

# Getting Familiar With Vulnerable Areas

The goal of the *Clean Water Act, 2006* is to reduce the risk posed by significant threats to drinking water and to prevent new [significant drinking water threats](#) from developing. The *Clean Water Act, 2006* identifies four types of vulnerable areas related to drinking water sources (Wellhead Protection Areas, Intake Protection Zones, Significant Groundwater Recharge Areas, and Highly Vulnerable Areas). The Source Protection Plans in the Lake Erie Region include policies related to wellhead protection areas and intake protection zones.

Vulnerable Areas		How are they developed?	Where are they identified?
Wellhead Protection Areas (WHPA)	Groundwater	By assessing the groundwater flow in an area, considering the geology and permeability of material, following provincial technical rules	Mandated for municipal residential water supplies (groundwater wells or surface water intakes)
Intake Protection Zones (IPZ)	Surface water	By assessing the flow of water in the surface water body (river or lake), following provincial technical rules	



## What is vulnerability?

How easily a source of drinking water (aquifer, river or lake) can become polluted with a dangerous material. The vulnerability of an area can range from 1 to 10, with 10 being highest.

## Groundwater Vulnerability

Municipal wells draw their water from underground areas called “aquifers.” These are places where water fills cracks in bedrock or spaces between grains of sand or gravel. Aquifers are replenished when water from rain and melting snow soaks into the ground. Sometimes, the water can carry pollutants from the surface to an aquifer. It can take years, or even decades, for water to move from the surface to the aquifer or to move within an aquifer toward a well.

### Wellhead Protection Areas (WHPAs)

Time-of-travel zones delineated around municipal groundwater wells based on the time it would take for a contaminant to reach the well. Time-of-travel depends on the characteristics of the soil and bedrock in the area. **Figure 1** illustrates the innermost zone (a circle with a radius of 100m) around the well, followed by a 2 year, 5 year and 25 year time-of-travel zone.

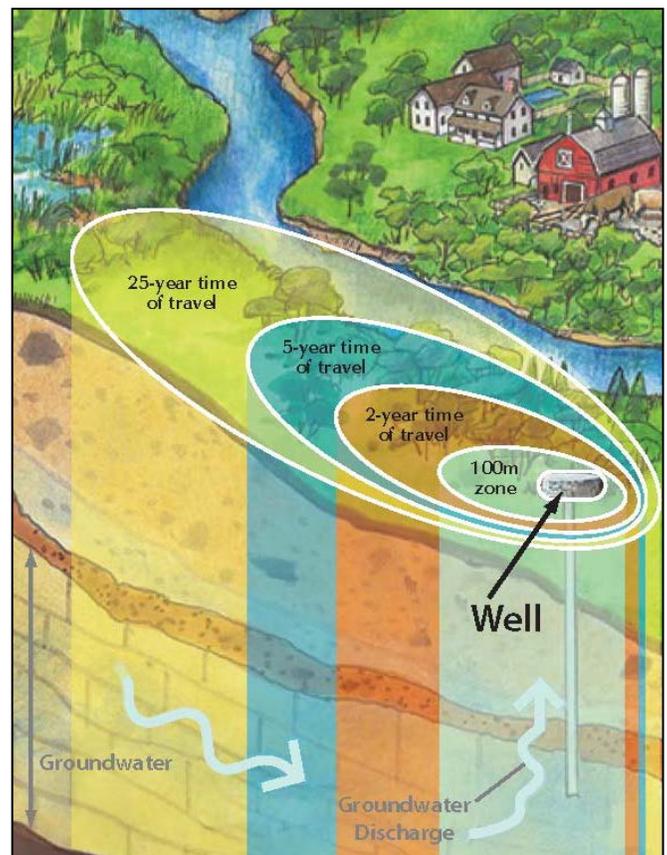
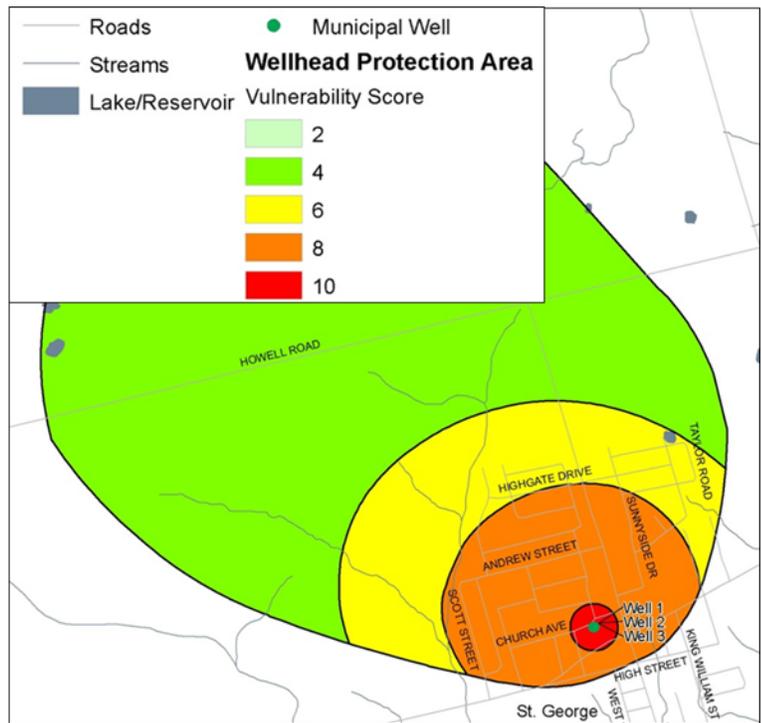


