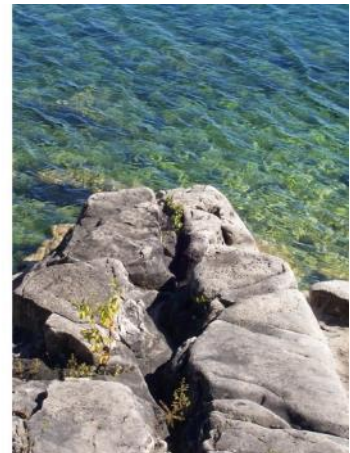
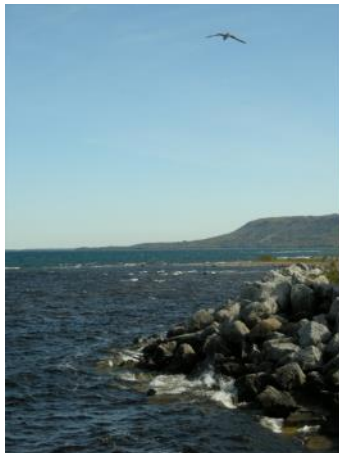


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Chapter 3

Drinking Water Threats



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3.0 Drinking Water Threats

3.1 Drinking Water Threat Categories

There are 21 drinking water threats prescribed in the *Clean Water Act* regulations. The provincial Tables of Drinking Water Threats (Threats Tables) are also part of the *Clean Water Act* regulations. The Threats Tables take each of the 21 categories of activities and state what circumstances must be present in order for that activity to be considered a potential drinking water threat. A threat category usually has many different sets of circumstances related to it. There is a table for chemical threats and another for pathogen threats.

List of Prescribed Drinking Water Threats:

1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the *Environmental Protection Act*.
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.
3. The application of agricultural source material to land.
4. The storage of agricultural source material.
5. The management of agricultural source material.
6. The application of non-agricultural source material to land.
7. The handling and storage of non-agricultural source material.
8. The application of commercial fertilizer to land.
9. The handling and storage of commercial fertilizer.
10. The application of pesticide to land.
11. The handling and storage of pesticide.
12. The application of road salt.
13. The handling and storage of road salt.
14. The storage of snow.
15. The handling and storage of fuel.
16. The handling and storage of a dense non-aqueous phase liquid.
17. The handling and storage of an organic solvent.
18. The management of runoff that contains chemicals used in the de-icing of aircraft.
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.
20. An activity that reduces the recharge of an aquifer.
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard.

The following sections describe the 21 prescribed drinking water threats. It should be noted that Threat 5 has no circumstances where this type of activity can be considered a significant

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drinking water threat. Further, the delineation for water quantity is of a size that recharge to the wells in question occurs outside of the area to which policies would apply. Therefore, the Source Protection Committee has not developed any policies that relate to Threat 5 or Threat 20 at this time.

3.1.1 Threat 1. The Establishment, Operation or Maintenance of a Waste Disposal Site Within the Meaning of Part V of the *Environmental Protection Act*

Waste disposal sites are activities that can be considered, under certain circumstances, to be a threat to drinking water. The *Environmental Protection Act* (Part V, Section 25) defines waste to include: “ashes, garbage, refuse, domestic waste, industrial waste, or municipal refuse and such other materials as are designated in the regulations.” As well, a waste disposal site is defined as:

- a) any land upon, into, in or through which, or building or structure in which, waste is deposited, disposed of, handled, stored, transferred, treated or processed, and
- b) any operation carried out or machinery or equipment used in connection with the depositing, disposal, handling, storage, transfer, treatment or processing referred to in clause (a).

The following sections provide a summary of these circumstances.

Waste disposal is divided into several threat subcategories within the Tables of Drinking Water Threats (Threats Tables):

- Landfarming of petroleum refining waste
- Landfilling (hazardous waste)
- Liquid industrial waste injected into a well
- Landfilling (municipal waste)
- Landfilling (solid non-hazardous industrial or commercial waste)
- Storage, treatment and discharge of tailings from mines
- PCB waste storage
- Storage of hazardous waste at disposal sites
- Storage of waste described in clauses (p), (q), (r), (s), (t), or (u) of the definition of hazardous waste (Note: this definition refers primarily to small quantities of hazardous waste, empty containers with residues and contaminated materials from the clean-up of a spill)
- Application of untreated septage to land

Threat Subcategory (Waste Disposal): Landfarming of petroleum refining waste

Activities under the threat subcategory of “Waste Disposal Site – Landfarming of petroleum refining waste” that have potential significant drinking water threat circumstances include:

- The area where the disposal is undertaken is:
 - more than 1 hectare, but not more than 10 hectares
 - more than 10 hectares

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Table 3.1.1(a) – Vulnerability scores and vulnerable areas where activities under “Landfarming of petroleum refining waste” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	9	9 or 10	9

Threat Subcategory (Waste Disposal): Landfilling (Hazardous Waste)

Activities under the threat subcategory of “Waste Disposal Site – Landfilling (Hazardous Waste)” that have potential significant drinking water threat circumstances include:

- The area where the disposal is undertaken is:
 - less than 1 hectare
 - at least 1 hectare, but not more than 10 hectares
 - more than 10 hectares

Table 3.1.1(b) – Vulnerability scores and vulnerable areas where activities under “Landfilling (Hazardous Waste)” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	9	9 or 10	9

Threat Subcategory (Waste Disposal): Liquid industrial waste injected into a well

Activities under the threat subcategory of “Waste Disposal Site: Liquid industrial waste injected into a well” that have potential significant drinking water threat circumstances include:

- The combined rate of discharge of all wells located at the site is:
 - more than 380 m³/yr, but not more than 3,800 m³/yr
 - more than 3,800 m³/yr, but not more 38,000 m³/yr
 - more than 38,000 m³/yr, but not more than 380,000 m³/yr
 - more than 380,000 m³/yr, but not more than 3,800,000 m³/yr
 - more than 3,800,000 m³/yr, but not more than 38,000,000 m³/yr
 - more than 38,000,000 m³/yr

Table 3.1.1(c) – Vulnerability scores and vulnerable areas where activities under “Liquid industrial waste injected into a well” may be a significant threat

VULNERABLE ZONE:

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	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	8 or 10	-	-	-	-

Threat Subcategory (Waste Disposal): Landfilling (Municipal Waste)

Activities under the threat subcategory of “Waste Disposal – Landfilling (Municipal Waste)” that have potential significant drinking water threat circumstances include:

- The fill area is:
 - less than 1 hectare
 - at least 1 hectare, but not more than 10 hectares
 - more than 10 hectares

Table 3.1.1(d) – Vulnerability scores and vulnerable areas where activities under “Landfilling (Municipal Waste)” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	8 or 10	-	9	9 or 10	9

Threat Subcategory (Waste Disposal): Landfilling (Solid non-hazardous industrial or commercial)

Activities under the threat subcategory of “Waste Disposal – Landfilling (Solid non-hazardous industrial or commercial)” that have potential significant drinking water threat circumstances include:

- The fill area is:
 - less than 1 hectare
 - at least 1 hectare, but not more than 10 hectares
 - more than 10 hectares

Table 3.1.1(e) – Vulnerability scores and vulnerable areas where activities under “Landfilling (Solid non-hazardous industrial or commercial)” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	8 or 10	-	9	9 or 10	9

Threat subcategory (Waste Disposal): Storage, treatment and discharge of tailings from mines

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Activities under the threat subcategory of “Storage, treatment and discharge of tailings from mines” that have potential significant drinking water threat circumstances include:

- The managed tailings from mining operations are:
 - stored in a pit, and the site is not part of a facility for which NPRI Notice requires a person to report
 - stored in a pit, and the site is part of a facility for which NPRI Notice requires a person to report
 - stored using an impoundment structure located on the surface, and the site is not part of a facility for which NPRI Notice requires a person to report
 - stored using an impoundment structure located on the surface, and the site is part of a facility for which NPRI Notice requires a person to report

Table 3.1.1(f) – Vulnerability scores and vulnerable areas where activities under “Storage, treatment and discharge of tailings from mines” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	9	9 or 10	9

Threat Subcategory (Waste Storage): PCB waste storage

Activities under the threat subcategory of “Waste Disposal Site – PCB waste storage” that have potential significant drinking water threat circumstances include:

- PCB waste stored below grade in a facility or engineered cell
- PCB waste stored in tanks below grade
- PCB waste stored in tanks installed partially below grade
- PCB waste stored in an outdoor area and not in a container

Table 3.1.1(g) – Vulnerability scores and vulnerable areas where activities under “PCB waste storage” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	-	10	-

Threat Subcategory (Waste Storage): Storage of hazardous waste at disposal sites

Activities under the threat subcategory of “Waste Disposal Site: Storage of hazardous waste at disposal sites” that have potential significant drinking water threat circumstances include:

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- waste stored at or above grade
- waste stored below grade
- a portion, but not all, stored above grade

Table 3.1.1(h) – Vulnerability scores and vulnerable areas where activities under “Storage of hazardous waste at disposal sites” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	9	9 or 10	9

Threat Subcategory (Waste Storage): Storage of waste described in clauses (p), (q), (r), (s), (t), or (u) of the definition of hazardous waste

This threat subcategory describes the following materials (*Environmental Protection Act*, O. Reg. 347 – General: Waste management):

- A small quantity of waste that is:
 - (p) a hazardous industrial waste, hazardous waste chemical, ignitable waste, corrosive waste, leachate toxic waste or reactive waste and that is produced in any month in an amount less than five kilograms or otherwise accumulated in an amount less than five kilograms,
 - (q) an acute hazardous waste chemical and that is produced in any month in an amount less than one kilogram or otherwise accumulated in an amount less than one kilogram,
- An empty container or the liner from an empty container,
 - (r) that contained hazardous industrial waste, hazardous waste chemical, ignitable waste, corrosive waste, leachate toxic waste or reactive waste,
 - (s) that contained acute hazardous waste chemical, where the container is less than twenty litres capacity, or one or more liners weighing, in total, less than ten kilograms from empty containers.
- The residues or contaminated materials from the clean-up of a spill,
 - (t) of less than five kilograms of waste that is a hazardous industrial waste, hazardous waste chemical, ignitable waste, corrosive waste, leachate toxic waste or reactive waste, or
 - (u) of less than one kilogram of waste that is an acute hazardous waste chemical;

Activities under the threat subcategory of “Waste Disposal Site: Storage of waste described in clauses (p), (q), (r), (s), (t), or (u) of the definition of hazardous waste” that have potential significant drinking water threat circumstances include:

- waste stored at or above grade
- waste stored below grade

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- a portion, but not all, stored above grade

Table 3.1.1(i) – Vulnerability scores and vulnerable areas where activities under “Storage of waste described in clauses (p), (q), (r), (s), (t), or (u) of the definition of hazardous waste” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	-	10	-

Threat subcategory (Other Waste): Application of untreated septage to land

Activities under the threat subcategory of “Application of untreated septage to land” that have potential significant drinking water threat circumstances include the following:

- Chemical:
 - managed land application area is at least 1 hectare, but not more than 10 hectares
 - managed land application area is more than 10 hectares
- Pathogen:
 - land application of hauled sewage in any quantity

Table 3.1.1(j) – Vulnerability scores and vulnerable areas where activities under “Application of untreated septage to land” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	-	10	-
Pathogen	10	10	-	8, 8.1, or 9	8, 8.1, 9 or 10	8, 8.1, or 9

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3.1.2 Threat 2. The Establishment, Operation or Maintenance of a System That Collects, Stores, Transmits, Treats or Disposes of Sewage

Sewage systems or sewage works are activities that can be considered, under certain circumstances, to be threats to drinking water.

Sewage System or Sewage Works is divided into several threat subcategories within the *Tables of Drinking Water Threats (Threats Tables)*:

1. *Septic system*
2. *Septic system holding tank*
3. *Sanitary sewers and related pipes*
4. *Industrial effluent discharges*
5. *Sewage treatment plant bypass discharge to surface water*
6. *Sewage treatment plant effluent discharges (includes lagoons)*
7. *Storage of sewage (e.g. treatment plant tanks)*
8. *Combined sewer discharge from a stormwater outlet*

Threat subcategory: Septic System

Activities under the threat subcategory of “Septic System” that have potential significant drinking water threat circumstances include the following:

- Class of sewage system:
 - Class 1 to Class 4 systems including earth pit privy, privy vault, greywater system, cesspool, or a leaching bed system and its associated treatment unit
- Regulatory framework:
 - Ontario Building Code; or
 - *Ontario Water Resources Act*
- Chemical:
 - acetone; ○ chloride; ○ dichlorobenzene 1,4 (para);
 - nitrogen; ○ phosphorous (total); ○ sodium
- Pathogen:
 - discharge may result in the presence of one or more pathogens

On-site sewage systems fall under either the Ontario Building Code or the *Ontario Water Resources Act*. Systems with a design flow of 10,000 litres or less per day are regulated under the Building Code and are administered by a local principal authority, such as a municipality. The *Ontario Water Resources Act* governs systems of more than 10,000 litres per day of design flow, as well as systems that span beyond one property, and is administered by the Ministry of the Environment.

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Table 3.1.2 (a) – Vulnerability scores and vulnerable areas where activities under “Sewage System or Sewage Works – Septic system” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	-	-	-
Pathogen	10	10	-	-	10	-

Threat subcategory: Septic System Holding Tank

Activities under the threat subcategory of “Septic System Holding Tank” that have potential significant drinking water threat circumstances include the following:

- Class of sewage system:
 - Class 5 systems including holding tanks
- Regulatory framework:
 - Ontario Building Code; or
 - *Ontario Water Resources Act*
- Chemical:
 - acetone; ○ chloride; ○ dichlorobenzene 1,4 (para);
 - nitrogen; ○ phosphorous (total); ○ sodium
- Pathogen:
 - discharge may result in the presence of one or more pathogens

Table 3.1.2 (b) – Vulnerability scores and vulnerable areas where activities under “Sewage System or Sewage Works – Septic system holding tank” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	-	-	-
Pathogen	10	10	-	-	10	-

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Threat subcategory: Sanitary sewers and related pipes

Activities under the threat subcategory of “Sanitary sewers and related pipes” that have potential significant drinking water threat circumstances include the following:

- Type of sewage system:
 - wastewater collection facility that collects or transmits sewage containing human waste, but does not include a sewage storage tank or a designed bypass
- Design capacity:
 - 10,000, but not more than 100,000 cubic metres of sewage per day
 - more than 100,000 cubic metres of sewage per day
- Chemical Parameters:
 - BTEX
 - Cadmium
 - Copper
 - Dichlorobenzidine-3,3
 - Hexachlorobenzene
 - Lead
 - Mercury
 - Nitrogen
 - Pentachlorophenol
 - Polychlorinated Biphenyls (PCBs)
 - Polycyclic Aromatic Hydrocarbons (PAHs)
 - Zinc
- Pathogen:
 - the system is a wastewater collection facility that collects or transmits sewage containing human waste, but does not include any part of the facility that is a sewage storage tank or works used to carry out a designed bypass; and the discharge from the system may result in the presence of one or more pathogens in groundwater or surface water.

