

3.2 Handling and Storage of Dense Non-Aqueous Phase Liquids (DNAPLs) and Organic Solvents

What is the Threat to Drinking Water

This discussion paper provides the background information to assist in the development of policy related to the storage and handling of dense non-aqueous phase liquid (DNAPLs) (drinking water threat 16) and organic solvents (drinking water threat 17). A DNAPL is a heavier than water organic liquid that is immiscible or sparingly soluble in water. They sink to the bottom of groundwater aquifers and surface water bodies as a separate phase liquid. DNAPLs distributes quickly in the environment, adsorb onto the geologic media and then slowly leach from the contaminating sources creating a dissolve-phase contaminant plume down gradient of these sources. The slow solubilization of the contaminant mass can take decades or centuries before being depleted.

The majority of DNAPL and organic solvents are used in industrial and commercial applications. These chemicals can also be found in small quantities in common household products such as paints, adhesives, and have been present historically in even smaller / trace quantities in other products (i.e., shampoo, cosmetics), having been significantly phased out of such products over recent times.

DNAPLs pose a large risk to drinking water due to their toxicity and how difficult they are to clean up. Until recently the United States Environmental Protection Agency (USEPA) has considered the cleanup of most major DNAPL sites “technically impractical”. Some technologies are now commercially available but are extraordinarily expensive to implement. Organic solvents can be found in the liquid, solid or gas state, and are used to dissolve or disperse other materials or substances (i.e. other organic materials that can be a liquid, solid or gas). Organic solvents present a risk to drinking water due to their toxicity and quick and extensive migration.

DNAPLs and organic solvents, which are often found together at contaminated sites, have been combined into one discussion paper due to similarities in their uses. These chemicals can also be found in small quantities in common household products (ex. adhesives and cleaners). Both DNAPLs and organic solvents pose health issues in a dissolved state. It is assumed that DNAPLs and organic solvents are being dealt with as a “pure” product or as a major constituent as opposed to a trace element in a mixture. For example, 1,4 dioxane is present in trace quantities in shampoo, cosmetics and deodorant. PAHs are produced in trace quantities from combustion processes (i.e. bonfire, BBQ, cigarette and car emissions) and need to be differentiated from DNAPLs containing PAHs. The tables of drinking water threats do not distinguish between or define “pure-phase” product versus “trace quantities”.

A primary objective of the Clean Water Act 2006 is to eliminate or manage significant drinking water threats such that they cease to be significant. As a result, the main consideration for reducing or eliminating drinking water threats related to the handling and storage of DNAPLs and organic solvents is to make sure they do not enter surface water and/or groundwater.

What Causes the Activity to be a Drinking Water Threat

DNAPLs and organic solvents, particularly those listed in the MOE Tables of Drinking Water Threats (Ontario Ministry of the Environment, 2009), have been readily used in vast quantities for decades in industrial and commercial applications such as dry cleaning, cleaning / degreasing solvents, electronics, aerosols, plastics, pesticides, pharmaceuticals, wood preservation, asphalt operations, varnishes and the repair of motor vehicles and equipment. These threats are identified in the Tables of Drinking Water Threats as separate categories. In considering which category a chemical is included in, it is important to take into account the circumstances of the activity, which include the chemical of concern. Only those chemicals of concern, which are listed, are currently

considered as threats. Although it is possible to request that the MOE approve other chemicals as local threats, only a few such requests have been submitted to the province and none have been requested for the Thames-Sydenham and Region. The Source Protection Committee is not aware that any DNAPL or organic solvents have been added as local threats. It is possible that chemicals added in regions as local threats will get added to the list of drinking water threats when the province review and updates that list.

There is considerable overlap between classes of chemicals from which these two threats are named. For example many of the organic solvents listed are also DNAPLs based on their physical characteristics. For the purposes of assessing the risk and level of threat of an activity involving one of these chemicals it is important to refer to the circumstances and in particular the chemicals of concern which are identified in the circumstances. The threat does not pertain to all chemicals which are DNAPLs or organic solvents, only those which are listed. Further to determine the circumstances which affect the level of threat of the chemical it is also important to refer to the circumstances and not to the chemical family or physical properties.

DNAPLs and organic solvents are discussed in general in the following sections. The specific chemical included in each threat within the Tables of Drinking Water Threats is also discussed.

Dense Non-Aqueous Phase Liquids (DNAPL)

In general, a DNAPL that is composed only of one chemical compound is referred to as a single component DNAPL. Dry cleaning fluid (typically tetrachloroethylene) is an example of this. 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 of multi-component DNAPL. Whether a single component or a multi-component DNAPL exists at a site depends on past uses of the various compounds at the site and the methods of disposal. A number of DNAPLs included as chemicals of concern in the drinking water source protection program are on Environment Canada's Priority Substance List and Toxic Substances List.

The common characteristic of the DNAPLs are that they are denser than water and pose health issues in a dissolved state. However, the characteristics of the listed DNAPL compounds and their influence on the environment vary considerably. Solvents such as 1,4-Dioxane are marginally more dense than water and quite miscible (soluble) in water while PAH's, which are associated with coal tars and creosote, are much denser than water, have a variable composition and are far less miscible in water. Experience from reclamation of sites from the past 20-30 years has demonstrated that DNAPL sites are difficult to investigate and challenging to remediate. DNAPL can penetrate fractured rock and clay and, in most hydrogeological environments, many decades are required for natural groundwater dissolution to dissipate DNAPL sources.

The MOE Tables of Drinking Water Threats (Ontario Ministry of the Environment, 2009) identify five (5) DNAPLs whose handling and storage are considered drinking water threats (circumstances 102 to 111, 1098 to 1112, and 1225 to 1272 respectively). The following chemicals are listed as drinking water threats in certain situations:

- 1,4-Dioxane (solvent) is used primarily as a solvent in the manufacture of pharmaceuticals, veterinary drugs and natural health products, for research and development and as a laboratory reagent. It is also used as a solvent in paints, varnishes, lacquers, cosmetics, deodorants, cleaning and detergent preparations and in scintillating fluids. It is also used in the processing of refining, petrochemicals, pulp and paper, explosives, commercial printing, electroplating/polishing, pesticide and agricultural manufacturing to name a few. It has been used with chlorinated solvents as a stabilizer and corrosion inhibitor. Due to its widespread use as a stabilizer for chlorinated solvents, it is often detected frequently at sites contaminated with chlorinated solvents. Production of the chemical has fallen significantly since 1982, in part due to many compounds containing 1,4-Dioxane have been banned and only one manufacturer produces the compound in the US.
- Tetrachloroethylene (Perchloroethylene [PCE]) (chlorinated solvent)-Chlorinated solvents often have several names related to their chemical formulas. For example tetrachloroethylene is also known as

Perchloroethene; Perchloroethylene; Perc and PCE. Tetrachloroethylene or PCE is one of the most widely detected organic chemicals at contaminated sites and is the second most commonly detected volatile organic compound in aquifers and the third most commonly detected compound at concentrations of concern to human health from private and public water supplies. PCE is not manufactured in Canada but is imported from the U.S and other countries for use in dry cleaning operations, degreasing metal, and as a solvent and chemical intermediate. Despite its considerable historical usage these products have fallen out of favour in usage due to its well known threat on the environment and newer 'greener' chemical formulations have replaced it.

PCE is leached more readily in sandy soils and it volatilizes more readily in dry soil. Unlike some other contaminants, chlorinated solvents have high taste and odor thresholds, meaning that people do not taste or smell the compounds in water until a relatively high concentration. Taste thresholds are highly dependent on the individual but chlorinated solvents have taste thresholds around several hundred ug/L.

- Trichloroethylene [TCE] (trichloroethene)- TCE is a widely used solvent for numerous applications and is a clear, colourless, non-flammable liquid that evaporates quickly and has a sweet chloroform-like scent. The chemical is used primarily as a large volume degreasing agent for metal and electronic parts. It is also used in extracting oils, waxes, and fats, and as a solvent for cellulose. It is also used as a refrigerant and heat exchange fluid, fumigant, carrier agent in paints and adhesives and as a feedstock for manufacturing organic chemicals. TCE is not manufactured in Canada.

In homes TCE can be found in typewriter correction fluid, paint, spot removers, carpet cleaning fluids, metal cleaners and varnishes.

- Vinyl Chloride [VC] Vinyl Chloride is a colourless, flammable, explosive gas and has a pleasant, ether-like odour at low concentrations. Most of the Canadian production of vinyl chloride was used to manufacture polyvinyl chloride (PVC). PVC is used widely in electrical wire, insulation, cables, pipes and when made more flexible with the addition of plasticizers inflatable toys.

VC is a synthetic chemical with no natural sources. VC is also formed by the breakdown of other DNAPL such as TCE and PCE in groundwater.

The low water solubility of VC indicates that any VC released to surface water will migrate rapidly to air, where it will be photodegraded in a few hours. VC that is released to the ground does not adsorb onto soil; any that does not evaporate migrates readily to groundwater, where it is expected to remain for months to years. VC does not bio-accumulate in animals or food chains. PVC pipes have been used for conveying potable water. The World Health Organization has concluded that the occurrence of VC in potable water is primarily associated with the use of PVC water pipes.

- Polycyclic Aromatic Hydrocarbons [PAHs] PAHs are traditionally atmospheric pollutants (16 in total). PAHs are commonly associated with coal tar as a product but represent carbon compound commonly found in incomplete combustion reactions. PAHs occur in oil, coal, and tar deposits, and are produced as byproducts of fuel burning (fossil fuel or biomass). PAHs are found in most burnt substances due to incomplete combustion of organic materials (i.e. cooked foods). Studies have shown that high levels of PAHs are found, in meat cooked at high temperature such as grilling or barbecuing and in smoked fish. As a pollutant, they are of concern because some compounds have been identified as carcinogenic (cancer producing), mutagenic (capable of inducing mutation), and teratogenic (able to disturb the growth and development of an [embryo](#) or [fetus](#)).

Thus PAHs when produced in trace quantities from combustion processes (i.e. a bonfire, BBQ, cigarette, car emissions) need to be differentiated from DNAPL liquids containing PAHs. This is noted since the PAHs can be found throughout the environment as combustible by-products (i.e. soot and smoke) but in this form it is suggested that the PAHs do not possess the DNAPL properties that coal tar does in moving through the environment.

PAHs are relatively immobile in the environment, but are recalcitrant and unlikely to breakdown over time even when measured in years and decades.

These 5 particular chemicals or compounds have historically been produced in large quantities and are known groundwater contaminants. No volume or concentration limits exist with DNAPLs due to the fact that even relatively small releases can migrate relatively deep within the subsurface. It is however important to note that

very low concentrations of DNAPL within a mixture lose some of the physical characteristics which make the pure substance a DNAPL.

Organic Solvents

Organic solvents refer to organic chemistry which involves the study of carbon based compounds, such as hydrocarbons, and their derivatives. These compounds may contain any number of other elements, including hydrogen, nitrogen, oxygen, halogens as well as phosphorus, silicon and sulfur. Many organic solvents, including some of those included in this category of drinking water threat, also exhibit the physical properties of a DNAPL. It is important to realize that they are distinguished from those chemicals included in the DNAPL category of drinking water threats. Four chemicals are identified as organic solvents in the Tables of Drinking Water Threats.

