

Keeping Chemicals Out of Our Drinking Water Sources

What can I do to help?

Dispose of hazardous wastes properly:

- Take batteries, paint and other hazardous waste from your home or property to your municipal hazardous waste site or waste disposal days. Contact your local municipal office for dates or visit this website: **makethedrop.ca**
- If you need to buy cleaners, find the least toxic one and only buy what you need to do the job. Look for natural and safe alternatives, like vinegar, when possible. Check your home to see if you have any already before buying more.
- Talk to your local store or supplier. Ask about alternatives that don't contain harmful chemicals.
- Visit sourcewaterinfo.on.ca or abca.on.ca and mvca.on.ca or phone us to find out more.



Your efforts to keep chemicals out of our water will help keep this and future generations safe. (Dan Holm Photo)

- Check the labels on products in your home. If a product is flammable or corrosive or hazardous, it may contain chemicals that could contaminate a drinking water source. Properly dispose of it.

Keep Out!

Some of these chemicals may be on your property – thank you for properly disposing of them (for example, at hazardous waste disposal days or sites) to keep these toxins out of our drinking water sources.

Types of products	Common names or trade names	Some chemical examples
Degreasers	• Varsol • Turpentine	• Acetone • Methyl hydrate
Paints Paint thinners Furniture strippers Paint removers Coolants, cleaners	• Acetone • Turpentine • Various others	• Chlorinated solvents • Toluene • Tetrachloroethylene (PCE) / Perchloroethylene (PCE) • Trichloroethylene (TCE)
Enamels and lacquers	• Varathane	• Hydrocote • Toluene
Glues and adhesives	• Epoxy	• Polyurethane
Resins	• PVC resin	• Urea formaldehyde
PCBs	• Polychlorinated Biphenyls	• Industrial
Creosote	• Coal and tar distillates • Wood production	• Benzene • Toluene • Ethylbenzene • Xylenes • PAHs
<i>These are just some of the chemical threats that you can help keep out of drinking water sources</i>		

What types of chemicals are threats?

The Ontario *Clean Water Act, 2006* lists 21 main activities that can threaten drinking water. They include activities that could, if not properly managed, lead to chemicals, pathogens, or dense non-aqueous phase liquids (DNAPLs) from reaching water sources. The following is a partial list some of the chemical threats which may exist on your property and on your shelves:

- **Pesticides**

Sources may include lawn care, residential or agricultural application, forestry management, other chemicals. Pesticides tend to be soluble aqueous phase liquids – but are still toxic and need to be kept out of our water sources. Dense non-aqueous phase liquids may also have been used in their manufacture.

- **Inorganic contaminants**

Sources may include inorganic fertilizers, road salt or other sources.

- **Chlorinated solvents**

Sources may include dry cleaning fluids, metal de-greasers and many more mixtures commonly found in residential, municipal, agricultural or industrial and commercial properties.

- **Dense non-aqueous phase liquids**

Please see accompanying fact sheet on these particularly threatening chemicals.

The provincial threats table lists five key chemical threats that are Dense Non-Aqueous Phase Liquids (DNAPLs).

They are:

- **Dioxane-1,4**
- **Polycyclic Aromatic Hydrocarbons (PAHs)**
- **Tetrachloroethylene (PCE)**
- **Trichloroethylene**
- **Vinyl chloride**

See accompanying fact sheet on DNAPLs to find out why these chemicals are of particular concern. Non-aqueous phase liquid threats also appear in other sections of the provincial list of threats and Tables of Circumstances (such as establishment, operation or maintenance of a waste disposal site). Local source protection committees may also add certain threats in certain circumstances.

