



# *Assessing Our Water Sources: Protecting Our Drinking Water*

*Volume 1: Drinking Water Assessment*



Public Open House,  
Erin



Public Open House,  
Caledon

The CTC Source Protection Committee is a group of citizens, appointed under the *Clean Water Act, 2006*, representing general public, municipal, business and interest group sectors from across the Credit Valley, Toronto and Region and Central Lake Ontario Source Protection Areas. The Committee is charged with creating Assessment Reports which identify the location and nature of potential risks to sources of municipal drinking water. Visit [www.ctcswp.ca](http://www.ctcswp.ca) for more information.

*"The first barrier to the contamination of drinking water involves protecting the sources of drinking water. I recommend that the Province adopt a watershed-based planning process ... to develop a source protection plan for each watershed in the province."*

Justice Dennis O'Connor  
The Walkerton Inquiry, 2002

The tainted water tragedy at Walkerton in 2000 highlighted the dangers of not protecting the sources of our drinking water. Hundreds became ill and seven died when a municipal well was polluted. In 2002 Justice Dennis O'Connor recommended a number of changes be made to Ontario's drinking water system, the most comprehensive of which was Source Water Protection.

The basic premise of Source Water Protection is simple:

*Protecting our Sources of drinking water before they are overused or polluted is the best, most cost effective way of ensuring the safety of our drinking water for generations to come.*

This is a companion document to the Credit Valley and Toronto and Region Assessment Reports. This document is a starting place for people not familiar with Assessment Reports and what kind of information can be found therein. For more comprehensive information, the reader is directed to the full text of each Assessment Report which can be found on our website at [www.ctcswp.ca](http://www.ctcswp.ca).



## Assessing Our Water Sources: Protecting Our Drinking Water

### What is

#### the Credit Valley, Toronto and Region & Central Lake Ontario (CTC) Source Protection Region?



The Ministry of the Environment has organized source protection areas (SPAs) using conservation authority boundaries. Conservation Authority areas are organized by watershed (areas where surface water flows in one direction). Justice O'Connor recommended this watershed-based approach to protect drinking water during the Walkerton Inquiry. In many cases, such as in the CTC, many SPAs are grouped to make one Source Protection Region (SPR). There are 19 SPRs in Ontario.

The CTC region covers three conservation authorities: Credit Valley, Toronto and Region and Central Lake Ontario (CTC). A 21 person committee (plus chair) is responsible for developing Source Protection Plans for these areas. The plans will set out policies and programs to eliminate or manage significant threats to the water supply as well as reducing the opportunity for low and moderate threats to become significant.

### Who is

#### the CTC Source Protection Committee?

The Source Protection Committee is a group of local representatives comprised of:

- Farmers
- Golf Course Industry
- Agregate Industry
- Environmental Groups
- Municipalities
- Petroleum Industry
- Residents
- Energy Sector

The Source Protection Committee has been established with responsibilities under the *Clean Water Act, 2006*, to lead the development of Assessment Reports and Source Protection Plans.

#### What is an Assessment Report?

The Assessment Report is a technical document that provides the scientific information which is used to develop Source Protection Plans. It:

- gives an overview of each watershed;
- provides a water budget;
- identifies the vulnerable areas near the wells and intakes;
- identifies the types and number of significant threats to water quality near wells and intakes;
- identifies areas that could have low, moderate or significant threats.

There is one report for each source protection area. The reports are publicly available at [www.ctcswp.ca](http://www.ctcswp.ca). Open houses are being held in each area to give people a chance to review the information and comment on the Assessment Reports before they are completed. The next step is to develop Source Protection Plans. These must be complete by August 2012.

## How do we determine the threats to our drinking water?

### Overview

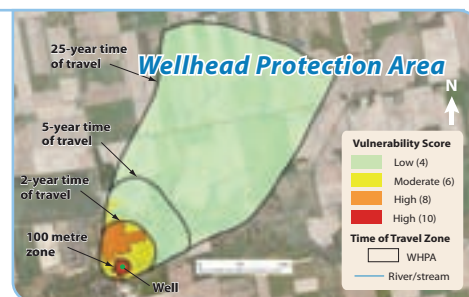
Assessing threats to Drinking Water involves 3 main steps.

- 1) Identify and map vulnerable areas
- 2) Identify threats
- 3) Calculate threat levels

### Step 1: Identify and map vulnerable areas

There are four types of vulnerable areas that need to be delineated:

1. Wellhead Protection Areas (WHPAs): areas where water travels through the ground to a municipal well
2. Intake Protection Zones (IPZs): areas around municipal surface water intakes
3. Highly Vulnerable Aquifers (HVAs): areas that are more susceptible to contamination moving from the surface into the groundwater
4. Significant Groundwater Recharge Areas (SGRAs): areas where larger amounts of water go into the ground instead of flowing directly into creeks, rivers or lakes.



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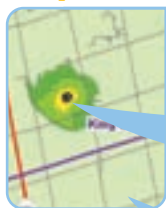
### Step 2: Determine where threats may exist

There are a number of different types of threat activities that can effect drinking water quality under the *Clean Water Act, 2006 (CWA)*:

- Waste disposal sites
- Sewage systems (including septic)
- Agricultural and non-agricultural source material applied to land, stored, handled or managed
- Commercial fertilizer applied, handled or stored
- Pesticides applied to land, handled or stored
- Road salt applied, handled or stored
- Fuel handled or stored
- Livestock grazing, pasturing, outdoor confinement areas and farm-animal yards
- Organic solvents handled or stored
- The handling and storage of a dense non-aqueous phase liquid (DNAPL)
- Chemicals used in the de-icing of aircraft
- Snow stored

Consultants used a number of information sources such as airphotos and databases to estimate where these threat activities might be located. Per the CWA, this assessment was only done for the 4 vulnerable areas.