- Carbon tetrachloride is also known by many other names. It was formerly widely used in fire extinguishers, as a precursor to refrigerants, and as a cleaning agent. It is a colourless liquid with a "sweet" smell that can be detected at low levels and has practically no flammability at lower temperatures. The production of carbon tetrachloride has steeply declined since the 1980s due to environmental concerns and the decreased demand for Chlorofluorocarbons (CFC), which were derived from carbon tetrachloride.
- Chloroform is an organic compound that is colorless, sweet-smelling, dense liquid. Several million tons are produced annually as a precursor to Teflon and refrigerants, but its use for refrigerants is being phased out. Chloroform is used as a solvent in the pharmaceutical industry and for producing dyes and pesticides. Chloroform was once used as an anesthetic as its vapor depresses the central nervous system of a patient. Due to its toxicity, it is no longer used.
- Methylene chloride (Dichloromethane) is a widely used organic solvent that is a colorless, volatile liquid with a moderately sweet aroma. Although it is not miscible with water, it is miscible with many organic solvents. It is a useful solvent for many chemical processes due to its volatility and its ability to dissolve a wide range of organic compounds. Concerns about its health effects have led to a search for alternatives in many applications.
- Pentachlorophenol (PCP) is widely used as a pesticide and disinfectant. PCP has been used as a herbicide, insecticide, fungicide, algaecide, disinfectant and as an ingredient in antifouling paint. It is most commonly used to treat utility poles and railway ties. Exposure to high levels of pentachlorophenol can cause increases in body temperature, liver effects, damage to the immune system, reproductive effects, and developmental effects.

What is the Local Scale of the Drinking Water Threat

It is assumed that DNAPL and organic solvents are currently handled and stored in the majority of the vulnerable areas, and that this activity can occur in all of the vulnerable areas in the future.

DNAPL

DNAPLs are unique in Source Water Protection risk assessment as they are the only constituent that is identified as a significant threat to drinking water anywhere and at any quantity within the 5 year time of travel (TOT). The handling and storage of DNAPL is or would be a significant drinking water threat in Wellhead Protection Areas (WHPA) A, B and C. In WHPA-A, B or C the vulnerability score is not relevant in assessing the risk posed. It is also a significant threat in IPZ-1 with a vulnerability score of 10, although none of the IPZ in the Thames-Sydenham and Region have this vulnerability score.

The MOE Tables of Drinking Water Threats (Ontario Ministry of the Environment, 2009) classifies the handling and storage of a DNAPL as moderate or low drinking water threats in other vulnerable areas dependent on the vulnerability score.

Organic Solvents

The classification of the handling and storage of an organic solvent as a significant, moderate or low drinking water threat is dependent on the vulnerability score, as well as the quantity of organic solvent stored (either above or below grade). The circumstances in the MOE Tables of Drinking Water Threats (Ontario Ministry of the Environment, 2009) consider four categories of volumes:

- less than 25 L,
- between 25 L and 250 L,
- between 250 L and 2500 L, and
- greater than 2500 L of organic solvent stored at a location.

In general, the greater the volume of material stored, the greater the inherent risk to drinking water. The concentration of chemical is not identified in the circumstances. It is interpreted that the volume refers to the volume of the product containing the chemical of concern rather than the equivalent volume of the chemical of concern within the product. In this way concentration is irrelevant, however as discussed earlier it is not intended that trace amounts of the chemical of concern within a product constitute a drinking water threat.

This activity is or would be a significant drinking water threat in WHPAs A and B with a vulnerability score of 10 and in IPZ-1 with a vulnerability score of 10. Also, organic solvents could be a moderate drinking or low water threat other vulnerable areas depending on the vulnerability score.

The table below indicates the local scale of the handling and storage of DNAPLs and organic solvents within the Thames-Sydenham and Region.

Table 3-7 Local Scale of the Handling and Storage of DNAPLs and Organic Solvents

SPR	Municipality	Threat	Type	Number of Locations	Vulnerable Area WHPA	Vulnerability Score	Circumstance Description
UTR	City of London-Hyde Park	The handling and storage of DNAPLs	DNAPL	1	C	8, 6, 4	vehicle maintenance garage
UTR	Melrose	The handling and storage of DNAPLs	DNAPL	3	A	10	vehicle maintenance
UTR	Thorndale	The handling and storage of DNAPLs	DNAPL	1	B	6	municipal garage
UTR	Beachville	The handling and storage of DNAPLs	DNAPL	1	B	6, 8	
UTR	Embro	The handling and storage of DNAPLs	DNAPL	3	A, B	10	
UTR	Ingersoll	The handling and storage of DNAPLs	DNAPL	24	A, B, C	2,4, 6, 8, 10	
UTR	Mount Elgin	The handling and storage of DNAPLs	DNAPL	2	A	10	
UTR	Tavistock	The handling and storage of DNAPLs	DNAPL	14	A, B, C	4, 6, 10	
UTR	Thamesford	The handling and storage of	DNAPL	1	A, B	6, 8, 10	

Chemical Threats

SPR	Municipality	Threat	Type	Number of Locations	Vulnerable Area WHPA	Vulnerability Score	Circumstance Description
		DNAPLs					
UTR	Woodstock-urban	The handling and storage of DNAPLs	DNAPL	66	A, B, C	2, 6,10	
UTR	Woodstock-rural	The handling and storage of DNAPLs	DNAPL	2	B	6	
UTR	Mitchell	The handling and storage of DNAPLs	DNAPL	1	A	10	3, handling, 3 storage
UTR	Mitchell	The handling and storage of DNAPLs	DNAPL	2	B	6	
UTR	Stratford	The handling and storage of DNAPLs	DNAPL	5	A	10	
UTR	Stratford	The handling and storage of DNAPLs	DNAPL	4	B	6	
UTR	Stratford	The handling and storage of DNAPLs	DNAPL	1	C	4	
UTR	St.Marys	The handling and storage of DNAPLs	DNAPL	14	A,B	8, 10	12 handling, 14 storage
LTV	Highgate	The handling and storage of DNAPLs	DNAPL	1	A	10	gas station and auto maintenance
LTV	Highgate	The handling and storage of DNAPLs	DNAPL	2	B		warehousing/storage and junk yard
LTV	Ridgetown	The handling and storage of DNAPLs	DNAPL	2	A	10	building supply companies
LTV	Ridgetown	The handling and storage of DNAPLs	DNAPL	2	B	6	automotive repair and maintenance, tool and die
UTR	Ingersoll	The handling and storage of an organic solvent	Chemical	1	A	10	
UTR	Tavistock	The handling and storage of an organic solvent	Chemical	2	A	10	
UTR	St.Marys	The handling and storage of an organic solvent	Chemical	2	B	8, 10	2 storage
LTV	Ridgetown	The handling and storage of an organic solvent.	Chemical	2	A	10	building supply companies

Applicable Legislation, Policies and Programs

The following section provides a summary of the applicable legislation, policies and programs (federal, provincial, municipal and other) that address the drinking water threats associated with DNAPLs and organic solvents. The majority of information found on legislation, policies and programs generally relate to the prevention of pollution related to the handling and storage of DNAPLs and organic solvents. Pollution prevention is an important measure in reducing the risk to drinking water associated with these activities. This is noted since the cost to remediate a DNAPL spill /release is drastically larger than the cost to implement pollution prevention systems.

Table 3-8 Applicable Legislation, Policies and Programs

Level of Government	Applicable Legislation/Policies/Programs
Federal	Canadian Environmental Protection Act (Government of Canada, 1999)
	Chemistry Industry Association of Canada <ul style="list-style-type: none"> Responsible Care Program
Provincial	Toxins Reduction Act (Government of Ontario, 2009)
	Environmental Protection Act (Government of Ontario, 1990) <ul style="list-style-type: none"> Environmental Protection Act Regulation 357-General Waste Management (Government of Ontario, 1990) Environmental Protection Act Regulation 323/94 Dry Cleaners (Government of Ontario, 1994)
	Guidelines for Environmental Protection Measures at Chemical and Waste Storage Facilities (Ontario Ministry of the Environment, 2007)
	Ministry of Environment Spills Action Centre
	Ministry of Environment Pollution Prevention Office
	Best Management Practices for Industrial Sectors
	Ontario Fire Code (Office of the Fire Marshall, 1997)
	Municipal/Industrial Strategy for Abatement (MISA) (Ontario Ministry of the Environment)
Municipal	Land Use Planning <ul style="list-style-type: none"> Community Improvement Planning
	Municipal Act 2001 <ul style="list-style-type: none"> Sewer Use By-Laws
Other	Educational programs targeting DNAPL specific industries (e.g. dry cleaning plants)
	Local Awareness Campaigns: Collection/Disposal
	Pollution Prevention Resource Exchange

Federal

Canadian Environmental Protection Act (Government of Canada, 1999) (CEPA)

The *Canadian Environmental Protection Act 1999* (CEPA) gives the federal government the authority to protect the environment and public health from risks associated with pollution and dangerous substances. CEPA is a comprehensive piece of legislation that controls and regulates toxic substances and nutrients from several different sectors. Environment Canada and Health Canada are responsible for assessing threats posed by these substances and for undertaking risk reduction measures.

The majority of the DNAPLs of interest to the drinking water source protection initiatives are on the Priority Substances List. The Toxic Substances Management Policy addresses how substances on the Toxic Substances List are to be managed. There are two tracks of substances. The intent is to virtually eliminate Track 1 substances from the environment. These substances result predominantly from human activity, and are persistent

and bioaccumulative (i.e. they build-up in fatty tissues). Track 2 substances are to be managed throughout their entire life cycles (i.e. development to disposal) to prevent or minimize their release into the environment. The toxic substances of interest require full life cycle management (Track 2). Table 3-9 provides a summary of a number of risk management tools have been developed by Environment Canada.

