Chemical Fact Sheets

Manganese, Mn
CAS No. 7439-96-5

WHAT IS MANGANESE?

Manganese is a gray-pink metal.

USES

Manganese is used in the manufacture of ceramics, matches, glass, dyes and welding rods. It is a component of steel, steel alloys, cast iron, superalloys & nonferrous alloys, as well as a chemical intermediate for high purity salts. Manganese is used as a purifying & scavenging agent in metal production.

SOURCES

Manganese is a naturally occurring substance found in many types of rock; it is ubiquitous in the environment and found in low levels in water air, soil, and food. It is commonly found in the environment as a result of its use in the manufacture of the above-noted materials.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to manganese might include:
- Inhaling it in ambient air, particularly near industries involved in the manufacture of manganese-containing materials. Occupational exposure via inhalation is most common.

Ambient air concentrations of manganese were not reported in 1997 or 1998 in Alberta.

ENVIRONMENTAL FATE AND BEHAVIOUR

- Manganese, as an aerosol, may dissolve upon contact with water on a time scale of a few minutes.

TOXICITY

- Manganese is an element considered essential to human health.
- Inhalation of manganese compounds in aerosols or fine dusts may cause "metal fume fever”.

- Early symptoms of chronic manganese poisoning may include languor, sleepiness and weakness in the legs. Emotional disturbances such as uncontrollable laughter and a spastic gait with tendency to fall in walking are common in more advanced cases.
- Chronic manganese poisoning is not a fatal disease.
- Chronic manganese poisoning following chronic exposure to manganese through inhalation for periods of from 6 months to 2 years results in "manganism", a disease of the central nervous system involving neurological disorders. It is reversible if recognized early and exposure is eliminated.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Objectives and Guidelines

Jurisdiction	**Guidelines (μg/m^3)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta		2			0.2
Texas		2			0.2
Ontario	7.5			2.5	

Adapted from:
ChemBank HSDB, IRIS, RTECS toxicity profiles.

Chemical Fact Sheets

Mecoprop (2-(2-Methyl-4-chlorophenoxy) propionic acid)
CAS No. 93-65-2
$C_{10}H_{11}ClO_3$

WHAT IS MECOPROP?

Mecoprop (MCPP) is a colorless, odorless crystal.

USES

Mecoprop is a selective herbicide for post-emergence control of broad-leaved weeds in wheat, barley, oats, herbage seed crops and turf.

SOURCES

There are no natural sources of mecoprop to the environment. Mecoprop will be released to the environment as a result of its use as a selective post-emergence herbicide for control of broad leaf weeds on cereals, grass-seed crops, apples, pears and turf. It may also be released as a result of its manufacture, formulation, transport, storage, and disposal.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to mecoprop might include:
- Occupational exposure via dermal contact with the herbicide and treated surfaces.
- Inhalation and ingestion of spray droplets.
- Ingestion of contaminated drinking water or dermal contact with contaminated surface water.

Ambient air concentrations of mecoprop were not reported in 1997 or 1998 in Alberta.

ENVIRONMENTAL FATE AND BEHAVIOUR

- Mecoprop readily biodegrades in soil; reported half-lives generally range from 3 to 21 days.
- Mecroprop is a weak acid and will exist in the anionic form in water. If released into water, it is not expected to adsorb to sediment or particulate matter in the water column, or be lost through volatilization.
- It biodegrades in soil and groundwater and would therefore be expected to biodegrade in surface water. Its estimated bio-concentration potential is moderate.
- Mecoprop will be released to the atmosphere as an aerosol during spraying applications and will be removed from the air by gravitational settling. Any mecoprop in the vapor

phase will react with photochemically-produced hydroxyl radicals, with a half-life of 22 hours.

TOXICITY

- Mecoprop may be fatal if inhaled, ingested or absorbed through skin. Inhalation or dermal contact may irritate or burn skin and eyes.
- Fire will produce irritating, corrosive and/or toxic gases.
- Vapors may cause dizziness or suffocation.

Adapted from:
ChemBank HSDB, IRIS, RTECS toxicity profiles.

Chemical Fact Sheets

Mercaptan, C_2H_6S
CAS No. 75-08-1

WHAT IS MERCAPTAN?

Mercaptan (or ethyl mercaptan) is a colorless liquid at low ambient temperature and a gas above 95 degrees. It has a strong, pungent odor.

USES

There is no commercial production or known use for mercaptan.

SOURCES

Mercaptan occurs naturally in some vegetables (such as cabbage), mammalian excretion products, manure gas from domestic animal pens, in various crude oils and in natural gas. It is formed naturally by biological processes. Anthropogenic sources of environmental release include emissions from petroleum manufacture, waste treatment and pulp mills.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to mercaptan might include:
- Occupational exposure through dermal contact (both vapor and liquid) and inhalation of vapor.
- The general population is exposed through inhalation and ingestion.

Ambient air concentrations of mercaptan were not recorded in 1997 or 1998 in Alberta.

ENVIRONMENTAL FATE AND BEHAVIOUR

- If released to the atmosphere, mercaptan will exist primarily in the vapor phase where it will degrade readily by reaction with photochemically-produced hydroxyl radicals (estimated half-life of 8 hours) and night-time nitrate radicals (estimated half-life of 1 hr).
- If released to surface water, volatilization may be important.
- If released to soil, mercaptan may be transported by leaching, gas penetration, and surface evaporation.
- Insufficient data are available to assess the relative importance of biodegradation in soil or water.

TOXICITY

- Mercaptan may be a Central Nervous System (CNS) depressant in high concentrations and can be irritating to mucous membranes. It is toxic by ingestion and inhalation.
- Inhalation or contact with material may irritate or burn skin and eyes. Vapors may cause dizziness or suffocation.
- Fire will produce irritating, corrosive and/or toxic gases.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Objectives and Guidelines

Jurisdiction	**Guidelines (μg/m^3)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta					
Texas		0.8			0.08
Ontario					

Adapted from:
ChemBank HSDB, IRIS, RTECS toxicity profiles.

Chemical Fact Sheets

Mercury, Hg
CAS No. 7439-97-6

WHAT IS MERCURY?

Mercury is a metal that has several forms. The metallic mercury is a shiny, silver-white, odorless liquid. If heated, it is a colorless, odorless gas.

USES

Metallic mercury is used to produce chlorine gas and caustic soda and also used in thermometers, dental fillings, and batteries. Mercury salts are used in skin-lightening creams and as antiseptic creams and ointments.

SOURCES

Mercury is a naturally occurring metal that combines with other elements, such as chlorine, sulfur, or oxygen, to form inorganic mercury compounds or "salts," which are usually white powders or crystals. Mercury also combines with carbon to make organic mercury compounds. The most common one, methylmercury, is produced mainly by small organisms in the water and soil. More mercury in the environment can increase the levels of methylmercury that these small organisms produce.

Inorganic mercury (metallic mercury and inorganic mercury compounds) enters the air from mining ore deposits, burning coal and waste, and from manufacturing plants. It enters the water or soil from natural deposits, volcanic activity and disposal of wastes.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to Mercury might include:

- Eating fish or shellfish contaminated with methylmercury.
- Inhalation of vapors from spills, incinerators, and industries that burn mercury-containing fuels.
- Release of mercury from dental work and medical treatments.
- Breathing contaminated workplace air or skin contact during use in the workplace (dental, health services, chemical, and other industries that use mercury).

Ambient air concentrations of mercury were not reported in 1997 or 1998 in Alberta.

ENVIRONMENTAL FATE AND BEHAVIOUR

- Methylmercury may be formed in water and soil by bacteria.
- Methylmercury builds up in the tissues of fish. Larger and older fish tend to have the highest levels of mercury.

TOXICITY

- The nervous system is very sensitive to all forms of mercury. Methylmercury and metal vapors are the most harmful forms, because more mercury reaches the brain.
- Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems.
- Acute exposure to metallic mercury vapors may cause lung damage, nausea, vomiting, diarrhea, increased blood pressure or heart rate, skin rashes, and eye irritation.
- Very young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and can pass to a nursing infant through breast milk.
- Effects of mercury on the developing fetus may include brain damage, mental retardation, in-coordination, blindness, seizures, and an inability to speak. Children poisoned by mercury may develop problems of their nervous and digestive systems and kidney damage.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Objectives and Guidelines

Jurisdiction	**Guidelines (μg/m^3)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta					
Texas (and compounds)		1			0.1
Texas (alkyls)		0.1			0.01
Ontario	5			2	
Ontario (alkyls)	1.5			0.5	

Mercury ToxFAQs. Agency for Toxic Substances and Disease Registry.
http://www.atsdr.cdc.gov/toxfaq.html.

MERCURY

The attendees of the 2004 Priority Setting Workshop identified mercury (Hg) as a potential substance of concern. They have requested background information to determine whether an Ambient Air Quality Objective for mercury should be a priority.

WHAT IS MERCURY?

