancer in animals.
- Many scientists believe there is no safe level of exposure to a cancinogen.

Reproductive Hazard

- There is limited evidence that **Vinylidene Chloride** may affect the reproductive ability of males.

Other Long-Term Effects

- Repeated exposure may cause liver and kidney damage.

MEDICAL

Medical Testing

For those with frequent or potentially high exposure (half the TLV or greater, or significant skin contact), the following are recommended before beginning work and at regular times after that:

- Liver and kidney function tests.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

Because more than light alcohol consumption can cause liver damage, drinking alcohol may increase the liver damage caused by **Vinylidene Chloride**.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

- Where possible, automatically pump liquid **Vinylidene Chloride** from drums or other storage containers to process containers.
- Before entering a confined space where **Vinylidene Chloride** may be present, check to make sure that an explosive concentration does not exist.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- Workers whose clothing has been contaminated by **Vinylidene Chloride** should change into clean clothing promptly.
- Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Vinylidene Chloride**.
- Eye wash fountains should be provided in the immediate work area for emergency use.
- If there is the possibility of skin exposure, emergency shower facilities should be provided.
- On skin contact with **Vinylidene Chloride**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Vinylidene Chloride**, whether or not known skin contact has occurred.
- Do not eat, smoke, or drink where **Vinylidene Chloride** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking or using the toilet.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- Avoid skin contact with **Vinylidene Chloride.** Wear protective gloves and clothing including an apron and boots. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
- Safety equipment manufacturers recommend *Nitrile* as a protective material.

Eye Protection

- Wear splash-proof chemical goggles and face shield when working with liquid, unless full facepiece respiratory protection is worn.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- Where the potential exists for exposures over **5 ppm**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

HANDLING AND STORAGE

- Prior to working with **Vinylidene Chloride** you should be trained on its proper handling and storage.
- **Vinylidene Chloride** must be stored to avoid contact with OXIDIZERS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, and NITRATES); and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) since violent reactions occur.
- Store in tightly closed containers in a cool well-ventilated area away from sources of HEAT.
- Protect storage containers from physical damage.
- Sources of ignition such as smoking and open flames are prohibited where **Vinylidene Chloride** is handled, used, or stored.
- Metal containers involving the transfer of **Vinylidene Chloride** should be grounded and bonded. Drums must be equipped with self-closing valves, pressure vacuum bungs, and flame arresters.
- Use only non-sparking tools and equipment, especially when opening and closing containers of **Vinylidene Chloride.**
- Wherever **Vinylidene Chloride** is used, handled, manufactured, or stored, use explosion-proof electrical equipment and fittings.
- A regulated, marked area should be established where **Vinylidene Chloride** is handled, used, or stored.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?
A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?
A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

Q: Don't all chemicals cause cancer?
A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?
A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?
A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

Q: Can men as well as women be affected by chemicals that cause reproductive system damage?
A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.

Q: Who is at the greatest risk from reproductive hazards?
A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of child-bearing age are at high risk.

The following information is available from:

New Jersey Department of Health
Occupational Health Service
Trenton, NJ 08625-0360
(609) 984-1863

Industrial Hygiene Information
Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation
If you think you are becoming sick because of exposure to chemicals at your workplace, you may call a Department of Health physician who can help you find the services you need.

Public Presentations
Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources
The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<<

Common Name: **VINYLIDENE CHLORIDE**
DOT Number: **UN 1303**
DOT Emergency Guide code: **129P**
CAS Number: **75-35-4**

Hazard rating	NJ DOH	NFPA
FLAMMABILITY	-	4
REACTIVITY	-	2

CARCINOGEN
POISONOUS GASES ARE PRODUCED IN FIRE
CONTAINERS MAY EXPLODE IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

- **Vinylidene Chloride** is a FLAMMABLE LIQUID.
- POISONOUS GASES ARE PRODUCED IN FIRE, including *Hydrogen Chloride*.
- CONTAINERS MAY EXPLODE IN FIRE.
- Do not extinguish fire unless flow can be stopped.
- Use dry chemical, CO_2, or foam extinguishers and water to keep fire exposed containers cool.
- Vapors may travel to a source of ignition and flash back.
- If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Vinylidene Chloride** is spilled or leaked, take the following steps:

- Evacuate and isolate the area of the spill or leak, and restrict persons not wearing protective equipment from area of spill or leak until clean-up is complete.
- Remove all ignition sources.
- Ventilate area of spill or leak after clean-up is complete.
- Keep **Vinylidene Chloride** out of a confined space, such as a sewer, because of the possibility of an explosion, unless the sewer is designed to prevent the build-up of explosive concentrations.
- It may be necessary to contain and dispose of **Vinylidene Chloride** as a HAZARDOUS WASTE. Contact your Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
- If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

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FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: (609) 292-7172

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HANDLING AND STORAGE (See page 3)

FIRST AID

In NJ, POISON INFORMATION 1-800-962-1253

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water. Seek medical attention.

Breathing

- Remove the person from exposure.
- Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facil-ity.

PHYSICAL DATA

Vapor Pressure: 591 mm Hg at 77°F (25°C)
Flash Point: -2°F (-19°C)
Water Solubility: Insoluble

OTHER COMMONLY USED NAMES

Chemical Name:
Ethene, 1,1-Dichloro-
Other Names:
1,1-Dichloroethylene

Not intended to be copied and sold for commercial purposes.

NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
CN 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **ETHYL CHLORIDE**

CAS Number: 75-00-3
DOT Number: UN 1037

RTK Substance number: 0863
Date: January 1986 Revision: June 1996

HAZARD SUMMARY

- **Ethyl Chloride** can affect you when breathed in and by passing through your skin.
- **Ethyl Chloride** can irritate the eyes and skin. Contact with the liquid can burn the eyes and cause frostbite on the skin.
- Breathing **Ethyl Chloride** can irritate the nose and throat.
- **Ethyl Chloride** may damage the liver and kidneys.
- **Ethyl Chloride** is a HIGHLY FLAMMABLE LIQUID or GAS and a DANGEROUS FIRE HAZARD.

IDENTIFICATION

Ethyl Chloride is a gas with a strong ether-like odor which may be available as a cold liquid under pressure. It is used in making certain other chemicals, in refrigeration, and as a solvent and local anesthetic.

REASON FOR CITATION

- **Ethyl Chloride** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, DEP, NFPA, NIOSH, HHAG and EPA.
- This chemical is on the Special Health Hazard Substance List because it is **FLAMMABLE**
- Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- Exposure to hazardous substances should be routinely evaluated. This may include collecting air samples. Under OSHA 1910.20, you have a legal right to obtain copies of sampling results from your employer.
- If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
- **ODOR THRESHOLD = 4.2 ppm.**
- The range of accepted odor threshold values is quite broad. Caution should be used in relying on odor alone as a warning of potentially hazardous exposures.