Chemicals in the category related to application of pesticides to land include:

- **Atrazine**
- **Dicamba**
- **Dichlorophenoxy Acetic Acid (D-2,4)**
- **Dichloropropene-1,3**
- **Glyphosate**
- **MCPA**
(2-methyl-4-chlorophenoxyacetic acid)
- **MCPB**
(4-(4-chloro-2-methylphenoxy)butanoic acid)
- **Mecoprop**
- **Metalaxyl**
- **Metolachlor or s-Metolachlor**
- **Pendimethalin**

Chemicals related to the “handling and storage of fuel” include:

- **BTEX**
- **Petroleum Hydrocarbons**

Chemicals related to the handling and storage of an organic solvent include:

- **Carbon tetrachloride**
- **Chloroform**
- **Methylene chloride**
- **Pentachlorophenol**

For more information see the Tables of Circumstances and other bulletins at the Province of Ontario’s Drinking Water Ontario website at: ontario.ca



Ausable Bayfield
Maitland Valley
Source Protection
Region

Ausable Bayfield Maitland Valley Drinking Water Source Protection Region

c/o 71108 Morrison Line, RR 3 Exeter, ON N0M 1S5

Phone: 519-235-2610 • 519-335-3557 • 1-888-286-2610

sourcewaterinfo.on.ca



This project has received funding support from the Ontario Ministry of the Environment and Climate Change. Such support does not indicate endorsement by the Ministry of the contents of the material. This publication created for local information purposes and may be subject to change.

March 2015 – For local information purposes – Subject to change • Visit ontario.ca for legislation and regulations.

Dense Non-Aqueous Phase Liquids

What are DNAPLs?

... and why is it so important that I help to keep them out of our water sources?

Dense non-aqueous phase liquids (DNAPLs) are contaminants that are especially threatening to our drinking water sources.

These substances are denser than water. Therefore, they can sink into the ground, below the water table and pollute an entire aquifer. Monitoring wells may not detect their presence as they are found at the bottom of aquifers instead of floating on the water table. Many of these liquids are proven, or suspected, of being carcinogenic (cancer causing).

Spills of DNAPLs are even more difficult to handle than spills of petroleum products. It is extremely expensive and difficult – or even impossible – to clean up DNAPLs once they have contaminated water sources. Except in large cities, drinking water is rarely tested for these contaminants (according to an Environment Canada fact sheet).

These are some of the reasons why it is so important we prevent these toxic mixtures from ever reaching our drinking water.

Examples of these chemical mixtures can be found in many homes, industries, commercial businesses, farms, landfill sites, municipal properties, and other properties.

These DNAPLs include chemicals used by some commercial dry cleaners to the production of pesticide mixtures applied on residential or farm land, to brake cleaner and other chemicals used in a service station to household items like spot removers, glues and adhesives, varnishes, furniture



The efforts by you and your community to keep chemicals like these out of your water sources is vital to preserving healthy, clean water. Dense, non-aqueous phase liquids like furniture stripper can be particularly threatening to water.

stripper, aerosols, degreasers, coolants, nail polish/remover, or cleaners.

You have a very important role to play in keeping these toxic chemicals out of our water sources. One way is to make sure you dispose of hazardous wastes at a local hazardous waste day or approved site. Contact your local municipality to find out when your next hazardous waste day takes place or if there is a location you can take them.

Trained staff are updating information on what chemicals and pathogens exist near our drinking water sources so plans can reduce the risk of these substances reaching our water. The local source protection committee has developed proposed plans to address these threats.

For information on threats assessment, source protection planning, risk management plans, or financial incentive programs,

call us. The contact information is located on the accompanying brochure *Keeping Chemicals Out of Our Drinking Water Sources*.



Don't throw your batteries out in the garbage!
Take them to a municipal Hazardous Waste Day.

What are examples of DNAPLs?

Dense non-aqueous phase liquids (DNAPLs) are threats to human health and, because of their chemical composition and density, are particular threats to drinking water sources.

DNAPLs may be present in homes, businesses, farms, municipal operations, and other properties.

These liquids include chlorinated solvents and cleaners and polychlorinated biphenyls (PCBs). There are also 'mixed' DNAPLs including coal tar and creosote.

These chemicals – often highly toxic – can find their way into groundwater or surface water through means such as landfill sites or industrial sites, among others.