Figure 1: Time-of-travel zones in a Wellhead Protection Area.

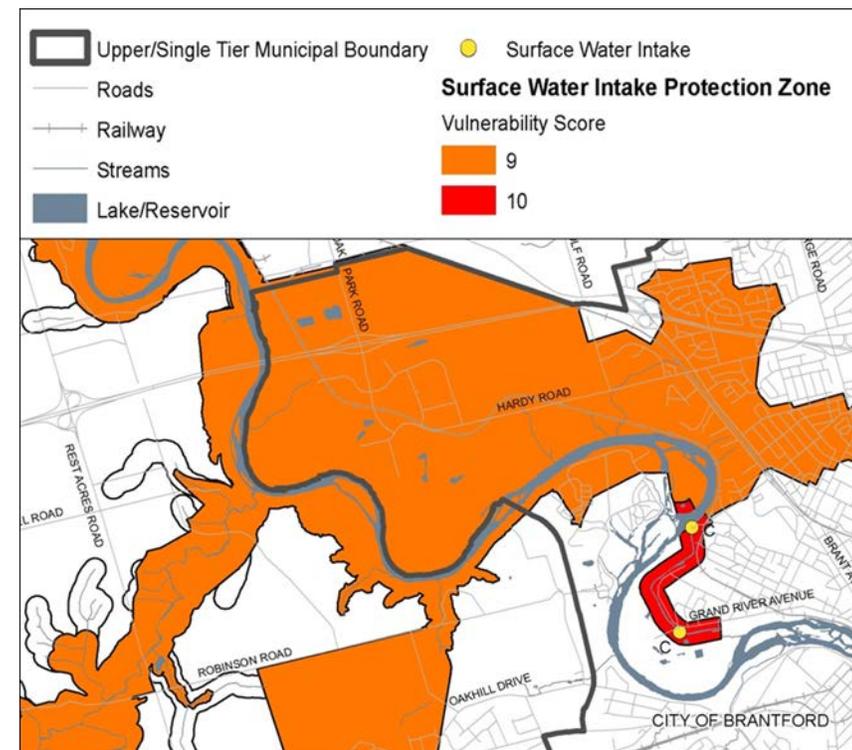
The vulnerability score of WHPAs takes into account how quickly water moves vertically from the surface down to the aquifer and how quickly water moves horizontally through an aquifer to the well. Generally, the scores are highest immediately around the well and lower further away. Because of the proximity to the well, the 100-metre zone around the well has the highest vulnerability score of 10. **Figure 2** illustrates three wells in St. George (Brant County) with vulnerability scoring in the different WHPAs.

### Surface Water Vulnerability

River and lake intakes can be impacted when dangerous materials are spilled into the water or on nearby land. It may take only a few minutes or hours for spilled material to reach a drinking water intake on a river or lake. Researchers determined how quickly water moves downstream or across a lake in various conditions to delineate Intake Protection Zones (IPZs). They identified streams, municipal storm sewers or rural drains that enter the river or lake upstream of, or close to the intake. Vulnerability scores range from 1 to 10, with 10 being the most vulnerable. Different time-of-travel zones and vulnerability scores have been assigned to river- and lake-based intakes. **Figure 3** illustrates the Intake Protection Zones for the City of Brantford’s Grand River intake.



**Figure 2: Wellhead Protection Areas for Wells 1, 2, and 3 in St. George in Brant County.**



**Figure 3: The Intake Protection Zone in the City of Brantford.**

### Intake Protection Zones (IPZ)

Time-of-travel zones established around municipal river or lake intakes that highlight the areas within which material from a spill or leak may get to the intake too quickly for the operators of the municipal water treatment plant to shut down the intake while the pollutant passes by.

For more information about vulnerable areas and vulnerability scoring, please refer to the [Assessment Reports](#).