Table 3-9 Risk Management Tools Developed by Environment Canada

Risk Management Tool	Summary
Sector Regulations	<p>Some industries that use specified chemicals are regulated in order to manage the life cycle of the chemical. Relevant chemical regulations include:</p> <ul style="list-style-type: none"> • Vinyl Chloride Release Regulation (Government of Canada, 1992) – limits the release of vinyl chloride from vinyl chloride plants and polyvinyl chloride plants; requires plans to control fugitive emissions and contingency plans; requires reporting to Environment Canada. • Solvent Degreasing Regulations (Government of Canada, 2003) – applies to degreasing operations who use more than 1000 kg of trichloroethylene (TCE) (such as big manufacturing plants) and tetrachloroethylene (PCE) each year; requires annual reporting to Environment Canada. • Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations (Government of Canada, 2003)– applies to owners and/or operators of dry-cleaning machines or facilities that use PCE, and to sellers, importers and recyclers of PCE. For dry-cleaning operations, the regulation restricts the use of PCE, requires containment systems and waste water management, record keeping and annual reporting to Environment Canada. Environment Canada enforces the regulation.
Pollution Prevention Plans	<p>Pollution prevention planning is a process that examines current operations and develops a plan to eliminate or reduce pollution at the source. The Pollution Prevention Planning Handbook (Environment Canada, 2001) was developed to help persons subject to a Pollution Prevention Planning Notice (mandatory implementation) and persons looking to voluntarily implement pollution prevention practices in their organization. For the chemicals of interest to source water protection, notification for pollution prevention planning has been made for dichloromethane (DCM) where greater than 1000 kg is used per year for aircraft paint stripping, flexible polyurethane foam blowing, industrial cleaning, or adhesives formulation activities.</p> <p>Environment Canada maintains an on-line database of pollution prevention resources that can be used to prepare a pollution prevention plan. According to Environment Canada (2001), the most common and effective pollution prevention practices are:</p> <ul style="list-style-type: none"> • Product design and reformulation; • Equipment modifications and process changes; • Materials and feedstock substitution; • Operating efficiencies and training; • Purchasing techniques and inventory management; • On-site reuse and recycling; and, • Co-operative pollution prevention action between facilities.
Environmental Performance Agreements (Environment Canada, 2001)	<p>Environmental Performance Agreements can be used to achieve specified environmental results that are significant and measurable, such as reducing the use and emission of substances on the CEPA Toxic Substances List (Environment Canada, 2001). Environment Canada can negotiate an agreement with a variety of parties ranging from a single company to sector associations. Other federal departments, provincial and municipal governments and non-governmental organizations may also be parties to these agreements.</p>
Codes of Practice (voluntary)	<p>The implementation of codes of practice is voluntary. Codes of practice identify and describe best management practices that can be used by specific industries to conserve the use of a particular chemical and minimize environmental releases. Codes of practice exist for commercial and industrial degreasing facilities, dry</p>

Risk Management Tool	Summary
	cleaning facilities, vinyl chloride manufacturing and commercial furniture refinishing. For example, the code of practice for commercial furniture refinishing and other stripping applications that use paint strippers containing dichloromethane (Environment Canada, 2003). This code identifies measures such as manual stripping, the use of low dichloromethane-containing strippers, capture and reuse of stripper.

Chemistry Industry Association of Canada (CIAC) Responsible Care Program

The Responsible Care program is a global voluntary initiative of the chemical industry that is implemented in Canada by the Chemistry Industry Association of Canada (CIAC). The intent of the program is to continuously improve the health, safety and environmental performance of companies, and to communicate with stakeholders about chemical products and processes (Responsible Care, 2010). It involves information sharing and support networks, and a rigorous system of checklists, performance indicators and verification procedures.

Provincial

Toxics Reduction Act (Government of Ontario, 2009)

Ontario has a Toxics Reduction Strategy that is focused on managing and reducing the use and creation of toxic substances to improve the protection of the environment and human health, and on informing Ontarians about toxic substances. This strategy is enacted through the *Toxics Reduction Act, 2009*.

Under the authority of Ontario Regulation 455/09 General, facilities are required to prepare toxic substance reduction plans; however, implementation of the plans is voluntary. The majority of these facilities do not likely use or create tetrachloroethylene, trichloroethylene, and vinyl chloride, which are on the list of toxic substances regulated under O. Reg. 455/09. Their actions related to these substances must be reported annually to MOE and to the public (Government of Ontario, 2009).

Environmental Protection Act (Government of Ontario, 1990)

Part X of the *Environmental Protection Act* outlines the required reporting and clean up of spills. The discharger is required to contact the MOE Spills Action Centre and the municipality in which the spill occurs. He or she is also required to contain and clean up the pollutant as quickly as possible under the circumstances, or arrange for these actions to be carried out, and to restore the spill site to pre-spill conditions.

The requirements for spill prevention and contingency plans are detailed in Ontario Regulation 224/07 (Government of Ontario, 2007). The plans could apply to spills on the property; and specifies what types of on-site spills must be reported to Spills Action Centre. All spills that egress off property must be reported.

Details on spills reporting are outlined in *Spills Reporting - A Guide to Reporting Spills and Discharges* (Ontario Ministry of the Environmental, 2007). Ontario Regulation 675/98 - Classification and Exemption of Spills and Reporting of Discharges exempts persons who have developed spill prevention and contingency plans from having to report certain spills to the Spills Action Centre (Government of Ontario, 1998).

Environmental Protection Act: Regulation 347 General – Waste Management (Government of Ontario, 1990)

In general, waste storage facilities must comply with the *Environmental Protection Act* and Regulation 347 General – Waste Management. Under the Regulation, spent DNAPL and organic solvents are considered to be hazardous wastes that must be managed throughout their life cycles (collection, storage, transportation, treatment, recovery and disposal).

Environmental Protection Act: Ontario Regulation 323/94 – Dry Cleaners (Government of Ontario, 1994)

Under O. Reg. 323/94 – Dry Cleaners, there must be at least one full-time trained employee at commercial establishments that operate dry cleaning equipment. This trained employee must have successfully completed a course in the management of solvents and wastes in connection with the operation of dry cleaning equipment. A Dry Cleaner Certification Program is offered by MOE and Seneca College.

Guidelines for Environmental Protection Measures at Chemical and Waste Storage Facilities (Ontario Ministry of the Environment, 2007)

The Guidelines for Environmental Protection Measures at Chemical and Waste Storage Facilities are intended to be used by Ontario Ministry of the Environment (MOE) staff to develop certificate of approval conditions or to promote environmental protection measures at facilities arising from inspections and in response to environmental incidents. The guidelines would also be used to assess existing storage equipment and/or spill containment provisions against a set of best practices to determine whether the design and operation of a facility presents an unacceptable risk or may result in an adverse effect. The guidelines cover a variety of topics including tank requirements, secondary containment, inspections and monitoring, and emergency preparedness

Spills Action Centre

The Ontario Ministry of the Environment (MOE) is the lead provincial agency for environmental emergencies. MOE's factsheet on "Responding to Spill and Emergencies (Ontario Ministry of the Environment, 2007) indicates that MOE operates the Spills Action Centre (SAC) which was established under the Environmental Protection Act to:

- maintain a province-wide, toll-free service for receiving, evaluating and initiating responses to notifications of spills and other urgent environmental matters that require immediate reporting to MOE on a 24-hour basis;
- serve as a provincial focal point for activities dealing with spills and related emergencies;
- liaise with other agencies on spills and related emergencies;
- maintain a provincial spill database for the Ministry; and,
- provide contingency planning functions and related spill response training.

In addition to receiving reports of spills, SAC is responsible for determining the adequacy of reported spills response activities, facilitating or triggering a response where it appears the response is inadequate, and activating a Ministry field response (on-site assessment), as required (Ontario Ministry of the Environment, 2007). MOE is expected to notify other agencies in a timely manner, and assists in warning "downstream" users or potentially affected parties. SAC Operating Procedure Cards, which are routinely updated, contain decision process guidelines for coordinating responses and for notifying other agencies, as required.

MOE Pollution Prevention Office

The Ministry of the Environment has an office dedicated to the promotion of pollution prevention. The office has four main programs:

- Pollution Prevention Partnerships - memorandums of understanding between MOE and industrial associations, private companies, environmental organizations and municipalities;
- Pollution Prevention Pledge Program - encourages the adoption of pollution prevention measures and rewards success;
- education and training support; and

- leadership.

Best Management Practices for Industrial Sectors

A number of documents have been prepared for the Ministry of the Environment that describe various best management practices (BMPs) to achieve pollution prevention and a reduction of specific contaminants that may be present in the effluent discharges of specific facilities. The sectors that are targeted include textiles, fabricated metal products, motor vehicle parts manufacturing, automotive repair and maintenance, dry cleaning and laundry services, and chemical manufacturing. Since most of the contaminants that are considered in the BMP documents are listed in the MOE Tables of Drinking Water Threats, these documents could provide examples of effective risk management measures for drinking water threats.

Ontario Fire Code (Office of the Fire Marshall, 1997)

The Ontario Fire Code contains specifications for fixed storage tanks (capacity greater than 230 L) containing flammable or combustible liquids that generally apply to existing development. The specifications include setbacks from buildings and property lines, clearance, and fire department access. This Code may not be implemented consistently across municipalities depending on their available resources (e.g. staff, time, funding).

Municipal/Industrial Strategy for Abatement (MISA) (Ontario Ministry of the Environment, 2010)

Like many industrialized areas, Ontario is faced with the challenge of effectively managing the presence of toxic contaminants. Industrial direct discharges represent a significant contributor to water quality impairment and a prominent source of toxics. With the signing of the 1987, 1994 and 2002 Canada/Ontario Agreement Respecting the Great Lakes Basin Ecosystem, Ontario committed to the management of persistent toxic substances. The Municipal Industrial Strategy for Abatement (MISA) program was the provincial response for addressing levels of persistent toxic substances in industrial direct discharges entering Ontario's waterways. The MISA program, by focusing on nine industrial sectors (petroleum, pulp and paper, metal mining, industrial minerals, metal casting, organic chemical manufacturing, inorganic chemical, iron and steel and electric power generation), covered the major toxic polluters.

Only one of the nine MISA regulations (the one for the Organic Chemical Manufacturing Sector – O. Reg. 63/95) has wastewater effluent discharge limits for some of the chemicals that are referred to as DNAPL when found/released/spilled in large quantities on their own but not when found in minute amounts as dissolved contaminants in wastewater. This regulation does not directly deal with DNAPL because it does not deal with spills but wastewater effluents. Spills are regulated separately under the EPA regulations (675/98 – Classification and Exemption of Spills and Reporting of Discharges; 224/07 – Spill Prevention and Contingency Plans; and 222/07 – Environmental Penalties), which apply to MISA, MISA-like and some other industrial and non-industrial facilities.

Municipal

Land Use Planning

Large volumes of DNAPLs and organic solvents would generally be located at a manufacturing industry. These types of activities are generally permitted on lands that are zoned for industrial uses. Future industrial land uses ('would be' threats) would likely occur in the same location as existing industries because these are the only locations zoned for this use in our municipalities. Vacant lands designated for future development often contain both employment uses (including industrial uses) as well as residential uses. Municipalities have control over where these activities can occur within their municipal boundaries.

Smaller volumes of DNAPLs and organic solvents may be stored and used at establishments such as automotive or other mechanical repair shops, dry cleaners, and retail stores. These types of uses are widely permitted in many commercial zones.

Community Improvement Planning (Ontario Ministry of Municipal Affairs and Housing, 2008).

Community improvement plans, which are shaped by local needs, priorities and circumstances, have been used for a broad array of priorities aimed at rehabilitating and revitalizing targeted areas. Section 28 of the Planning Act, sections 106 and 365.1 of the Municipal Act, 2001 provide the primary legislative framework for community improvement planning. Through community improvement plans, municipalities can:

- focus public attention on local priorities and municipal initiatives;
- target areas in transition or in need of repair, rehabilitation and redevelopment;
- facilitate and encourage community change in a coordinated manner; and,
- stimulate private sector investment through municipal incentive-based programs.

Community improvement plans may be considered by a municipality to address underutilized and neglected brownfield sites. A community improvement approach is a flexible, comprehensive, coordinated and strategic framework for dealing with lands and buildings, which can address many physical, social, economic or environmental matters.