Table 3.1.2 (c) – Vulnerability scores and vulnerable areas where activities under “Sewage System or Sewage Works – Sanitary sewers and related pipes” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	-	-	-
Pathogen	10	10	-	-	10	-

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Threat subcategory: Industrial effluent discharges

Activities under the threat subcategory of “Industrial effluent discharges” that have potential significant drinking water threat circumstances include the following:

- Chemical:
 - the system discharges to surface water and has as its primary function the collection, transmission or treatment of industrial sewage and the system is not part of a facility for which the NPRI Notice requires a person to report
 - the system discharges to surface water and has as its primary function the collection, transmission or treatment of industrial sewage and the system is part of a facility for which the NPRI Notice requires a person to report and the report must include information in relation to a substance listed in Group 1, 2, 3 or 4 of Part 1 of Schedule 1 or Part 2 of Schedule 1 of the notice
- Chemical Parameters:
 - Acrylonitrile
 - Adsorbable Organic Halides (AOXs)
 - Aluminum
 - Arsenic
 - Biphenyl-1,1
 - Bis(2-ethylhexyl) phthalate
 - Boron
 - Bromomethane
 - BTEX
 - Butoxyethanol-2
 - Butyl-n alcohol
 - Butyl-tert alcohol
 - Cadmium
 - Carbon Tetrachloride
 - Chloride
 - Chloroform
 - Chromium VI
 - Cobalt
 - Copper
 - Cyanide (CN-)
 - Dichlorobenzene-1,2 (ortho)
 - Dichlorobenzene-1,4 (para)
 - Dichloroethane 1,2
 - Ethylene Glycol
 - Formaldehyde
 - Hexachlorobenzene
 - Hexachlorobutadiene
 - Hexachloroethane
 - Hydrazine
 - Hydroquinone
 - Iron
 - Lead
 - Manganese
 - Mercury
 - Methanol
 - Methyl ethyl ketone
 - Methylene chloride (Dichloromethane)
 - Molybdenum
 - Napthalene
 - Nickel
 - Nitrogen
 - Nitrosodimethylamine-N (NDMA)
 - Pentachlorobenzene
 - Petroleum Hydrocarbons (F1, F2, F3 or F4)
 - Phenol
 - Phosphorus (total)
 - Polycyclic Aromatic Hydrocarbons (PAHs)
 - Selenium
 - Silver
 - Sodium fluoride
 - Styrene
 - Sulphide (Hydrogen)
 - Tetrachlorobenzene-1,2,4,5
 - Tetrachloroethylene (PCE)
 - Tetrachlorobenzene 1,2,4
 - Trichloroethylene
 - Tritium
 - Vanadium
 - Vinyl chloride
 - Zinc

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- Pathogen:
 - the system discharges to surface water and its primary functions include conveying sewage from a meat plant the discharge may result in the presence of one or more pathogens in surface water

Table 3.1.2 (d) – Vulnerability scores and vulnerable areas where activities under “Sewage System or Sewage Works – Industrial effluent discharges” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	-	-	-	8, 8.1, or 9	8, 8.1, 9 or 10	8, 8.1, or 9
Pathogen	-	-	-	8, 8.1, or 9	8, 8.1, 9 or 10	8, 8.1, or 9

Threat subcategory: Sewage treatment plant bypass discharge to surface water

Activities under the threat subcategory of “Sewage treatment plant bypass discharge to surface water” that have potential significant drinking water threat circumstances include the following:

- Chemical:
 - the system is a wastewater treatment facility that may discharge sanitary sewage containing human waste to surface water by way of a designed bypass and the wastewater treatment facility is designed to discharge treated sanitary sewage at an average daily rate that is:
 - more than 2,500 but not more than 17,500 cubic metres on an annual basis;
 - more than 17,500 but not more than 50,000 cubic metres on an annual basis; or
 - more than 50,000 cubic metres on an annual basis
- Chemical Parameters:
 - BTEX
 - Cadmium
 - Copper
 - Hexachlorobenzene
 - Lead
 - Mercury
 - Nitrogen
 - Nitrosodimethylamine-N (NDMA)
 - Pentachlorophenol
 - Polychlorinated Biphenyls
 - Trichloroethylene
 - Vinyl chloride
 - Zinc
- Pathogen:
 - the system is a wastewater treatment facility that may discharge sanitary sewage containing human waste to surface water by way of a designed bypass and the discharge may result in the presence of one or more pathogens in surface water

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Table 3.1.2 (e) – Vulnerability scores and vulnerable areas where activities under “Sewage System or Sewage Works – Sewage treatment plant bypass discharge to surface water” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	-	-	-	8, 8.1, or 9	8, 8.1, 9 or 10	8, 8.1, or 9
Pathogen	-	-	-	8, 8.1, or 9	8, 8.1, 9 or 10	8, 8.1, or 9

Threat subcategory: Sewage treatment plant effluent discharges (includes lagoons)

Activities under the threat subcategory of “Sewage treatment plant effluent discharges (includes lagoons)” that have potential significant drinking water threat circumstances include the following:

- Chemical:
 - the system is a wastewater treatment facility that discharges directly to land or surface water through a means other than a designed bypass and the wastewater treatment facility is designed to discharge treated sanitary sewage at an average daily rate that is more than 2,500 but not more than 17,500 cubic metres on an annual basis
 - the system is a wastewater treatment facility that discharges directly to land or surface water through a means other than a designed bypass and the wastewater treatment facility is designed to discharge treated sanitary sewage at an average daily rate that is more than 17,500 but not more than 50,000 cubic metres on an annual basis
 - the system is a wastewater treatment facility that discharges directly to land or surface water through a means other than a designed bypass and the wastewater treatment facility is designed to discharge treated sanitary sewage at an average daily rate that is more than 50,000 cubic metres on an annual basis
- Chemical Parameters:
 - Antimony
 - Arsenic
 - Barium
 - BTEX
 - Cadmium
 - Chlorophenol-2
 - Chromium VI
 - Copper
 - Cyanide (CN-)
 - Dibutyl phthalate
 - Dichlorobenzene-1,2 (ortho)
 - Dichlorobenzene-1,4 (para)
 - Dichlorophenol-2,4
 - Ethylene Glycol
 - Lead
 - MCPA (2-methyl-4-chlorophenoxyacetic acid)
 - Mercury
 - Nickel
 - Nitrogen
 - Nitrosodimethylamine-N (NDMA)
 - Phenol
 - Phosphorus (total)
 - Silver
 - Zinc

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- Pathogen:
 - the system is a wastewater treatment facility that discharges to surface water through a means other than a designed bypass and a discharge may result in the presence of one or more pathogens in groundwater or surface water

Table 3.1.2 (f) – Vulnerability scores and vulnerable areas where activities under “Sewage System or Sewage Works – Sewage treatment plant effluent discharges (includes lagoons)” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	8, 8.1, or 9	8, 8.1, 9 or 10	8, 8.1, or 9
Pathogen	10	10	-	8, 8.1, or 9	8, 8.1, 9 or 10	8, 8.1, or 9

Threat subcategory: Storage of sewage (e.g. treatment plant tanks)

Activities under the threat subcategory of “Storage of sewage (e.g. treatment plant tanks)” that have potential significant drinking water threat circumstances include the following:

- Type of system:
 - the system is a treatment tank or storage tank that is part of a sewage works within the meaning of the Ontario Water Resources Act, the tank treats or stores sanitary sewage containing human waste and the system is associated with a wastewater treatment facility
- Chemical:
 - the tank is at or above grade and the system is designed to discharge treated sanitary sewage at an average daily rate that is:
 - more than 2,500 but not more than 17,500 cubic metres on an annual basis
 - more than 17,500 but not more than 50,000 cubic metres on an annual basis
 - more than 50,000 cubic metres on an annual basis
 - the tank is below grade and the system is designed to discharge treated sanitary sewage at an average daily rate that is:
 - more than 2,500 but not more than 17,500 cubic metres on an annual basis
 - more than 17,500 but not more than 50,000 cubic metres on an annual basis
 - more than 50,000 cubic metres on an annual basis
 - a part of the tank, but not all, is below grade and the system is designed to discharge treated sanitary sewage at an average daily rate that is:
 - more than 2,500 but not more than 17,500 cubic metres on an annual basis
 - more than 17,500 but not more than 50,000 cubic metres on an annual basis
 - more than 50,000 cubic metres on an annual basis

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- Chemical Parameters:
 - BTEX
 - Cadmium
 - Copper
 - Hexachlorobenzene
 - Lead
 - Mercury
 - Nitrogen
 - Nitrosodimethylamine-N (NDMA)
 - Pentachlorophenol
 - Polychlorinated Biphenyls (PCBs)
 - Trichloroethylene
 - Vinyl chloride
 - Zinc
- Pathogen:
 - the system is a sewage treatment tank or sewage storage tank in either a wastewater collection facility or wastewater treatment facility, and any part of the tank is at or above grade and a spill from the tank may result in the presence of one or more pathogens in groundwater or surface water
 - the system is a sewage treatment tank or sewage storage tank in a wastewater collection facility or a wastewater treatment facility and the tank is below grade and a spill from the tank may result in the presence of one or more pathogens in groundwater or surface water

Table 3.1.2 (g) – Vulnerability scores and vulnerable areas where activities under “Sewage System or Sewage Works – Storage of sewage (e.g. treatment plant tanks)” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	8 or 10	-	-	10	-
Pathogen	10	10	-	9	9 or 10	9

Threat subcategory: Combined sewer discharge from a stormwater outlet to surface water

Activities under the threat subcategory of “Combined sewer discharge from a stormwater outlet to surface water” that have potential significant drinking water threat circumstances include the following:

- Type of system:
 - the system is a combined sewer that may discharge sanitary sewage containing human waste to surface water other than by way of a designed bypass and the combined sewer is part of a system that includes a wastewater treatment facility
- Chemical:
 - the system is designed to discharge treated sanitary sewage at an average daily rate that is more than 2,500 but not more than 17,500 cubic metres on an annual basis

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- the system is designed to discharge treated sanitary sewage at an average daily rate that is more than 17,500 but not more than 50,000 cubic metres on an annual basis
- the system is designed to discharge treated sanitary sewage at an average daily rate that is more than 50,000 cubic metres on an annual basis
- Chemical Parameters:
 - BTEX
 - Hexachlorobenzene
 - Nitrogen
 - Pentachlorophenol
 - Trichloroethylene
 - Cadmium
 - Lead
 - Nitrosodimethylamine-N (NDMA)
 - Polychlorinated Biphenyls (PCBs)
 - Vinyl chloride
 - Copper
 - Mercury
 - Zinc
- Pathogen:
 - the system is a combined sewer that may discharge sanitary sewage containing human waste to surface water and the discharge may result in the presence of one or more pathogens in surface water

Table 3.1.2 (h) – Vulnerability scores and vulnerable areas where activities under “Sewage System or Sewage Works – Combined sewer discharge from a stormwater outlet to surface water” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	-	-	-	8, 8.1, or 9	8, 8.1, 9 or 10	8, 8.1, or 9
Pathogen	-	-	-	8, 8.1, or 9	8, 8.1, 9 or 10	8, 8.1, or 9

Threat subcategory: Discharge of untreated stormwater from a stormwater retention pond

Activities under the threat subcategory of “Discharge of untreated stormwater from a stormwater retention pond” that have potential significant drinking water threat circumstances include the following:

- Type of system:
 - the system is a storm water management facility designed to discharge storm water to land or surface water
- Chemical:
 - the drainage area associated with the storm water management facility is more than 1 but not more than 10 hectares and the predominant land use in the area is:
 - high density residential land use;
 - industrial or commercial

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- the drainage area associated with the storm water management facility is more than 10 but not more than 100 hectares and the predominant land uses in the area are:
 - rural, agricultural, or low density residential;
 - high density residential land use
 - industrial or commercial
- the drainage area associated with the storm water management facility is more than 100 hectares and the predominant land uses in the area are:
 - rural, agricultural, or low density residential;
 - high density residential land use
 - industrial or commercial
- Chemical Parameters:
 - Aluminum
 - Chloride
 - Glyphosate
 - Mercury
 - Polycyclic Aromatic Hydrocarbons (PAHs)
 - Petroleum Hydrocarbons (F1, F2, F3, F4)
 - Phosphorous
 - Arsenic
 - Chromium VI
 - Lead
 - Nickel
 - Zinc
 - Cadmium
 - Copper
 - Mecoprop
 - Nitrogen
- Pathogen:
 - the system is a storm water management facility designed to discharge storm water to land or surface water and the discharge may result in the presence of one or more pathogens in surface water

Table 3.1.2 (i) – Vulnerability scores and vulnerable areas where activities under “Sewage System or Sewage Works – Discharge of untreated stormwater from a stormwater retention pond” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	8, 8.1, or 9	8, 8.1, 9 or 10	8, 8.1, or 9
Pathogen	-	-	-	-	-	-

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3.1.3 Threat 3. The Application of Agricultural Source Material to Land

The application of agricultural source material to land (ASM) is an activity that can be considered, under certain circumstances, to be a threat to drinking water. Agricultural source materials (ASMs) can include manure, bedding, washwater, yard runoff, and similar organic products that contain nutrients (see O.Reg. 267/03 s. 1(1) under the *Nutrient Management Act*).

Agricultural source material application activities are grouped in the Tables of Drinking Water Threats (Threats Tables) by:

- Managed land percentage:
 - the managed land map shows a managed land percentage for the applicable area that is:
 - less than 40%
 - at least 40%, but not more than 80%
 - more than 80%
- Nutrient units:
 - the livestock density map shows a livestock density for the applicable area that is sufficient to annually apply agricultural source material at a rate that is:
 - less than 0.5 nutrient units per acre
 - at least 0.5 nutrient units per acre but not more than 1.0 nutrient units per acre
 - more than 1.0 nutrient units per acre
- Parameter:
 - Nitrogen
 - Phosphorous (total)

Managed lands are lands to which nutrients are applied.

Agricultural managed land can include areas of cropland, fallow and improved pasture.

Non-agricultural managed land can include golf courses, parks, ski hills, lawns.

Agricultural managed land includes areas of cropland, fallow and improved pasture. Non-agricultural managed land includes golf courses, sports fields, municipal parks, large school playgrounds, ski hills, lawns, and other grassed areas that may receive nutrients, which is primarily commercial fertilizer. The percentage of managed lands is computed by dividing the hectares of managed lands by the hectares in the vulnerable area zone and multiplying by 100.