WORKPLACE EXPOSURE LIMITS

OSHA:	The legal airborne permissible exposure limit (PEL) is **1,000 ppm** averaged over an 8-hour workshift.
NIOSH:	The recommended airborne exposure limit is **1,000 ppm** averaged over a 10-hour workshift.
ACGIH:	The recommended airborne exposure limit is **1,000 ppm** averaged over an 8-hour workshift.

- The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

- Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- Wear protective work clothing.
- Wash thoroughly immediately after exposure to **Ethyl Chloride** and at the end of the workshift.
- Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Ethyl Chloride** to potentially exposed workers.

Printed on Recycled Paper

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Ethyl Chloride**:

- **Ethyl Chloride** can irritate the eyes and skin. Contact with the liquid can burn the eyes and cause frostbite on the skin.
- Breathing **Ethyl Chloride** can irritate the nose and throat.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Ethyl Chloride** and can last for months or years:

Cancer Hazard

- There is limited evidence that **Ethyl Chloride** causes cancer in animals. It may cause skin or uterine cancers.
- Many scientists believe there is no safe level of exposure to a carcinogen. Such substances may also have the potential for causing reproductive damage in humans.

Reproductive Hazard

- According to the information presently available to the New Jersey Department of Health, **Ethyl Chloride** has not been tested for its ability to affect reproduction.

Other Long-Term Effects

- **Ethyl Chloride** may damage the liver and kidneys.

MEDICAL

Medical Testing

If symptoms develop or overexposure is suspected, the following may be useful:

- Liver and kidney function tests.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

- Before entering a confined space where **Ethyl Chloride** may be present, check to make sure that an explosive concentration does not exist.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- Workers whose clothing has been contaminated by **Ethyl Chloride** should change into clean clothing promptly.
- Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Ethyl Chloride**.
- Eye wash fountains should be provided in the immediate work area for emergency use.
- If there is the possibility of skin exposure, emergency shower facilities should be provided.

- On skin contact with **Ethyl Chloride**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Ethyl Chloride**, whether or not known skin contact has occurred.
- Do not eat, smoke, or drink where **Ethyl Chloride** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- Avoid skin contact with **Ethyl Chloride**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- Where exposure to cold equipment, vapors, or liquid may occur, employees should be provided with special clothing designed to prevent the freezing of body tissues.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear splash-proof chemical goggles and face shield when working with liquid, unless full facepiece respiratory protection is worn.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- Where the potential exists for exposures over **1,000 ppm**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- Exposure to **3,800 ppm** is immediately dangerous to life and health. If the possibility of exposure above **3,800 ppm** exists, use a MSHA/NIOSH approved self contained breathing apparatus with a full facepiece operated in continuous flow or other positive pressure mode.

HANDLING AND STORAGE

- Prior to working with **Ethyl Chloride** you should be trained on its proper handling and storage.
- **Ethyl Chloride** must be stored to avoid contact with OXIDIZERS (such as PEROXIDES, CHLORATES, PERCHLORATES, NITRATES and PERMANGANATES) and CHEMICALLY ACTIVE METALS (such as SODIUM, POTASSIUM, CALCIUM, POWDERED ALUMINUM, ZINC and MAGNESIUM) since violent reactions occur.
- Store in tightly closed containers in a cool, well-ventilated area away from HEAT.
- Sources of ignition, such as smoking and open flames, are prohibited where **Ethyl Chloride** is handled, used, or stored.
- Metal containers involving the transfer of **Ethyl Chloride** should be grounded and bonded. Drums must be equipped with self-closing valves, pressure vacuum bungs, and flame arresters.
- Use only non-sparking tools and equipment, especially when opening and closing containers of **Ethyl Chloride**.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?

A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?

A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?

A: Conditions which increase risk of exposure include physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?

A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

Q: Should I be concerned if a chemical causes cancer in animals?

A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?

A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

The following information is available from:

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Senior Services
Occupational Health Service
Trenton, NJ 08625-0360
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Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

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If you think you are becoming sick because of exposure to chemicals at your workplace, you may call a Department of Health physician who can help you find the services you need.

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Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

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A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

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A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

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OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<

Common Name: **ETHYL CHLORIDE**
DOT Number: UN 1037
DOT Emergency Guide code: 115
CAS Number: 75-00-3

Hazard rating	NJ DOH	NFPA
FLAMMABILITY	-	4
REACTIVITY	-	0
POISONOUS GASES ARE PRODUCED IN FIRE CONTAINERS MAY EXPLODE IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

- **Ethyl Chloride** is a FLAMMABLE LIQUID or GAS.
- POISONOUS GASES ARE PRODUCED IN FIRE, including *Phosgene*.
- CONTAINERS MAY EXPLODE IN FIRE.
- Use dry chemical, CO_2, or foam extinguishers. Vapors may travel to a source of ignition and flash back.
- If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Ethyl Chloride** is leaked, take the following steps:

- Restrict persons not wearing protective equipment from area of leak until clean-up is complete. Vapor buildup may cause suffocation.
- Remove all ignition sources.
- Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.
- Ventilate area of leak.
- Keep **Ethyl Chloride** out of a confined space, such as a sewer, because of the possibility of an explosion, unless the sewer is designed to prevent the build-up of explosive concentrations.
- It may be necessary to contain and dispose of **Ethyl Chloride** as a HAZARDOUS WASTE. Contact your Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
- If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

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FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: (609) 292-7172

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HANDLING AND STORAGE (See page 3)

FIRST AID

In NJ, POISON INFORMATION 1-800-962-1253

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention immediately.

Skin Contact

- Quickly immerse affected part in warm water. Seek medical attention immediately.

Breathing

- Remove the person from exposure.
- Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 1,064 mm Hg at 68°F (20°C)
Flash Point: -58°F (-50°C)
Water Solubility: Soluble

OTHER COMMONLY USED NAMES

Chemical Name:
Ethane, Chloro-

Other Names:
Monochloroethane; Muriatic Ether; Clorene

Not intended to be copied and sold for commercial purposes.

NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
CN 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health

HAZARDOUS SUBSTANCE FACT SHEET

COMMON NAME: MANGANESE

CAS NUMBER: 7439-96-5 **DOT NUMBER:** None

HAZARD SUMMARY

* Manganese can affect you when breathed in.
* Repeated exposure can cause permanent brain damage. Early symptoms include poor appetite, weakness and sleepiness. Later effects include changes in speech, balance and personality. The later symptoms are identical to Parkinsons Disease.
* Heated **Manganese** can release fumes causing a flu-like illness with chills, fever and aching. Chest congestion resembling pneumonia can also occur.
* Exposure may also cause a lung allergy.
* It may damage the kidneys and liver.

IDENTIFICATION

Manganese is a reddish-gray or silvery brittle, metallic element. It is used in making steel, dry cell batteries and potassium permanganate.

REASON FOR CITATION

* Manganese is on the Workplace Hazardous Substance List because it is regulated by OSHA and cited by ACGIH.
* Definitions are provided on page 5.