Mercury is a shiny, silver-white metal that exists as a liquid at room temperature. It is found naturally as the metallic form, as well as in organic and inorganic compounds. At room temperature, mercury liquid may form vapors. The most common forms of mercury are elemental, mercuric sulfide, mercuric chloride and methyl mercury.

Table 1 Properties of mercury

Property	Elemental Mercury
Chemical Formula	Hg
CAS Registry number	7439-97-6
RTECS number	OV4550000
UN number	UN 2809
Common Synonyms and Trade names	Azogue (folk medicine), Hydrargyrum, Liquid silver, Marcero, Quicksilver, Rathje
Molecular Weight (g mol^{-1})	200.59
Oxidation state	0, +1, +2
Physical state (at room temperature)	Liquid
Melting Point (°C)	-38.9
Boiling Point (°C)	357.3
Specific gravity (water=1)	13.5
Vapor pressure	0.002
Solubility in water	0.002 g/100ml at 20°C
Solubility in other solvents	Affinity for gold, silver and tin (makes alloys)

USES

In its many forms, mercury is used in fluorescent lights, dental amalgam, traditional ceremonies, fungicides, skin-lightening creams, and as a disinfectant. Mercuric sulfide (cinnabar) has a brilliant red color, and is used as a pigment in paints and tattoo dyes.

SOURCES

Mercury can be found in small concentrations in many rocks and is the main component of the mineral cinnabar. Natural background levels can be detected in soils, air, and water around the world. Mercury releases in Canada can typically be attributed to waste incineration, coal combustion, base metal smelting, and the chlor-alkali industry.

Another source of mercury in the environment is consumer products. When these products are disposed of in landfill sites, they break down in both active and closed landfills, which may represent a significant pathway for the transport and eventual deposition in various terrestrial and aquatic ecosystems. For example, if the total amount of mercury contained in a typical fluorescent tube (approximately 20 milligrams) were to mix completely and evenly in a body of water it would contaminate around 20,000 litres of water which is beyond Health Canada limits for safe drinking water (0.001 milligrams of mercury per litre of water).

MERCURY EMISSIONS AND AMBIENT LEVELS

Environment Canada and other federal Departments have developed many diverse policy and program initiatives to manage mercury emissions. Canada is a signatory to several international and continental agreements that contain commitments to reduce anthropogenic emissions of mercury. Canada's domestic emissions of mercury were reduced by around 90% between 1970 and 2003. The Canadian Council of Ministers of the Environment (CCME) has set Canada-wide Standards for mercury emissions from base-metal smelters, waste incinerators, coal-fired power plants, mercury-containing lamps and dental amalgam waste.

In 2007, 982 kg of mercury were released to the air in Alberta and 5,199 kg were released to the air in Canada.

ENVIRONMENTAL EFFECTS

Most of the research done on plants and mercury is to study plant up-take pathways, and relationships between plants and soil mercury levels.

Table 2 Mercury effects on vegetation

Effects Reported	Exposure Period	Air Concentration (ng m^{-3})	Species
No observed relationship between air concentrations and plant growth	Chronic exposure in air and soil	7.6 ± 1.7 to 35.9 ± 4.7	*Rosmarinus officinalis* L.
Mercury uptake was only significant at concentrations from 10 to 600 ng m^{-3}	Chronic exposure in air and soil	Up to 600	*Pinus spp.*
No damage from air concentrations lower than 0.1 ppm. Mercury emissions did not have observable impacts on vegetation	Chronic exposure near a geothermal power plant	0.035 ppm	Assorted tree species

MERCURY EXPOSURE AND HEALTH EFFECTS

Metallic or elemental mercury has two main exposure pathways, inhalation and oral. Air exposure can occur from particles emitted to the air from industrial processes, off-gassing from liquid mercury, such as from a broken thermometer, and natural sources such as volcanoes. Dental amalgam and consumption of fish are the two primary exposure pathways for most people.

Health Canada has advised that based on available science, normal ambient air concentrations of mercury vapour, averaging 1.6 nanograms per cubic meter of air, do not appear to be a cause for concern (1 nanogram = one billionth of a gram). The studies shown in the table are all for exposures occurring in the workplace.

When a person is exposed to mercury, about 80% of elemental mercury is absorbed when inhaled, however less than 1% of ingested liquid mercury is absorbed. Absorption depends on the route of exposure and the form of the mercury or type of inorganic salt. Inorganic mercury compounds do not readily migrate through the blood-brain or placental barriers, but do accumulate in the kidneys. Exposure to elemental mercury can result in effects on the nervous system, including tremor, memory loss and headaches. Other symptoms include bronchitis, weight loss, fatigue, gastro-intestinal problems, gingivitis, excitability, thyroid enlargement, unstable pulse, and toxicity to the kidneys.

IRIS (2007) states "epidemiologic studies failed to show a correlation between exposure to elemental mercury vapor and carcinogenicity". Likewise, the ATSDR does not classify mercury as a human carcinogen.

Table 3 Mercury health effects on humans via inhalation exposure in the work place

Effects Reported	Exposure Period	Air Concentration ($\mu g\ m^{-3}$)	Study Size
Tremors increase related to exposure, not chronological age	15.3 years	26 LAOEL[1] is 9	26 male workers
Slower and attenuated brain activity in 15% of exposed workers	15.6 ± 8.9 years	25	41 workers
Memory disturbance, sleep disorders, increased anger, fatigue, and confusion but did not detect disturbances in perceptual motor, memory or learning abilities	13.7 ± 5.5 years	25	60 workers
Increased reporting of palpitations in exposed workers; decrease in pulse rate variations	15.6 ± 8.9 years	30	41 workers
Motor speed performance decreased (finger tapping), visual scanning, visual memory, visuomotor coordination speed, and visuomotor coordination and concentration.	8-hr TWA for 5.5 years	23 LOAEL of 12	98 dentists
Exposure decreased performance for finger tapping, mental arithmetic, two-digit searches, switching attention, and visual reaction time	15.8 years	33 LOAEL of 12	98 workers

NOAEL[2] for kidney effects	13.7 ± 5.5 years	25	60 workers
Short term chest pains, shortness of breath, cough, coughing up blood, impaired pulmonary function, diffuse pulmonary infiltrates and evidence of interstitial pneumonitis with chronic neurological dysfunction	4-8 hr	1,100 to 44,000	6 workers

[1] Lowest observed adverse effect level (LOAEL)
[2] No observed adverse effect level (NOAEL)

OTHER JURISDICTIONS

In March 2006, Alberta passed the Mercury Emissions from Coal-Fired Power Plants Regulation. This regulation requires that companies submit a plan to capture 70% of the mercury in the coal, which is approximately 50% reduction from current emissions on or before April 1, 2007. By the end of 2012, plants must submit a management plan to capture 80% of the mercury in coal. These are aggressive targets that are in line with recommendations by the CCME and the Canada Wide Standards for managing mercury emissions.

Based on information from across Canada and the United States, an emissions cap similar to what has been implemented in Alberta is the most effective way of managing and reducing ambient mercury levels. Health Canada has set no limits for ambient exposure to mercury. The CCME has set standards for mercury for smelters, incinerators, coal-fired power, lamps and dental amalgam.

California, Ontario, Manitoba, New Brunswick and Saskatchewan do not include mercury on their lists for ambient air objectives. All other states appear to be defaulting to the National Ambient Air Quality Standards, which does not include mercury. The following tables outline objectives and reduction goals in other jurisdictions.

Table 4 Mercury objectives and goals for other jurisdictions

		Objective / Guideline	
Agency	**Description**	**24 Hour**	**Annual**
Alberta	Provincial average by 2010		590 kg
Minnesota	Maximum		5 lbs
US EPA	Coal-fired power plants maximum		34 tons
Massachusetts	Threshold Effects Exposure Limits	0.14 µg m^{-3}	0.07 µg m^{-3}
ATSDR	Chronic Minimal Risk Level	0.0002 mg m^{-3}	
	Emissions from Mercury Ore Processing Facilities	5 lbs	

Table 5 Mercury reduction goals in other jurisdictions

Agency	Reduction Goal
Alberta	70% capture, program proposal by April 1, 2007 80% capture program proposal by Dec 31, 2010
Maryland	90% reduction from 2000 levels by 2008
North Carolina	55% emissions capture by 2013
Wisconsin	40% reduction by 2010 off 2002-2004 baseline 80% reduction by 2015 off 2002-2004 baseline
Minnesota	20% reduction by July 1, 2008 50% reduction by July 1, 2013
New Hampshire	75% reduction from 1996-97 baseline by 2006
New York	90% reduction from power plants by 2007
EPA	69% reduction from coal fired power plants by 2018 70% reduction by 2005 under Clear Skies Act 30% per year reduction in absence of regulations
Connecticut	86% reduction by 2008
Iowa	90% reduction from measured inlet condition
New Jersey	90% reduction by December 15, 2007
Ohio	90% reduction
Massachusetts	85% or greater reduction commencing January 1, 2008 95% reduction commencing October 1, 2012

Chemical Fact Sheets

Methane, CH_4
CAS No. 74-82-8

WHAT IS METHANE?