Municipal Act 2001-Sewer Use By-laws

Municipalities can regulate waste water services and discharges to municipal sewers through sewer use by-laws. These by-laws generally apply to industrial, commercial and institutional establishments. Sewer use by-laws may include requirements for compliance programs and pollution prevention planning.

As an example, the City of Toronto Municipal Code Chapter 681 (sewers) requires specific sector industries that discharge specific pollutants to prepare a detailed six-year pollution prevention plan unless the industry continually meets the requirements and is participating in a Best Management Practices Plan approved by Council. A pollution prevention plan must include a description of the processes that use or produce the pollutants; the types, quantities and concentrations of pollutants discharged to a sewer; current waste reduction, recycling, waste treatment and prevention activities with respect to sewer discharges; description and evaluation of pollution prevention options; and a list of three- and six-year targets to reduce or eliminate the discharge of pollutants to the sewers.

Where a municipality requires a pollution prevention plan related to pollutant discharge to a sewer, it may be easier to gain acceptance for other activities such as the handling and storage of chemicals to also be included in a pollution prevention plan.

Region of Waterloo

The Region of Waterloo has been actively involved in source water protection for almost twenty years through its Water Resources Protection Master Plan (2008) and the implementation of community-wide programs. The Business Water Quality Program (from 2001 to 2005) provided financial incentives to businesses to prevent spills to groundwater, surface water and sewers. Grants (50% cost-share) were made available for projects such as secondary containment structures for waste oils, spill kits, and employee training programs. The program was funded by the Region of Waterloo, Environment Canada and the Ontario Ministry of the Environment. A steering committee made up of local businesses and government representatives helped to develop and market the program. The program was managed by an outside agency, the Ontario Centre for Environmental Technology Advancement (now part of Canadian Pollution Prevention Centre), to preserve confidentiality and maximize links with other similar programs.

The Region also had a series of water pollution prevention fact sheets for specific activities, such as fabricated metal product manufacturing, that discussed topics such as the handling and storage of organic solvents.

Other

Outreach and Education Programs

Outreach and education programs are intended to inform people of threats to sources of local municipal drinking water and help identify means by which such threats can be minimized. They are intended to encourage risk management without having to require it through a more regulatory process. They may also be used in conjunction with incentive programs to further awareness and acceptance of the programs.

Local Awareness Campaigns- Collection/ Disposal

Household hazardous waste sites for DNAPLs and other contaminants should be widely accessible, even in small communities and frequently available- e.g. last Saturday of the month. Household hazardous wastes should be covered in a comprehensive municipal website as well as print materials available throughout the community and an education and outreach policy developed. Chemical list may be developed as illustrated below.

Table 3-10 Examples of Household Hazardous Waste

HSW in the home	HSW in the garage	HSW in the Yard
cleaning and detergent preparations e.g. spot removal products.	paints	Wood preservatives and materials (e.g. wood) containing preservatives (deck material, railway ties for landscaping)
Cosmetics, deodorants	varnishes	
adhesives	lacquers	
Estate waste often contains old products	adhesives, glues and resins	
mothballs	paint thinners	
Water repellents	Furniture strippers	
Typewriter collection fluid	Paint removers	
Carpet cleaning fluids and cleaning fluids for walls	wood preservatives	
Metal cleaners	engine degreasers, automobile cleaners and car care products	
	Water repellents	
Estate waste often contains old products: e.g. fire extinguishers with carbon		

Educational programs that target DNAPL specific industries e.g. dry cleaning plants

Best management practices for dry cleaning operations (i.e. installing the appropriate treatment works, hiring a waste management company to dispose of or recycle PERC waste and install spill containment systems) have been developed for states such as California and municipalities such as Victoria, BC and were designed to help owners / managers comply with policy, worker emergency response and hazardous waste disposal.

The City of Toronto provides a guide - Resources for Greening Dry Cleaning and Laundry Services Pollution Prevention Information Version 1.0 December 2010. The City of Toronto includes a disclaimer that the municipality assumes no liability for the accuracy or completeness of these materials. Readers are responsible for ensuring compliance with Toronto's Environmental Reporting and Disclosure Bylaw (Municipal Code Chapter 423).

Toronto's ChemTRAC program includes an Environmental Reporting and Disclosure Bylaw (Municipal Code Chapter 423) that requires local businesses to track and report their use and release of 25 priority substances. The ChemTRAC program provides an opportunity for you to identify strategies for improving your environmental performance. Strategies include those that reduce the use and release of the 25 priority substances (many of which include DNAPLs and organic solvents indicated in this document). Strategies may also reduce the use and release of other chemicals that may have a health and/or an environmental impact. This Greening Resource for Dry Cleaning and Laundry Services helps the reader to understand the chemicals that you are using and find ways to reduce or eliminate their use.

The Dry Cleaning and Laundry Services sector may use and produce some of these priority substances and other chemicals of concern. Below are the substances that may be used or produced by a dry cleaning facility and its operation. This is not an exhaustive list.

Table 3-11 Priority DNAPL and Organic Solvents Tracked by ChemTRAC

Chemical Sources	Priority DNAPL and Organic Solvents Tracked by ChemTRAC * Chemicals that may have a health and/or an environmental impact as defined in the CWA, 2006
Soiled items may contain chemicals other than designated DNAPLs and organic solvents :	Volatile Organic Compounds (VOCs) (from towels/wipes soaked in solvent, oils and lubricants)
Laundering chemicals may contain chemicals other than designated DNAPLs and organic solvents:	<ul style="list-style-type: none"> • Trichloroethylene (pre-cleaning agent) • VOCs (in soaps and sizing agents)
Dry cleaning chemicals may contain chemicals other than designated DNAPLs and organic solvents:	<ul style="list-style-type: none"> • Tetrachloroethylene (Perchloroethylene or PERC) (a VOC) • Trichloroethylene (pre-cleaning agent) (a VOC) • Vinyl chloride (a by-product of PERC, but not a major release from dry cleaning)) • Other VOCs (pre-cleaning agents) which could include DNAPLs and organic solvents
Equipment cleaning and maintenance operations may use or produce:	<ul style="list-style-type: none"> • VOCs which could include DNAPLs and organic solvents • Trichloroethylene
Source of table altered to reflect DNAPLs and Organic solvent only Notes: http://www.toronto.ca/chemtrac/ . 1. VOCs (Volatile Organic Compounds) are emitted as gases from certain solids or liquids.	

Pollution Prevention Resource Exchange

The Pollution Prevention Resource Exchange was created by the United States Environmental Protection Agency. The exchange maintains a comprehensive collection of pollution prevention resources and case studies that can be used to select pollution prevention measures for specific activities. It is a network that is intended to provide easy access to high quality pollution prevention information that promotes waste reduction throughout the United States.

Gaps in Existing Legislation, Policies and Programs

The following table provides the gaps that exist in the legislation, policies and programs that are currently associated with DNAPLs and Organic Solvents.

Table 3-12 Gaps in Existing Legislation, Policies and Programs

Level of Government	Applicable Legislation/Policies/Programs	Gaps
Federal	Canadian Environmental Protection Act (Government of Canada, 1999)	<ul style="list-style-type: none"> The legislation is more focussed on spills than pollution prevention There is a perception that some of the risk management tools (i.e. Pollution Prevention Plans) do not have the strength needed to achieve source water protection
	Chemical Industry of Canada Responsible Care Program	<ul style="list-style-type: none"> Program is voluntary
Provincial	Environmental Protection Act (Government of Ontario, 1990)	<ul style="list-style-type: none"> The focus on larger industries commercial, residential, retail and smaller industry have less regulation There are only standards for some industries, while others are not covered. For example, Tetrachloroethylene (PCE) Regulation - applies to owners and/or operators of dry-cleaning machines or facilities that use PCE, and to sellers, importers and recyclers of PCE.
	Toxics Reduction Act and Ontario Regulation 455/09 General (Government of Ontario, 2009)	<ul style="list-style-type: none"> implementation of toxic substance reduction plans is voluntary reporting on the use of toxic substances is the main regulatory requirement of the Act; this is mostly an administrative process the majority of the facilities regulated under O.Reg 455/09 do not likely use or create four out of the five DNAPLs that are concerns to drinking water (tetrachloroethylene, trichloroethylene, and vinyl chloride), meaning its effect is limited in this context.
	Ontario Fire Code (Office of the Fire Marshall, 1997)	<ul style="list-style-type: none"> local enforcement is dependent on resources
Other		<ul style="list-style-type: none"> there is no central governing body to regulate the use of DNAPLs and organic solvents the legislation/regulations are focussed on waste DNAPLs/organic solvents and spills. CWA drinking water threats only addresses storage as a significant drinking water threat.

There are limited regulatory requirements for the handling and storage of specific chemical classes (as they pertain to the environment), with the exception of certain chemicals (e.g. tetrachlorethylene) or land uses (e.g. dry cleaners). Pollution prevention planning is a major factor in managing the risk associated with these activities. It is also noted that current chemical uses and trends tend to preclude these identified contaminants of concern.

Should policies consider some threshold volume over which the policy would apply to handling and storage of DNAPL. Is it necessary to protect against a spill of 1 L or 10 L or 100 L. For organic solvent threats, the MOE has established minimum threshold volumes for consideration. Similarly, exemptions to “spills” exist in the legislation under certain circumstances and volumetric size (i.e. Ontario Regulation 675/98 – Classification and Exemption of Spills and Reporting of Discharges). Similarly, should there be a threshold concentration of DNAPLs or Organic solvent to be considered? Threshold volumes have been established but no threshold concentration- simply “trace amounts” versus “pure product”.

The existing risk management efforts are focused on industrial activities where larger quantities of DNAPL and organic solvents may be used. Other land uses including commercial activities such as retail, agricultural residential and institutional use of these chemicals is not considered by most of the current risk management efforts.

Policy Considerations

The primary consideration for reducing or eliminating drinking water threats related to the handling and storage of a DNAPL or an organic solvent is to reduce the likelihood that it enters surface water and/or groundwater. Policy will be focused on the areas where the storage and handling of DNAPL and Organic Solvents will be significant threats. In the Thames-Sydenham and Region this is limited to the WHPA-A, B, C. This is the area which can contribute to a well within a 5 year 'time of travel'. This 5 year time frame is based on the approximate time required to replace a well as remediation technology is presently incapable of satisfactorily remediating DNAPL contamination.