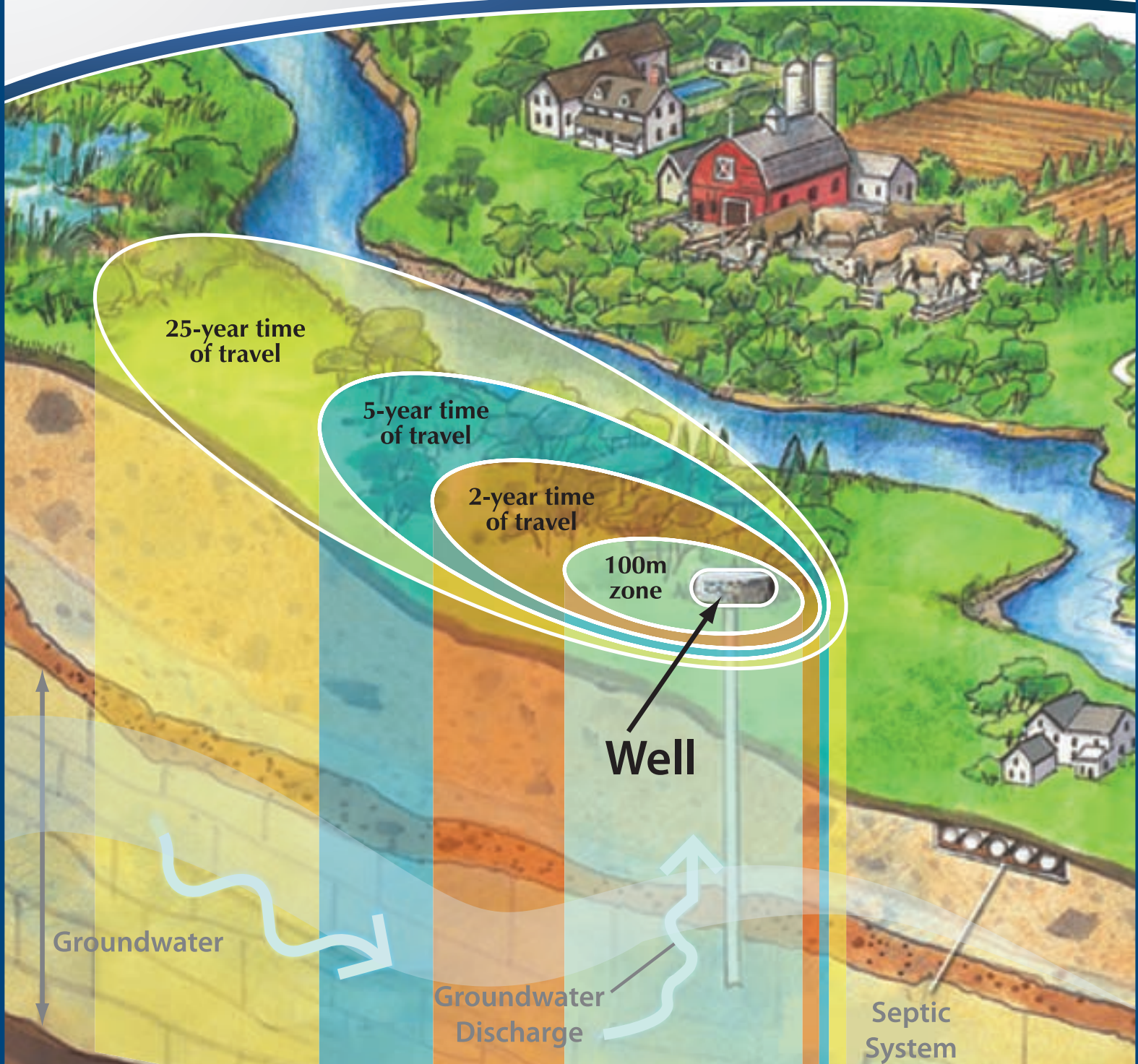
### Step 3: Calculate threat levels



Hazardous material in an area of high vulnerability  
= High level of risk  
(Significant drinking water threats)



Hazardous material in an area of low vulnerability  
= Low level of risk  
(low or no threat to drinking water)



**Wellhead Protection Area (WHPA):** The area on the land around a municipal well, the size of which is determined by how quickly water travels underground to the well, measured in years. For Source Protection Planning, we are required to draw a standard 100 metre radius around each municipal well, which is called the WHPA-A. The WHPA-B represents the 2-year time of travel, the WHPA-C, the 5-year, and the WHPA-D the 25 year time of travel.

## Step 1: Identify and Map Vulnerable Areas: Municipal Wells

### What is vulnerability?

Vulnerability describes how easily a well can become polluted. Consultants, using available technical information, have studied the municipal wells within the CTC Source Protection Region to determine how vulnerable they are. There are 22 municipal wells in the TRSPA and 46 municipal wells in the CVSPA. CLOSPA has no municipal wells.

### Wellhead Protection Areas

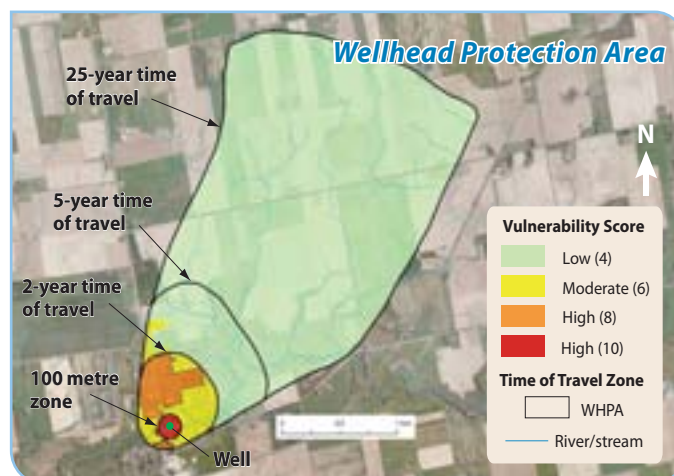
Wells draw water from underground areas called aquifers where water fills cracks in bedrock or spaces between grains of sand, gravel or dirt.

Aquifers are replenished when water from rain and melting snow soaks into the ground. Sometimes, this water carries pollutants. It can take years, or even decades, for water to reach a well. The speed depends on the characteristics of the soil and bedrock in the area.

#### Measuring groundwater vulnerability

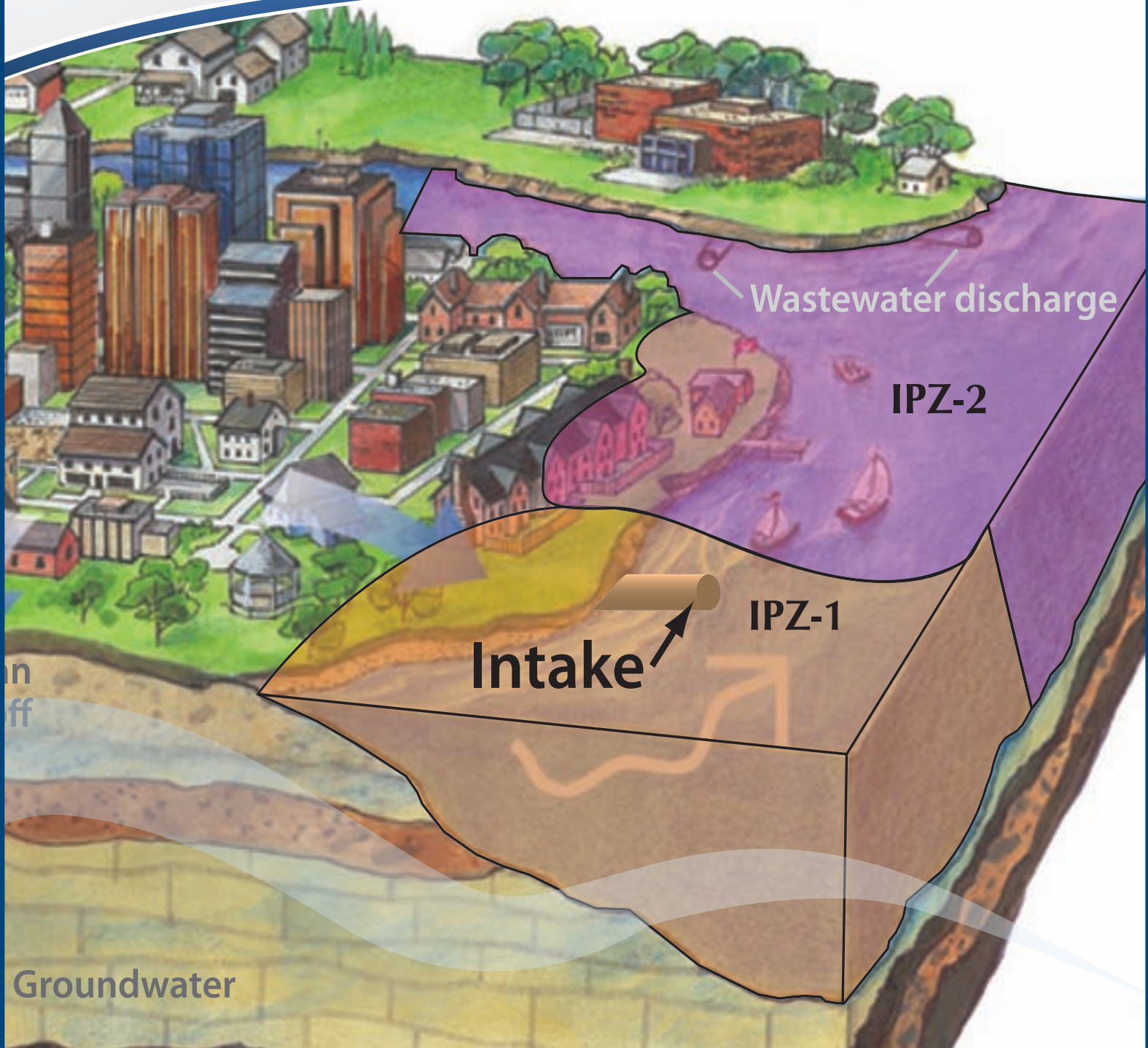
To determine the vulnerability score for a well, the consultants had to answer two questions:

- 1) How quickly does water move horizontally through the aquifer to the well? The information was used to draw Wellhead Protection Areas (WHPA) around each well. WHPAs are divided into rings called Time of Travel Zones. The innermost zone is a 100-metre circle. The other zones are set at times of travel of 2 years, 5 years and 25 years.
- 2) How quickly does water move vertically from the surface down to the aquifer? This is called "intrinsic vulnerability."



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The answers to the two questions are combined to come up with vulnerability scores on a 10-point scale for all the land within the Wellhead Protection Area for each municipal well. This score lets us know where there needs to be increased protection from threats.