WORKPLACE EXPOSURE LIMITS

OSHA:	The legal airborne permissible exposure limit (PEL) is 5 mg/m^3 as *Manganese*, not to be exceeded at any time.
ACGIH:	The recommended airborne exposure limit is 5 mg/m^3 as *Manganese* for *dust* and *compounds*, which should not be exceeded at any time.
ACGIH:	The recommended airborne exposure limit is 1 mg/m^3 as *Manganese* for *fume* averaged over an 8-hour workshift and 3 mg/m^3 as *Manganese* for *fume* as a STEL (short term exposure limit).

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.20.

* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WAYS OF REDUCING EXPOSURE

* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* Wear protective work clothing.
* Wash thoroughly at the end of the workshift.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of Manganese to potentially exposed workers.

his Fact Sheet is a summary source of information for workers, employers, and ommunity residents. Health professionals ay also find it useful. If this substance is part of a mixture, this Fact Sheet should be used along with the anufacturer-supplied Material Safety Data heet (MSDS).

EALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to Manganese:

* Exposure to heated Manganese fumes can cause "metal fume fever" with chills, fever and aching, lasting up to 24 hours. If shortness of breath occurs, Manganese "pneumonia" may be present, with congestion in the chest and coughing.

hronic Health Effects

The following chronic (long-term) health ffects can occur at some time after expoure to Manganese and can last for months or years:

ancer Hazard

* According to the information presently available to the New Jersey Department of Health, Manganese has not been tested for its ability to cause cancer in animals.

eproductive Hazard

* There is limited evidence that Manganese may decrease fertility in males.

ther Long-Term Effects

* Repeated exposure may cause gradual brain damage. Early effects include sleepiness, weakness and poor appetite. If exposure is stopped at this stage, damage may be temporary. Later effects include changes in speech, a loss of facial expression, personality changes, poor muscle coordination, changes in walking, muscle cramps, twitching and tremors. When later changes occur, some permanent brain damage can result and symptoms are identical to Parkinsons Disease.
* Repeated exposure can cause a variety of changes in the blood count. Liver and/or kidney damage may also occur.
* High or repeated exposure may damage the lungs.
* Exposure may cause lung allergy (asthma) to develop with wheezing and shortness of breath. Once allergy develops, even low future exposures can cause symptoms.

MEDICAL

Medical Testing

For those with frequent or potentially high exposure (half the TLV or greater), the following are recommended before beginning work and at regular times after that:

* A complete exam of the nervous system.
* Complete blood count.
* Lung function tests. These may be normal if the person is not having an attack at the time of the test.
* Kidney function tests.

If symptoms develop or overexposure is suspected, the following may be useful:

* Consider chest x-ray after acute overexposure.
* Liver function tests.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are <u>not</u> a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

Mixed Exposures

Because smoking can cause heart disease, as well as lung cancer, emphysema, and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, ENGI-

NEERING CONTROLS are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace, and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Manganese** should change into clean clothing promptly.
* Do not take contaminated work clothes home. Family members could be exposed.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Manganese**.
* Wash any areas of the body that may have contacted **Manganese** at the end of each workday, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where **Manganese** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.
* Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Manganese**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

* Wear dust-proof goggles when working with powders or dust, unless full facepiece respiratory protection is worn.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in OSHA 1910.134.

* Where the potential exists for exposures over 1 mg/m^{3} *of fume* or over 5 mg/m^{3} *of dust*, use a MSHA/NIOSH approved respirator with a high efficiency particulate filter. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator. Particulate filters must be checked every day before work for physical damage, such as rips or tears, and replaced as needed.
* If while wearing a filter, cartridge or canister respirator, you can smell, taste, or otherwise detect **Manganese**, or in the case of a full facepiece respirator you experience eye irritation, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter, cartridge, or canister. If the seal is no longer good, you may need a new respirator.
* Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters,

cartridges, or canisters to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.

- Where the potential for high exposures exists, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in the positive pressure mode or with a full facepiece, hood, or helmet in the continuous flow mode.
- Exposure to 10,000 ppm is immediately dangerous to life and health. If the possibility of exposures above 10,000 ppm exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in continuous flow or other positive pressure mode.

QUESTIONS AND ANSWERS

If I have acute health effects, will I later get chronic health effects?

Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

What are my chances of getting sick when I have been exposed to chemicals?

The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?

Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Is the risk of getting sick higher for workers than for community residents?

A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

Q: Can men as well as women be affected by chemicals that cause reproductive system damage?

A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.

Q: Who is at the greatest risk from reproductive hazards?

A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

The New Jersey State Department of Health, Occupational Disease Prevention and Information Program offers multiple services in occupational health. These include: Right to Know Information Resources, Public Presentations, General References, Industrial Hygiene Information, Surveys and Investigations, and Medical Evaluation. Consult another Fact Sheet for a more detailed description of these services or call (609) 984-1863.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

CAG is the Carcinogens Assessment Group of the federal EPA.

A carcinogen is a substance that causes cancer.

The CAS number is assigned by the Chemical Abstracts Service to identify a specific chemical.

A combustible substance is a solid, liquid or gas that will burn.

A corrosive substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A fetus is an unborn human or animal.

A flammable substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The flash point is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A miscible substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A mutagen is a substance that causes mutations. A mutation is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A reactive substance is a solid, liquid or gas that can cause an explosion under certain conditions or on contact with other specific substances.

A teratogen is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The vapor pressure is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

EMERGENCY INFORMATION

Common Name: **MANGANESE**

DOT Number: None
NFPA Flammability: No Citation
NFPA Reactivity: No Citation

WARNING

DECOMPOSES IN WATER
DO NOT USE WATER
Health hazards on front page

FIRE HAZARDS

- Use dry chemicals appropriate for extinguishing metal fires. DO NOT USE WATER.
- If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If Manganese is spilled, take the following steps:

- Restrict persons not wearing protective equipment from area of spill or leak until clean-up is complete.
- Collect powdered material in the most convenient and safe manner and deposit in sealed containers.
- It may be necessary to contain and dispose of Manganese as a HAZARDOUS WASTE. Contact the NJ Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

FOR LARGE SPILLS AND FIRES immediately call your local fire department. You can also request emergency information from the following:

DEP HOTLINE: (609) 292-7172
CHEMTREC: (800) 424-9300

HANDLING AND STORAGE

- Prior to working with Manganese you should be trained on its proper handling and storage.
- Manganese must be stored to avoid contact with WATER and STEAM since flammable *Hydrogen gas* is produced.
- Store in tightly closed containers in a cool, well-ventilated area away from OXIDIZERS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES and NITRATES).
- Protect storage against physical damage.

FIRST AID

NJ POISON INFORMATION 1-800-962-1253

Eye Contact
- Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.

Skin Contact
- Remove contaminated clothing. Wash contaminated skin with water.