Where might DNAPLs be found?

These chemical threats have been used in the production of drugs, in dry cleaning, in metal degreasing, in the creation of pesticides, paint stripping, in manufacturing of cars, steels and aircraft and the manufacturing of electronics – and through other means.

Properly disposing of hazardous waste is one way you can help protect water sources. Proper containment is another.

The "handling and storage of a dense non-aqueous phase liquid" is one of 21 drinking water threat activity categories under the General Regulation of the Ontario *Clean Water Act, 2006*. The DNAPL category of the provincial list of threats, and Tables of Circumstances, itemizes some key chemical threats related to handling and storage of these chemical mixtures:

- **Dioxane-1,4**
- **Polycyclic Aromatic Hydrocarbons (PAHs)**
- **Tetrachloroethylene (PCE)**
- **Trichloroethylene**
- **Vinyl chloride**

Chemicals, including non-aqueous phase liquids, can threaten both groundwater and surface water sources and human health. That's why your continued efforts to properly store and dispose of these chemicals is so important.

DNAPLs aren't the only threats. Other toxic chemicals can be found in other categories of the threats list – for instance, under pesticide handling and storage or application. See accompanying brochure, *Keeping Chemicals Out of Our Drinking Water Sources*.



What are LNAPLs?

Light Non-Aqueous Phase Liquids

Now, that we have informed you about DNAPLs we would take this opportunity to introduce you to another set of drinking water threats: LNAPLs. These are 'Light Non-Aqueous Phase Liquids.'

These include all hydrocarbons, like oil and gas.

Like DNAPLs, these liquids don't generally mix with water. However, unlike the denser liquids, LNAPLs are less dense than water. They generally float on top of the water – not sink to the bottom. But – they're still highly toxic.

LNAPL contaminants include BTEX:

- **Benzene**
- **Toluene**
- **Ethylbenzene**
- **Xylenes (total)**

Common products that may contain DNAPLs or LNAPLs

Common products on local properties that may contain light (or dense) non-aqueous phase liquids include:

- Cleaners and manufacturing solvents
- Glues and adhesives
- Dry cleaning fluids in some operations
- Paint removers
- Aerosols
- Printing inks
- Cosmetics, nail polish or nail polish remover
- Auto engine coolant
- Brake cleaner
- Metal degreasers
- Others ...

Assessment reports for this region document potential significant drinking water threats from these chemicals and source protection planning policies by the local Ausable Bayfield Maitland Valley Drinking Water Source Protection Committee can help reduce the risk of these or other chemicals from contaminating your water.

What chemicals might be located on my property?

Dense, Non-Aqueous Phase Liquids (DNAPLs) are usually toxic, heavier than water, and can sink below the water table.

* Asterisk denotes chemicals listed in the CWA threats table category for DNAPLs. Other chemicals may appear in other categories such as pesticides.

Chlorinated solvents are used in: Electronics manufacturing • Solvent production • Pesticide/herbicide manufacturing • Dry cleaning • Instrument manufacturing • Solvent recycling • Engine and steel product manufacturing • Chemical production • Rocket engine/fuel manufacturing • Aircraft cleaning/engine degreasing. • Other home, municipal, farm and business uses. **They are used in processes such as:** Metal cleaning and machining • Tool and die operations • Vapour and liquid degreasers • Paint stripping (NOTE: Some of these chemicals may no longer be in common use.)