**Intake Protection Zone (IPZ):** The area on the water and land surrounding a municipal water intake. Its size is determined by how quickly water flows to the intake, in hours. The Intake Protection Zone is drawn primarily for emergency response purposes (e.g., knowing how far water would travel in the time it would take the water operator to shut down a water intake in the event of a contamination or spill event.)



## Step 1: Identify and Map Vulnerable Areas: Surface Water Intakes

### What is vulnerability?

Vulnerability describes how easily an intake can become polluted. Surface Water Intakes in the CTC Source Protection Region are being studied for their vulnerability. This work is being done by a group called the Lake Ontario Collaborative (LOC) which consists of all the Source Protection Regions around Lake Ontario. This work is being lead by the Region of Peel and results from this ongoing work will be incorporated into an updated version of the Assessment Reports, scheduled for completion in June 2011.

### Intake Protection Zones

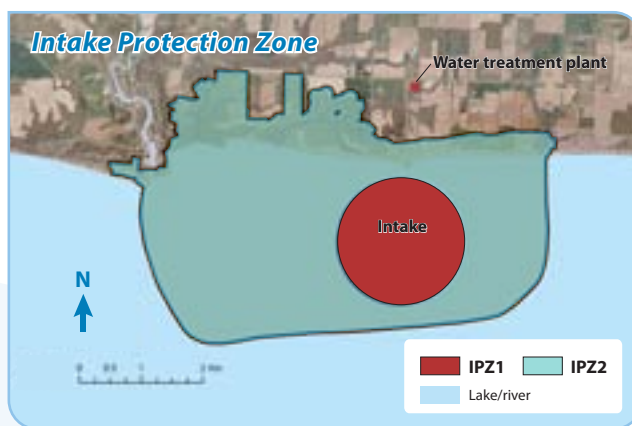
River and lake intakes can be contaminated when pollutants are spilled into the water or on nearby land and make their way to the intake. Intake Protection Zones (IPZ) map areas where pollutants may get to an intake too quickly for operators of the municipal water treatment plant to shut down the intake before the pollutant reaches it.

#### Measuring surface water vulnerability

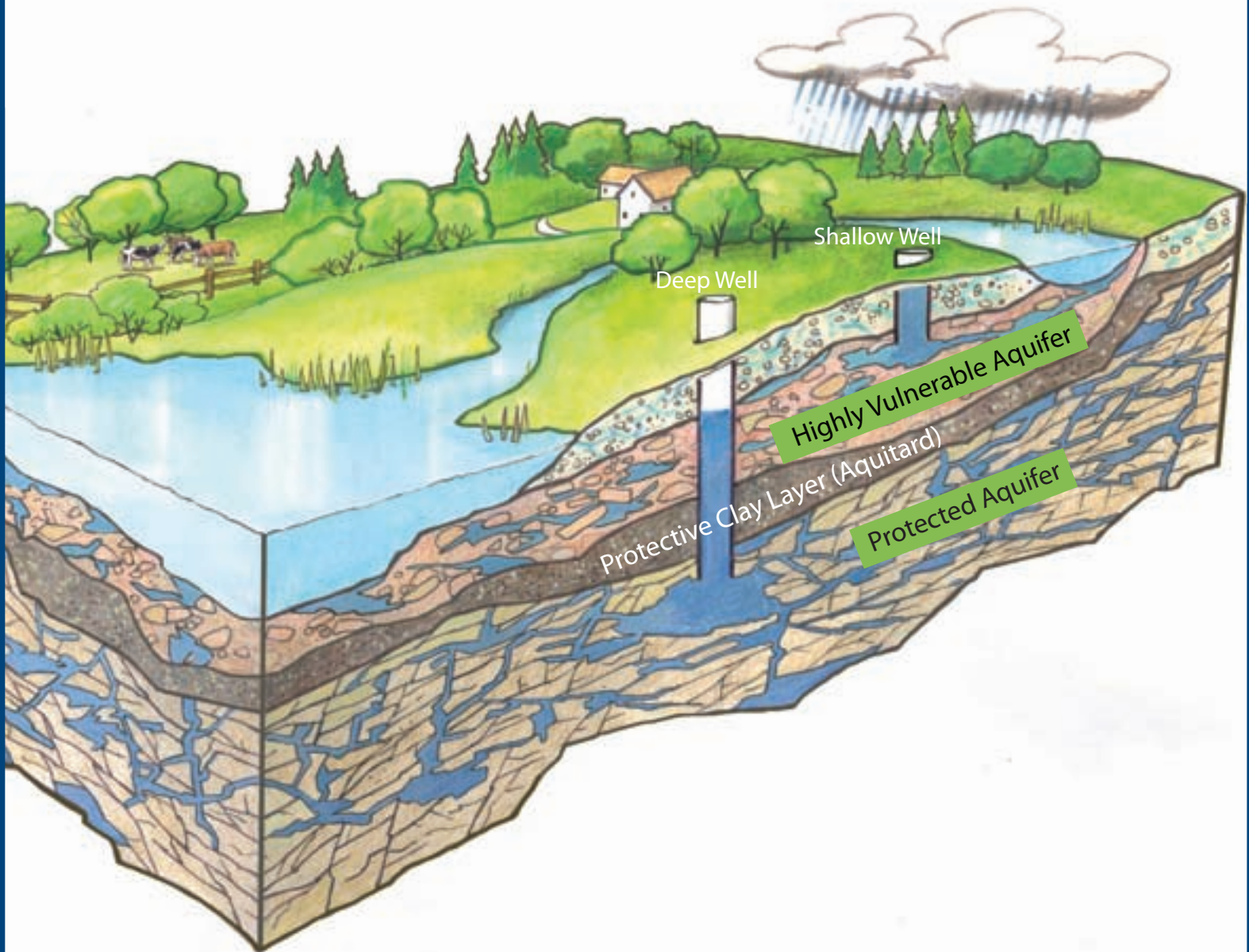
Consultants studied how water moves in the area around each intake. For all of the Lake Ontario intakes, the the LOC studied how the movement of water is affected by currents and winds. This work also identified streams, municipal storm sewers and rural drains that enter Lake Ontario and may impact the source water.

Intake Protection Zones were drawn around the intakes and assigned vulnerability scores based on an area factor (on a 10-point scale) multiplied by the source factor (for Great Lakes sources this ranges between 0.5 and 0.7):

- IPZ-1: Is a one-kilometre circle around the intake and has vulnerability scores that range between 5 and 7.
- IPZ-2: Is the area where water can reach the intake within two hours. Vulnerability scores range between 3.5 to 6.3.
- IPZ-3: Spills and extreme storm events are modelled to assess if specific activities could have an impact on water quality regardless of the amount of time it takes to reach the intake. This work is still underway and will be included in an updated Assessment Report.



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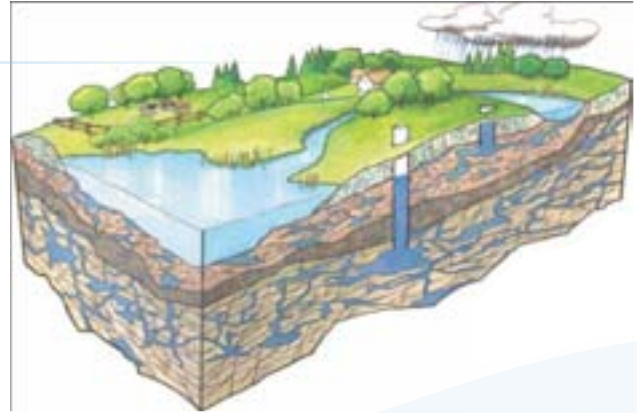


**Highly Vulnerable Aquifers (HVA):** These are aquifers that are more susceptible to contamination because of their location. In general, an HVA will consist of source granular aquifer materials (e.g. sand and/or gravel) or fractured rock that has a high permeability and is exposed near the ground surface with a relatively shallow water table.