- Policies developed related to DNAPL and Organic Solvents need to consider both handling and storage of the chemicals. The storage of DNAPL and organic solvents is not covered by TSSA as are fuels, although for all practical purposes the goals of prevention of spills and leaks are similar. The mandatory safeguards afforded fuel handling and storage through the Fuel Handling Act does not apply to chemical storage facilities.
- A notable difference between DNAPLs and solvents or fuels is the absence of specific volumetric limits. No such limits exist with DNAPLs due to the fact that even relatively small releases can migrate relatively deep within the subsurface and they are difficult to impossible to remediate. It is important to consider this in policies as the same risk management measures which would be appropriate for a large volume of materials may not be practical or appropriate for smaller quantities.
- It is possible that even in a residential area a small business of hobby activity could handle or store sufficient quantities of DNAPL or Organic Solvents. An example might be a furniture stripping or repair business or antique car restoration in a backyard shed or garage in a residential area.
- There are challenges in developing an effective strategy to address situations such as a process change that would introduce such a chemical into an existing manufacturing facility. However, given the trend away from such chemical uses this may be an academic exercise.
- Need to consider the risk associated throughout the life of the materials of concern within a vulnerable area where it is a significant threat. Each of these stages in the life of the material could be considered either handling or storage:
 - manufacturing of the material
 - transportation of the material through the area
 - the delivery of the material
 - storage of the material for sale
 - storage of the material for use
 - handling of the material
 - disposal of the material or any bi-products which might also be significant threats
- People may be unaware of the materials and risk associated with the products. Although they may heed warnings to protect themselves in the use of the materials, the same care may not be considered in the disposal of the materials.
- Waste Disposal of these materials may not be convenient or even accessible to all who may use these materials.

Proposed Policy Ideas

For discussion purposes, this section of the report provides examples of policy ideas that could be applicable to the subject threat in the Thames-Sydenham and Region. It is not an exhaustive list. Each policy tool is discussed separately in the table below.

Table 3-13 Policy Ideas for handling and storage of DNAPL

Threat:	The Handling and Storage of DNAPL
Sub- Threat	The handling of DNAPL The storage of DNAPL
Circumstances	<ul style="list-style-type: none"> • No limit to the volume of DNAPL on site. • Stored or handled above, at or above, below grade, or a portion below grade. • For the purposes of these policies trace amounts in other products are not considered a drinking water threat. • All areas where the storage and handling of DNAPL are considered a significant drinking water threat (i.e. within WHPA-A, B or C). • Handling is considered to include handling during manufacturing, disposal and all other uses of DNAPL

Policy Tool	Policy ideas
Education and Outreach	<ul style="list-style-type: none"> • Education and outreach policies should be included for handling and storage of DNAPL to complement incentive and regulatory approaches. • Incorporate source water messaging into existing education and outreach programs whenever possible. • Implement an outreach and education program intended to help inform affected landowners of threats to the source of local municipal drinking water. • Educate businesses about the importance of proper handling and hazardous waste disposal. • Encourage businesses (especially smaller ones) to dispose of hazardous waste properly. • Raise awareness of the location of WHPA / IPZ zones through various means including roadside signs. • Encourage the use of more environmentally friendly landscaping products rather than products which may contain DNAPL (such as creosote or pentachlorophenol used in some treated wood products) in designated areas (WHPAs). Promote the benefits of the more environmentally friendly products. • Encourage proper disposal of landscaping materials which contain DNAPL such as creosote or pentachlorophenol rather than burning these treated wood products. • Improve on existing or develop new education programs on the importance of local hazardous waste collection, for household products and help identify means to minimize threats including providing a list of possible hazardous chemicals and where they might be found. • Improve on the promotion of hazardous waste collection. • Incorporate Environmental aspects into Employee training. • Educate rail operators in the location of the WHPA where DNAPL are significant threats to reduce the storage of creosote railway ties within the areas where DNAPL are a significant threat.
Incentive Programs	<ul style="list-style-type: none"> • Recommend that Ontario Drinking Water Stewardship Program continue to adequately fund risk mitigation practices for DNAPL threats. • Encourage long-term support of existing incentive programs. • Encourage new incentives to reduce risk of significant threats such as: <ul style="list-style-type: none"> • Process / technology review / revision evaluations and BMPs; • Relocation of chemical storage; • Secondary containment, reducing individual tank volumes; and, • Replacing Underground Storage Tanks for Above Ground Storage Tanks • Provide Incentives to municipalities to make hazardous waste disposal more

	<ul style="list-style-type: none"> accessible. Encourage municipalities to establish or participate in incentive programs to manage significant threats. Consider incentive programs to encourage replacement of landscaping products DNAPL products with more environmentally friendly products.
Land Use Planning	<ul style="list-style-type: none"> Include in Official Plans and Zoning By-laws policies and by-laws to address the creation / conversion of any structure which would result in the production, sale, handling or storage of DNAPL. Encourage “alternative” corridor access (truck) routes around rather than through areas where DNAPL are considered significant threats. Expansion or replacements of properties with existing significant threats may be permitted if the expansion allows for a reduction in risk over the existing. Expansion of current land use may not be permitted if the expansion causes the activity to become a significant threat. Prohibit new land uses that handle and store significant quantities of DNAPL. Incorporate SWP into future municipal service expansion plans. Encouraging municipalities to reflect risk management in their bylaws. Use Restricted Land Uses to identify land uses that are associated with the handling and storage of DNAPLs in areas where these activities are or would be a significant drinking water threat.
Prescribed Instruments	<ul style="list-style-type: none"> In areas where DNAPLs are significant threats new Certificates of Approval (C of A) for waste management activities shall have conditions which do not allow the storage or handling of specified DNAPL. MOE shall review and revise where necessary existing C of A to manage the threat through conditions in the C of A so that the significant threat ceases to be significant These policies need to be linked to those under waste management.
S.57 Prohibition	<ul style="list-style-type: none"> Prohibit new handling and storage of DNAPLs in WHPA-A, B and C. Although the committee considered prohibiting existing storage and handling where it would be a significant threat when a suitable risk management plan is not able to be negotiated it was determined that an activity could not be subject to risk management and prohibition in the same area. It is preferred to develop policy which will give municipalities the flexibility to prohibit this significant threat where they see fit.
S. 58 Risk Management Plans (RMPs)	<ul style="list-style-type: none"> Require risk management plans for activities involving the handling and storage of DNAPLs in areas where this activity is a significant threat. The plan should address items of operating practices including containment and management, proper waste disposal, employee training as well as a spill contingency plan. Other areas to be covered may include monitoring of groundwater, appropriate alarm system and automatic valves to ensure containment of leaks and spills, periodic testing of storage systems, secondary containment systems as well as other items. Require annual inspection as part of plan. Rely on industry best practices for risk management measures as well as those included in the Risk Management Catalogue. Conduct formal site inspection on a prescribed schedule within areas where storage and handling of DNAPL are a significant threat of private sector occupants to identify potential threats within their properties. May be combined with Fire Department visits. Inspection to be done in conjunction with education and outreach programs.
S.59 Restricted Land Uses	<ul style="list-style-type: none"> Flag those land uses that are associated with the handling and storage of DNAPLs as restricted land uses in WHPAs where these activities are or would be significant drinking water threats so that municipal planners and building officials consider implications of the proposed development.
S.26 p.1 Other – specify action	<ul style="list-style-type: none"> Encourage municipalities to improve access to hazardous waste collection within the areas where DNAPL are significant threats. Regular collection is preferred over infrequent depot days.
S. 26 p.1 Other-	<ol style="list-style-type: none"> Encourage municipalities to enact sewer use by-laws which require that floor drains

Specify Action (Municipal Act)	<p>in areas where DNAPLs are being handled or stored are not directly connected to sanitary or storm sewers.</p> <ul style="list-style-type: none"> Encourage municipalities to conduct inspections to make sure that floor drains are properly contained and that materials collected are properly disposed.
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Table 3-14 Policy Ideas for handling and storage of organic solvents

Threat: The Handling and Storage Organic Solvents
Sub- Threat The storage of organic solvents
 Handling is also considered a threat as indicated in the name of the activity
Circumstances

- The volume circumstances for Organic Solvents are divided into four groups:
 - less than 25 L,
 - between 25 L and 250 L,
 - between 250 L and 2500 L, and
 - greater than 2500 L of organic solvent stored at a location.
- In general, the greater the volume of material stored, the greater the inherent risk to drinking water.
- Storage of the organic solvent at or above, below or partially below grade.
- Handling is also identified as a threat however the circumstances are the same as for storage with volumes and locations referring to the storage.

Policy Tool	Policy ideas
Education and Outreach	<ul style="list-style-type: none"> Education and outreach policies should be included for the handling and storage of Organic Solvent threats to complement incentive and regulatory approaches. Incorporate source water messaging into existing education and outreach programs whenever possible. Implement an outreach and education program intended to help inform affected landowners of threats to the source of local municipal drinking water. Educate businesses about the importance of proper handling and hazardous waste disposal. Encourage businesses (especially smaller ones) to dispose of hazardous waste properly. Raise awareness of the location of WHPA / IPZ zones through various means including road side signs. Improve on existing or develop new education programs on the importance of local hazardous waste collection, for household products. <ul style="list-style-type: none"> help identify means to minimize threats provide a list of possible hazardous chemicals and where they might be found. Improve on the promotion of hazardous waste collection. Incorporate Environmental aspects into Employee training
Incentive Programs	<ul style="list-style-type: none"> Recommend that Ontario Drinking Water Stewardship Program continue to adequately fund risk mitigation practices for Organic Solvent threats. Encourage long-term support of existing incentive programs . Encourage new incentives to reduce risk of significant threats such as: <ul style="list-style-type: none"> Process / technology review / revision evaluations and BMPs; Relocation of chemical storage; Secondary containment, reducing individual tank volumes; and, Replacing UST for AST. Encourage municipalities to establish or participate in incentive programs to manage significant threats.
Land Use Planning	<ul style="list-style-type: none"> Include in Official Plans and Zoning By-laws, policies and by-laws to address the creation / conversion of any structure which would result in the production, sale, handling or storage of Organic Solvents. Revise existing municipal zoning plans that are not in keeping with vulnerable area designation under SWP.