Livestock density is given as nutrient units per acre of agricultural managed land. A nutrient unit is defined as the number of animals that will give the fertilizer replacement value of the lower of 43 kilograms of nitrogen or 55 kilograms of phosphate per year as nutrients. Each type of livestock has its own nutrient unit conversion factor to determine the number of animals that generate 1 NU. For instance, one beef cow produces 1 NU while 12 sheep produce 1 NU.

Maps located in the Assessment Reports illustrate the percentage of managed lands and the amount of nutrients units for each vulnerable area. Consulting the pair of maps for each vulnerable area will show which set of circumstances applies in any given location. Note that the maps only include parts of the vulnerable area where activities could potentially be classified as a significant drinking water threat.

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Agricultural source material application activities that have potential significant drinking water threat circumstances include:

- Chemical:
 - less than 40% managed lands and more than 1.0 nutrient units per acre
 - at least 40% but not more than 80% managed lands and more than 1.0 nutrient units per acre
 - more than 80% managed lands and less than 0.5 nutrient units per acre
 - more than 80% managed lands and at least 0.5 nutrient units per acre but not more than 1.0 nutrient units per acre
 - more than 80% managed lands and more than 1.0 nutrient units per acre
- Pathogen:
 - agricultural source material is applied to land in any quantity

Table 3.1.3 – Vulnerability scores and vulnerable areas where activities under “Application of Agricultural Source Material to Land” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	9	9 or 10	9
Pathogen	10	10	-	8, 8.1, or 9	8, 8.1, 9 or 10	8, 8.1, or 9

3.1.4 Threat 4. The Storage of Agricultural Source Material

The storage of agricultural source material (ASM) is an activity that can be considered, under certain circumstances, to be a threat to drinking water. Agricultural source materials (ASMs) can include manure, bedding, washwater, yard runoff, and similar organic products that contain nutrients (see O.Reg. 267/03 s. 1(1) under the *Nutrient Management Act*).

Agricultural source material storage activities are grouped in the Tables of Drinking Water Threats (Threats Tables) by:

- Physical position:
 - at or above grade
 - below grade
 - a portion, but not all, is stored above grade
- Storage facility type:
 - permanent nutrient storage facility
 - temporary field nutrient storage site

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- Nutrient units:
 - the weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is
 - more than 0.5 nutrient units per acre of the farm units, but not more than 1.0 nutrient units per acre of the farm units
 - more than 1.0 nutrient units per acre of the farm units
- Parameter:
 - Nitrogen
 - Phosphorous (total)

Agricultural source material storage activities that have potential significant drinking water threat circumstances include:

- Chemical:
 - storage at or above grade
 - storage below grade
 - storage where a portion, but not all, is stored above grade
- Pathogen:
 - at or above grade in a permanent nutrient storage facility
 - below grade in a permanent nutrient storage facility
 - at a temporary field nutrient storage site

Table 3.1.4 – Vulnerability scores and vulnerable areas where activities under “Storage of Agricultural Source Material” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	9	9 or 10	9
Pathogen	10	10	-	8, 8.1, or 9	8, 8.1, 9 or 10	8, 8.1, or 9

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3.1.5 Threat 5. The Management of Agricultural Source Material

The management of agricultural source material (ASM) under Threat 5 relates specifically to aquaculture, that is fish farming. The Threats Tables do not contain circumstances where it is considered a significant drinking water threat.

Table 3.1.5 – Vulnerability scores and vulnerable areas where activities under “Management of Agricultural Source Material” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	-	-	-	-	-	-
Pathogen	-	-	-	-	-	-

3.1.6 Threat 6. The Application of Non-agricultural Source Material to Land

The application of non-agricultural source material to land is an activity that can be considered, under certain circumstances, to be a threat to drinking water. Non-agricultural source materials (NASMs) can include pulp and paper biosolids, sewage biosolids, anaerobic digestion, and any other material that is not from an agricultural source and that is capable of being applied to land as a nutrient (see O. Reg. 267/03 s.1(1) under the *Nutrient Management Act*).

Application of non-agricultural source material activities are grouped in the Tables of Drinking Water Threats (Threats Tables) by:

- Managed land percentage:
 - the managed land map shows a managed land percentage for the applicable area that is:
 - less than 40%
 - at least 40%, but not more than 80%
 - more than 80%
- Nutrient units:
 - the livestock density map shows a livestock density for the applicable area that is sufficient to annually apply agricultural source material at a rate that is
 - less than 0.5 nutrient units per acre
 - at least 0.5 nutrient units per acre, but not more than 1.0 nutrient units per acre
 - more than 1.0 nutrient units per acre
- Parameter:
 - Nitrogen
 - Phosphorous (total)

For a discussion on managed lands and nutrient units, reference should be made to section 3.1.3.

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Non-agricultural source material application activities that have potential significant drinking water threat circumstances include:

- Chemical:
 - less than 40% managed lands and more than 1.0 nutrient units per acre
 - at least 40% but not more than 80% managed lands and more than 1.0 nutrient units per acre
 - more than 80% managed lands and less than 0.5 nutrient units per acre
 - more than 80% managed lands and at least 0.5 nutrient units per acre but not more than 1.0 nutrient units per acre
 - more than 80% managed lands and more than 1.0 nutrient units per acre
- Pathogen:
 - application of non-agricultural source material (NASM) to land (including treated septage)

Table 3.1.6 – Vulnerability scores and vulnerable areas where activities under “Application of Non-agricultural Source Material to Land” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	9	9 or 10	9
Pathogen	10	10	-	8, 8.1, or 9	8, 8.1, 9 or 10	8, 8.1, or 9

3.1.7 Threat 7. The Handling and Storage of Non-agricultural Source Material

The handling and storage of non-agricultural source material are activities that can be considered, under certain circumstances, to be a threat to drinking water. Non-agricultural source materials (NASMs) can include pulp and paper biosolids, sewage biosolids, anaerobic digestion, and any other material that is not from an agricultural source and that is capable of being applied to land as a nutrient (see O. Reg. 267/03 s.1(1) under the *Nutrient Management Act*).

Handling and storage of non-agricultural source material activities are grouped in the Tables of Drinking Water Threats (Threats Tables) by:

- Physical position:
 - at or above grade
 - below grade
 - a portion, but not all, is stored above grade

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- Storage facility type:
 - permanent nutrient storage facility
 - temporary field nutrient storage site
- Mass of nitrogen:
 - the mass of nitrogen in the non-agricultural source material stored is
 - at least 0.5 tonnes, but not more than 5 tonnes
 - more than 5 tonnes
- Parameter:
 - Nitrogen
 - Phosphorous (total)

Non-agricultural source material storage activities that have potential significant drinking water threat circumstances include:

- Chemical:
 - at or above grade
 - below grade
 - a portion, but not all, is stored above grade
- Pathogen:
 - at or above grade
 - below grade

Table 3.1.7 – Vulnerability scores and vulnerable areas where activities under “Handling and Storage of Non-agricultural Source Material” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	9	9 or 10	9
Pathogen	10	10	-	8, 8.1, or 9	8, 8.1, 9 or 10	8, 8.1, or 9

3.1.8 Threat 8. The Application of Commercial Fertilizer to Land

The application of commercial fertilizer to land is an activity that can be considered, under certain circumstances, to be a threat to drinking water. Commercial fertilizer is a synthetic substance containing nitrogen, phosphorus, potassium, or other plant food intended for use as a plant nutrient. The main problems associated with the land application of commercial fertilizer appear to be improper use. Two examples of its potential improper use include:

- (1) application without consideration for nutrients available in the soil and plant requirements;
- (2) inappropriate timing of application for plant growth cycles and weather conditions.