## Step 1: Identify and Map Vulnerable Areas: Highly Vulnerable Aquifers

### What are *Highly Vulnerable Aquifers*?

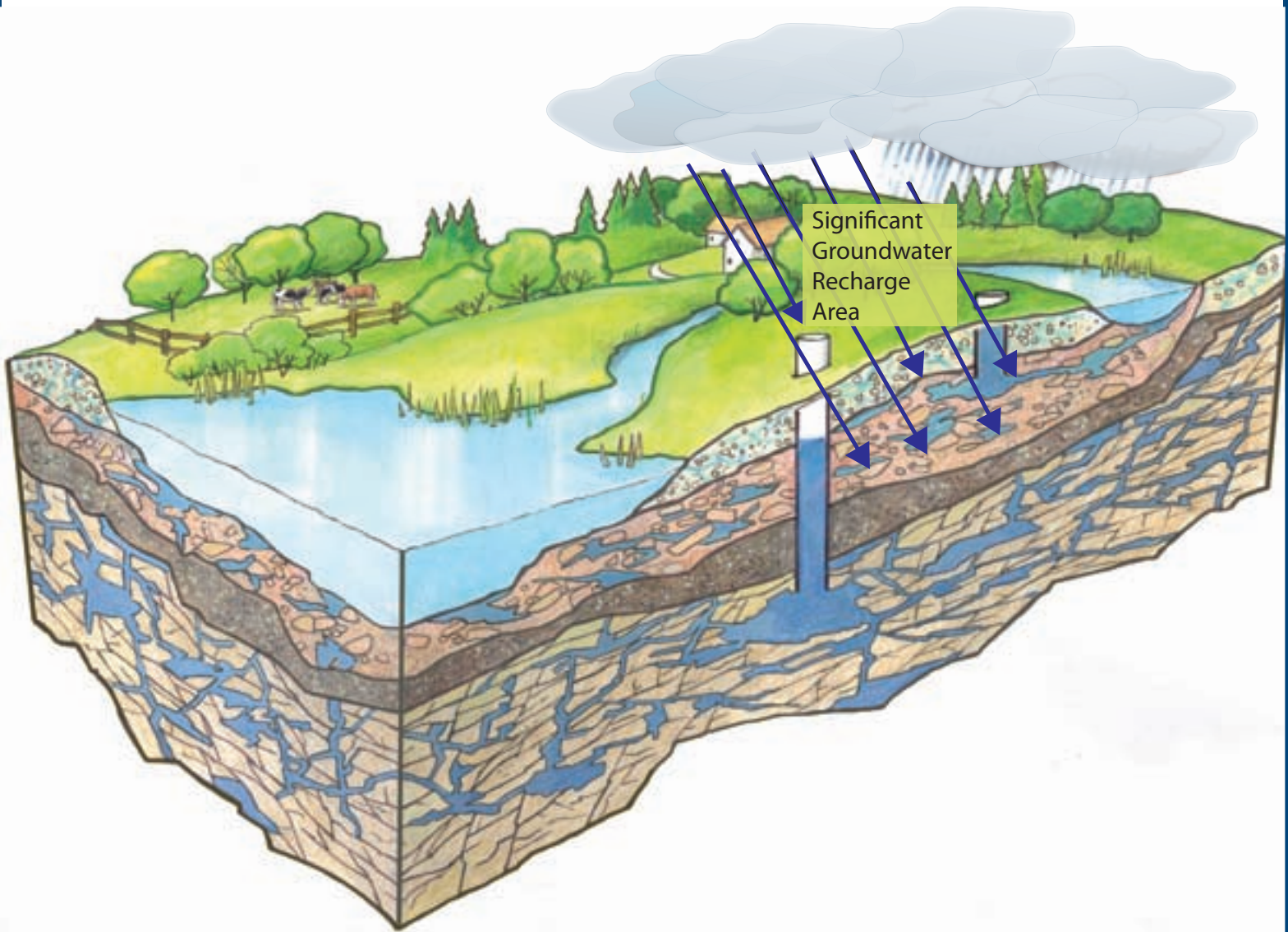
Highly Vulnerable Aquifers (HVAs) are aquifers that are more susceptible to contamination. In general, a Highly Vulnerable Aquifer will consist of granular aquifer materials (e.g. sand and/or gravel) or fractured rock that has a high permeability and is near the ground surface.



### Threat Levels *within Highly Vulnerable Aquifers*

Highly Vulnerable Aquifers have a groundwater vulnerability score of 6. HVAs exist under a large percentage of the CTC Source Protection Region. Not all of these areas are used for drinking water purposes. Threat activities can be Moderate or Low (but not Significant) within Highly Vulnerable Aquifers.





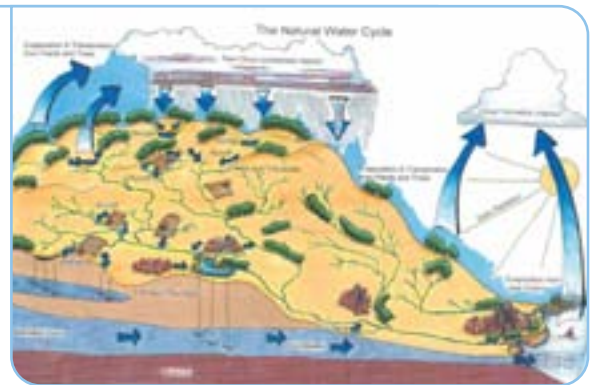
Significant Groundwater Recharge Areas (SGRA): Recharge areas tend to be areas that are characterized by permeable soils, such as sand or gravel that allow the water to seep easily into the ground and flow to an aquifer. Under the *Clean Water Act, 2006*, a recharge area is considered significant when it helps maintain the water level in an aquifer that supplies drinking water (including private wells), and has higher than average recharge across the Source Protection Area.

## Step 1: Identify and Map Vulnerable Areas: Significant Groundwater Recharge Areas

### What are Significant Groundwater Recharge Areas?

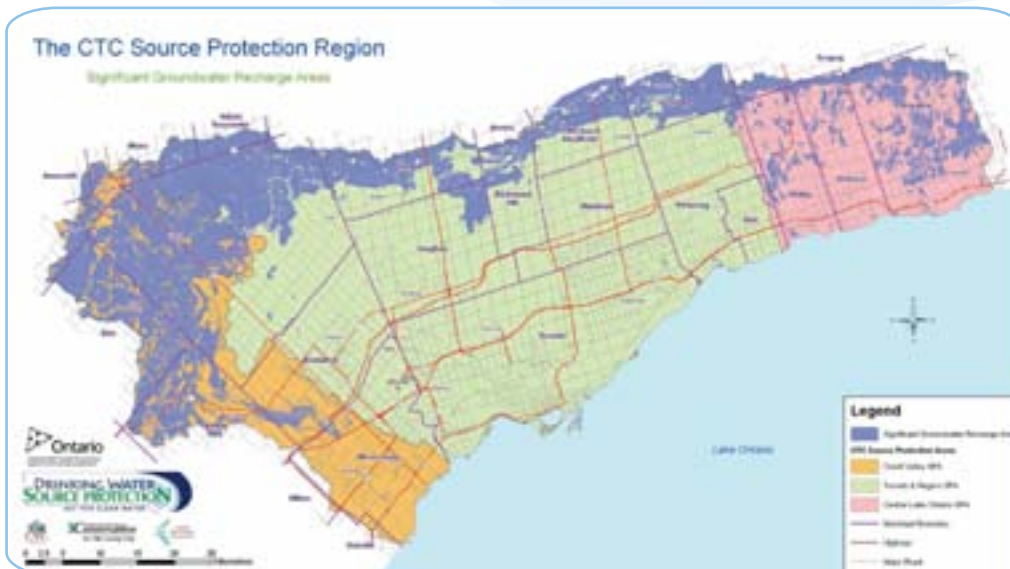
Significant Recharge Areas (SGRAs) are locations where larger amounts of water on the surface seep into the ground to replenish an aquifer that is used for municipal or other drinking water supplies. This recharge is also important as a source of cold water discharge into streams that sensitive ecosystems depend on.

SGRAs have permeable soils such as sand or gravel that allow the water to soak easily into the ground.