Breathing
- Remove the person from exposure.
- Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 1 mm Hg at 2,240°F
Water Solubility: Decomposes in water

New Jersey Department of Health
CN 368 Trenton, NJ 08625
(609) 984-2202

Date prepared: May 1986
Revision:

New Jersey Department of Health

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **TETRACHLOROETHYLENE**

CAS Number: 127-18-4
DOT Number: UN 1897

RTK Substance number: 1810
Date: February 1989 Revision: April 1996

HAZARD SUMMARY

- **Tetrachloroethylene** can affect you when breathed in and by passing through your skin.
- **Tetrachloroethylene** should be handled as a CARCINOGEN--WITH EXTREME CAUTION.
- It may damage the developing fetus.
- Contact can cause skin irritation, burns and drying and cracking of the skin.
- Exposure to **Tetrachloroethylene** can irritate the eyes, nose, mouth and throat.
- High exposure can cause headache, dizziness, lightheadedness, vomiting, nausea and even passing out.
- Breathing **Tetrachloroethylene** can irritate the lungs causing coughing and/or shortness of breath. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.
- **Tetrachloroethylene** may damage the liver and kidneys and affect the nervous system.

IDENTIFICATION

Tetrachloroethylene is a clear liquid with a sweet chloroform-like odor. It is used in dry cleaning and metal degreasing.

REASON FOR CITATION

- **Tetrachloroethylene** is on the Hazardous Substance List because it is regulated by OSHA and cited by NIOSH, HHAG, ACGIH, NIOSH, DOT, DEP, NTP, NFPA, IARC and EPA.
- This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN.**
- Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- Exposure to hazardous substances should be routinely evaluated. This may include collecting air samples. Under OSHA 1910.20, you have a legal right to obtain copies of sampling results from your employer. If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
- **ODOR THRESHOLD = 47 ppm.**
- The range of accepted odor threshold values is quite broad. Caution should be used in relying on odor alone as a warning of potentially hazardous exposures.

WORKPLACE EXPOSURE LIMITS

OSHA:	The legal airborne permissible exposure limit (PEL) is **100 ppm** averaged over an 8-hour workshift <u>and</u> **200 ppm** which should not be exceeded at any time.
NIOSH:	Recommends that occupational exposure to carcinogens be limited to the lowest feasible concentration.
ACGIH:	The recommended airborne exposure limit is **25 ppm** averaged over an 8-hour workshift <u>and</u> **100 ppm** as a STEL (short term exposure limit).

- **Tetrachloroethylene** may be a CARCINOGEN in humans. There may be <u>no</u> safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- The above exposure limits are for <u>air levels only</u>. When skin contact also occurs, you may be overexposed, even though air levels are less than the limit(s) listed above.

WAYS OF REDUCING EXPOSURE

- Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- Wear protective work clothing.
- Wash thoroughly <u>immediately</u> after exposure to **Tetrachloroethylene** and at the end of the workshift.
- Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Tetrachloroethylene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Tetrachloroethylene**:

- Contact can cause skin irritation and burns.
- Exposure to **Tetrachloroethylene** can irritate the eyes, nose, mouth and throat.
- Breathing **Tetrachloroethylene** can irritate the lungs, causing coughing and/or shortness of breath. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.
- High exposure can cause headache, dizziness, lightheadedness, nausea, vomiting and even passing out.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Tetrachloroethylene** and can last for months or years:

Cancer Hazard

- **Tetrachloroethylene** may be a CARCINOGEN in humans since it causes liver cancer in animals.
- Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

- **Tetrachloroethylene may damage the developing fetus.**

Other Long-Term Effects

- **Tetrachloroethylene** may damage the liver and kidneys and affect the nervous system.
- Long-term exposure can cause drying and cracking of the skin.

MEDICAL

Medical Testing

For those with frequent or potentially high exposure (half the TLV or greater, or significant skin contact), the following are recommended before beginning work and at regular times after that:

- Liver and kidney function tests.

If symptoms develop or overexposure is suspected, the following may be useful:

- Consider chest x-ray after acute overexposure.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

Mixed Exposures

- Because more than light alcohol consumption can cause liver damage, it can increase the liver damage caused by **Tetrachloroethylene**.
- Because smoking can cause heart disease, as well as lung cancer, emphysema, and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, ENGINEERING CONTROLS are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

- Where possible, automatically pump liquid **Tetrachloroethylene** from drums or other storage containers to process containers.
- Specific engineering controls are recommended for this chemical by NIOSH. Refer to the NIOSH criteria document: *Tetrachloroethylene #76-185.*

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- Workers whose clothing has been contaminated by **Tetrachloroethylene** should change into clean clothing promptly.
- Do not take contaminated work clothes home. Family members could be exposed.
- Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Tetrachloroethylene**.
- Eye wash fountains should be provided in the immediate work area for emergency use.
- If there is the possibility of skin exposure, emergency shower facilities should be provided.
- On skin contact with **Tetrachloroethylene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Tetrachloroethylene**, whether or not known skin contact has occurred.
- Do not eat, smoke, or drink where **Tetrachloroethylene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking or using the toilet.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- Avoid skin contact with **Tetrachloroethylene**. Wear solvent-resistant gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
- ACGIH recommends *Nitrile Rubber, Polyvinyl Alcohol* and *Viton* as protective materials.

Eye Protection

- Wear splash-proof chemical goggles and face shield when working with liquid, unless full facepiece respiratory protection is worn.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- Where the potential exists for exposures over **25 ppm**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- Exposure to **150 ppm** is immediately dangerous to life and health. If the possibility of exposure above **150 ppm** exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?

A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?

A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?

A: Conditions which increase risk of exposure include physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?

A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

Q: Don't all chemicals cause cancer?

A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?

A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?

A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone do not cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

Q: Aren't pregnant women at the greatest risk from reproductive hazards?

A: Not necessarily. Pregnant women are at greatest risk from chemicals which harm the developing fetus. However, chemicals may affect the <u>ability</u> to have children, so both men and women of childbearing age are at high risk.

The following information is available from:

New Jersey Department of Health
Occupational Health Service
Trenton, NJ 08625-0360
(609) 984-1863

<u>Industrial Hygiene Information</u>

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

<u>Medical Evaluation</u>

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call a Department of Health physician who can help you find the services you need.

<u>Public Presentations</u>

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

<u>Right to Know Information Resources</u>

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<<

Common Name: **TETRACHLOROETHYLENE**
DOT Number: UN 1897
DOT Emergency Guide code: 74
CAS Number: 127-18-4

Hazard rating	NJ DOH	NFPA
FLAMMABILITY	-	0
REACTIVITY	-	0
CARCINOGEN POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

- **Tetrachloroethylene** is a non-combustible liquid.
- Extinguish fire using an agent suitable for type of surrounding fire. **Tetrachloroethylene** itself does not burn.
- POISONOUS GASES ARE PRODUCED IN FIRE, including *Hydrogen Chloride* and *Phosgene*.
- If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Tetrachloroethylene** is spilled or leaked, take the following steps:

- Evacuate and isolate the area of the spill or leak, and restrict persons not wearing protective equipment from area of spill or leak until clean-up is complete.
- Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.
- Ventilate the area of spill or leak after clean-up is complete.
- It may be necessary to contain and dispose of **Tetrachloroethylene** as a HAZARDOUS WASTE. Contact your Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
- If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

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FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: (609) 292-7172

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HANDLING AND STORAGE

- Prior to working with **Tetrachloroethylene** you should be trained on its proper handling and storage.
- **Tetrachloroethylene** is not compatible with STRONG OXIDIZERS (such as CHLORINE, BROMINE and CHLORINE DIOXIDE); CHEMICALLY ACTIVE METALS (such as BARIUM, LITHIUM and BERYLLIUM); STRONG BASES (such as CAUSTIC SODA, SODIUM HYDROXIDE and POTASH); and NITRIC ACID.
- Store in tightly closed containers in a cool, well-ventilated area away from HEAT.