Methane is a colorless gas with a weak odor. It is non-poisonous and a simple asphyxiant. Methane is a highly volatile constituent of crude oil and natural gas.

USES

There are no known industrial uses for methane.

SOURCES

The major sources of methane are biological in origin. Two important natural sources include the rumen of domestic animals, especially of cattle, and the emission of methane during the growing of rice.

Methane is also released to the environment via the manufacture, use, and disposal of many products associated with the petroleum and gasoline industries. Methane may be released to the environment as emissions from coal out gassing, combustion and liquefaction. Data show releases of methane into the environment from hazardous waste disposal sites, landfills and waste incinerators; and the combustion of gasoline and diesel fueled engines.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to methane might include:
- Inhalation of ambient air containing methane, particularly in close proximity to facilities involved in the above-noted activities.

Ambient air concentrations of methane were not reported in 1997 or 1998 in Alberta.

ENVIRONMENTAL FATE AND BEHAVIOUR

- Methane adsorbs strongly to soil, and therefore has low mobility with water in soil.
- Biodegradation and adsorption of methane may occur in soil and water; however, volatilization is expected to be a far more important environmental fate process in water.

- Methane is expected to exist entirely in the vapor phase in the ambient atmosphere. Reaction with hydroxyl radicals is the major sink for methane (half life of 1,908 days).
- Methane is not likely to undergo direct photolysis in the environment.

TOXICITY

- Vapors may cause dizziness or asphyxiation without warning. Some may be irritating if inhaled at high concentrations.

OBJECTIVES AND GUIDELINES

Guidelines are not in place in Alberta, Texas, or Ontario.

Adapted from:
ChemBank HSDB, IRIS, RTECS toxicity profiles.

Chemical Fact Sheets

Methyl bromide, CH_3Br
CAS No. 74-83-9

WHAT IS METHYL BROMIDE?

Methyl bromide is a colorless gas that is usually odorless. At high concentrations it may have a chloroform-like odor.

USES

Methyl bromide is used as a soil and space fumigant.

SOURCES

The primary source of methyl bromide in the environment is ocean water, within which it exists as a salt. Releases to the environment also result from the use of methyl bromide as a soil and space fumigant and its occurrence in automobile exhaust.

No releases of methyl bromide were reported to the NPRI for Alberta in 2001.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to methyl bromide might include:

- Inhalation of contaminated ambient or occupational air.
- Inhalation of ambient air near sites where methyl bromide is used as a fumigant for soil, grain, or other commodities.
- Inhalation of gas that occurs from its use as a solvent, methylating agent or extracting agent.

Annual Averages of Ambient Levels of Methyl Bromide in Alberta ($\mu g/m^3$)

Station	1999	2000
Calgary Central	0.1431	0.1433
Edmonton Central	0.1362	0.1500
Edmonton East	0.1463	0.1463

ENVIRONMENTAL FATE AND BEHAVIOUR

- Methyl bromide released to soil is expected to be lost primarily by volatilisation.
- Methyl bromide can be trapped in soil micropores following application to soil.
- Methyl bromide in soil may be broken down by soil organisms or chemical reaction.
- It is not expected to accumulate significantly in organisms.
- In the atmosphere it reacts with hydroxyl radicals created in the presence of sunlight with a half-life of 0.29 yr to 1.6 yr. In the stratosphere it may be broken down by reaction with sunlight.
- Methyl bromide is expected to aid in the depletion of stratospheric ozone.

TOXICITY

- Effects of methyl bromide on human health and the environment depend on the quantity present and the length and frequency of exposure. Effects also depend on the health of a person or the condition of the environment when exposure occurs.
- Methyl bromide is toxic by inhalation, ingestion, and dermal absorption.
- Chronic exposure can cause central nervous system depression or kidney injury.
- It may cause contact burns to the skin and eyes, dizziness, headache, nausea, respiratory irritation, ventricular fibrilation, pulmonary edema (sometimes delayed 4-5 days), convulsions, frostbite, coma, and death at certain concentrations.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Objectives and Guidelines

Jurisdiction	**Guidelines (μg/m^3)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta					
Texas		120			12
Ontario	4,000			1,350	

Adapted from:
ChemBank HSDB, IRIS, RTECS toxicity profiles.

Chemical Fact Sheets

Methyl chloride, CH_3Cl
CAS No. 74-87-3

WHAT IS METHYL CHLORIDE?

Methyl chloride is a colorless gas that compresses to a colorless liquid with a faint, sweet odor.

USES

Methyl chloride is primarily used to produce silicone resins and rubbers. It may be also be used as an aerosol propellant, a foaming agent in the plastics industry, as a refrigerant, and a solvent for extracting oils, fats and resins.

SOURCES

Methyl chloride is produced naturally in the oceans by mechanisms that are not entirely understood. One source is believed to be the reaction of biologically produced methyl iodide with chloride ions. Other natural sources include forest and brush fires and volcanoes.

Man-made sources of methyl chloride arise from its production and use in the manufacture of silicones and other chemicals, and as a solvent and propellant.

No releases of Methyl chloride were reported to the NPRI for Alberta in 2001.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to methyl chloride might include:

- Inhalation of ambient air.

Annual Averages of Ambient Levels of methyl chloride in Alberta ($\mu g/m^3$).

Station	1997	1998
Calgary Central	1.0137	1.0933
Edmonton Central	1.0520	1.0612
Edmonton East	1.0143	1.0331

Annual Averages of Ambient Levels of Methyl Chloride in Alberta ($\mu g/m^3$)

Station	1999	2000
Calgary Central	1.1349	1.1867
Edmonton Central	1.1788	1.1927
Edmonton East	1.1156	1.1630

ENVIRONMENTAL FATE AND BEHAVIOUR

- If released into water, methyl chloride will be rapidly lost by volatilization (half-life in a typical river is approximately 2.1 hours).
- Methyl chloride will be rapidly lost from soil by volatilization; however, there is a potential for it to leach into groundwater where it may very slowly biodegrade and hydrolyze (half-life may exceed a year).
- In the troposphere it will be lost primarily by upward dispersion, although washout by rain may also be important.
- Above the tropopause, reaction with hydroxyl radicals aids in the removal of methyl chloride. Above 30 km, photodissociation, diffusion and reaction with hydroxyl radicals make roughly equal contributions to its removal.

TOXICITY

- Vapors may cause dizziness or asphyxiation without warning.
- Contact with gas or liquefied gas may cause burns, severe injury or frostbite.
- Acute exposure may result in dizziness, drowsiness, poor motor coordination, confusion, nausea, vomiting, abdominal pains, hiccoughs, delirium, convulsions or coma. Death may be immediate with acute nephritis.
- Chronic exposure may lead to fatigue, loss of appetite, muscular weakness or drowsiness.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Objectives and Guidelines

Jurisdiction	**Guidelines (μg/m^3)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta					
Texas		1,030			103
Ontario	20,000			7,000	

Adapted from:
ChemBank HSDB, IRIS, RTECS toxicity profiles.

Chemical Fact Sheets

Methyl chloroform, $C_2H_3Cl_3$
CAS No. 71-55-6

WHAT IS METHYL CHLOROFORM?

Methyl chloroform is a colorless liquid with a sharp, sweet odor. Although it is usually found as a liquid, it evaporates quickly and becomes a vapor. It is also known as 1,1,1-trichloroethane, methyl trichloromethane and trichloromethylmethane.

USES

Methyl chloroform is used in the manufacture of certain glues, paints, industrial degreasers and aerosol sprays.

SOURCES

Methyl chloroform does not occur naturally in the environment. It is found in the environment as a result of the manufacture, use or disposal of glue, paint, industrial degreasers, and aerosol sprays, in which it is a constituent.

Methyl chloroform was not reportable to the NPRI in 2001.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to methyl chloroform may include:

- Inhalation of indoor air contaminated as a result of off-gassing from building materials.
- Inhalation of contaminated air in the workplace while using cleaning products, aerosol sprays, paint, and metal degreasing agents.
- Ingesting contaminated drinking water and food.
- Dermal contact with liquids containing methyl chloroform.

Annual Averages of Ambient Levels of Methyl Chloroform in Alberta ($\mu g/m^3$)

Station	1997	1998
Calgary Central	0.6351	0.4994
Edmonton Central	0.6531	0.4993
Edmonton East	0.5929	0.4520

ENVIRONMENTAL FATE AND BEHAVIOUR

- Most methyl chloroform released into the environment is evaporated into the air, where it has a residence time of approximately 6 years.
- It may aid in the depletion of stratospheric ozone.
- Contaminated water from hazardous waste sites may also contaminate surrounding soil and nearby surface or groundwater.
- Most of the methyl chloroform in surface waters evaporates quickly into the air.
- Water can carry methyl chloroform through the soil and into the groundwater where it can evaporate and pass through the soil as a gas, then be released to the air.
- Organisms living in soil or water may break down methyl chloroform.