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Commercial fertilizer application activities that have potential significant drinking water threat circumstances include:

- Chemical:
 - less than 40% managed lands and more than 1.0 nutrient units per acre
 - at least 40% but not more than 80% managed lands and more than 1.0 nutrient units per acre
 - more than 80% managed lands and less than 0.5 nutrient units per acre
 - more than 80% managed lands and at least 0.5 nutrient units per acre but not more than 1.0 nutrient units per acre
 - more than 80% managed lands and more than 1.0 nutrient units per acre

For a discussion on managed lands and nutrient units, reference should be made to section 3.1.3.

Table 3.1.8 – Vulnerability scores and vulnerable areas where activities under “Application of Commercial Fertilizer to Land” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	9	9 or 10	9

3.1.9 Threat 9. The Handling and Storage of Commercial Fertilizer

The handling and storage of commercial fertilizer are activities that can be considered, under certain circumstances, to be a threat to drinking water. Commercial fertilizer is a synthetic substance containing nitrogen, phosphorus, potassium or other plant food intended for use as a plant nutrient. Problems associated with the storage of commercial fertilizers are leaks and spills as a result of aging infrastructure or improper storage. For both storage and application of commercial fertilizer, it should be noted that the movement of phosphorus is often, but not exclusively, associated with runoff and soil erosion.

Handling and storage of commercial fertilizer activities that have potential significant drinking water threat circumstances include:

- storage for retail sale or in relation to its application to land, of more than 2500 kg

Table 3.1.9 – Vulnerability scores and vulnerable areas where activities under “Handling and Storage of Commercial Fertilizer” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	-	10	-

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3.1.10 Threat 10. The Application of Pesticide to Land

The application of pesticide to land is an activity that can be considered, under certain circumstances, to be a threat to drinking water. All of the pesticides considered through the Drinking Water Source Protection initiative are chemicals used to control weeds or fungi.

The main consideration for reducing or eliminating drinking water threats related to the land application of pesticides is to make sure it does not enter surface water and/or groundwater.

Pesticide application activities that have potential significant drinking water threat circumstances include:

- application:
 - less than 1 hectare
 - at least 1 hectare, but not more than 10 hectares
 - more than 10 hectares

*In Ontario, the Pesticides Act defines **pesticide** as “any organism, substance or thing that is manufactured, represented, sold or used as a means of directly or indirectly controlling, preventing, destroying, mitigating, attracting or repelling any pest or altering the growth, development or characteristics of any plant life that is not a pest and includes any organism, substance or thing registered under the federal Pest Control Products Act”.*

Table 3.1.10 – Vulnerability scores and vulnerable areas where activities under “Application of Pesticide to Land” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	8.1 or 9	8.1, 9 or 10	8.1 or 9

3.1.11 Threat 11. The Handling and Storage of Pesticide

The handling and storage of pesticides are activities that can be considered, under certain circumstances, to be a threat to drinking water. For additional discussion on pesticides, refer to section 3.1.10 above. Handling and storage of pesticides is most commonly associated with agricultural, recreational, public works, and retail land uses. There are eleven (11) chemicals listed in the Threats Tables that could make their way into surface water and groundwater through spills resulting from the improper handling and storage of pesticides.

The handling and storage of pesticide activities that have potential significant drinking water threat circumstances include:

- storage for retail sale or in relation to its application to land; more than 250 kg but less than 2500 kg
- storage at a facility where it is manufactured or processed, or from which it is wholesaled; more than 2500 kg
- storage for retail sale or in relation to its application to land; more than 2500 kg

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Table 3.1.11 – Vulnerability scores and vulnerable areas where activities under “Handling and Storage of Pesticide” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	9	9 or 10	9

3.1.12 Threat 12. The Application of Road Salt

The application of road salt can be considered, under certain circumstances, to be a threat to drinking water. Road salt as a drinking water threat means any product that is used to maintain roads and pedestrian areas and contains one or both of sodium and chloride. The majority of road salt is used as a deicer or an ice prevention agent, but limited use for dust suppression does occur. The most commonly used products are sodium chloride and calcium chloride because they are effective and inexpensive.

Road salt application activities that have potential significant drinking water threat circumstances include:

- the impervious surface map shows a total of impervious surface percentage for the applicable area that is:
 - more than 8%, but less than 80%
 - more than 80%

Table 3.1.12 – Vulnerability scores and vulnerable areas where activities under “Application of Road Salt” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	9	9 or 10	9

3.1.13 Threat 13. The Handling and Storage of Road Salt

The handling and storage of road salt can be considered, under certain circumstances, to be a threat to drinking water. The handling and storage of road salt activities that have potential significant drinking water threat circumstances include:

- road salt stored in a manner that may result in its exposure to precipitation or runoff from precipitation or snow melt and at least 500 tonnes, but not more than 5,000 tonnes, of road salt
- road salt stored in a manner that may result in its exposure to precipitation or runoff from precipitation or snow melt and more than 5,000 tonnes of road salt

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Table 3.1.13 – Vulnerability scores and vulnerable areas where activities under “Handling and Storage of Road Salt” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	9	9 or 10	9

3.1.14 Threat 14. The Storage of Snow

The storage of snow can be considered, under certain circumstances, to be a threat to drinking water. Snow removed (plowed) from roads and parking lots can be contaminated with salt, oil, grease, and heavy metals from vehicles, litter and airborne pollutants. Large snow banks along roads and in parking areas can create traffic hazards, and can result in localized flooding when the snow melts, especially on major roadways and in urban areas. In these situations, the excess snow must be melted on-site or transported to a location where it is either melted or stockpiled and allowed to melt. The disposal of snow in one location concentrates the potential contaminants; however, they are diluted by the larger volume of snow. Since the snow is contaminated, it must be handled and stored in ways that protect water sources.

This drinking water threat includes:

- a) Snow that is pushed into large piles on a property (e.g. stored in parking lots),
- b) Snow transported to a central site from other locations (e.g. snow disposal sites),
- c) Large snow banks along roads that are close to municipal wellheads or surface water intakes (if accumulation meets area circumstances identified below).

The classification of a snow storage area as either a significant, moderate or low drinking water threat is dependent on its specific location (vulnerability score) as well as whether the snow is stored above or below grade. Snow storage below grade would occur in a pit or quarry. In general, the greater the snow storage area (and therefore the volume of snow stored), the greater the inherent risk to drinking water.

The storage of snow activities that have potential significant drinking water threat circumstances include:

- Facility where snow is stored at or above grade:
 - at least 0.01 hectares but not more than 0.5 hectares
 - more than 0.5 hectares but not more than 1 hectares
 - more than 1 hectares but not more than 5 hectares
 - more than 5 hectares
- Facility where snow is stored below grade:
 - at least 0.01 hectares but not more than 0.5 hectares
 - more than 0.5 hectares but not more than 1 hectares

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- more than 1 hectares but not more than 5 hectares
- more than 5 hectares

Table 3.1.14 – Vulnerability scores and vulnerable areas where activities under “Storage of Snow” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	9	9 or 10	9

3.1.15 Threat 15. The Handling and Storage of Fuel

Fuel handling and storage are activities that can be considered, under certain circumstances, to be a threat to drinking water. The handling and storage of fuel can include diesel, heating oil, kerosene, hydrocarbon fuel (e.g. gasoline), and used oil (when used as a fuel).