FIRST AID

NJ POISON INFORMATION 1-800-962-1253

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water. Seek medical attention.

Breathing

- Remove the person from exposure.
- Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.
- Medical observation is recommended for 24 to 48 hours after breathing overexposure, as pulmonary edema may be delayed.

PHYSICAL DATA

Vapor Pressure: 14 mm Hg at 68°F (20°C)
Water Solubility: Insoluble

OTHER COMMONLY USED NAMES

Chemical Name:
Ethene, Tetrachloro-
Other Names:
Perchloroethylene; PERC; Ethylene Tetrachloride

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NEW JERSEY DEPARTMENT OF HEALTH
Right to Know Program
CN 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **1,1,2,2-TETRACHLOROETHANE**
CAS Number: 79-34-5
DOT Number: UN 1702

RTK Substance number: 1809
Date: September 1986 Revision: July 1996

HAZARD SUMMARY

- **1,1,2,2-Tetrachloroethane** can affect you when breathed in and by passing through your skin.
- Because this is a MUTAGEN, handle it as a possible carcinogen--WITH EXTREME CAUTION.
- Contact can cause eye and skin irritation.
- Breathing **1,1,2,2-Tetrachloroethane** can irritate the nose, mouth and throat causing coughing and wheezing.
- **1,1,2,2-Tetrachloroethane** can cause headache, dizziness and drowsiness. Poor appetite, nausea and weakness may occur.
- Long-term exposure may damage the liver, kidneys and blood forming organs.
- Repeated exposure to **1,1,2,2-Tetrachloroethane** may damage the nervous system causing tremors, weakness, dizziness, incoordination and even unconsciousness and death.

IDENTIFICATION

1,1,2,2-Tetrachloroethane is a colorless or pale yellow liquid with a sickly sweet odor. It is used in making other chemicals, insecticides, paints, rust removers, varnishes and as a solvent.

REASON FOR CITATION

- **1,1,2,2-Tetrachloroethane** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, HHAG, NIOSH, DOT, DEP and EPA.
- This chemical is on the Special Health Hazard Substance List because it is a **MUTAGEN**.
- Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- Exposure to hazardous substances should be routinely evaluated. This may include collecting air samples. Under OSHA 1910.20, you have a legal right to obtain copies of sampling results from your employer.
- If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
- **ODOR THRESHOLD = Less than 3 ppm.**
- The range of accepted odor threshold values is quite broad. Caution should be used in relying on odor alone as a warning of potentially hazardous exposures.

WORKPLACE EXPOSURE LIMITS

OSHA:	The legal airborne permissible exposure limit (PEL) is **5 ppm** averaged over an 8-hour workshift.
NIOSH:	The recommended airborne exposure limit is **1 ppm** averaged over a 10-hour workshift.
ACGIH:	The recommended airborne exposure limit is **1 ppm** averaged over an 8-hour workshift.

- **1,1,2,2-Tetrachloroethane** is a MUTAGEN. Mutagens may have a cancer risk. All contact with this chemical should be reduced to the lowest possible level.
- The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

- Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- Wear protective work clothing.
- Wash thoroughly immediately after exposure to **1,1,2,2-Tetrachloroethane** and at the end of the workshift.
- Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **1,1,2,2-Tetrachloroethane** to potentially exposed workers.

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This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **1,1,2,2-Tetrachloroethane**:

- Contact can cause eye and skin irritation.
- Breathing **1,1,2,2-Tetrachloroethane** can irritate the nose, mouth and throat causing coughing and wheezing.
- **1,1,2,2-Tetrachloroethane** can cause headache, dizziness and drowsiness. Poor appetite, nausea and weakness may occur.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **1,1,2,2-Tetrachloroethane** and can last for months or years:

Cancer Hazard

- **1,1,2,2-Tetrachloroethane** causes MUTATIONS (genetic changes). Such chemicals may have a cancer risk.

Reproductive Hazard

- There is limited evidence that **1,1,2,2-Tetrachloroethane** is a teratogen in animals. Until further testing has been done, it should be treated as a possible teratogen in humans.

Other Long-Term Effects

- Long-term exposure may damage the liver, kidneys and blood forming organs.
- Repeated exposure to **1,1,2,2-Tetrachloroethane** may damage the nervous system causing tremors, weakness, dizziness, incoordination and even unconsciousness and death.

MEDICAL

Medical Testing

Before beginning employment and at regular times after that, the following are recommended:

- Exam of the nervous system.
- Liver and kidney function tests with a complete blood count.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

Mixed Exposures

Because more than light alcohol consumption can cause liver damage, drinking alcohol may increase the liver damage caused by **1,1,2,2-Tetrachloroethane**.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

- Where possible, automatically pump liquid **1,1,2,2-Tetrachloroethane** from drums or other storage containers to process containers.

- Specific engineering controls are recommended for this chemical by NIOSH. Refer to the NIOSH criteria document: *Occupational Exposure to* 1,1,2,2-Tetrachloroethane *#77-121*.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- Workers whose clothing has been contaminated by **1,1,2,2-Tetrachloroethane** should change into clean clothing promptly.
- Do not take contaminated work clothes home. Family members could be exposed.
- Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **1,1,2,2-Tetrachloroethane.**
- Eye wash fountains should be provided in the immediate work area for emergency use.
- If there is the possibility of skin exposure, emergency shower facilities should be provided.
- On skin contact with **1,1,2,2-Tetrachloroethane,** immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **1,1,2,2-Tetrachloroethane,** whether or not known skin contact has occurred.
- Do not eat, smoke, or drink where **1,1,2,2-Tetrachloroethane** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- Avoid skin contact with **1,1,2,2-Tetrachloroethane.** Wear solvent-resistant gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day and put on before work.
- Gloves made of *PVC* or *Neoprene* provide suitable protection.

Eye Protection

- Wear splash-proof chemical goggles and face shield when working with liquid, unless full facepiece respiratory protection is worn.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- Where the potential exists for exposures over **1 ppm**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- Exposure to **100 ppm** is immediately dangerous to life and health. If the possibility of exposure above **100 ppm** exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?
A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include <u>physical and mechanical processes</u> (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and <u>"confined space" exposures</u> (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?

A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

Q: What are the likely health problems from chemicals which cause mutations?

A: There are two primary health concerns associated with mutagens: (1) cancers can result from changed induced in cells and, (2) adverse reproductive and developmental outcomes can result from damage to the egg and sperm cells.