TOXICITY

- Acute exposure to methyl chloroform via inhalation may cause dizziness, light-headedness, and loss of balance.
- Breathing much higher levels may cause unconsciousness, low blood pressure, and loss of heartbeat.
- Dermal contact may cause irritation.
- No information is available to show that Methyl chloroform causes cancer.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Objectives and Guidelines

Jurisdiction	**Guidelines (μg/m³)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta					
Texas		10,800			1,080
Ontario	350,000			115,000	

Adapted from:
Methyl Chloroform OPPT Chemical Fact Sheets. United States Environmental Protection Agency. http://www.epa.gov/docs/chemfact.

Chemical Fact Sheets

Methylene chloride, CH_2Cl_2
CAS No. 75-09-2

WHAT IS METHYLENE CHLORIDE?

Methylene chloride is a colorless liquid with a mild, sweet odor. Another name for it is dichloromethane.

USES

Methylene chloride is widely used as a solvent in paint strippers, as a propellant in aerosols, and as a process solvent in the manufacturing of drugs. It is also used as a metal cleaning and finishing solvent. Methylene chloride is often added to aerosol sprays and used to extract unwanted material from foods and beverages, such as coffee.

SOURCES

- Methylene chloride does not occur naturally in the environment. It is made from methane gas or wood alcohol. Methylene chloride is found in the environment as a result of its manufacture, use and disposal from the above-noted industrial processes. Most direct releases of methylene chloride to the environment are to the atmosphere.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to methylene chloride might include:
- Inhalation of contaminated air in the workplace, where methylene chloride is manufactured, used or disposed of.
- Inhalation of ambient air or ingestion of contaminated water near facilities involved in the manufacture, use or disposal of methylene chloride.
- Inhalation resulting from use of certain aerosol spray paints and paint strippers.

Annual Averages of Ambient Levels of Methylene chloride in Alberta ($\mu g/m^3$)

Station	1999	2000
Calgary Central	0.5529	0.5155
Edmonton Central	0.5529	0.5155
Edmonton East	0.4771	0.6686

ENVIRONMENTAL FATE AND BEHAVIOUR

- Methylene chloride evaporates when exposed to air. Once in air, it is expected to break down to other chemicals.
- It doesn't stick to soil particles or dissolve in water, so it moves from both soil and water to air.
- Because it is a liquid that does not bind well to soil, methylene chloride can readily move through the ground and enter groundwater.
- Plants and animals are not likely to store methylene chloride.
- Soil and water organisms break it down to simpler compounds.

TOXICITY

- Effects of methylene chloride on human health and the environment depend on how much methylene chloride is present and the length and frequency of exposure. Effects also depend on the health of a person or the condition of the environment when exposure occurs.
- Acute exposure to methylene chloride affects the human nervous system and the heart. Effects range from unsteadiness and numbness in fingers and toes to unconsciousness and death.
- Dermal contact with high concentrations of methylene chloride liquid or vapor may cause irritation of the skin and eyes.
- The US Department of Health and Human Services (DHHS) has determined that methylene chloride may reasonably be anticipated to be a human carcinogen.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Objectives and Guidelines

Jurisdiction	**Guidelines (μg/m^3)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta					
Texas		260			26
Ontario	660			220	

Adapted from:
Methylene chloride OPPT Chemical Fact Sheets. United States Environmental Protection Agency. http://www.epa.gov/docs/chemfact.

Chemical Fact Sheets

Methylene diphenyl diisocyanate, $C_{15}H_{10}N_2O_2$
CAS No. 101-68-8

WHAT IS METHYLENE DIPHENYL DIISOCYANATE?

Methylene diphenyl diisocyanate is a colorless gas (or a liquid below 38 degrees F). It has a sweet, chloroform-like odor at high concentrations, but it is normally odorless. It is also known as methylene bisphenyl disocyanate.

USES

Methylene diphenyl diisocyanate is used for bonding rubber to rayon and nylon, and as a chemical intermediate for polyurethane coatings, elastomers, thermoplastic resins, spandex fibers and millable gums.

SOURCES

Methylene diphenyl diisocyanate is not known to exist as a natural product. It can be released to the environment in waste stream emissions from sites of industrial manufacture and use. It is also present in the environment as a result of emissions from manufacturers of metalworking machinery, household furniture, pipe coatings, building materials and electronic components. Emissions may occur from spills during transport of methylene diphenyl diisocyanate.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to methylene diphenyl diisocyanate might include:
- Inhalation of vapors and aerosols containing it in the workplace.
- Dermal contact in the workplace.

Ambient air concentrations of methylene diphenyl diisocyanate were not reported in 1997 or 1998 in Alberta.

ENVIRONMENTAL FATE AND BEHAVIOUR

- If released to the atmosphere methylene diphenyl diisocyanate will degrade by reaction with hydroxyl radicals formed in the presence of sunlight (with a half-life of approximately 32 hours). The presence of water vapour may increase the atmospheric degradation rate by several times.

- It reacts with water readily and, if spilled into water or moist soil, will form a crust of non-reactive material that does not dissolve in water. This crust will increase the length of time that it remains in the environment.
- It will not leach through soil because of its reaction with water.
- It hydrolyses in solutions containing water, therefore it will not accumulate in the bodies of organisms.

TOXICITY

- Methylene diphenyl diisocyanate is toxic by inhalation, ingestion or dermal contact with vapours or dust.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Objectives and Guidelines

Jurisdiction	**Guidelines (μg/m^3)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta		0.51			
Texas		0.5			0.05
Ontario					

Adapted from:
ChemBank HSDB, IRIS, RTECS toxicity profiles.

Chemical Fact Sheets

Molybdenum, Mo
CAS No. 7439-98-7

WHAT IS MOLYBDENUM?

Molybdenum is a dark gray or black powder with metallic luster or coherent mass of silver white color.

USES

The primary use of molybdenum is as a steel alloy. As such it is utilised in the arms industry, in aeronautical engineering and in the automobile industry. End use applications of molybdenum are: machinery, 35%; oil and gas industry, 20%; transportation, 15%; chemicals, 15%; electrical, 10%; and other, 5%.

Other uses include: processing molybdenum steel; for use as electrodes; during welding operations; as a chemical reagent for lab analyses; in petroleum refining and chemical processing; and as an intermediate in the manufacture of corrosion inhibitors. Molybdenum is also used: as a coloring agent for enamels and ceramic glazes; in agricultural chemicals; in the electroplating process; in formulation of corrosion inhibitors for aqueous systems; as a pigment for paints, lacquers, and coloring animal fibers and hair; in enamel processes for adherence of vitreous coatings to ceramics and metal; and in leather and skin tanning. It is also used as a chlorination catalyst; in fire retardant resins; as a brazing flux and as an intermediate for organometallic compounds; in photography; ion exchange processes and formulation of plastics and adhesives; as a catalyst in desulfurization of gasoline; and as a reagent for determination of phosphorus and lead.

SOURCES

Primary ore bodies in the Western Hemisphere contain about 0.2-0.4% molybdenum and give a recovery of 2 to 4 kg per metric ton of ore. Molybdenum does not occur as a native species, but is obtained principally from molybdenite (molybdenum disulfide). Wulfenite lead (molybdate) and powellite are also minor commercial ores. Occurrence of molybdenum in the earth's crust is 1-2 mg/kg, and the world mean of soils is around 2 mg/kg.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to molybdenum might include:

- Ingestion of dusts and fumes of molybdenum, its oxides and sulfides, chiefly from electric furnace or other high temperature treatment related to production and fabrication of molybdenum products.

Ambient air concentrations of molybdenum were not reported in 1997 or 1998 in Alberta.

ENVIRONMENTAL FATE AND BEHAVIOUR

- Global mobilisation of molybdenum by weathering is: 6x10^6 kg Mo/year; by rivers: 19x10^6 kg Mo/year; by mining: 76x10^6 kg Mo/year; by combustion (oil and coal): 0.8x10^6 kg Mo/year.
- Terrestrial plants can retain molybdenum.

TOXICITY ASSESSMENT

- High levels of ingested molybdenum may be associated with potential mineral imbalance.
- Anemia is a characteristic feature of molybdenum toxicity.
- In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of insoluble molybdenum compounds might cause exacerbation of symptoms due to their irritant properties.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Objectives and Guidelines

Jurisdiction	**Guidelines (μg/m^3)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta					
Texas		50			5
Ontario	100			120	

Adapted from:
ChemBank HSDB, IRIS, RTECS toxicity profiles.

Chemical Fact Sheets

Naphthalene, $C_{10}H_8$
CAS No. 91-20-3

WHAT IS NAPHTHALENE?

Naphthalene is a white solid that has a strong, but not unpleasant, odour.

USES

The major products made from naphthalene are moth repellents. It is used for making dyes, resins, leather tanning agents, and the insecticide Carbaryl.