	<ul style="list-style-type: none"> • Encourage “alternative” corridor access (truck) routes around rather than through areas where handling and storage of Organic Solvents are considered significant threats. • Expansion or replacement of properties with existing significant threats will be permitted if the expansion allows for a reduction in risk over the existing. • Expansion of current land use may not be permitted if the expansion causes the activity to become a significant threat. • Prohibit new land uses that would handle and store Organic Solvents where that storage would be a significant drinking water threat. • Incorporate SWP elements into future municipal service expansion plans. • Use Restricted Land Uses to identify land uses that are associated with the handling and storage of Organic Solvents in areas where these activities are or would be a significant drinking water threat.
Prescribed Instruments	<ul style="list-style-type: none"> • New Certificates of Approval (C of A) for waste management activities associated with Organic Solvent in the areas where the handling and storage of Organic Solvents are significant threats shall have conditions which do not allow the storage or handling of specified Organic Solvents. • MOE shall review and revise where necessary existing C of A to manage the threat through conditions in the C of A so that the significant threat ceases to be significant. • These policies need to be linked to those under waste management.
S. 57 Prohibition	<ul style="list-style-type: none"> • Prohibit new handling and storage of Organic Solvents in areas where the handling and storage of Organic Solvents is a significant threat. • Although the committee considered prohibiting existing storage and handling where it would be a significant threat when a suitable risk management plan is not able to be negotiated it was determined that an activity could not be subject to risk management and prohibition in the same area. • It is preferred to develop policy which will give municipalities the flexibility to prohibit this significant threat where they see fit.
S.58 Risk Management Plans (RMPs)	<ul style="list-style-type: none"> • Require risk management plans for activities involving the handling and storage of Organic Solvents in areas where this activity is a significant threat. The plan should address items of operating practices including containment and management, proper waste disposal, employee training as well as a spill contingency plan. Other areas to be covered may include monitoring of groundwater, appropriate alarm system and automatic valves to ensure containment of leaks and spills, periodic testing of storage systems, secondary containment systems as well as other items. Require annual inspection as part of plan. • Rely on industry best practices for risk management measures as well as those included in the Risk Management Catalogue. • Conduct formal site inspection on a prescribed schedule within areas where storage and handling of Organic Solvents are a significant threat of private sector occupants to identify potential threats within their properties. May be combined with Fire Department visits. Inspection to be done in conjunction with education and outreach programs.
S. 59 Restricted Land Uses	<ul style="list-style-type: none"> • Flag those land uses that are associated with the handling and storage of Organic Solvents as restricted land uses in WHPAs where these activities are or would be significant drinking water threats so that municipal planners and building officials consider implications of the proposed development.
S. 26 p.1 Other – Specify action	<ul style="list-style-type: none"> • Encourage municipalities to improve access to hazardous waste collection within the areas where Organic Solvents are significant threats. Regular collection is preferred over infrequent depot days.
S.26 p.1 Other-Specify Action (Municipal Act)	<ul style="list-style-type: none"> • Encourage municipalities to enact sewer use by-laws which require that floor drains in locations where Organic Solvents are being handled or stored are not directly connected to sanitary and/or storm sewers. • Encourage municipalities to conduct inspections to make sure that floor drains are properly contained and that materials collected are properly disposed.

Policy Examples

Policy examples presented within this section are based on the policy ideas noted above. These policy examples were presented to the SPC to facilitate discussion and have been further reviewed by the Source Protection Municipal Policy Advisory Committee.

Policy Number	16-1
Sub- Threat(s)	The Handling and Storage of DNAPL
Circumstance	<p>DNAPLs are a significant threat to drinking water anywhere and at any quantity within the 5 year time of travel.</p> <ul style="list-style-type: none"> • DNAPLs are stored or handled at or above, below grade or a portion below grade. • The handling of DNAPLs is considered to include handling during manufacturing, disposal and other uses.
Vulnerable Area	WHPA-A, B and C
Risk	Significant, Moderate, Low
Body Responsible for Implementing	Municipal Watershed Partnership with Conservation Authority to lead. The implementation of this policy in this manner builds on the strengths and efficiencies of the Conservation Authorities as a partnership of the municipalities in the watershed.
Threat Status	Existing and Future
Land Use	All land use which could be associated with the storage and handling of DNAPLs
Legal Effect	Conform (Significant), Strategic (Moderate, Low)
Policy Tool	Education and Outreach
Policy Idea	<p>Develop new or where possible expand on existing education and outreach programs to complement incentive and regulatory approaches as well as promote Best Management Practices to protect drinking water sources from the risks associated with the handling and storage of DNAPLs including:</p> <ul style="list-style-type: none"> • Incorporation of source water messaging into existing education and outreach programs whenever possible; • Implementation of an outreach and education program intended to help inform affected landowners of threats to the source of local municipal drinking water; • Promotion of education of businesses (especially the smaller ones) about the importance of proper handling and hazardous waste disposal; • Promotion of vulnerable areas (i.e. WHPA/IPZ zones) through various means including roadside signs; • Promotion of the benefits and use of more environmentally friendly landscaping products rather than products which may contain DNAPL (such as creosote or pentachlorophenol used in some treated wood products) in designated WHPAs; • Promotion of proper disposal of landscaping materials which contain DNAPL (i.e. creosote or pentachlorophenol); • Promotion of existing education programs related to local hazardous waste collection for household products; • Development of specific education and outreach programs such as the promotion of the importance of local hazardous waste collection for household products by identifying means to minimize threats including providing a list of possible hazardous chemicals and where they might be found; • Development of education and outreach programs for private sector occupants who store or handle DNAPLs. These programs would promote regular inspections to identify potential threats on their properties. • Promotion of hazardous waste collection; • Promotion of environmental awareness into employee training; • Promotion of education of rail operators with regards to the storage of creosote railway ties within the areas where DNAPLs are a significant threat; and, • The implementation of this policy through the existing municipal partnership of the Conservation Authority will allow these programs to be built on existing

Chemical Threats

Policy Number	16-1
	watershed education and outreach in an efficient manner. The municipalities can be involved in the program development and delivery depending on their individual needs; however the program(s) would be developed in a consistent manner across the region.
Implementation schedule	Within 2 years of the approval of the Source Protection Plan.
Monitoring Policy	The implementing body shall report to the SPA the number of educational packages offered as well as a description of the actions/measures they have taken to implement the education/outreach in the previous year. Measures tracking the uptake by the target audience will also be included in this report.

Policy Number	16-2
Sub- Threat(s)	The Handling and Storage of DNAPL
Circumstance	DNAPLs are a significant threat to drinking water anywhere and at any quantity within the 5 year time of travel. <ul style="list-style-type: none"> • DNAPLs are stored or handled at or above, below grade or a portion below grade. • The handling of DNAPLs is considered to include handling during manufacturing, disposal and other uses.
Vulnerable Area	WHPA-A, B and C
Risk	Significant, Moderate, Low
Body Responsible for Implementing	Conservation Authority, Municipality, MOE
Threat Status	Existing and Future
Land Use	All land use which could be associated with the storage and handling of DNAPLs
Legal Effect	Strategic
Policy Tool	Incentive Programs
Policy Idea	The Ontario Drinking Water Stewardship Program should continue to adequately fund risk mitigation practices for DNAPL threats. New incentive programs (i.e. process/technology review/revision evaluations and BMPs, relocation of chemical storage, secondary containment and reducing individual tank volumes, and replacing underground storage tanks to above ground storage tanks) should be considered to assist with the implementation costs of risk mitigation practices for significant, moderate and low threats on drinking water sources. Where funding is limited, emphasis shall be on significant threat mitigation. New incentive programs should be considered to encourage the replacement of landscaping products, which contain DNAPLs, with more environmentally friendly products. The provincial government should consider encouraging municipalities to participate in incentive programs to manage significant threats. The provincial government should consider providing incentives to municipalities to make hazardous waste disposal more accessible. All implementing bodies should consider long-term support of existing incentive programs.
Implementation schedule	Ongoing implementation for existing programs or within 2 years of the approval of the SPP for new programs.
Monitoring Policy	Program operators shall report to the CA annually and include the number and type of risk management measures which have been applied for and the number funded in vulnerable areas.

Policy Number	16-3
Sub- Threat(s)	The Handling and Storage of DNAPL
Circumstance	DNAPLs are a significant threat to drinking water anywhere and at any quantity within the 5 year time of travel. <ul style="list-style-type: none"> • DNAPLs are stored or handled at or above, below grade or a portion below grade. • The handling of DNAPLs is considered to include handling during manufacturing, disposal and other uses of DNAPL.
Vulnerable Area	WHPA-A, B and C
Risk	Significant

Policy Number	16-3
Body Responsible for Implementing	Municipality
Threat Status	Existing and Future
Land Use	All land use which could be associated with the storage and handling of DNAPLs
Legal Effect	Conform
Policy Tool	Land Use Planning
Policy Idea	<p>Municipalities shall develop specific policies and by-laws in their Official Plans and Zoning By-laws to address the creation/conversion of any structure which would result in the production, sale, handling or storage of DNAPLs.</p> <p>Municipalities shall reflect risk management in their by-laws.</p> <p>Municipalities shall develop “alternative” corridor access (truck) routes around rather than through areas where DNAPLs are considered significant threats.</p> <p>New land uses that handle and store substantial quantities of DNAPL shall be prohibited in areas where they would be a significant threat.</p> <p>Expansion or replacements of properties with existing significant threats shall be permitted only if the expansion allows for a reduction in the existing risk.</p> <p>Expansion of a current land use shall not be permitted if the expansion causes the activity to become a significant threat.</p> <p>Municipalities shall incorporate Source Water Protection into future municipal service expansion plans.</p>
Implementation schedule	Shall be initiated in all Official Plans within 6 months of Source Protection Plan approval with the goal to be completed within 2 years of the Source Protection Plan approval date. Zoning bylaws shall be updated within 3 years of the Source Protection Plan approval date.
Monitoring Policy	Municipalities shall report to the CA on new policies incorporated in Official Plans and any new by-laws relevant to source water protection. All municipalities must report even if it is to indicate that no changes were required. Where no changes were required, the report is to describe how the existing OP and by-laws meet the requirements of this policy. Municipalities must update the SPA annually on progress towards the completion of the implementation of relevant policies in their OP and zoning by-laws.

Policy Number	16-4
Sub- Threat(s)	The Handling and Storage of DNAPL
Circumstance	<p>DNAPLs are a significant threat to drinking water anywhere and at any quantity within the 5 year time of travel.</p> <ul style="list-style-type: none"> • DNAPLs are stored or handled at or above, below grade or a portion below grade. • The handling of DNAPLs is considered to include handling during manufacturing, disposal and other uses of DNAPL.
Vulnerable Area	WHPA-A, B and C
Risk	Significant
Body Responsible for Implementing	MOE
Threat Status	Existing and Future
Land Use	All land use which could be associated with the storage and handling of DNAPLs
Legal Effect	Conform
Policy Tool	Prescribed Instruments-Environmental Protection Act
Policy Idea	<p>MOE under the Environmental Protection Act, shall review and revise where necessary existing C of As. The conditions set out in the C of A will manage the threat reducing the risk so that it ceases to be significant.</p> <p>MOE shall put conditions on new C of As for waste management activities prohibiting the storage or handling of specified DNAPLs in areas where DNAPLs are a significant threat.</p> <p>Waste storage facilities must comply with the Environmental Protection Act and Regulation 347-General Waste Management. DNAPLs are considered hazardous waste and must be managed throughout their lifecycle.</p>
Implementation schedule	Within 1 year of approval of the Source Protection Plan
Monitoring Policy	The MOE shall submit an annual report to the CA which identifies the number of C of A

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Policy Number	16-4
	applications which were reviewed and the number which required updates to adequately manage the significant threats.

Policy Number	16-5
Sub- Threat(s)	The Handling and Storage of DNAPLs
Circumstance	DNAPLs are a significant threat to drinking water anywhere and at any quantity within the 5 year time of travel. <ul style="list-style-type: none"> • DNAPLs are stored or handled at or above, below grade or a portion below grade. • The handling of DNAPLs is considered to include handling during manufacturing, disposal and other uses of DNAPL.
Vulnerable Area	WHPA-A, B and C
Risk	Significant
Body Responsible for Implementing	Municipality
Threat Status	Future
Land Use	All land use which could be associated with the storage and handling of DNAPLs
Legal Effect	Conform
Policy Tool	S. 57 Prohibition
Policy Idea	New handling and storage areas for DNAPLs shall be prohibited within WHPA-A, B and C.
Implementation schedule	The policy takes effect one year after the approval date of the first source protection plan.
Monitoring Policy	The municipality shall submit a report annually to the CA, which includes whether they have identified any DNAPL handling or storage area which was used in contravention of this policy.