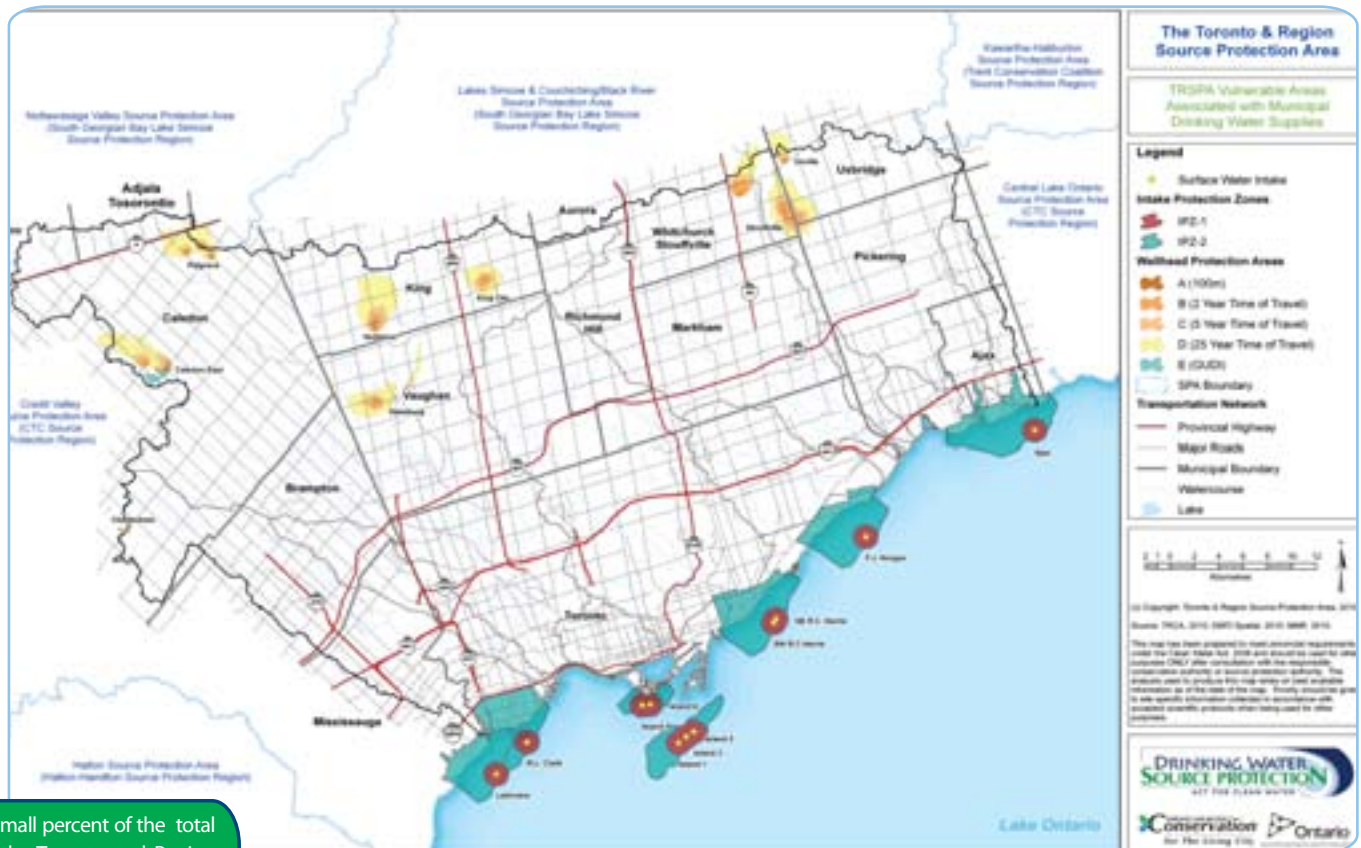


### Threat Levels within Significant Groundwater Recharge Areas

Significant Groundwater Recharge Areas can have vulnerability scores of 2, 4 or 6. Activities can only be moderate or low (not significant) within Significant Groundwater Recharge Areas.

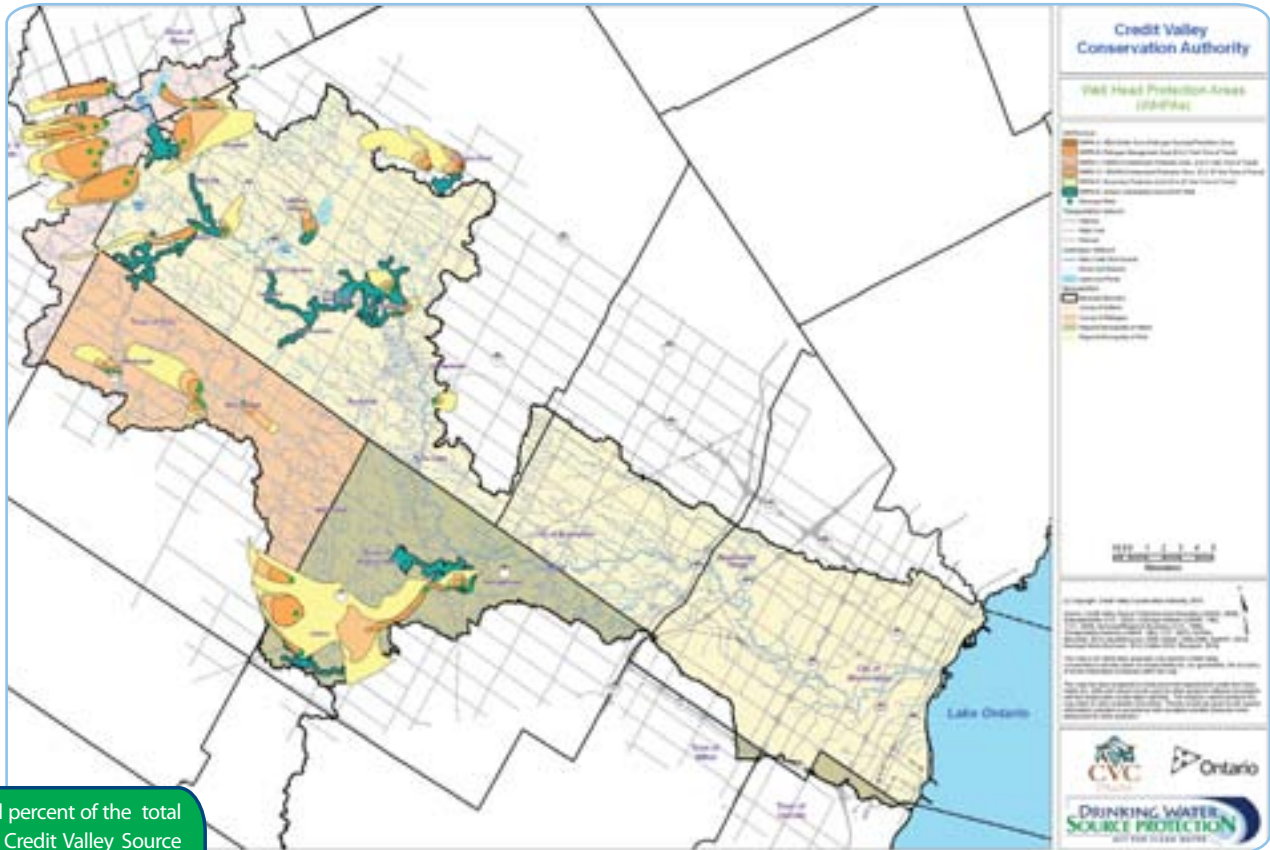


## Step 1: Results - Vulnerable Areas for municipal drinking water supplies within the TRSPA



Only a small percent of the total area of the Toronto and Region Source Protection Area is in a wellhead protection area where there can be significant drinking water threats. Significant threats in intake protection zones are still being evaluated.

## Step 1: Results - Vulnerable Areas for municipal drinking water supplies within the CVSPA



Only a small percent of the total area of the Credit Valley Source Protection Area is in a wellhead protection area where there can be significant drinking water threats. Significant threats in intake protection zones are still being evaluated.

## Step 2: Identify Threats

### What are threats?

Consultants have studied the areas around municipal wells and intakes to identify the human activities that could threaten municipal water supplies.

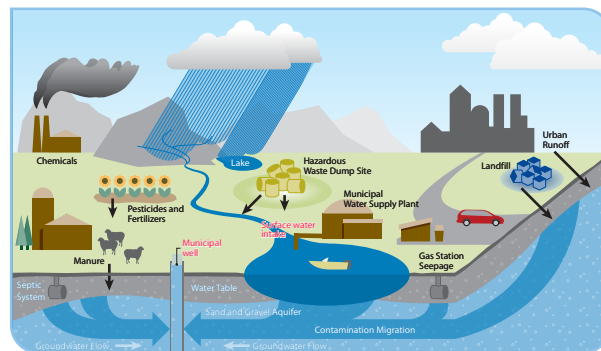
There are two categories of threats – chemicals and pathogens:

- Chemical threats include things like solvents, fuels, fertilizers, pesticides and similar products. They can be found in factories, storage depots, gasoline stations, farms or other places. DNAPLs (Dense Non-Aqueous Phase Liquids) are a group of chemicals that are particularly hazardous when they get into groundwater.
- A pathogen is a dangerous bacteria, virus or other organism found in human or animal waste. Human pathogens can be found in septic systems, and animal pathogens can be found in manure.