SOURCES

Naphthalene is found naturally in fossil fuels. Man-made sources include combustion of tobacco, fossil fuels and wood. Naphthalene also enters the environment from industrial uses, from its use as a moth repellent, and from accidental spills.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to naphthalene might include:

- Inhalation of low levels in ambient air.
- Inhalation of air contaminated from industrial discharges or from burning wood or fossil fuels.
- Inhalation of indoor air in homes or businesses where cigarettes are smoked, wood is burned, or moth repellents are used.
- Ingestion of water from contaminated wells.
- Dermal contact with clothing, blankets, or coverlets that are treated with naphthalene.

Annual Averages of Ambient Levels of Naphthalene in Alberta ($\mu g/m^3$)

Station	1999	2000
Calgary Central	0.3588	
Edmonton Central	0.2935	
Edmonton East	0.1913	

ENVIRONMENTAL FATE AND BEHAVIOUR

- Naphthalene evaporates readily.
- In air, moisture and sunlight break it down, often within 1 day.
- Naphthalene in water is destroyed by bacteria or evaporates into the air.
- Naphthalene adsorbs weakly to soils and sediment.

- It does not accumulate in animals or fish.

TOXICITY

- Exposure to large amounts of naphthalene may damage or destroy red blood cells.
- Exposure to large amounts of naphthalene may also cause nausea, vomiting, diarrhea, blood in the urine, and a yellow color to the skin.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Objectives and Guidelines

Jurisdiction	**Guidelines (μg/m^3)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta					
Texas		440			44
Ontario	36			22.5	
Ontario	50 (10 min odour)				

Adapted from:
Napthalene ToxFAQs. Agency for Toxic Substances and Disease Registry.
http://www.atsdr.cdc.gov/toxfaq.html.

Chemical Fact Sheets

Nickel, Ni
CAS No. 7440-02-0

WHAT IS NICKEL?

Nickel is a very abundant element. Pure nickel is a hard, silvery-white metal that is combined with other metals to form mixtures called alloys. In the environment, it is found primarily combined with oxygen (oxides) or sulfur (sulfides). Nickel and its compounds have no characteristic odor or taste.

USES

Alloys of nickel are used in the making of metal coins and jewelry and in industry for making metal items. Some of the metals that nickel can be alloyed with are iron, copper, chromium, and zinc. Nickel compounds are also used for nickel plating, to color ceramics, to make some batteries, and as substances known as catalysts that increase the rate of chemical reactions.

SOURCES

Nickel is found in all soils and is emitted from volcanoes. Man-made sources include tailings from mining processes and accidental spills. Nickel is also found in cigarette smoke.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to Nickel might include:
- Breathing air or smoking tobacco containing nickel.
- Eating food containing nickel.
- Drinking water which contains small amounts of nickel.
- By handling coins and touching other metals containing nickel.

Ambient air concentrations of nickel were not reported in 1997 or 1998 in Alberta.

ENVIRONMENTAL FATE AND BEHAVIOUR

- Small nickel particles in the atmosphere settle to the ground or are taken out of the air in rain.
- Much of the nickel in the environment is found with soil and sediments because nickel attaches to particles that contain iron or manganese, which are often present in soil and sediments.

- Nickel does not appear to concentrate in fish, plants, or animals used for food.

TOXICITY

- Nickel is required to maintain health in animals. A small amount of nickel is probably essential for humans, although a lack of nickel has not been found to affect the health of humans.
- The most common adverse health effect of nickel in humans is an allergic reaction. People can become sensitive to nickel when jewelry or other items containing it are in direct contact with the skin. The most common reaction is a skin rash at the site of contact.
- Less frequently, some people who are sensitive to nickel have asthma attacks following exposure to nickel. Some sensitized persons react when they eat nickel in food, drink it in water, or breathe dust containing it.
- Chronic exposure, particularly in industrial workers, may result in lung effects, including chronic bronchitis and reduced lung function.
- The US Department of Health and Human Services (DHHS) has determined that nickel and certain nickel compounds may reasonably be anticipated to be human carcinogens. Cancers of the lung and nasal sinus have resulted when workers breathed dust containing high levels of nickel compounds while working in nickel refineries or nickel processing plants.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Objectives and Guidelines

Jurisdiction	**Guidelines (μg/m^3)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta		6			0.05
Texas		0.15			0.015
Ontario	5			2	

Adapted from:
Nickel ToxFAQs. Agency for Toxic Substances and Disease Registry.
http://www.atsdr.cdc.gov/toxfaq.html.

Chemical Fact Sheets

Nitric oxide, NO
CAS No. 10102-43-9

WHAT IS NITRIC OXIDE?

Nitric oxide is a colourless gas that appears brown at high concentration in air. It has a sharp, sweet odor.

USES

Nitric oxide is used in the manufacture of nitric acid, the bleaching of rayon, and as a stabilizer for propylene and methyl ether. It is also used to prepare nitrosyl carbonyls and is a component of various medications.

SOURCES

Natural sources of nitric oxide to the environment include the action of microbes on fertilizers and by lightning. Nitric oxide is more abundantly emitted to the environment as a result of the high temperature combustion of coal, natural gas, or oil in power plants and the combustion of gasoline in internal combustion engines. Industrial processes where nitric oxide is made or used play an important role in its emissions.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to Nitric oxide might include:
- Inhalation of emissions from the combustion of fossil fuels.
- Inhalation of gases from industrial processes where nitric oxide is made or used, or from fertilizer or explosive factories.

Nitric Oxide accounts for 6% of atmospheric pollution worldwide.

Annual Averages of Ambient Levels of Nitric Oxide in Alberta (ppm).

Station	1999	2000
Calgary Central	0.02870	0.02657
Edmonton Central	0.02193	
Edmonton East	0.01398	

ENVIRONMENTAL FATE AND BEHAVIOUR

- Nitric oxide is converted spontaneously in air to nitrogen dioxide; hence, some of the latter gas is invariably present whenever nitric oxide is found in air.
- Nitric oxide enters into the chemical reactions that lead to formation of photochemical smog.

TOXICITY

- Nitric oxide may be fatal if inhaled or absorbed through the skin at very high concentrations.
- Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
- Only very concentrated nitrous fumes produce prompt coughing, choking, headache, nausea, abdominal pain, and dyspnea (tightness and burning pain in the chest).
- Chronic exposure via inhalation causes corrosion of teeth.

OBJECTIVES AND GUIDELINES

Guidelines are not in place in Alberta, Texas or Ontario. However; nitric oxide converts rapidly to nitrogen dioxide and is a component of NO_x (nitrogen oxides). Many jurisdictions have guidelines for nitrogen dioxide or NO_x.

Adapted from:
ChemBank HSDB, IRIS, RTECS toxicity profiles.

Chemical Fact Sheets

Nitrogen dioxide, NO_2
CAS No. 10102-44-0

WHAT IS NITROGEN DIOXIDE?

Nitrogen dioxide is a red to brown gas above 21.1 °C, a brown liquid below 21.1 °C, and a colorless solid at approximately -11 °C.

USES

Some uses of nitrogen dioxide include the bleaching of flour and the manufacture of oxidized cellulose compounds. It is also used as a chemical intermediate for the production of nitric acid, polymerization inhibitor for acrylates, and oxidizer for rocket fuel.

SOURCES

Atmospheric oxidation of nitric oxide (NO) may lead to the formation of nitrogen dioxide. Other natural sources include forest fires, atmospheric lightning discharges and the biogenic oxidation of nitrogen-containing compounds.

Nitrogen dioxide is a ubiquitous product of combustion, occurring in exhaust from motor vehicles, emissions from the combustion of stationary fuel sources such as coal, oil or natural gas and various industrial sources. Nitrogen dioxide's production and use as an intermediate in the manufacture of nitric acid and as an oxidizing agent may also lead to its release to the environment through various waste streams.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to nitrogen oxide might include:

- Inhalation and dermal contact at workplaces where nitrogen dioxide is produced or used or where combustion processes are important.
- The general population may be exposed to nitrogen dioxide through the inhalation of ambient air and by smoking tobacco products.

Annual Averages of Ambient Levels of Nitrogen Dioxide in Alberta (ppm)

Station	1999	2000
Calgary Central	0.02811	0.02806
Edmonton Central	0.02374	0.02485
Edmonton East	0.01731	0.01835

ENVIRONMENTAL FATE AND BEHAVIOUR

- If released to air, nitrogen dioxide will exist solely as a gas in the ambient atmosphere.
- Gas-phase nitrogen dioxide is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals.
- Nitrogen dioxide is expected to undergo direct photolysis in the environment, ultimately leading to the production of ozone and smog conditions in the lower troposphere.
- If released to soil, this compound is expected to decompose to nitric acid in moist soil surfaces. Nitrogen dioxide is expected to volatilize from dry soil surfaces based upon its vapor pressure.
- If released into water, nitrogen dioxide is expected to decompose to nitric acid.

TOXICITY

- Nitrogen dioxide is toxic and may be fatal if inhaled or absorbed through the skin at high concentrations. Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
- Only very high concentrations induce prompt or immediate distress. Usually there are no symptoms at the time of exposure, except perhaps for a slight and transient cough, mild fatigue and brief nausea.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Objectives and Guidelines

Jurisdiction	**Guidelines (μg/m^3)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta		400		200	60
Texas – must meet NAAQS					100
Ontario (NO measured as NO_2)	500	400		200	

Adapted from:
ChemBank HSDB, IRIS, RTECS toxicity profiles.