The following information is available from:

New Jersey Department of Health
Occupational Health Service
Trenton, NJ 08625-0360
(609) 984-1863

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call a Department of Health physician who can help you find the services you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

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A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

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NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<

Common Name: **1,1,2,2-TETRACHLOROETHANE**
DOT Number: UN 1702
DOT Emergency Guide code: 151
CAS Number: 79-34-5

Hazard rating	NJ DOH	NFPA
FLAMMABILITY	-	0
REACTIVITY	-	1
POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

- Extinguish fire using an agent suitable for type of surrounding fire. **1,1,2,2-Tetrachloroethane** itself does not burn.
- POISONOUS GASES ARE PRODUCED IN FIRE, including *Phosgene* and *Hydrogen Chloride*.
- If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **1,1,2,2-Tetrachloroethane** is spilled or leaked, take the following steps:

- Evacuate and isolate the area of the spill or leak, and restrict persons not wearing protective equipment from area of spill or leak until clean-up is complete.
- Ventilate the area of spill or leak.
- Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.
- It may be necessary to contain and dispose of **1,1,2,2-Tetrachloroethane** as a HAZARDOUS WASTE. Contact your Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
- If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

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FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: (609) 292-7172

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HANDLING AND STORAGE

- Prior to working with **1,1,2,2-Tetrachloroethane** you should be trained on its proper handling and storage.
- **1,1,2,2-Tetrachloroethane** must be stored to avoid contact with CHEMICALLY ACTIVE METALS (such as POTASSIUM, POWDERED ALUMINUM, SODIUM, MAGNESIUM and ZINC) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) since violent reactions occur.
- **1,1,2,2-Tetrachloroethane** is not compatible with strong oxidizing agents and strong bases.

FIRST AID

In NJ, POISON INFORMATION 1-800-962-1253

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention immediately.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash area with large amounts of water. Seek medical attention.

Breathing

- Remove the person from exposure.
- Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 5 mm Hg at 68°F (20°C)
Water Solubility: Slightly soluble

OTHER COMMONLY USED NAMES

Chemical Name:

Ethane, 1,1,2,2-Tetrachloro-

Other Names:

Acetylene Tetrachloride; Dichloro-2,2-dichloroethane; Tetrachloroethane

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NEW JERSEY DEPARTMENT OF HEALTH
Right to Know Program
CN 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **TRICHLOROETHYLENE**

CAS Number: 79-01-6
DOT Number: UN 1710

RTK Substance number: 1890
Date: March 1986 Revision: April 1994

HAZARD SUMMARY

- Trichloroethylene can affect you when breathed in.
- Trichloroethylene may cause mutations. Handle with extreme caution.
- Exposure can cause you to feel dizzy, lightheaded, and can cause an irregular heartbeat leading to sudden death.
- Repeated exposure can cause memory loss, headache, and depression.
- Trichloroethylene can damage the liver, and kidneys.
- Contact with the liquid can irritate the skin. Both the liquid and vapor can irritate and damage the eyes.

IDENTIFICATION

Trichloroethylene is a colorless liquid with a sweet odor. It is used as a solvent for degreasing and dry cleaning, and in printing inks, paints, lacquers, varnishes, and adhesives.

REASON FOR CITATION

- Trichloroethylene is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DEPE, HHAG, NIOSH, DOT, NFPA and EPA.
- Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

- Exposure to hazardous substances should be routinely evaluated. This may include collecting air samples. Under OSHA 1910.20, you have a legal right to obtain copies of sampling results from your employer. If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
- ODOR THRESHOLD = 28 ppm.
- The odor threshold only serves as a warning of exposure. Not smelling it does not mean you are not being exposed.

WORKPLACE EXPOSURE LIMITS

OSHA:	The legal airborne permissible exposure limit (PEL) is 100 ppm averaged over an 8-hour workshift and 200 ppm not to be exceeded during any 15 minute work period.
NIOSH:	The recommended airborne exposure limit is 25 ppm averaged over a 10-hour workshift.
ACGIH:	The recommended airborne exposure limit is 50 ppm averaged over an 8-hour workshift and 100 ppm as a STEL (short term exposure limit).

- Trichloroethylene may cause mutations. All contact with this chemical should be reduced to the lowest possible level.

WAYS OF REDUCING EXPOSURE

- Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- Wear protective work clothing.
- Wash thoroughly immediately after exposure to Trichloroethylene and at the end of the workshift.
- Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of Trichloroethylene to potentially exposed workers.

Printed on Recycled Paper

This Fact Sheet is a summary source of information of <u>all potential</u> and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to Trichloroethylene:

* Trichloroethylene can irritate the skin.
* Both the liquid and vapor can irritate and damage the eyes.
* Exposure can cause lightheadedness, dizziness, visual disturbances, an excited feeling, nausea and vomiting. Very high levels can cause irregular heartbeat, unconsciousness, and death.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to Trichloroethylene and can last for months or years:

Cancer Hazard

* There is limited evidence that Trichloroethylene causes cancer in animals. It may cause lung and liver cancer.
* Trichloroethylene may cause mutations (genetic changes).
* Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

* According to the information presently available to the New Jersey Department of Health, Trichloroethylene has been tested and has not been shown to affect reproduction.

Other Long-Term Effects

* Trichloroethylene may cause a skin allergy. If an allergy develops, very low future exposures can cause itching and a skin rash.
* It can damage the liver and kidneys.
* Repeated exposure can cause memory loss, headache, intolerance of alcohol, depression, and weakness in the arms and legs.
* Repeated contact can cause irritation, blistering, roughening, and cracking of the exposed skin.

MEDICAL

Medical Testing

For those with frequent or potentially high exposure (half the TLV or greater, or significant skin contact), the following are recommended before beginning work and at regular times after that:

* Liver and kidney function tests.

If symptoms develop or overexposure is suspected, the following may be useful:

* Exam of the nervous system. Consider nerve conduction tests.
* Urinary *Trichloracetic Acid* level (for repeated exposures) or blood Trichlorethylene levels (for acute exposure).
* Evaluation by a qualified allergist, including careful exposure history and special testing, may help diagnose skin allergy.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are <u>not</u> a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

Mixed Exposures

* Because more than light alcohol consumption can cause liver damage, drinking alcohol can increase the liver damage caused by Trichloroethylene.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

* Where possible, automatically pump liquid Trichloroethylene from drums or other storage containers to process containers.
* Specific engineering controls are recommended for this chemical by NIOSH. Refer to the NIOSH criteria document: *Occupational Exposure to Trichloroethylene #73-11025*.

Good WORK PRACTICES can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by Trichloroethylene should change into clean clothing promptly.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to Trichloroethylene.
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with Trichloroethylene, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted Trichloroethylene, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where Trichloroethylene is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.
* Do not smoke in the work area. Even a little vapor inhaled through a burning cigarette, cigar, or pipe will be converted into more highly toxic substances.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with Trichloroethylene. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
* ACGIH and safety equipment manufacturers recommend VITON and *Polyvinyl Alcohol* as protective materials.