Activities related to the handling and storage of fuel are grouped in the Tables of Drinking Water Threats (Threats Tables) by:

- Physical position:
 - at or above grade
 - below grade
 - a portion, but not all, is stored above grade
- The types of facilities to be considered:
 - facility as defined in Ontario Regulation 213/01 (Fuel Oil) or Ontario Regulation 217/01 (Liquid Fuels), but not a bulk plant
 - a bulk plant as defined in Ontario Regulation 217/01 (Liquid Fuels), or facility that manufactures or refines fuel
- Quantity of fuel stored:
 - not more than 25 litres
 - more than 25 litres, but not more than 250 litres
 - more than 250 litres, but not more than 2,500 litres
 - more than 2,500 litres

The fuel handling and storage activities that have potential significant drinking water threat circumstances include:

- Handling:
 - above grade
 - below grade

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- Storage:
 - storage at or above grade
 - storage below grade
 - storage if a part, but not all, below grade

Table 3.1.15 – Vulnerability scores and vulnerable areas where activities under “Handling and Storage of Fuel” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	-	10	-

3.1.16 Threat 16. The Handling and Storage of a Dense Non-aqueous Phase Liquid (DNAPL)

DNAPL handling and storage are activities that can be considered, under certain circumstances, to be a threat to drinking water. There are five compounds identified in the Threats Tables: Dioxane-1,4; Polycyclic Aromatic Hydrocarbons (PAHs); Tetrachloroethylene (PCE); Trichloroethylene or another DNAPL that could degrade to Trichloroethylene; and Vinyl chloride or another DNAPL that could degrade to vinyl chloride.

The DNAPL handling and storage activities that have potential significant drinking water threat circumstances include:

- below grade handling
- above grade handling
- storage at or above grade
- storage below grade
- storage if a portion, but not all, of the storage is below grade

Dense non-aqueous phase liquids, or DNAPLs, are chemical compounds that are denser than water and tend to be sparingly soluble in water. Many are highly toxic and persistent. They may sink to the bottom of groundwater aquifers and surface water bodies, where they can slowly leach into the water over time.

Table 3.1.16 – Vulnerability scores and vulnerable areas where activities under “Handling and Storage of a Dense Non-aqueous Phase Liquid (DNAPL)” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
DNAPL	10	6, 8 or 10	4, 6 or 8	-	10	-

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3.1.17 Threat 17. The Handling and Storage of an Organic Solvent

Organic solvent handling and storage are activities that can be considered, under certain circumstances, to be a threat to drinking water. Organic solvents are liquid organic compounds with the ability to dissolve solids, gases or liquids. They have been used in vast quantities for decades in industrial and commercial applications and can also be found in small quantities in common household products such as adhesives and cleaners. Four organic solvents have been identified as potential concerns related to drinking water: carbon tetrachloride, chloroform, dichloromethane and pentachlorophenol.

Activities related to the handling and storage of an organic solvent are grouped in the Tables of Drinking Water Threats (Threats Tables) by:

- Physical position:
 - at or above grade; or
 - below grade; or
 - partially below grade
- Quantity of organic solvent stored is:
 - not more than 25 litres
 - more than 25 litres, but not more than 250 litres
 - more than 250 litres, but not more than 2,500 litres
 - more than 2,500 litres

The organic solvent handling and storage activities that have potential significant drinking water threat circumstances include:

- storage at or above grade
- storage below grade
- storage if a portion, but not all, of the storage is below grade

Table 3.1.17 – Vulnerability scores and vulnerable areas where activities under “Handling Handling and Storage of an Organic Solvent” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	-	10	-

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3.1.18 Threat 18. The Management of Runoff that Contains Chemicals Used in the De-icing of Aircraft

The management of runoff that contains chemicals used in the de-icing of aircraft can be considered, under certain circumstances, to be a threat to drinking water. Ethylene glycol or propylene glycol is the active ingredient in aircraft de-icing fluids. The runoff of large volumes of de-icing fluids into surface water bodies over a short period of time can lead to oxygen depletion, which results in poor water quality and toxicity to aquatic life and mammals.

The management of runoff that contains chemicals used in the de-icing of aircraft activities that have potential significant drinking water threat circumstances include:

- runoff originates at a regional airport
- runoff originates at a national airport

A “regional airport” is defined in the Threats Tables as an airport with an annual passenger traffic that is less than 200,000 persons and that is not a remote airport or a small airport. A “National airport” is an airport that serves the national capital region or the Greater Toronto Area, or an airport with annual passenger traffic of 200,000 persons or more. All existing airports in the Source Protection Region would meet the definition of a “small airport”, which means an airport that does not have regular scheduled service to other airports and is not a remote airport.

Table 3.1.18 – Vulnerability scores and vulnerable areas where activities under “Management of Runoff that Contains Chemicals Used in the De-icing of Aircraft” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	9	9 or 10	9

3.1.19 Threat 19. An Activity That Takes Water From an Aquifer or a Surface Water Body Without Returning the Water Taken to the Same Aquifer or Surface Water Body

The identification of activities as significant threats under Threat 19 requires that: a) a water quantity stress assessment be completed; and b) the assessment indicates that a significant or moderate stress level exists. The Lake Rosalind/Hanover subwatershed is the only area identified in the Assessment Reports as having a potential stress level of moderate. Further study will be undertaken to confirm the final level. Therefore, no threats have been identified at this time in the Source Protection Region.

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Table 3.1.19 – Vulnerability scores and vulnerable areas where activities under “An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body” may be a significant threat

	VULNERABLE ZONE:	
	WHPA-Q1	IPZ-Q
Water Quantity	Existing taking, increase to an existing taking or a new taking	Existing taking, increase to an existing taking or a new taking

3.1.20 Threat 20. An Activity That Reduces the Recharge of an Aquifer

The same requirements as identified in section 3.1.19 above also apply to Threat 20. Therefore, no threats have been identified at this time in the Source Protection Region.

Table 3.1.20 – Vulnerability scores and vulnerable areas where activities under “An activity that reduces the recharge of an aquifer” may be a significant threat

	VULNERABLE ZONE:	
	WHPA-Q2	IPZ-Q
Water Quantity	Existing activity, modified activity or new activity	Existing activity, modified activity or new activity

3.1.21 Threat 21. The Use of Land as Livestock Grazing or Pasturing Land, an Outdoor Confinement Area or a Farm-Animal Yard

Livestock grazing, pasturing, outdoor confinement areas and farm-animal yards are activities that can be considered, under certain circumstances, to be a threat to drinking water.

The activities are grouped in the Tables of Drinking Water Threats (Threats Tables) by:

- Activity type:
 - livestock grazing or pasturing land
 - outdoor confinement area or farm-animal yard
- Agricultural source material generation:
 - the number of animals confined in the area at any time is sufficient to generate agricultural source material at a rate of:
 - at least 120 nutrient units and not more than 300 nutrient units per hectare of the area annually
 - more than 300 nutrient units per hectare of the area annually
- Nutrient units:
 - the number of nutrient units generated in the farm unit divided by the number of acres of land that is used for livestock grazing or pasturing land is sufficient to generate nutrients at an annual rate that is:
 - at least 0.5 nutrient units per acre and not more than 1.0 nutrient units per acre
 - more than 1.0 nutrient units per acre

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The activities related to use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard that have potential significant drinking water threat circumstances include:

- Chemical:
 - Livestock grazing or pasturing land
 - Outdoor confinement area or farm-animal yard
- Pathogen:
 - Livestock grazing or pasturing land (one or more animals)
 - Outdoor confinement area or farm-animal yard (one or more animals)

Table 3.1.21 – Vulnerability scores and vulnerable areas where activities under “Use of Land as Livestock Grazing or Pasturing Land, an Outdoor Confinement Area or a Farm-Animal Yard” may be a significant threat

	VULNERABLE ZONE:					
	WHPA-A	WHPA-B	WHPA-C	WHPA-E	IPZ-1	IPZ-2
Chemical	10	10	-	9	9 or 10	9
Pathogen	10	10	-	8, 8.1, or 9	8, 8.1, 9 or 10	8, 8.1, or 9

3.2 Tables of Drinking Water Threats

The Tables of Drinking Water Threats (Threats Tables) form part of the regulations made under the *Clean Water Act*. The Threats Tables detail the circumstances under which certain activities may be considered drinking water threats. These tables list activities and circumstances, and set out hazard scores and risk levels. To determine where an activity is a significant, moderate or low threat, and the circumstances, requires one to look at the maps contained in Chapter 5 of the Source Protection Plan to determine the vulnerability score at a particular location.