Chemical Fact Sheets

Nitrogen oxide, N_2O
CAS No. 10024-97-2

WHAT IS NITROGEN OXIDE?

Nitrogen oxide is a colorless, liquefied gas with a pleasant, slightly sweet odour. Some may react explosively with fuels. It may ignite combustibles such as wood, paper, oil and clothing.

USES

Nitrogen oxide is used to oxidize organic compounds at temperatures above 300°C; to make nitrites from alkali metals at their boiling points; in rocket fuel formulations (with carbon disulfide); and in the preparation of whipped cream. It is an agent in detection of leaks in natural gas pipelines; a propellant for food aerosols; and a general anesthetic. It has been used experimentally as an effective bactericide.

SOURCES

Nitrogen oxide is produced by the thermal decomposition of ammonium nitrate, and by the controlled reduction of nitrites or nitrates. It is released to the environment via natural and man-made sources. Man-made sources include industrial operations involved in the manufacture, use and disposal of nitrogen oxide.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to nitrogen oxide might include:

- Inhalation of ambient air in proximity to facilities involved in the manufacture, use and disposal of nitrogen oxide.
- Inhalation of air in the workplace where nitrogen oxide is important.

Ambient air concentrations of nitrogen oxide were not reported in 1997 or 1998 in Alberta.

TOXICITY

- Vapours may cause dizziness or asphyxiation without warning.
- Acute exposure to concentrations over 50 ppm reduce dexterity, cognition, and motor and audiovisual skills.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Guidelines

Jurisdiction	**Guidelines ($\mu g/m^3$)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta					
Texas		4,500			450
Ontario	27,000			9,000	

Adapted from:
ChemBank HSDB, IRIS, RTECS toxicity profiles.

Chemical Fact Sheets

Nonane,
CAS No. 111-84-2
C_9H_{20}

WHAT IS NONANE?

Nonane is a colorless liquid with a gasoline-like odor.

USES

Nonane is used in the manufacture of some wallpaper, caulking compounds, floor coverings, chipboard, adhesives, cement flagstone, jointing compounds, floor varnishes and floor waxes.

SOURCES

Nonane is a constituent in the paraffin fraction of crude oil and natural gas. Nonane is released to the environment via the manufacture, use, and disposal of many products associated with the petroleum and gasoline industries. Extensive data show release of nonane into the environment from: solvent based building materials, printing pastes, paints, varnishes, adhesives and other coatings; hazardous waste sites, landfills and waste incinerators; vulcanization and extrusion operations during rubber and synthetic production; and the combustion of gasoline, diesel fuels and plastics.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to nonane might include:

- Inhalation in the workplace, where nonane is manufactured, used or disposed of.
- Inhalation of ambient air, particularly near facilities involved in the manufacture, use or disposal of nonane.

Annual Averages of Ambient Levels of Nonane in Alberta ($\mu g/m^3$)

Station	1999	2000
Calgary Central	0.3503	0.3336
Edmonton Central	0.2849	0.4037
Edmonton East	0.6313	0.8911

ENVIRONMENTAL FATE AND BEHAVIOUR

- Nonane is expected to exist almost entirely in the vapor phase in ambient air.
- Reactions with photochemically produced hydroxyl radicals in the atmosphere have been shown to be important (estimated half-life of 1.5 days).
- Biodegradation of nonane may occur in soil and water; however, volatilization and adsorption are expected to be far more important environmental fate processes.
- Nonane is relatively immobile in soil and may partition from the water column to organic matter contained in sediments and suspended solids.
- The bio-concentration of nonane may be important in aquatic systems.
- Nonane is expected to volatilize readily from environmental waters.

TOXICITY ASSESSMENT

- Inhalation or dermal contact with nonane may irritate or burn skin and eyes.
- Fire may produce irritating, corrosive and/or toxic gases.
- Vapors may cause dizziness or suffocation.
- Nonane is a Central Nervous System depressant in high concentrations.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Objectives and Guidelines

Jurisdiction	**Guidelines (μg/m^3)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta					
Texas		10,500			1,050
Ontario					

Adapted from:
ChemBank HSDB, IRIS, RTECS toxicity profiles.

Chemical Fact Sheets

Octane, C_8H_{18}
CAS No. 111-65-9

WHAT IS OCTANE?

Octane is a colorless liquid with a gasoline-like odor.

USES

Octane is used in the manufacture of many printing pastes, paints, varnishes, adhesives, and other coatings.

SOURCES

Octane is a highly volatile constituent in the paraffin fraction of crude oil and natural gas. It is released to the environment via the manufacture, use, and disposal of many products associated with the petroleum and gasoline industries. Extensive data show release of octane into the environment from printing pastes, paints, varnishes, adhesives, and other coatings; hazardous waste sites, landfills, and waste incinerators; vulcanization and extrusion operations during rubber and synthetic production; and the combustion of gasoline fueled engines.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to octane might include:

- Inhalation of air in the workplace, where octane is manufactured, used or disposed of.
- Inhalation of ambient air, particularly near facilities involved in the manufacture, use or disposal of octane.

Annual Averages of Ambient Levels of Octane in Alberta ($\mu g/m^3$)

Station	1999	2000
Calgary Central	0.3325	0.3664
Edmonton Central	0.3305	0.4627
Edmonton East	0.6707	0.9149

ENVIRONMENTAL FATE AND BEHAVIOUR

- Octane is expected to exist entirely in the vapor phase in ambient air.
- Reactions with photochemically produced hydroxyl radicals in the atmosphere have been shown to be important.
- Nighttime reactions with nitrate radicals may contribute to the atmospheric transformation of octane, especially in urban environments.
- Biodegradation of octane may occur in soil and water; however, volatilization and adsorption are expected to be far more important fate processes.
- Rapid volatilization of octane is expected to occur from environmental waters.
- The bioconcentration of octane may be important in aquatic systems.
- Octane is immobile in soil and may partition from the water column to organic matter in sediments and suspended solids.

TOXICITY

- Inhalation or contact with octane may irritate or burn skin and eyes.
- Fire may produce irritating, corrosive and/or toxic gases.
- Vapors may cause dizziness or suffocation.
- Octane is a Central Nervous System depressant in high concentrations.
- The manifestations of exposure to vapors of octane are giddiness, vertigo, headache, and anesthetic stupor.
- Direct aspiration of paraffins into the lung may cause chemical pneumonitis, pulmonary edema, & hemorrhaging.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Objectives and Guidelines

Jurisdiction	**Guidelines (μg/m^3)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta					
Texas		3,500			350
Ontario	45,400 61,800 (10-minute)				

Adapted from:
ChemBank HSDB, IRIS, RTECS toxicity profiles.

Chemical Fact Sheets

Ozone, O_3

CAS No. 10028-15-6

WHAT IS OZONE?

Ozone exists as a colorless to bluish gas, a dark blue liquid, or blue black crystals.

USES

Some uses of ozone include: a disinfectant for air and water by virtue of its oxidizing power; bleaching waxes, textiles and oils; organic synthesis; deodorization of air and sewage gases.

SOURCES

Ozone is formed locally in air from lightning, in stratosphere by UV radiation and is found in atmosphere in varying proportions, since it is produced continuously in the outer layers of the atmosphere by the action of solar UV radiation on the oxygen of the air.

Ozone is formed through complex chemical reactions between precursor emissions of volatile organic compounds like hydrocarbons and nitrogen oxides in the presence of sunlight. Car exhaust is one source of precursor emissions for ground-level ozone.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to ozone might include:

- Inhalation of ambient air, particularly in urban centers as a result of increased pollution.
- Inhaling natural background levels of ozone.

Annual Averages of Ambient Levels of Ozone in Alberta (ppm)

Station	1999	2000
Calgary Central	0.01473	0.01466
Edmonton Central	0.01648	0.01537
Edmonton East	0.01500	0.02105

ENVIRONMENTAL FATE AND BEHAVIOUR

- Ozone can be scavenged by other chemicals in the atmosphere.
- It may be deposited to vegetation and taken up by plants. Inside the plant, it is consumed almost immediately.

TOXICITY

- The primary site of acute injury is the lung, which is characterized by pulmonary congestion, edema, and hemorrhage.
- Inhalation may initiate, accelerate or exacerbate respiratory tract disease of bacterial or viral origin.
- Discomfort to exposed individuals may involve dryness of throat & mucous membranes of nose & eyes following exposures of short duration.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Objectives and Guidelines

Jurisdiction	**Guidelines (μg/m^3)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta		160			
Texas					
Ontario	200	165			

Adapted from:
ChemBank HSDB, IRIS, RTECS toxicity profiles.

Chemical Fact Sheets

Particulate Matter, PM (There is no molecular formula for PM.)
CAS No.: None

WHAT IS PARTICULATE MATTER?