Eye Protection

* Wear splash-proof chemical goggles and face shield when working with liquid, and air-tight goggles and face shield when exposed to the vapor.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* Where the potential exists for exposures over 25 ppm, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in the positive pressure mode or with a full facepiece, hood, or helmet in the continuous flow mode, or use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
* Exposure to 1,000 ppm is immediately dangerous to life and health. If the possibility of exposure above 1,000 ppm exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in continuous flow or other positive pressure mode.

ANDLING AND STORAGE

- Prior to working with **Trichloroethylene** you should be trained on its proper handling and storage.
- **Trichloroethylene** must be handled and stored away from operations which generate HIGH TEMPERATURES such as ARC WELDING or CUTTING, UNSHIELDED RESISTANCE HEATING, OPEN FLAMES, and HIGH INTENSITY LIGHT, as poisonous gases are produced.
- **Trichloroethylene** can react violently with ALKALI METALS (LITHIUM SODIUM), with ALKALINE EARTH METALS (BARIUM and MAGNESIUM), and with ALUMINUM, producing toxic *HYDROGEN CHLORIDE*, *CHLORINE* and *PHOSGENE* gases.
- **Trichloroethylene** is not compatible with OXIDIZERS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES and NITRATES) and STRONG OXIDIZERS (such as CHLORINE, BROMINE and FLUORINE).
- **Trichloroethylene** in contact with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) results in the evolution of spontaneously flammable and explosive *Dichloroacetylene*.
- Store in tightly closed containers in a cool, well-ventilated area away from SUNLIGHT.

UESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?
A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include <u>physical and mechanical processes</u> (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and <u>"confined space" exposures</u> (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?
A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods.

Q: Don't all chemicals cause cancer?
A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?
A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?
A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent.

Q: Who is at the greatest risk from reproductive hazards?
A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the <u>ability</u> to have children, so both men and women of childbearing age are at high risk.

The New Jersey State Department of Health, Occupational Health Service offers multiple services in occupational health. These include: Right to Know Information Resources, Public Presentations, General References, Industrial Hygiene Information, Surveys and Investigations, and Medical Evaluation. Consult another Fact Sheet for a more detailed description of these services or call (609) 984-1863.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEPE is the New Jersey Department of Environmental Protection and Energy.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A mutation is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<<

Common Name: TRICHLOROETHYLENE
DOT Number: UN 1710
DOT Emergency Guide code: 74
CAS Number: 79-01-6

Hazard rating	NJ DOH	NFPA
FLAMMABILITY	-	1
REACTIVITY	-	0
POISONOUS GASES ARE PRODUCED IN FIRE CONTAINERS MAY EXPLODE IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* Extinguish fire using an agent suitable for type of surrounding fire. Trichloroethylene itself does not burn.
* POISONOUS GASES ARE PRODUCED IN FIRE, including *Phosgene* and *Hydrogen Chloride*.
* CONTAINERS MAY EXPLODE IN FIRE.
* Water can be used to keep fire-exposed containers cool.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If Trichloroethylene is spilled or leaked, take the following steps:

* Restrict persons not wearing protective equipment from area of spill or leak until clean-up is complete.
* Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.
* Ventilate the area of spill or leak after clean-up is complete.
* It may be necessary to contain and dispose of **Trichloroethylene** as a HAZARDOUS WASTE. Contact your Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEPE HOTLINE: (609) 292-7172

HANDLING AND STORAGE (See page 4)

FIRST AID

In NJ, POISON INFORMATION 1-800-962-1253

Eye Contact

* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention immediately.

Skin Contact

* Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water. Seek medical attention immediately.

Breathing

* Remove the person from exposure.
* Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
* Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 58 mm Hg at 68°F (20°C)
Water Solubility: Slightly soluble

OTHER COMMONLY USED NAMES

Chemical Name:
Trichloroethene
Other Names:
1,2,2-Trichloroethylene; Tri-clene; Tri; TCE

Not intended to be copied and sold for commercial purposes.

NEW JERSEY DEPARTMENT OF HEALTH
Right to Know Program
CN 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **VINYL CHLORIDE**

CAS Number: 75-01-4
DOT Number: UN 1086

RTK Substance number: 2001
Date: September 1986 Revision: December 1994

HAZARD SUMMARY

- **Vinyl Chloride** can affect you when breathed in.
- **Vinyl Chloride** is a CARCINOGEN--HANDLE WITH EXTREME CAUTION. It may also cause damage to the developing fetus.
- **Vinyl Chloride** can severely irritate and burn the eyes and can reduce vision.
- Exposure to **Vinyl Chloride** can irritate and burn the skin. Contact with the liquid or gas can cause frostbite.
- **Vinyl Chloride** can cause headache, dizziness, fatigue, weakness, sleeping disturbances and loss of memory. Higher levels can cause you to feel lightheaded and to pass out.
- Long-term exposure can damage the liver, nervous system, lungs, skin and blood vessels in the hands.
- **Vinyl Chloride** is a HIGHLY FLAMMABLE and REACTIVE chemical and is a DANGEROUS FIRE and EXPLOSION HAZARD.

IDENTIFICATION

Vinyl Chloride is a colorless gas which is usually shipped as a liquid. It has a faintly sweet odor and is used to make plastics, adhesives and other chemicals.

REASON FOR CITATION

- **Vinyl Chloride** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, IARC, DEP, NFPA, NTP and EPA.
- This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN** and **MUTAGEN**, and is **FLAMMABLE**.
- Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

- Exposure to hazardous substances should be routinely evaluated. This may include collecting air samples. Under OSHA 1910.20, you have a legal right to obtain copies of sampling results from your employer. If you think you are experiencing any workrelated health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
- **ODOR THRESHOLD = 10 to 20 ppm.**
- The range of accepted odor threshold values is quite broad. Caution should be used in relying on odor alone as a warning of potentially hazardous exposures.

WORKPLACE EXPOSURE LIMITS

OSHA:	The legal airborne permissible exposure limit (PEL) is **1 ppm** averaged over an 8-hour workshift and **5 ppm** not to be exceeded during any 15 minute work period.
NIOSH:	Recommends the lowest reliably detectable level.
ACGIH:	The recommended airborne exposure limit is **5 ppm** averaged over an 8-hour workshift.

- **Vinyl Chloride** is a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.

WAYS OF REDUCING EXPOSURE

- Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- A regulated, marked area should be established where **Vinyl Chloride** is handled, used, or stored as required by the OSHA Standard 1910.1017.
- Wash thoroughly immediately after exposure to **Vinyl Chloride** and at the end of the workshift.
- Wear protective work clothing.
- Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Vinyl Chloride** to potentially exposed workers.