Common present or past uses	Common names or trade names	Chemical names
Solvent that removes grease from metal parts. • dry cleaning • extractions • chlorinated solvent • industrial solvent • metal degreaser	TCE • Trichlor • Trike • Tricky • Tri • Trimar • Trilene • ethinyl trichloride • Tri-Clene • Trielene • Trichloran • Trichloren • Algylen • Trimar • Trethylene • Westrosol • Chlorlylen • Gemalgene • Germalgene	• Trichloroethylene (TCE) *
Dry cleaning • metal cleaning • intermediates in processes • brake cleaner • paint remover • textile production processes	Tetrachloroethylene • ethylene • tetrachloride • Nema • Tetracap • Tetropil • Perclene • Ankilostin • PerSec	• Tetrachloroethylene (PCE) * Also: Perchloroethylene (PCE)
Automotive coolant • manufacturing solvent • soaps, shampoos, baby lotions • cosmetics • fumigants	Underground Storage DNAPL	• Dioxane – 1,4 *
Byproducts of fuel burning • Found in oil and coal deposits	PAHs • benzo[a]pyrene is an example • naphthalene and phenanthrene are other examples	• Polycyclic Aromatic Hydrocarbons (PAHs) *
Widely used plastic • aerosols • pipes • bottles • hair spray	• VCM • Used to create polymer polyvinyl chloride (PVC) • Vinyl chloride monomer • Chloroethene • Chloroethylene	• Vinyl chloride *

Other threat activities are found in the provincial list of threats and Tables of Circumstances – e.g., operation of a waste disposal site, or may be added by committees in certain cases. Here are more DNAPLs and chemical contaminants to keep out of our water:

Thermometers • barometers • phosphorous tubes	Element HG • A toxic metal in liquid form • “The ultimate DNAPL” – highly dense	• Mercury (HG)
Paint stripper • metal cleaning • pharmaceuticals • aerosols • acetate films • electronics • urethane foam	DCM • methylene chloride • methylene dichloride • methylene bichloride	• Dichloromethane (DCM)
Metal cleaning • adhesives • aerosols • inks • cold cleaning • electronics • aerosol paint concentrates	TCA • methyl chloroform • Chlorothene • Solvent 111 • Tri-ethane	• 1,1,1 –Trichloroethane (TCA)
Solvent • degreaser • pesticide formulation	Organic halogen compound	• Chlorobenzene
Fluorocarbon synthesis • fire extinguishers • refrigeration • electronics • sterilization	Carbon chloride • methane tetrachloride • benziform • perchloromethane • tetrachloroethane • Benzinoform • Freon 10 • Halon 104 • Tetraform • Tetrasol	• Carbon tetrachloride (CTC)
Solvent • Insecticide • Used in pesticides	ortho-dichlorobenzene • organic comp. • benzene der.	• 1,2 – Dichlorobenzene
Solvent • chemical intermediate for dyes, pigment • commonly used in agrochemicals • insecticide • fungicide	M-dichlorobenzene • an organic halogen compound	• 1,3 – Dichlorobenzene
Fumigant • gasoline additive • pesticide • used in dye and wax preparation	ethylene dibromide • ethylene bromide	• 1,2 – Dibromoethane (EDB)
Solvent • Used in herbicide, pigment, dye production	Chlorination of benzene results in this byproduct	• 1,2,4 – Trichlorobenzene [also: 1,1,2 Tri.]
Chlorinated solvent • Creation of semiconductors	DCE • An organochloride	• Dichloroethylene (DCE)
Solvent for fats, greases • fire extinguishers	Carbon tetrachloride • Benziform • Carbon chloride • Methane tetrachloride • Perchloromethane • Carbon tet • Benzinoform • Tetraform • Tetrasol • Freon 10 • Halon 104	• Tetrachloromethane
Fluorocarbon synthesis • pharmaceuticals • Re-agent • solvent for adhesives, fats, rubbers, oils, pesticides • dyes	Part of group of compounds called trihalomethanes • methyl trichloride	• Chloroform, Trichloromethane (TCM)

Polychlorinated Biphenyls (PCBs) PCBs may also have been mixed with aschlorobenzenes and/or mineral oil – as “carrier fluids.”

PCBs (Polychlorinated Biphenyls)	Congeners, Aroclor (1221, 1232, 1242, 1248, 1254)	PCBs (Polychlorinated Biphenyls)
----------------------------------	---	----------------------------------

More chemicals listed on back of this page.