### Hazard ratings

Not all threats are equal. The danger posed by particular chemicals or pathogens depends on several factors including the amount, its toxicity and how it behaves in the environment.

The Ontario Ministry of the Environment has identified many materials that could contaminate water. It has assigned a hazard rating to each using a 10-point scale based on the nature of the material, how much is present, and how it is used or stored.



There are many types of potential threats to water in rural and urban areas.

### What are drinking water threats?

There are a number of different types of threats to drinking water under the *Clean Water Act, 2006 (CWA)*. They are:

- Waste disposal sites
- Sewage systems (including septic)
- Agricultural and non-agricultural source material applied to land, stored, handled or managed
- Commercial fertilizer applied, handled or stored
- Pesticides applied to land, handled or stored
- Road salt applied, handled or stored
- Snow stored
- Fuel handled or stored
- Chemicals used in the de-icing of aircraft
- An activity that reduces the recharge of an aquifer
- An activity that takes water from an aquifer or surface water body without returning the water taken to the same aquifer or surface water body.
- Activities taking water from an aquifer (groundwater) or surface water body (lake or river)
- Activities reducing recharge of an aquifer's underground water sources
- Livestock grazing, pasturing, outdoor confinement areas and farm-animal yards
- Organic solvents handled or stored
- The handling and storage of a dense non-aqueous phase liquid (DNAPL)

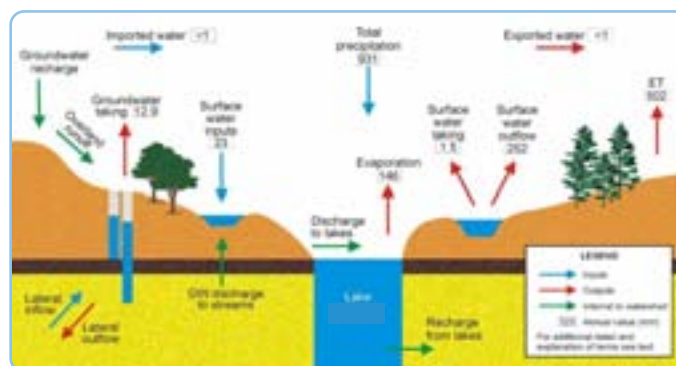


## Water Budgets: Determining Water Quantity Threats

### What is a Water Budget?

A Water Budget is a process that helps us ensure we have enough water. It measures how much water enters the system, how much leaves the system (through natural processes and human consumption). This allows us to determine if more water is being used than is available (water quantity stress).

Municipal water supplies within the highlighted local areas are being further examined for water quantity risks through a Tier 3 Water Budget. The results of the Tier 3 study will be available in an updated Assessment Report planned for June 2011.

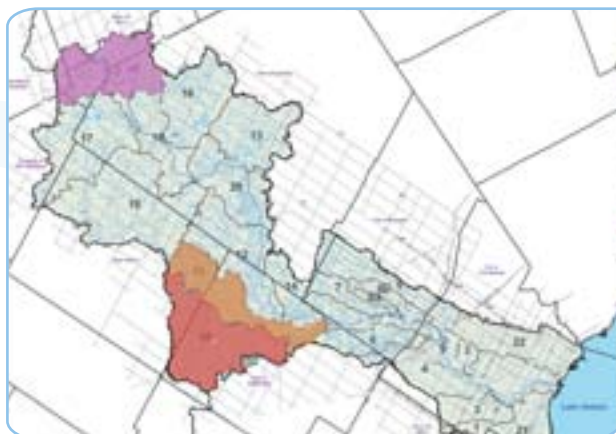


### Credit Valley Source Protection Area

Local Area	Anticipated Completion Date
Orangeville	Summer 2011
Black Creek	Summer 2011
Silver Creek	Summer 2011

### Toronto and Region Source Protection Area

Local Area	Anticipated Completion Date
Whitchurch-Stouffville/Uxville	Summer 2011



## Step 3: Calculating Threat Levels

### Low, Moderate or Significant Threats

There are many potential threats to drinking water in our urban and rural areas, but the level of risk they pose depends on the nature of the threat and its location. The Clean Water Act requires the elimination of threats that pose the greatest risk to municipal drinking water. The level of risk they pose depends on the nature of the threat and its relative location to a municipal water system. These are called significant threats.

To decide which threats are significant, the Ontario Ministry of the Environment has developed a methodology which is outlined in the *Technical Rules (Nov, 2009)* to calculate a risk score based on:

- the hazard rating of the threat, on a 10-point scale
- the vulnerability of the water source, on a 10-point scale

### How are possible threats identified?

Technical experts have used a variety of means to identify the possible location of potential threats. They have examined documents such as publicly available industrial databases, municipal land use databases, windshield surveys and satellite imagery. They were also directed to make some assumptions, such as that a rural home would have a septic system and fuel tank.

*At this point threats have not been field verified and may not actually exist within the vulnerable areas discussed.*

The location of properties containing potential significant threats are not identified in the Assessment Report. The report only identifies the number and type of threats in the wellhead and intake protection areas.

### Risk to drinking water

#### Vulnerability Score



- Depth of aquifer
- Composition of the soil above the aquifer

**X**

#### Hazard Score



- Likelihood of release
- Volume
- Mobility
- Toxicity

**=**

#### Risk

If risk score is greater than 80, then risk is 'significant'

## Step 3: Results - Potential Number of Significant Threats within the Toronto and Region Source Protection Area

### Potential Number of Significant Threat Activities

(Note: some parcels may have more than one threat)

THREAT	Uxville System	Stouffville System	King City System	Nobleton System	Kleinburg System	Caledon East System	Palgrave System
1 The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act.	3	3	1	0	0	0	0
2 The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	6	62	9	59	10	2	4
3 The application of agricultural source material to land.	0	22	0	1	3	0	0
4 The storage of agricultural source material.	0	4	9	0	1	0	0
5 The management of agricultural source material.	0	0	0	0	0	0	0
6 The application of non-agricultural source material to land.	0	0	0	0	0	0	0
7 The handling and storage of non-agricultural source material.	0	0	0	0	0	0	0
8 The application of commercial fertilizer to land.	10	15	0	0	0	0	0
9 The handling and storage of commercial fertilizer.	0	10	0	0	1	0	0
10 The application of pesticide to land.	0	21	0	1	2	0	0
11 The handling and storage of pesticide.	0	11	0	0	1	0	0
12 The application of road salt.	0	0	0	0	0	0	0
13 The handling and storage of road salt.	0	0	0	0	0	0	0
14 The storage of snow.	0	0	0	0	0	0	0
15 The handling and storage of fuel.	1	87	10	76	16	2	4
16 The handling and storage of a dense non-aqueous phase liquid.	3	6	0	17	3	10	0
17 The handling and storage of an organic solvent.	1	2	0	0	0	1	0
18 The management of runoff that contains chemicals used in the de-icing of aircraft.	0	0	0	0	0	0	0
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.	Tier 3 Water Budget Work Underway		0	0	0	0	0
20 An activity that reduces the recharge of an aquifer.	Tier 3 Water Budget Work Underway		0	0	0	0	0
21 The use of land as livestock grazing or pasturing land, an outdoor confinement area, or a farm-animal yard.	0	4	0	0	0	0	0
Total Threats	14	247	20	154	36	15	8
Total Parcels	13	80	11	73	16	5	4

## Step 3: Results - Potential Number of Significant Threats within the Credit Valley Source Protection Area: Orangeville, Mono, Amaranth, Erin

### Potential Number of Significant Threat Activities

(Note: some parcels may have more than one threat)