Policy Number	16-6
Sub- Threat(s)	The Handling and Storage of DNAPLs
Circumstance	DNAPLs are a significant threat to drinking water anywhere and at any quantity within the 5 year time of travel. <ul style="list-style-type: none"> • DNAPLs are stored or handled at or above, below grade or a portion below grade. • The handling of DNAPLs is considered to include handling during manufacturing, disposal and other uses of DNAPL.
Vulnerable Area	WHPA-A, B and C
Risk	Significant
Body Responsible for Implementing	Municipality
Threat Status	Existing and Future
Land Use	All land use which could be associated with the storage and handling of DNAPLs
Legal Effect	Conform
Policy Tool	S. 58 Risk Management Plan
Policy Idea	The RMO shall require risk management plans for activities involving the storage of DNAPLs in areas where this activity is a significant threat. The plan should address items of operating practices including containment and management, proper waste disposal, employee training as well as a spill contingency plan. Other areas to be covered may include monitoring of groundwater, appropriate alarm system and automatic valves to ensure containment of leaks and spills, periodic testing of storage systems, secondary containment systems as well as other items. Annual inspections would be required as part of this plan. Industry best practices for risk management measures as well as those included in the Risk Management Catalogue shall be relied upon to develop a Risk Management Plan. Risk Management Plans will cover any deficiencies not undertaken through the use of the prescribed instrument tool. Where an adequate risk management plan cannot be negotiated, the significant threat cannot be undertaken. The Risk Management Official shall conduct formal site inspections of private sector occupants within areas where the storage and handling of DNAPLs are a significant threat.

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	To identify potential threats within their properties, these inspections shall be undertaken on a prescribed schedule and may be combined with Fire Department visits.
Implementation schedule	Within 1 year of the approval of the Source Protection Plan
Monitoring Policy	The Risk Management Official shall submit an annual report to the CA which includes the number of RMP required and approved. The report shall include a summary of the types of Risk Management Measures which were approved as part of Risk Management Plans. The Risk Management Official will also report on the inspections completed.

Policy Number	16-7
Sub- Threat(s)	The Handling and Storage of DNAPLs
Circumstance	DNAPLs are a significant threat to drinking water anywhere and at any quantity within the 5 year time of travel. <ul style="list-style-type: none"> • DNAPLs are stored or handled at or above, below grade or a portion below grade. • The handling of DNAPLs is considered to include handling during manufacturing, disposal and other uses of DNAPL.
Vulnerable Area	WHPA-A, B and C
Risk	Significant
Body Responsible for Implementing	Municipality
Threat Status	Future
Land Use	All land use which could be associated with the storage and handling of DNAPLs
Legal Effect	Conform
Policy Tool	S. 59 Restricted Land Uses
Policy Idea	All land use which could be associated with the storage and handling of DNAPLs identified in municipal Official Plans and Zoning By-laws in this SPA are designated for the purpose of S. 59 of the CWA in the areas where the storage and handling of DNAPLs is subject to S.57 Prohibition or S. 58 Risk Management Plans under the CWA.
Implementation schedule	Implementation of the policy immediately following the approval of the SPP. Implementation creates a “red flag” when a municipality receives building permit and planning act applications.
Monitoring Policy	Monitoring is not applicable because it does not require municipal amendments or changes to Official Plans or Zoning By-Laws.

Policy Number	16-8
Sub- Threat(s)	The Handling and Storage of DNAPLs
Circumstance	DNAPLs are a significant threat to drinking water anywhere and at any quantity within the 5 year time of travel. <ul style="list-style-type: none"> • DNAPLs are stored or handled at or above, below grade or a portion below grade. • The handling of DNAPLs is considered to include handling during manufacturing, disposal and other uses of DNAPL.
Vulnerable Area	WHPA-A, B and C
Risk	Significant
Body Responsible for Implementing	Municipality
Threat Status	Existing and Future
Land Use	All land use which could be associated with the storage and handling of DNAPLs
Legal Effect	Strategic
Policy Tool	S.26 p.1 Other-Specify Action
Policy Idea	Municipalities shall consider improving access to residential hazardous waste depots within the areas where DNAPLs are significant threats.
Implementation schedule	N/A
Monitoring Policy	Municipality shall report to the CA on the location, frequency and number of residents using the depots.

Policy Number	16-9
Sub- Threat(s)	The Handling and Storage of DNAPLs
Circumstance	DNAPLs are a significant threat to drinking water anywhere and at any quantity within the 5 year time of travel. <ul style="list-style-type: none"> • DNAPLs are stored or handled at or above, below grade or a portion below grade. • The handling of DNAPLs is considered to include handling during manufacturing, disposal and other uses of DNAPL.
Vulnerable Area	WHPA-A, B and C
Risk	Significant
Body Responsible for Implementing	Municipality
Threat Status	Existing and Future
Land Use	All land use which could be associated with the storage and handling of DNAPLs
Legal Effect	Strategic
Policy Tool	S. 26 p.1 Other-Specify Action (Municipal Act Powers)
Policy Idea	Municipalities shall be encouraged to enact sewer use by-laws which require that floor drains in areas where DNAPLs are being handled or stored are not directly connected to sanitary or storm sewers. Municipalities, through Building Inspectors or Risk Management Officials, shall be encouraged to conduct inspections to make sure that floor drains are properly contained and that materials collected are properly disposed.
Implementation schedule	N/A
Monitoring Policy	The municipality shall report to the CA with the number of inspections carried out as well as the number of locations where corrective action was required and the nature of the corrective action.

Policy Number	17-1
Sub- Threat(s)	The handling and storage of organic solvents
Circumstance	This threat is significant where >25 L of organic solvents are stored in a container partially or completely underground or where >250 L of organic solvents are stored in a container at or above ground.
Vulnerable Area	WHPA-A, B with a vulnerability score of 10
Risk	Significant, Moderate and Low
Body Responsible for Implementing	Municipal Watershed partnership with Conservation Authority to lead. The implementation of this policy in this manner builds on the strengths and efficiencies of the Conservation Authorities as a partnership of the municipalities in the watershed.
Threat Status	Existing and Future
Land Use	All land use which could be associated with the storage and handling of organic solvents.
Legal Effect	Conform (Significant), Strategic (Moderate, Low)
Policy Tool	Education and Outreach
Policy Idea	Develop new or where possible expand on existing education and outreach programs to complement incentive and regulatory approaches as well as promote Best Management Practices to protect drinking water sources from the risks associated with the handling and storage of organic solvents including: <ul style="list-style-type: none"> • Incorporation of source water messaging into existing education and outreach programs whenever possible. • Promotion of vulnerable areas (i.e. WHPA/IPZ zones) through various means including roadside signs. • Promotion of education of businesses (especially the smaller ones) about the importance of proper handling and hazardous waste disposal. • Promotion of hazardous waste collection; • Promotion of environmental awareness into employee training. • Implementation of an outreach and education program intended to help inform affected landowners of threats to the source of local municipal drinking water. • Promotion of existing education programs related to local hazardous waste collection for household products;

Policy Number	17-1
	<ul style="list-style-type: none"> • Development of specific education and outreach programs such as the promotion of the importance of local hazardous waste collection for household products by identifying means to minimize threats including providing a list of possible hazardous chemicals and where they might be found; • Development of education and outreach programs for private sector occupants who store or handle organic solvents. These programs would promote regular inspections to identify potential threats on their properties; • The implementation of this policy through the existing municipal partnership of the Conservation Authority will allow these programs to be built on existing watershed education and outreach in an efficient manner. The municipalities can be involved in the program development and delivery depending on their individual needs; however the program(s) would be developed in a consistent manner across the region.
Implementation schedule	Within 2 years of the approval of the Source Protection Plan.
Monitoring Policy	The implementing body shall report to the SPA the number of educational packages offered as well as a description of the actions/measures they have taken to implement the education/outreach in the previous year. Measures tracking the uptake by the target audience will also be included in this report.

Policy Number	17-2
Sub- Threat(s)	The handling and storage of organic solvents
Circumstance	This threat is significant where >25 L of organic solvents are stored in a container partially or completely underground or where >250 L of organic solvents are stored in a container at or above ground.
Vulnerable Area	WHPA-A, B with a vulnerability score of 10
Risk	Significant, Moderate, Low
Body Responsible for Implementing	Conservation Authority, Municipality, MOE
Threat Status	Existing and Future
Land Use	All land use which could be associated with the storage and handling of organic solvents.
Legal Effect	Strategic
Policy Tool	Incentives
Policy Idea	<p>The Ontario Drinking Water Stewardship Program shall continue to adequately fund risk mitigation practices for organic solvents.</p> <p>New incentive programs (i.e. process/technology review/revision evaluations and BMPs, relocation of chemical storage, secondary containment and reducing individual tank volumes, and replacing underground storage tanks to above ground storage tanks) should be considered to assist with the implementation costs of risk mitigation practices for significant, moderate and low threats on drinking water sources. Where funding is limited, emphasis shall be on significant threat mitigation.</p> <p>The provincial government should consider encouraging municipalities to participate in incentive programs to manage significant threats.</p> <p>All implementing bodies should consider long-term support of existing incentive programs.</p>
Implementation schedule	Ongoing implementation for existing programs or within 2 years of the approval of the SPP for new programs.
Monitoring Policy	Program operators shall report to the CA annually and include the number and type of risk management measures which have been applied for and the number funded in vulnerable areas.

Policy Number	17-3
Sub- Threat(s)	The handling and storage of organic solvents
Circumstance	This threat is significant where >25 L of organic solvents are stored in a container partially or completely underground or where >250 L of organic solvents are stored in a container at or above ground.
Vulnerable Area	WHPA-A, B with a vulnerability score of 10

Policy Number	17-3
Risk	Significant
Body Responsible for Implementing	Municipality
Threat Status	Existing and Future
Land Use	All land use which could be associated with the storage and handling of organic solvents.
Legal Effect	Conform
Policy Tool	Land Use Planning
Policy Idea	<p>Municipalities shall develop specific policies and by-laws in their Official Plans and Zoning By-laws to address the creation/conversion of any structure which would result in the production, sale, handling or storage of organic solvents.</p> <p>Municipalities shall develop “alternative” corridor access (truck) routes around rather than through areas where the handling and storage of organic solvents are considered significant threats.</p> <p>New land uses that handle or store organic solvents shall be prohibited in areas where they would be a significant threat.</p> <p>Expansion or replacements of properties with existing significant threats shall be permitted only if the expansion allows for a reduction in the existing risk.</p> <p>Expansion of a current land use shall not be permitted if the expansion causes the activity to become a significant threat.</p> <p>Municipalities shall revise municipal zoning plans that are not in keeping with the vulnerable area designation under Source Water Protection.</p> <p>Municipalities shall incorporate Source Water Protection into future municipal service expansion plans.</p>
Implementation schedule	Official Plan Amendments shall be in conformity at the time of the approved Source Protection Plan. New policies shall be included in updates of the Official Plans. Zoning By-laws shall also be updated in the time outlined in the Planning Act.
Monitoring Policy	Municipalities shall report to the CA on new policies incorporated in Official Plans and any new by-laws relevant to source water protection. All municipalities must report even if it is to indicate that no changes were required. Where no changes were required, the report is to describe how the existing OP and by-laws meet the requirements of this policy. Municipalities must update the SPA annually on progress towards the completion of the implementation of relevant policies in their OP and zoning by-laws.