Particulates, or PM, are airborne solid and liquid particles. They have no specific chemical composition, and may include a wide range of chemical species. Particulates are classified by size, considered the most important parameter in characterising the physical behaviour of particulate matter. Particulates are classified as follows:

Size	
$PM_{2.5}$	Fine fraction. Refers to airborne particles that are 2.5 microns or less in diameter.
$PM_{2.5\text{-}10}$	Coarse fraction. Refers to airborne particles in the size range 2.5 to 10 microns in diameter, known as the coarse fraction of $PM_{10.}$
PM_{10}	Refers to airborne particles that are 10 microns or less in diameter.

Size of particulate matter is closely related to the health impacts associated with the particle. Fine particulates ($PM_{2.5}$) can pierce further into the lung tissue than coarse particulates.

The chemical composition of fine particles is different from that of coarse particles, such as sea spray or dust, because the mechanisms for formation are different. Fine particles are created when chemicals react in the atmosphere (nucleation of supersaturated vapours), and grow through particle-particle or gas-particle interactions. Grinding or atomization are the primary mechanisms by which coarse particles are formed.

Fine fraction particles ($PM_{2.5}$) scatter light effectively, reducing the distance for which the atmosphere has a clear appearance (i.e. it decreases the visual range). Smog is the term commonly used to describe the photochemical haze that results when light scattering particles are formed through the reaction of chemical pollutants in the atmosphere.

USES

There are no industrial uses of particulate matter.

SOURCES

Fine particulate matter ($PM_{2.5}$) is formed primarily by chemical reactions that occur in situations including:

- Combustion of wood in forest fires or residential wood burning.
- Combustion of fossil fuels in motor vehicles, furnaces, boilers, and heaters.
- Smelting of metals other than iron.
- Recovery, lime kilning, and smelt dissolving in Kraft pulp mills.
- Plywood manufacture, especially relating to the veneer dryer.

Coarse fraction particulate matter ($PM2_{2.5\text{-}10}$) is released primarily by mechanical breakdown of matrices, and is generally released from natural sources such as:

- Windblown dust.
- Sea salt particles.
- Vegetation-derived particles, including seeds, pollens, spores, leaf waxes and resins.
- Road dust.
- Agricultural crops (from wind erosion and tillage).

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to PM might include:

- Inhalation of products from plants (pollens, spores, moulds, cornstarch), animals (bacteria, viruses, hair, insect parts and byproducts, dandruff), minerals (talc, man-made mineral fibers), combustion (tobacco smoke, cooking, heating appliances), home and personal care products (sprays, humidifiers), and radioactive sources (radon progeny).
- Occupational exposure to combustion products from wood or smelters or fossil fuels.
- Inhalation of ambient air during agricultural operations, including tilling.
- Inhalation of smog in traffic-heavy areas.
- Inhalation of dusty air, especially where the climate is dry.

Annual Averages of Ambient Levels of PM_{10} in Alberta ($\mu g/m^3$)

Station	1999	2000
Calgary Central	23.94	23.94
Edmonton Central	No data	No data
Edmonton East	19.62	No data

Annual Averages of Ambient Levels of $PM_{2.5}$ in Alberta ($\mu g/m^3$)

Station	1999	2000
Calgary Central	9.197	9.998
Edmonton Central	No data	9.501
Edmonton East	No data	10.24

ENVIRONMENTAL FATE AND BEHAVIOUR

- Coarse particulates tend to fall to the ground quickly due to gravity's effects (sedimentation) or inertial effects (impaction).
- Fine particulates undergo removal from the atmosphere by interaction with rainfall or by dry deposition.

TOXICITY

- Toxic effects of airborne particles are more likely to be associated with the fine mode of particulate matter air pollution, including acidic sulfates, possibly occurring as a coating on fine or even ultrafine carrier particles.
- Effects of fine particulates may include decreased lung function, decreased (or sometimes increased) particle clearance from airways, altered alveolar macrophage numbers and functions, modified immunological function, cytotoxicity and histological changes, and cardiographic abnormalities.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Objectives Guidelines

Jurisdiction	**Guidelines (μg/m^3)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta – 2.5 μ or less		80		30	
Alberta – total suspended		100			60*
Texas					
Ontario - < 44 μm	100			120	

*geometric mean

Adapted from:
CEPA/FPAC Working Group on Air Quality Objectives and Guidelines. *National Ambient Air Quality Objectives for Particulate Matter Part 1: Science Assessment .Document.* Minister, Public Works and Government Services.

Chemical Fact Sheets

Pentachlorophenol, C_6Cl_5OH
CAS No. 87-86-5

WHAT IS PENTACHLOROPHENOL?

Pure pentachlorophenol occurs as a colorless crystal. The impure form is dark gray to brown dust, beads, or flakes. It has a sharp chemical odor when hot, but very little smell at room temperature.

USES

Pentachlorophenol has been registered for use in Canada since 1949. Concerns about dioxins as micro-contaminants in 1980 lead to the Pest Management Regulatory Agency (PMRA) prohibiting a number of uses, including uses on horticultural lumber, above-ground interior woodwork of farm buildings, interior use in homes, curing of hides and others in January, 1981. The two use areas left (sapstain inhibition – inhibition of spore growth, and material preservation) were subject to ongoing scrutiny. In July of 1992 the PMRA announced the re-evaluation of all heavy-duty wood preservatives, including pentachlorophenol. Through the North American Free Trade Agreement, Canada's PMRA is now working co-operatively with the United States Environmental Protection Agency to complete the review. Pending completion of the review, pentachlorophenol remains available for industrial uses. Domestic products have not been registered for approximately ten years.

Pentachlorophenol is still used in industry as a wood preservative for power line poles, railroad ties, cross arms, and fence posts.

SOURCES

Pentachlorophenol is a manufactured chemical that is not found naturally in the environment. Environmental levels of pentachlorophenol are a result of its manufacture, use or disposal from the above noted industries.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to pentachlorophenol might include:

- Breathing contaminated air while working with treated wood at wood-treatment facilities and lumber mills.
- Touching treated lumber, for example, in wood-treatment facilities and lumber mills or in construction or farming.
- Breathing contaminated air near waste sites, sites of accidental spills, and work sites.

- Eating contaminated food, such as fish, or drinking contaminated water.

Ambient air concentrations of pentachlorophenol were not reported in 1997 or 1998 in Alberta.

ENVIRONMENTAL FATE AND BEHAVIOUR

- Pentachlorophenol generally adsorbs to soil particles, but its movement in soils depends on the soil's acidity.
- Not much pentachlorophenol will evaporate into the air.
- It doesn't dissolve easily in water.
- Breakdown is mainly via anaerobic biodegradation; breakdown via sunlight and hydrolysis are not significant processes.
- Aerobic biodegradation occurs mainly in surface waters.
- Pentachlorophenol is toxic to very toxic to fish; however, because of its rapid metabolism, bio-magnification is not of concern.

TOXICITY

- Chronic or acute exposure can harm the liver, kidneys, blood, lungs, nervous system, immune system, and gastrointestinal tract.
- Dermal contact with pentachlorophenol can cause irritation of the skin, eyes, and mouth, particularly when it is a hot vapor.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Objectives and Guidelines

Jurisdiction	**Guidelines (μg/m^3)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta		5			0.5
Texas		5			0.5
Ontario	60			20	

Adapted from:
ChemBank HSDB, IRIS, RTECS toxicity profiles.
Etoxnet. Pesticide Information Profiles. Pentachlorophenol. 1996.
Agriculture Canada, Pesticides Directorate. Trade Memorandum T-1-229. Changes in The Regulatory Status of the Chlorophenols. 1980.

Chemical Fact Sheets

Perchloroethylene, C_2Cl_4
CAS No. 127-18-4

WHAT IS PERCHLOROETHYLENE?

Perchloroethylene (also called PERC) is a colorless, nonflammable liquid with a sharp, sweet odor. Other names include tetrachloroethylene, PCE, and tetrachloroethene.

USES

The dry cleaning industry accounts for a large proportion of perchloroethylene use. In the United States, for example, PERC accounts for 80% to 85% of all dry cleaning fluid used. Textile mills, chlorofluorocarbon producers, vapor degreasing and metal cleaning, and makers of rubber coatings also use PERC. It can be added to aerosol formulations, solvent soaps, printing inks, adhesives, sealants, polishes, lubricants, and silicones. Typewriter correction fluid and shoe polish are among the consumer products that can contain PERC.

SOURCES

PERC does not occur naturally in the environment. Its presence in the environment is a result of its manufacture, use and disposal in the above-noted industries.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to perchloroethylene might include:

- Inhalation or dermal contact in the workplace where perchloroethylene is manufactured, used or disposed of.
- Inhalation, ingestion or dermal contact in the environment following releases to air, water, land, or groundwater.
- Inhalation or dermal contact in the home when using products containing PERC.
- Inhalation of PERC fumes in the home after having garments dry cleaned.

PERC enters the body when breathed in with contaminated air or when consumed with contaminated food or water. It is less likely to be absorbed through skin contact. Once in the body, PERC can remain stored in fat tissue.