THREAT	Town of Orangeville	Town of Mono	Township of Amaranth	Erin System	Hillsburgh System	Bel-Erin System
1 The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act.	1	0	0	0	0	0
2 The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	9	4	2	3	17	102
3 The application of agricultural source material to land.	2	1	0	2	1	3
4 The storage of agricultural source material.	1	0	0	2	0	2
5 The management of agricultural source material.	0	0	2	0	0	0
6 The application of non-agricultural source material to land.	2	1	2	2	1	0
7 The handling and storage of non-agricultural source material.	0	0	0	0	0	0
8 The application of commercial fertilizer to land.	0	0	0	0	0	0
9 The handling and storage of commercial fertilizer.	1	0	1	4	0	2
10 The application of pesticide to land.	2	1	2	3	1	3
11 The handling and storage of pesticide.	1	0	1	4	0	2
12 The application of road salt.	0	0	0	0	0	0
13 The handling and storage of road salt.	3	0	0	0	0	0
14 The storage of snow.	1	0	0	0	0	0
15 The handling and storage of fuel.	3	3	0	3	17	101
16 The handling and storage of a dense non-aqueous phase liquid.	36	14	0	5	0	2
17 The handling and storage of an organic solvent.	0	1	0	1	0	3
18 The management of runoff that contains chemicals used in the de-icing of aircraft.	0	0	0	0	0	0
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.	Tier 3 Water Budget Work Underway			0	0	0
20 An activity that reduces the recharge of an aquifer.	Tier 3 Water Budget Work Underway			0	0	0
21 The use of land as livestock grazing or pasturing land, an outdoor confinement area, or a farm-animal yard.	1	0	0	0	0	2
<b>Total Threats</b>	<b>63</b>	<b>25</b>	<b>10</b>	<b>29</b>	<b>37</b>	<b>222</b>
<b>Total Parcels</b>	<b>27</b>	<b>11</b>	<b>2</b>	<b>10</b>	<b>18</b>	<b>103</b>

## Step 3: Results - Potential Number of Significant Threats within the Credit Valley Source Protection Area: Halton and Peel

### Potential Number of Significant Threat Activities

(Note: some parcels may have more than one threat)

THREAT	Acton System	Georgetown System	Alton System	Caledon Village System	Inglewood System	Cheltenham System
1 The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act.	0	0	0	0	1	2
2 The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	60	1	1	0	0	0
3 The application of agricultural source material to land.	79	10	0	0	0	2
4 The storage of agricultural source material.	56	9	0	0	1	2
5 The management of agricultural source material.	0	0	0	0	0	0
6 The application of non-agricultural source material to land.	0	0	0	0	0	2
7 The handling and storage of non-agricultural source material.	0	0	0	0	0	0
8 The application of commercial fertilizer to land.	28	0	0	0	0	2
9 The handling and storage of commercial fertilizer.	14	1	0	0	0	2
10 The application of pesticide to land.	52	9	0	0	0	1
11 The handling and storage of pesticide.	14	1	0	0	0	2
12 The application of road salt.	135	157	0	0	0	0
13 The handling and storage of road salt.	1	1	0	0	0	0
14 The storage of snow.	0	0	0	0	0	0
15 The handling and storage of fuel.	23	3	2	2	1	2
16 The handling and storage of a dense non-aqueous phase liquid.	4	39	2	2	0	0
17 The handling and storage of an organic solvent.	18	16	0	0	0	0
18 The management of runoff that contains chemicals used in the de-icing of aircraft.	0	0	0	0	0	0
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.	Tier 3 Water Budget Work Underway		0	0	0	0
20 An activity that reduces the recharge of an aquifer.	Tier 3 Water Budget Work Underway		0	0	0	0
21 The use of land as livestock grazing or pasturing land, an outdoor confinement area, or a farm-animal yard.	9	4	0	0	1	2
<b>Total Threats</b>	<b>493</b>	<b>251</b>	<b>5</b>	<b>4</b>	<b>4</b>	<b>19</b>
<b>Total Parcels</b>	<b>201</b>	<b>125</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>6</b>

### **Threat Activity #15: The handling and storage of fuel**

Underground home heating fuel storage tanks, gasoline stations and agricultural fuel storage all fall under this threat activity.

#### **How is Fuel Storage a threat to drinking water?**

Fuel storage systems contain chemicals, which if they are released into the environment, can pose a significant threat to drinking water sources. Storage of more than 250 litres of fuel in the most vulnerable areas is considered to be a significant drinking water threat.

Fuel leaks often occur in populated areas, where public and domestic water supplies are concentrated, and it is difficult and expensive to clean them up. It is much cheaper and more effective to prevent them from contaminating the water in the first place. This is what Source Water Protection Planning is all about.

#### **Signs you might have a fuel leak**

- Are you using more fuel than normal?
- Are there signs of oil sheens in nearby streams, wetlands, or drainage ditches?
- Are there signs of distressed (withered) vegetation over or down slope of the tank?
- Is the tank vent clogged or restricted because of ice, snow, or insect nests? (Screened vents can be used to prevent insect nest problems.)
- Is the overfill whistle silent when the tank is being filled? (Ask your delivery person.)
- Are there signs of spills around the fill pipe or the vent pipe?



#### **How might this affect me?**

The Source Protection Committee is in the process of developing Source Protection Plans which will outline policies that will affect residents on whose property fuel storage or handling have been identified as a significant threat to drinking water. These policies are designed to reduce the risk associated with fuel storage so close to a drinking water source. We invite you to join the Source Protection Process at [ctcswp.ca](http://ctcswp.ca) and provide us with local knowledge about fuel storage sites in your community.

## Threat Activity #16: The handling and storage of a dense non-aqueous phase liquid

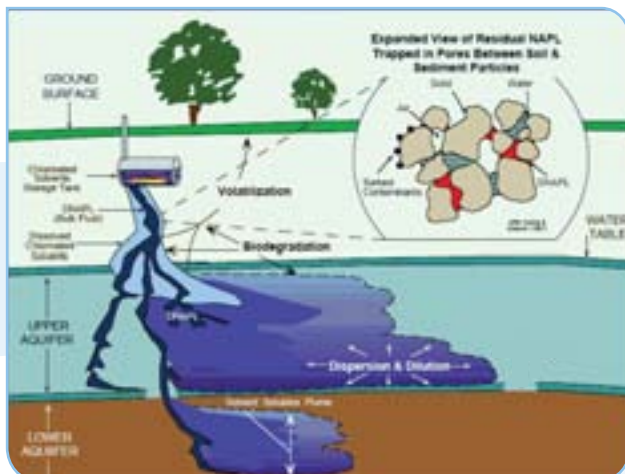
### What are DNAPLs?

Dense, Non-Aqueous Phase Liquids, or DNAPLs (pronounced dee-napple) are chemicals that are more dense than water and generally do not dissolve readily in water, but remain as a distinct liquid in surface or ground waters. If spilled, they tend to sink into the ground and can contaminate the deepest groundwater resources (and those in between).

These chemicals can be quite toxic to humans and/or the environment, even at low levels, which means that even if only a little gets into the water, it would be harmful to consume. Some compounds, such as PCBs and mercury, are persistent in the environment for decades, while others can become more toxic as they break down (chlorinated ethenes). DNAPLs of greatest interest tend to be those products that have been used extensively in commercial and industrial applications. The *Clean Water Act, 2006* stipulates that we pay extra attention to DNAPLs because if they get into the water they are very difficult to get out. DNAPL contaminants may very well be the most difficult groundwater contaminant to deal with.

### What are the commonly used DNAPLs

DCM (dichloromethane)	Paint stripper, metal cleaning, pharmaceuticals, aerosols.
TCM (chloroform)	Pharmaceuticals, fats, oils, rubber, resins.
TCA (trichloroethane)	Metal/plastic cleaning, adhesives, aerosols, inks, fats, waxes.
TCE (trichloroethylene)	Metal cleaning, dry cleaning, paint removers, adhesives.
PCE (perchloroethylene)	Dry cleaning, metal cleaning, intermediates in processes.



### Why are DNAPLs so dangerous?

- DNAPLs don't dissolve readily, which means they sink into the ground and create pools which may remain for decades to centuries..
- DNAPLs are sometimes also called "sinkers" or "toxic blobs" because of these characteristics.

### What can you do?

- Dispose of household chemicals at your local Hazardous Household Waste Disposal Centre
- Help the CTC Source Protection Committee identify locations of old DNAPL use and disposal sites

***Threat Activity #2: The establishment, operation, or maintenance of a system that collects, stores, transmits, treats, or disposes of sewage***

**Why are septic systems a threat to drinking water?**

This threat activity includes septic systems, storm water ponds, sewage pipes in the ground, pumping stations and sewage treatment plants.

If a poorly maintained septic system is located close to a drinking water source, it can become a source of pollution for that water source, contaminating the water and causing people to become sick. Within the CTC Source Protection Region, septic systems represent the greatest number of identified significant drinking water threats to municipal systems. Septic systems are located on many properties in a vulnerable areas around municipal wells.