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This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Vinyl Chloride**:

- **Vinyl Chloride** can severely irritate and burn the eyes and can reduce vision.
- Exposure to **Vinyl Chloride** can irritate and burn the skin. Contact with the liquid or gas can cause frostbite.
- **Vinyl Chloride** can cause headache, dizziness, fatigue, weakness, sleeping disturbances and loss of memory. Higher levels can cause you to feel lightheaded and to pass out.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Vinyl Chloride** and can last for months or years:

Cancer Hazard

- **Vinyl Chloride** is a CARCINOGEN in humans. It has been shown to cause liver, brain and lung cancer.
- Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

- **Vinyl Chloride** may damage the developing fetus. There is limited evidence that **Vinyl Chloride** is a teratogen in animals.
- An excess of spontaneous abortions has been reported among spouses of workers who had been exposed to **Vinyl Chloride**.
- Increased rates of birth defects have been reported in areas where **Vinyl Chloride** processing plants are located. **Vinyl Chloride's** role in this increased risk is unknown at this time.

Other Long-Term Effects

- Repeated exposure can cause a disease called "scleroderma". This causes the skin to become very smooth, tight and shiny. It causes the bones of the fingers to erode ("acro-osteolysis"), and damages the blood vessels in the hands ("Raynauds syndrome"). This causes the hands (or feet) to turn numb, pale or blue with even mild cold exposure.
- **Vinyl Chloride** can damage the liver, nervous system and lungs.

MEDICAL

Medical Testing

For those with frequent or potentially high exposure (half the TLV or greater, or significant skin contact), the following are recommended before beginning work and at regular times after that:

- Complete liver function tests.
- Exam of the eyes and vision.
- Exam of the skin and nervous system.
- Chest x-ray and lung function tests.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

- Where possible, automatically pump liquid **Vinyl Chloride** from drums or other storage containers to process containers.
- Specific engineering controls are required for this chemical by OSHA. Refer to the OSHA Standard: *1910.1017 Vinyl Chloride.*
- Specific engineering controls are recommended for this chemical by NIOSH. Refer to the NIOSH Current Intelligence Bulletins: *Vinyl Halides Carcinogenicity # 79-102* and *Reprints #79-146.*

- Before entering a confined space where **Vinyl Chloride** may be present, check to make sure that an explosive concentration does not exist.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- Workers whose clothing has been contaminated by **Vinyl Chloride** should change into clean clothing promptly.
- Do not take contaminated work clothes home. Family members could be exposed.
- Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Vinyl Chloride**.
- Eye wash fountains should be provided in the immediate work area for emergency use.
- If there is the possibility of skin exposure, emergency shower facilities should be provided.
- On skin contact with **Vinyl Chloride**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Vinyl Chloride**, whether or not known skin contact has occurred.
- Do not eat, smoke, or drink where **Vinyl Chloride** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- Avoid skin contact with **Vinyl Chloride**. Wear protective gloves and clothing. Safety equipment suppliers/ manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day and put on before work.
- Safety equipment manufacturers recommend *North Silvershield* gloves.
- Where exposure to cold equipment, vapors, or liquid may occur, employees should be provided with special clothing designed to prevent the freezing of body tissues.

Eye Protection

- Wear splash-proof chemical goggles and face shield when working with liquid, unless full facepiece respiratory protection is worn.
- Wear gas-proof goggles and face shield, unless full facepiece respiratory protection is worn.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- Where the potential exists for exposures over **1 ppm**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in the positive pressure mode or with a full facepiece, hood, or helmet in the continuous flow mode, or use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.

HANDLING AND STORAGE

- Prior to working with **Vinyl Chloride** you should be trained on its proper handling and storage.
- A regulated, marked area should be established where **Vinyl Chloride** is handled, used, or stored.
- **Vinyl Chloride** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE), COPPER, ALUMINUM, IRON and STEEL.
- Store in tightly closed containers in a cool, well-ventilated area away from HEAT, AIR and SUNLIGHT as hazardous polymerization may occur.
- Sources of ignition, such as smoking and open flames, are prohibited where **Vinyl Chloride** is handled, used, or stored.
- Metal containers involving the transfer of 5 gallons or more of **Vinyl Chloride** should be grounded and bonded. Drums must be equipped with self-closing valves, pressure vacuum bungs, and flame arresters.
- Use only non-sparking tools and equipment, especially when opening and closing containers of **Vinyl Chloride**.
- Wherever **Vinyl Chloride** is used, handled, manufactured, or stored, use explosion-proof electrical equipment and fittings.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?
A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?
A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

Q: Don't all chemicals cause cancer?
A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Can men as well as women be affected by chemicals that cause reproductive system damage?
A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.

Q: Who is at the greatest risk from reproductive hazards?
A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

Q: Should I be concerned if a chemical is a teratogen in animals?
A: Yes. Although some chemicals may affect humans differently than they affect animals, damage to animals suggests that similar damage can occur in humans.

The following information is available from:

New Jersey Department of Health
Occupational Health Service
Trenton, NJ 08625-0360
(609) 984-1863

Industrial Hygiene Information
Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation
If you think you are becoming sick because of exposure to chemicals at your workplace, you may call a Department of Health physician who can help you find the services you need.

Public Presentations
Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources
The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

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DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

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A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<

Common Name: **VINYL CHLORIDE**
DOT Number: **UN 1086**
DOT Emergency Guide code: **17**
CAS Number: **75-01-4**

Hazard rating	NJ DOH	NFPA
FLAMMABILITY	-	4
REACTIVITY	-	2

CARCINOGEN
FLAMMABLE
REACTIVE
POISONOUS GASES ARE PRODUCED IN FIRE
CONTAINERS MAY EXPLODE IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

- **Vinyl Chloride** is a FLAMMABLE GAS.
- Use dry chemical, CO_2, water spray, or foam extinguishers.
- POISONOUS GASES ARE PRODUCED IN FIRE, including *Phosgene, Hydrogen Chloride,* and *Carbon Monoxide.*
- CONTAINERS MAY EXPLODE IN FIRE.
- FIRE MAY RESTART AFTER IT HAS BEEN EXTINGUISHED.
- Vapors may travel to a source of ignition and flash back.
- Use water spray to keep fire-exposed containers cool.
- If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Vinyl Chloride** is leaked, take the following steps:

- Restrict persons not wearing protective equipment from area of leak until clean-up is complete.
- Remove all ignition sources.
- Ventilate area of leak to disperse the gas.
- Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.
- Keep **Vinyl Chloride** out of a confined space, such as a sewer, because of the possibility of an explosion, unless the sewer is designed to prevent the build-up of explosive concentrations.

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FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: (609) 292-7172

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HANDLING AND STORAGE (See page 3)

FIRST AID

In NJ, POISON INFORMATION 1-800-962-1253

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention immediately.

Skin Contact

- Immerse affected part in warm water. Seek medical attention.

Breathing

- Remove the person from exposure.
- Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 2524 mm Hg at 68°F (20°C)
Flash Point: -108°F (-78°C)
Water Solubility: Very slightly soluble

OTHER COMMONLY USED NAMES

Chemical Name:
Ethene, Chloro-
Other Names:
Chloroethylene; VC; VCM; Vinyl Chloride Monomer; Chlorethene; Chlorethylene

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NEW JERSEY DEPARTMENT OF HEALTH
Right to Know Program
CN 368, Trenton, NJ 08625-0368
(609) 984-2202