Pull-out Technical DNAPL and Chemical Reference Sheet

What other chemicals might be located on my property?

Continued from previous page

Pesticides (Some examples)

Chlordane • Chloropicrin • 1,2-Dibromo-3-chloropropane • 1,2-Dichloropropane • 1,2-Dichloropropylene • Dichlorvos • Disulfoton • Ethion • Ethylene dibromide • Malathion • Parathion • Chlordane – Domestic and agricultural pesticide

Mixed DNAPLs

A DNAPL that is composed of two or more chemical compounds is referred to as a multi-component DNAPL. Creosote and coal tar are examples.

Common present or past uses

• Toluene can be found in nail polishes, paints, lacquers • solvent • feedstock • produced in making of gasoline

Common names or trade names

Toluene – methylbenzene

Chemical contaminant

Mixed DNAPL solvents may contain: • toluene • 1,1,1-TCA • TCE • PCE • m-xylene • o,p-xylene • 1,2,4-TCB • PCB-1242 • PCB-1254

Creosote

Creosote contains many hydrocarbons and is made up of coal tar distillates. It was at one time used to treat wood products and in roofing and road tars.

Acid extractable

Phenol • cresols • pentachlorophenol • xylenols • 2,3,5-trimethylphenol

Base/neutral

• Naphthalene • methyl-naphthalenes • biphenyl • dimethyl-naphthalenes • acenaphthene • fluorene • phenanthrene • anthracene • pyrene • chrysene • anthraquinone • 2,3-benzo[b]pyrene • methylanthracene • benzo[a]pyrene • diphenyldimethylnaphthylene • diphenyloxide

Heterocyclic

• Quinoline • isoquinoline • carbazole • 2,4-dimethylpyridine • benzo[b]thiophene • dibenzothiophene • dibenzofuran

Coal tar

Coal tar can contain hundreds of hydrocarbons. It can be created from coal gasification or be a blast furnace coke production by-product. It can contain fractions of oils as well as anthracene oil and pitch. Coal tar compounds include: Benzene • Toluene • Ethylbenzene • Xylenes • PAHs.

Some other chemicals

**Halogens /
Some halogenated organics**

- Benzyl chloride
- Bromobenzene
- Bromochloromethane
- Bromodichloromethane Bromoform (e.g., solvent for waxes, greases, oils)
- 4-Bromophenyl phenyl ether
- bis(2-Chloroethyl) ether 2-Chloroethyl vinyl ether
- 1-Chloro-1-nitropropane
- 4-Chlorophenyl phenyl ether
- Dibromochloromethane
- 1,1-Dichloromethane (e.g., paint strippers)
- 1,2-Difluorotetrachloroethane
- 1-Iodopropane
- Hexachlorodibutadiene
- Pentachloroethane
- 1,1,2,2-Tetrabromoethane
- 1,1,2,2-Tetrachloroethane
- 1,2,3-Trichloropropane
- 1,1,2-Trichloro-1,2,2-trifluoroethane

**Substituted aromatics, phthalates,
and miscellaneous organics**

- Chloroanilines
- Chlorotoluenes
- Nitrotoluenes
- Nitrobenzene
- Benzyl butyl phthalate
- Di-n-butyl phthalate
- Diethyl phthalate
- o-Anisidine
- Phenyl ether
- Tri-o-cresol phosphate

Some information courtesy Groundwater Protection and Restoration Group (University of Sheffield) [<http://www.dnapl.group.shef.ac.uk/main.htm>] and Pankow, James F. & Cherry, John A. (eds.). *Dense Chlorinated Solvents and other DNAPLs in Groundwater*, Portland, Oregon: Waterloo Press, 1996.

Some other chemicals of concern

Common use or name

Contaminant

Nail polish remover

Acetone

Petroleum, varnishes

Benzene

Many other chemicals may also be of concern: ethylene glycol (e.g., antifreeze), methyl alcohol (e.g. windshield washer fluid), chlorodibromomethane, dichloroethane, phenol, and others