When a septic system is not properly maintained or fails, untreated wastewater can seep directly into the ground and potentially pollute the sources of our drinking water. Bacteria and viruses from human waste that get into drinking water can cause a variety of illnesses.

Many septic systems in a small area can become a major source of pollution. The more polluted the source water, the more costly it is to clean for human consumption.

In addition to pollution from pathogens, chemicals in the system such as nitrates and salt are not removed and enter the ground and contaminate drinking water. Other chemicals such as phosphorus can get into surface water and cause too much algal and plant growth. A number of municipal wells in the CTC have been closed and/or the levels of contamination are rising due in part to septic system discharges.

**The good news ...**

If a septic system is properly located, is working properly, and is maintained regularly, it will effectively and efficiently remove disease-causing bacteria. This reduces the threat to the drinking water we all depend on.

**How to keep your system safe**

- Regularly pump and maintain your septic system, no matter what kind of system it is.
- Conserve water in your home or business. Use low flow faucets and toilets, and repair leaks
- Redirect surface water flow away from your system's leach field
- Place a buffer or greenbelt between your leach field and any body of water
- Keep paint, varnish, thinners, oil, pesticides and other hazardous chemicals out of your system
- Reduce water softener usage
- Replace your septic system, if necessary



**Funding to keep your septic safe**

The Ontario Drinking Water Stewardship Program (ODWSP) offers funding for landowners who have been identified as significant threats for septic systems. For further information, and to see if you are eligible, please contact Joanne Jeffery at 416-661-6600 or [jjeffery@trca.on.ca](mailto:jjeffery@trca.on.ca)



## Funding to Protect Drinking Water



### What's Been Done

The Ontario Drinking Water Stewardship Program (ODWSP) has already provided funding assistance for 80 projects in the CTC Source Protection Region through the Early Actions Program.

By the end of this year across the region, approximately \$360,000 will have been spent to help fund private well upgrades and repairs, decommission unused abandoned wells, septic system upgrades and repairs, erosion and run-off control measures and Pollution Prevention Reviews for small and medium sized businesses that are located within vulnerable zones next to municipal sources of drinking water.

### Additional Funding is Coming through "Early Response"

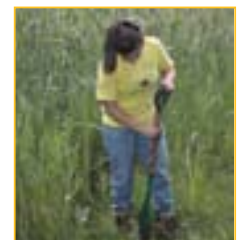
More funding will be announced in spring of 2011. This "Early Response" funding will be aimed directly at projects to reduce significant threats to municipal drinking water sources. If activities or land uses on your property have been identified as a significant threat, you may be eligible for this funding.

For further details contact:

Joanne Jeffery,  
Toronto and Region Conservation Authority,  
416-661-6600



Improved security around a municipal well



Planting buffer vegetation along a watercourse



Well upgrades



## Next Steps: Updated Assessment Report and Source Protection Plans



### Updated Assessment Report

There will be an updated Assessment Report available in June of 2011 with:

- Lake Ontario findings,
- Tier 3 water budget (water quantity stress assessment)
- Reassessment of vulnerability scores in areas of WHPAs due to transport pathways (i.e. other wells)

Public consultation will be undertaken in areas affected by the updates and this updated information will be used in the source protection plan

Affected property owners will be consulted in the development of plan policies which will directly affect them

### The Source Protection Plan

As mandated by the *Clean Water Act, 2006*, Source Protection Plans must contain policies, at a minimum, to reduce or eliminate significant threats on the landscape. These significant threat policies must be complied with. Policies must address both existing threats as well as future threats.

Low and moderate threats may be address through "have regard to" policies that the committee may choose to write. Any moderate or low threat policy must be considered in making decisions.

Source Protection Plans will dictate the methods by which the different significant threats can be made less harmful. The Committee can use a number of different approaches to achieve this:

- prescribed instruments (other provincial approvals such as certificates of approval);
- requiring risk management plans (negotiated with individual businesses);
- restricted land use;
- prohibition of activities;
- education and outreach; or
- combination of the above tools



**Aquifer** - Aquifers are underground water-bearing layer(s) of soil, sand, gravel, or rock that will yield usable quantities of water to a well. Aquifers can be layered one over the other. Generally speaking, the deeper the aquifer the more protected it is. Most municipal wells draw from very deep aquifers and are therefore generally more protected than private wells which tend to draw from shallower aquifers.

**Hazard Rating** - This is the score that is associated with the threat activities. It is determined by threats tables provided to the committee by the Ministry of the Environment.

**HVA** - Highly Vulnerable Aquifers – These are aquifers that are more susceptible to contamination because of their location. In general, an HVA will consist of source granular aquifer materials (e.g. sand and/or gravel) or fractured rock that has a high permeability and is exposed near the ground surface with a relatively shallow water table.

**IPZ** - Intake Protection Zone – The area on the water and land surrounding a municipal water intake. Its size is determined by how quickly water flows to the intake, in hours. Since water travels very quickly at the surface, the Intake Protection Zone is drawn primarily for emergency response purposes (e.g., knowing how far water would travel in the time it would take the water operator to shut down a water intake in the event of a contamination or spill event.)

**SGRA** - Significant Groundwater Recharge Areas – Recharge areas tend to be areas that are characterized by permeable soils, such as sand or gravel that allow the water to seep easily into the ground and flow to an aquifer. Under the *Clean Water Act, 2006*, a recharge area is considered significant when it helps maintain the water level in an aquifer that supplies drinking water (including private wells), and has higher than average recharge across the Source Protection Area.

**Significant (moderate, low) Drinking Water Threat** - A drinking water threat is scored as significant if its threat score is over 80. This is determined by multiplying the hazard ranking by the vulnerability score. Scores between 60-79 are determined to be moderate drinking water threats while a score between 40-59 is considered a low drinking water threat. The source protection plan must make policies to reduce all significant drinking water threats, but the committee may choose to write “have regard to” policies for moderate and low drinking water threats.

**Source Protection Plan** - The Source Protection Plan is the culmination of all the work to date. It outlines policies that will outline how drinking water threats are to be mitigated. The committee has the option of using existing legislation, risk management plans, education and outreach policies, and, in certain cases the committee can prohibit existing or future activities in a particular location.

**Threat Score** - The threat score is the product of the hazard score (how bad is the threat) and the vulnerability score (how vulnerable is the land).

**Vulnerability Score** - The vulnerability score of a parcel of land is determined by looking at how close it is to a well, how easily water can travel through it, as well as if there are any transport pathways which might increase the vulnerability. (e.g. an improperly decommissioned well might be considered a “transport pathway,” as it represents a more direct pathway to the aquifer for contaminants than if it didn’t exist normal).

**Vulnerable Area** - The Clean Water Act, 2006 states that there are four vulnerable areas which we must map as part of the Source Water Protection process. These are: Wellhead Protection Areas (WHPAs), Intake Protection Zones (IPZ), Highly Vulnerable Aquifers (HVA) and Significant Groundwater Recharge Areas (SGRAs)

**Water Budget** - A Water Budget is a tool that helps us ensure we have enough water. It measures how much water enters the watershed, how much leaves the watershed (through natural processes and human consumption) in order to determine if water being used is more than is available (water quantity stresses) within a watershed.

**Watershed** - A watershed is an area of land where water from rain and melting snow or ice drains downhill into a body of water, such as a river, lake or ocean. The watershed includes both the streams and rivers that convey the water as well as the land surfaces water runs off from which into those channels, and is separated from adjacent watersheds by geographical barriers such as a ridges, hills or mountains.

**WHPA** - Wellhead Protection Area – The area on the land around a municipal well, the size of which is determined by how quickly water travels underground to the well, measured in years. For Source Protection Planning, we are required to draw a standard 100 metre radius around each well, which is called the WHPA-A. The WHPA-B represents the 2-year time of travel, the WHPA-C, the 5-year, and the WHPA-D the 25 year time of travel.



## Assessing Our Water Sources: Protecting Our Drinking Water

The Assessment Reports for the CTC Source Protection Region are a requirement of the *Clean Water Act, 2006* (CWA).

Assessment Reports identify the location and nature of potential risks to sources of municipal drinking water supplies. These risks include activities that impact or could adversely impact drinking water quality or quantity from groundwater and/or surface water sources.

This document is a companion piece to the Assessment Reports, to help guide stakeholders through the content and results of the Assessment Reports.