The Threats Tables give risk ratings for hundreds of unique sets of circumstances. Of these, one table lists chemical threats under almost 2000 sets of circumstances for a combined total of almost one hundred different chemical substances. A second table lists the circumstances under which activities would be considered pathogen threats.

The Threats Tables can be found at the following website:

<https://www.ontario.ca/environment-and-energy/tables-drinking-water-threats>

The Ministry of the Environment also provides the Provincial Tables of Circumstances (Circumstance Tables). These tables divide the Threats Tables into a more manageable size. Each of the Circumstance Tables details activities that are a drinking water threat:

- for one type of contaminant (Chemical/DNAPL/Pathogen);
- within one type of vulnerable area (intake protection zone, wellhead protection area, highly vulnerable aquifer, or significant recharge area);

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- at one vulnerability score (10, 9, 8.1, 8, etc.); and
- at one particular threat level (low/moderate/significant).

For example, one table pinpoints all activities or circumstances that are or would be significant chemical threats in a WHPA-B where the vulnerability score at a location is eight. The name of this table is CW8S. The Provincial Tables of Circumstances are meant to be used in conjunction with the Tables of Drinking Water Threats.

Copies of the Circumstance Tables that relate to significant drinking water threats have been included in Appendix D of the Source Protection Plan.

The complete set of Circumstance Tables can be found at the following website:
<https://www.ontario.ca/environment-and-energy/provincial-tables-circumstances>

3.3 Levels of Threats

Drinking water threats identified in the Threats Tables can be considered under one of four threat levels:

- significant;
- moderate;
- low; or
- none.

To determine this risk level, a risk score is first calculated for each activity that takes into account the vulnerability of the water source in the vulnerable area and the hazard rating of a specific activity. The hazard rating and risk rating are already considered in the Threats Tables when each set of circumstances is categorized at a threat level and vulnerability score needed to reach that threat level.

3.4 Transport Pathways

Constructed transport pathways are human-made features or open pathways through the ground. The *Clean Water Act* regulations define transport pathways as “a condition of land resulting from human activity that increases the vulnerability of a raw water supply of a drinking water system” (O.Reg 287/07 s. 1). Transport pathways are not considered a drinking water threat of themselves under the *Clean Water Act*. However, the presence of transport pathways can make an aquifer more susceptible to contamination. In groundwater, transport pathways provide a channel to an aquifer that bypasses the natural protection of the overburden layer resulting in greater potential risk for contamination from nearby threats.

Transport pathways are not considered a drinking water threat of themselves under the Clean Water Act. However, the presence of transport pathways can make an aquifer more susceptible to contamination.

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Common examples of the different types of transport pathways include:

- Improperly constructed or maintained water wells
- Unused/abandoned water wells
- Stormwater sewers/drains
- Agricultural tile drainage
- Improperly constructed or maintained oil and gas wells
- Pits and quarries; construction of underground services or subsurface excavations
- Vertical geothermal wells/earth energy systems
- Private well clusters

Transport pathways may be considered when interpreting the vulnerability score of the surface water sources (Intake Protection Zone or IPZ) or groundwater sources (Wellhead Protection Area or WHPA) of drinking water. Transport pathways also affect the size of a surface water delineation (IPZ or WHPA-E). These pathways have the ability to facilitate the movement of contaminants laterally for IPZs or vertically below the ground for WHPAs. In assigning transport pathway adjustments, the hydrology or the hydrogeology of the site and the condition of the pathway are considered, as well as the cumulative impact of transport pathways.

The risk level may be influenced by the presence of transport pathways. Changes in vulnerability scoring to a higher number would raise the risk level of a prescribed drinking water threat and could change some moderate threats into significant threats. In contrast, natural transport pathways, such as fracturing and karst, are already accounted for under the vulnerability assessment. Therefore, natural transport pathways do not need further consideration in vulnerability scoring.

There are relatively few pits and quarries within IPZs and WHPAs in the Region. Depending on the depth of pits and quarries with respect to the water table, aquifer vulnerability may be adjusted from low to moderate or high, or from moderate to high.

Wells that are not in compliance with existing regulations may be potential conduits for water that would increase the vulnerability of the aquifer locally. Additionally, there are properties for which no well record exists, nor any well is obvious by site inspection, and yet have structures that require water.

Urban areas warrant special consideration as potential areas for transport pathway adjustments under Technical Rule 41 (3) of the *Clean Water Act* regulations, as the cumulative effects of a high density of abandoned historic wells are common. Although these areas today are serviced by a municipal well, most were historically serviced by private wells. Additionally, the age of these wells precludes the existence of a record for the wells.

Finally, there are surface water transport pathways that have increased the size of the vulnerable areas for surface water in the Region. The most common of these are stormwater sewers and

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drains in the coastal towns and agricultural tile drainage for the inland intake and the wellheads under the direct influence of surface water.

Transport pathways are considered and addressed by some provincial legislation, policies and programs, including:

- *Clean Water Act*, 2006, and its related regulations, such as O. Reg. 287/07
- *Ontario Water Resources Act*, 1990, and its related regulations, such as O. Reg. 903 that covers wells
- *Oil Gas and Salt Resource Act* (O. Reg. 245/97)
- *Municipal Act*, 2001
- Abandoned Works Program
- Ontario Drinking Water Stewardship Program, which provides funding opportunities for well upgrades and well decommissioning
- Safe Water Program under the Ministry of Health and Long-term Care and in partnership with local Health Units

In addition, programs that address wells and, in some cases, other transport pathways are offered by agencies and non-profit organizations, including: the Canadian Groundwater Association with the Guidelines for Water Well Construction; Well Aware Program; Well Wise Program; Clean Water Program; and Canada-Ontario Environmental Farm Plan.

Policies have been developed to address transport pathways and can be found in section 6.3.

3.5 Local Threats

The *Clean Water Act* Technical Rules allow Source Protection Committees to request the addition of local threats to the Assessment Reports and associated policies to the Source Protection Plan. Approval for local threats come directly from the Minister of Environment and Climate Change. Once approval for the addition of a local threat is obtained, the technical work can be done and policies written.

The Saugeen, Grey Sauble, Northern Bruce Peninsula Source Protection Committee requested of the Minister the addition of the following two activities as significant drinking water threats;

1. The operation of Nuclear Generating Stations where deuterium (heavy water) is used to moderate nuclear reactions; and
2. The storage and treatment of tritiated deuterium.

The SPC has not created policies regarding these two threats. Drinking Water Source Protection staff continues to keep in contact with staff at Bruce Nuclear Power Development.