Annual Averages of Ambient Levels of Perchloroethylene in Alberta ($\mu g/m^3$)

Station	1999	2000
Calgary Central	0.8424	0.7615
Edmonton Central	0.4637	0.5094
Edmonton East	0.2900	0.3579

ENVIRONMENTAL FATE AND BEHAVIOUR

- Perchloroethylene evaporates when exposed to air. It dissolves only slightly when mixed with water.
- Most direct releases of PERC to the environment are to air. It also evaporates from water and soil exposed to air.
- Once in air, PERC breaks down to other chemicals over a period of several weeks.
- PERC can contribute to the formation of photochemical smog when it reacts with other volatile organic carbon substances in air. These reactions tend to eliminate PERC before it reaches the upper atmosphere in amounts sufficient to damage the ozone layer.
- PERC does not adsorb well to soil particles; thus, can move through the ground and enter groundwater.
- Plants and animals living in environments contaminated with PERC can store small amounts of the chemical.

TOXICITY

- Effects of perchloroethylene on human health and the environment depend on the amount present and the length and frequency of exposure. Effects also depend on the health of a person or the condition of the environment when exposure occurs.
- Breathing PERC for short periods of time can adversely affect the human nervous system. Effects range from dizziness, fatigue, headaches and sweating to in-coordination and unconsciousness.
- Dermal contact with PERC liquid or vapor may cause irritation of the skin, eyes, nose and throat.
- Chronic exposure via inhalation can cause liver and kidney damage in humans. Workers exposed repeatedly to large amounts of PERC in air can also experience memory loss and confusion.
- The US Department of Health and Human Services has determined that perchloroethylene can reasonably be anticipated to be a human carcinogen.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Objectives and Guidelines

Jurisdiction	**Guidelines ($\mu g/m^3$)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta					
Texas		340			34
Ontario	1,080			360	

Adapted from:
Perchloroethylene OPPT Chemical Fact Sheets. United States Environmental Protection Agency. http://www.epa.gov/docs/chemfact.

Chemical Fact Sheets

Phenol, C_6H_6O
CAS No. 108-95-2

WHAT IS PHENOL?

Phenol is a colourless to light pink crystalline solid that can be liquefied by mixing with about 8% water.

USES

Phenol is used as a general disinfectant in solution or mixed with slaked lime, etc., for toilets, stables, cesspools, floors and drains. It is also used in the manufacture of colourless or light-colored artificial resins along with many medical & industrial organic compounds & dyes. Phenol is an important reagent in many chemical analyses, and is a chemical intermediate for phenolic resins, bisphenol a, caprolactam (via cyclohexanone), adipic acid and other important industrial chemicals.

SOURCES

Phenol is produced naturally by decaying organic matter. It is also an important industrial chemical and enters the environment in air emissions, wastewater and spills connected with its use as a chemical intermediate, disinfectant and antiseptic. Phenol is released by wood stoves, in vehicle exhaust and other industrial processes.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to phenol may include:

- Inhalation and dermal contact in the workplace where phenol is manufactured, used or disposed of.
- Inhalation of ambient air, ingestion of food and lozenges and dermal contact with disinfects and other consumer products containing phenol.

ENVIRONMENTAL FATE AND BEHAVIOUR

- If released to the environment, phenol's primary removal mechanism is biodegradation which is generally rapid (days). Phenol rapidly degrades in sewage, soil, fresh water and seawater.
- In the atmosphere, Phenol occurs as a vapour and reacts with photochemically-produced hydroxyl radicals.
- Sensitized photolysis may be important in the atmosphere.
- Phenol has been shown to be readily removed from the atmosphere by rain.

- Acclimation of resident populations of microorganisms is rapid. Under anaerobic conditions degradation is slower and microbial adaptation periods longer. If Phenol is released to soil, it will readily leach and biodegrade.
- Phenol does not bio-concentrate in aquatic organisms.

TOXICITY

- Phenol is toxic; inhalation, ingestion, or dermal contact with material may cause severe injury or death.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Guidelines

Jurisdiction	**Guidelines (μg/m^3)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta		100			
Texas		150			15
Ontario	100			30	

Adapted from:
ChemBank HSDB, IRIS, RTECS toxicity profiles.

Chemical Fact Sheets

Polycyclic Aromatic Hydrocarbons (PAHs)
CAS No. 130498-29-2

There is no chemical formula because PAHs are a mixture of many different chemicals.

WHAT ARE POLYCYCLIC AROMATIC HYDROCARBONS?

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot. Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids.

USES

Some PAHs are used in the production of medicines, dyes, plastics and pesticides. They are also used in the preservation of wood, as a component of creosote and coal tar.

SOURCES

Natural sources of PAHs to the environment include volcanoes and forest fires. PAHs are found in coal tar, crude oil, creosote, and roofing tar, and are emitted to the environment as a result of the production, use and disposal of these materials. Other sources include the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. Automobile exhaust and cigarette smoke contain PAHs.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to polycyclic aromatic hydrocarbons might include:

- Inhalation of air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- Inhalation of air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Dermal contact with air, water, or soil near hazardous waste sites.
- Ingestion of grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Ingestion of contaminated water or cow's milk.

Ambient air concentrations of PAHs, on the whole, were not reported in 1997 or 1998 in Alberta.

ENVIRONMENTAL FATE AND BEHAVIOUR

- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.
- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They adsorb to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to adsorb tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

TOXICITY

- The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.
- Inhalation of, and dermal contact with, certain mixtures of PAHs and other chemicals for long periods of time have been shown to cause cancer.

OBJECTIVES AND GUIDELINES

Objectives or guidelines for polycyclic aromatic hydrocarbons, on the whole, are not in place in Alberta, Texas or Ontario. Jurisdictions may elect to put objectives or guidelines in place for individual PAHs.

Adapted from:
Polycyclic Aromatic Hydrocarbons (PAHs) ToxFAQs. Agency for Toxic Substances and Disease Registry. http://www.atsdr.cdc.gov/toxfaq.html.

Chemical Fact Sheets

Propylene oxide, C_3H_6O
CAS No. 75-56-9

WHAT IS PROPYLENE OXIDE?

Propylene oxide is a colourless, ethereal liquid with a sweet, alcoholic odor. In foods, Propylene oxide has no residual odor.

USES

Propylene oxide is used for sterilization of packaged food products in fumigation chambers, and as a method of control of salmonella in meat scraps. It is also used as a herbicide. Propylene oxide is a chemical intermediate in the preparation of many industrial chemicals, such as polyurethane polyols, propylene glycol, dipropylene glycol, glycol ethers and nonpolyurethane polyols, among others. It is used in the preparation of lubricants, surfactants and oil demulsifiers, and is an important solvent, fumigant and soil sterilant.

SOURCES

Sources of propylene oxide include industries involved in the production, storage, transport, and use of propylene oxide. The major release of propylene oxide into the environment is expected to occur during its production or use as an intermediate or as a fumigant and a soil sterilant. In addition to its industrial uses, Propylene oxide may be emitted to the atmosphere in automobile exhaust and combustion exhausts of stationary sources that burn hydrocarbons.

No releases of propylene oxide were reported to the NPRI in 2001.

ENVIRONMENTAL LEVELS AND EXPOSURE

Exposure to propylene oxide might include:
- Inhalation of air in the workplace, where production and use of propylene oxide is involved.

Ambient air concentrations of propylene oxide were not reported in 1997 or 1998 in Alberta.

ENVIRONMENTAL FATE AND BEHAVIOUR

- If released to the atmosphere, propylene oxide will react in the vapour phase with photochemically produced hydroxyl radicals.
- Physical removal of propylene oxide from the ambient atmosphere is not expected to be generally important, although localized wash-out due to rainfall may occur.
- If released to soil, propylene oxide is expected to be susceptible to leaching and chemical hydrolysis in moist soils. It is expected to evaporate rapidly from dry soil surfaces; evaporation from wet soils may also occur, but at a rate diminished by leaching.
- Volatilization of propylene oxide from the aquatic environment may be an important transport mechanism.

TOXICITY

- Propylene oxide is classified toxicologically as a primary irritant, a mild protoplasmic protein and a mild depressant of Central Nervous System activity.
- Contact with skin may result in irritation and necrosis of skin.
- Excessive exposure to vapor irritates eyes, upper respiratory tract and lung.
- Central Nervous System effects consist of incoordination, ataxia & general depression.
- Chromosomal aberrations have been reported in workers exposed to propylene oxide.
- The US Department of Health and Human Services has determined that propylene oxide can reasonably be anticipated to be a human carcinogen.

OBJECTIVES AND GUIDELINES

Ambient Air Quality Objectives and Guidelines

Jurisdiction	**Guidelines (μg/m^3)**				
	0.5hr	**1hr**	**8hr**	**24hr**	**Annual**
Alberta		480			30
Texas		70			7
Ontario	4.5			1.5	

Adapted from:
ChemBank HSDB, IRIS, RTECS toxicity profiles.