Policy Number	17-4
Sub- Threat(s)	The handling and storage of organic solvents
Circumstance	This threat is significant where >25 L of organic solvents are stored in a container partially or completely underground or where >250 L of organic solvents are stored in a container at or above ground.
Vulnerable Area	WHPA-A, B with a vulnerability score of 10
Risk	Significant
Body Responsible for Implementing	MOE
Threat Status	Existing and Future
Land Use	All land use which could be associated with the storage and handling of organic solvents.
Legal Effect	Conform
Policy Tool	Prescribed Instruments-Environmental Protection Act
Policy Idea	<p>MOE under the Environmental Protection Act shall review and revise where necessary existing C of As. The conditions set out in the C of A will manage the threat reducing the risk so that it ceases to be significant.</p> <p>MOE shall put conditions on new C of As for waste management activities prohibiting the storage or handling of organic solvents in areas where organic solvents are a significant threat.</p> <p>Waste storage facilities must comply with the Environmental Protection Act and Regulation 347-General Waste Management. Organic solvents are considered hazardous waste and must be managed throughout their lifecycle.</p>

Implementation schedule	Within 1 year of approval of the Source Protection Plan
Monitoring Policy	The MOE shall submit an annual report to the CA which identifies the number of C of A applications which were reviewed and the number which required updates to adequately manage the significant threats.

Policy Number	17-5
Sub- Threat(s)	The handling and storage of organic solvents
Circumstance	This threat is significant where >25 L of organic solvents are stored in a container partially or completely underground or where >250 L of organic solvents are stored in a container at or above ground.
Vulnerable Area	WHPA-A, B with a vulnerability score of 10
Risk	Significant
Body Responsible for Implementing	Municipality
Threat Status	Future
Land Use	All land use which could be associated with the storage and handling of organic solvents.
Legal Effect	Conform
Policy Tool	S. 57 Prohibition
Policy Idea	New handling and storage of organic solvents shall be prohibited in areas where the handling and storage of organic solvents is a significant threat.
Implementation schedule	The policy takes effect one year after the approval date of the first source protection plan.
Monitoring Policy	The municipality shall submit an annual report to the CA, which includes whether they have identified any organic solvent handling or storage area which was used in contravention of this policy.

Policy Number	17-6
Sub- Threat(s)	The handling and storage of organic solvents
Circumstance	This threat is significant where >25 L of organic solvents are stored in a container partially or completely underground or where >250 L of organic solvents are stored in a container at or above ground.
Vulnerable Area	WHPA-A, B with a vulnerability score of 10
Risk	Significant
Body Responsible for Implementing	Municipality
Threat Status	Future
Land Use	All land use which could be associated with the storage and handling of organic solvents.
Legal Effect	Conform
Policy Tool	S. 58 Risk Management Plan
Policy Idea	<p>The RMO shall require risk management plans for activities involving the handling and storage of organic solvents in areas where this activity is a significant threat. The plan should address items of operating practices including containment and management, proper waste disposal, employee training as well as a spill contingency plan. Other areas to be covered may include monitoring of groundwater, appropriate alarm system and automatic valves to ensure containment of leaks and spills, periodic testing of storage systems, secondary containment systems as well as other items. Annual inspections would be required as part of this plan</p> <p>Industry best practices for risk management measures as well as those included in the Risk Management Catalogue shall be relied upon to develop a Risk Management Plan. Risk Management Plans will cover any deficiencies not undertaken through the use of the prescribed instrument tool. Where an adequate risk management plan cannot be negotiated, the significant threat cannot be undertaken.</p> <p>The Risk Management Official shall conduct formal site inspections of private sector occupants within areas where the storage and handling of organic solvents are a significant threat. To identify potential threats within their properties, these inspections shall be undertaken on a prescribed schedule and may be combined with Fire Department visits.</p>
Implementation schedule	Within 1 year of the approval of the Source Protection Plan

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Monitoring Policy	The Risk Management Official shall submit an annual report to the CA which includes the number of RMP required and approved. The report shall include a summary of the types of Risk Management Measures which were approved as part of Risk Management Plans. . The Risk Management Official will also report on the schedule of inspections and the number of inspections carried out.
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Policy Number	17-7
Sub- Threat(s)	The handling and storage of organic solvents
Circumstance	This threat is significant where >25 L of organic solvents are stored in a container partially or completely underground or where >250 L of organic solvents are stored in a container at or above ground.
Vulnerable Area	WHPA-A, B with a vulnerability score of 10
Risk	Significant
Body Responsible for Implementing	Municipality
Threat Status	Future
Land Use	All land use which could be associated with the storage and handling of organic solvents.
Legal Effect	Conform
Policy Tool	S. 59 Restricted Land Uses
Policy Idea	All land use which could be associated with the storage and handling of DNAPLs identified in municipal Official Plans and Zoning By-laws in this SPA are designated for the purpose of S. 59 of the CWA in the areas where the storage and handling of DNAPLs is subject to S.57 Prohibition or S. 58 Risk Management Plans under the CWA.
Implementation schedule	Implementation of the policy immediately following the approval of the SPP. Implementation creates a “red flag” when a municipality receives building permit and planning act applications.
Monitoring Policy	Monitoring is not applicable because it does not require municipal amendments or changes to Official Plans or Zoning By-Laws.

Policy Number	17-8
Sub- Threat(s)	The handling and storage of organic solvents
Circumstance	This threat is significant where >25 L of organic solvents are stored in a container partially or completely underground or where >250 L of organic solvents are stored in a container at or above ground.
Vulnerable Area	WHPA-A, B with a vulnerability score of 10
Risk	Significant
Body Responsible for Implementing	Municipality
Threat Status	Existing and Future
Land Use	All land use which could be associated with the storage and handling of organic solvents.
Legal Effect	Strategic
Policy Tool	S.26 p.1 Other-Specify Action
Policy Idea	Municipalities shall consider improving access to residential hazardous waste depots within the areas where organic solvents are significant threats.
Implementation schedule	N/A
Monitoring Policy	Municipality shall report to the CA on the location, frequency and number of residents using the depots.

Policy Number	17-9
Sub- Threat(s)	The handling and storage of organic solvents
Circumstance	This threat is significant where >25 L of organic solvents are stored in a container partially or completely underground or where >250 L of organic solvents are stored in a container at or above ground.
Vulnerable Area	WHPA-A, B with a vulnerability score of 10
Risk	Significant
Body Responsible for	Municipality

Policy Number	17-9
Implementing	
Threat Status	Existing and Future
Land Use	All land use which could be associated with the storage and handling of organic solvents.
Legal Effect	Strategic
Policy Tool	S. 26 p.1 Other-Specify Action (Municipal Act Powers)
Policy Idea	Municipalities shall be encouraged to enact sewer use by-laws which require that floor drains in areas where organic solvents are being handled or stored are not directly connected to sanitary or storm sewers. Municipalities, through Building Inspectors or Risk Management Officials, shall be encouraged to conduct inspections to make sure that floor drains are properly contained and that materials collected are properly disposed.
Implementation schedule	N/A
Monitoring Policy	The municipality shall report to the CA with the number of inspections carried out as well as the number of locations where corrective action was required and the nature of the corrective action.

Draft Policies

Draft policies have been developed for Thames-Sydenham and Region for the handling and storage of DNAPL and the handling and storage of organic solvents. The table below provides a brief description of these policies. Refer to the Source Protection Plan for a detailed version of the policies.

Table 3-15 Draft Policies for the Handling and Storage of DNAPLs and Organic Solvents

TSR Policy Number	Policy Database Number	Threat	Description	Risk Category	Threat Status	Policy Approach	Implementer
TS.16.1	1673	Handling and storage of DNAPL	Management of Existing Handling and Storage of Dense Non-Aqueous Phase Liquids (DNAPLs) Through Section 58 of the Clean Water Act	Significant	Existing	Section 58	Risk Management Official
TS.16.2	1674	Handling and storage of DNAPL	Management of Future Handling and Storage of Dense Non-Aqueous Phase Liquids (DNAPLs) Through Section 58 of the Clean Water Act	Significant	Future	Section 58	Risk Management Official
TS.16.3	1675	Handling and storage of DNAPL	Prohibition of Future Handling and Storage of Dense Non-Aqueous Phase Liquids (DNAPLs) Through Section 57 of the Clean Water Act	Significant	Future	Section 57	Risk Management Official
TS.17.1	1676	Handling	Management of	Significant	Existing	Section 58	Risk

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TSR Policy Number	Policy Database Number	Threat	Description	Risk Category	Threat Status	Policy Approach	Implementer
		and storage of organic solvents	Existing Storage of Organic Solvents Through Section 58 of the Clean Water Act				Management Official
TS.17.2	1677	Handling and storage of organic solvents	Prohibition of Future Storage of Organic Solvents Through Section 57 of the Clean Water Act	Significant	Future	Section 57	Risk Management Official
TS.1.3.1	1636	All threats	Management of Existing Waste Disposal Sites Through the Environmental Protection Act	Significant	Existing	Specify Action	MOE
TS.1.3.3	1637	All threats	Prohibit Future Waste Disposal Sites Through the Environmental Protection Act	Significant	Future	Specify Action	MOE
G.2.1.2	1691	All threats	Continued Funding of Ontario Drinking Water Stewardship Program	Significant	Existing	Incentives	MOE
G.6.1 to G.6.2	1692	All threats	Section 59 of the Clean Water Act general restricted land use policies	Significant	Future	Section 59	Risk Management Official
G.3.1, G.3.3.1, G.3.4.1	1693	All threats	General land use planning policies	Significant	Future	Land Use Planning	Planning Approval Authority
G.5.1 to G.5.5	1694	All threats	Section 58 of the Clean Water Act general risk management policies	Significant	Existing and future	Section 58	Risk Management Official
G.1.1 and G.1.2	1696	All threats	General education and outreach policies	Significant Moderate Low	Existing and future	Education and Outreach	Municipality Conservation Authority MOE
G.2.1.1	1724	All threats	Existing incentive programs general policy	Significant	Existing	Incentives	Municipality Conservation Authority MOE
G.2.2.1	1728	All threats	New incentive programs general policy	Significant	Existing	Incentives	Municipality Conservation Authority MOE
G.1.3	1866	All threats	Provincial signage to locate WHPA and IPZ	Significant	Existing and future	Education and Outreach	MOE MTO
G.1.4	1867	All threats	Signage policy as	Significant	Existing	Education	Municipality

TSR Policy Number	Policy Database Number	Threat	Description	Risk Category	Threat Status	Policy Approach	Implementer
			part of municipal education policy		and future	and Outreach	

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- Ontario Ministry of the Environment. 2007. Guidelines for Environmental Protection Measures at Chemical and Waste Storage Facilities. www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/std01_079136.pdf

