



**DRINKING WATER**  
**SOURCE PROTECTION**

ACT FOR CLEAN WATER

# **The Science behind the Clean Water Act, 2006**

44th Central Canadian Symposium on Water Quality  
Research

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Canada Centre for Inland Waters, Burlington, Ontario

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*Source Protection Programs Branch*  
*Ontario Ministry of the Environment*

# DRINKING WATER SOURCE PROTECTION

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- *Clean Water Act, 2006* was proclaimed into force July 3<sup>rd</sup>, 2007
- Complements other MOE initiatives - **Multi-Barrier / Source to Tap** protection
- Objective is to establish a **collaborative, locally driven, science-based, multi-stakeholder process**
- First Principle - concept of **prevention** in the safeguarding of our drinking water for our communities and our health
- July 3<sup>rd</sup>, 2007, the “Phase I” regulations came into effect, establishing **source protection areas/regions**, the **source protection committees** and **terms of reference** requirements

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- “Phase II” of the regulation included:
  - In June 2008, miscellaneous regulation was updated to include prescribed requirements around training for property entry and the Ontario Drinking Water Stewardship Program,
  - In November 2008, amendments were made to some of the Phase I regulations to establish a General Regulation. Within the General Regulation, a section was added on the development of the **Assessment Report**. Later in November, the **Director’s Technical Rules** were posted setting out the Assessment Report requirements. Minor updates were made to these rules in December 2008.

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How the CWA fits into  
the multi-barrier  
approach

*Clean Water  
Act, 2006*



*Safe Drinking Water  
Act, 2002*



Treatment  
Plant



Reservoirs



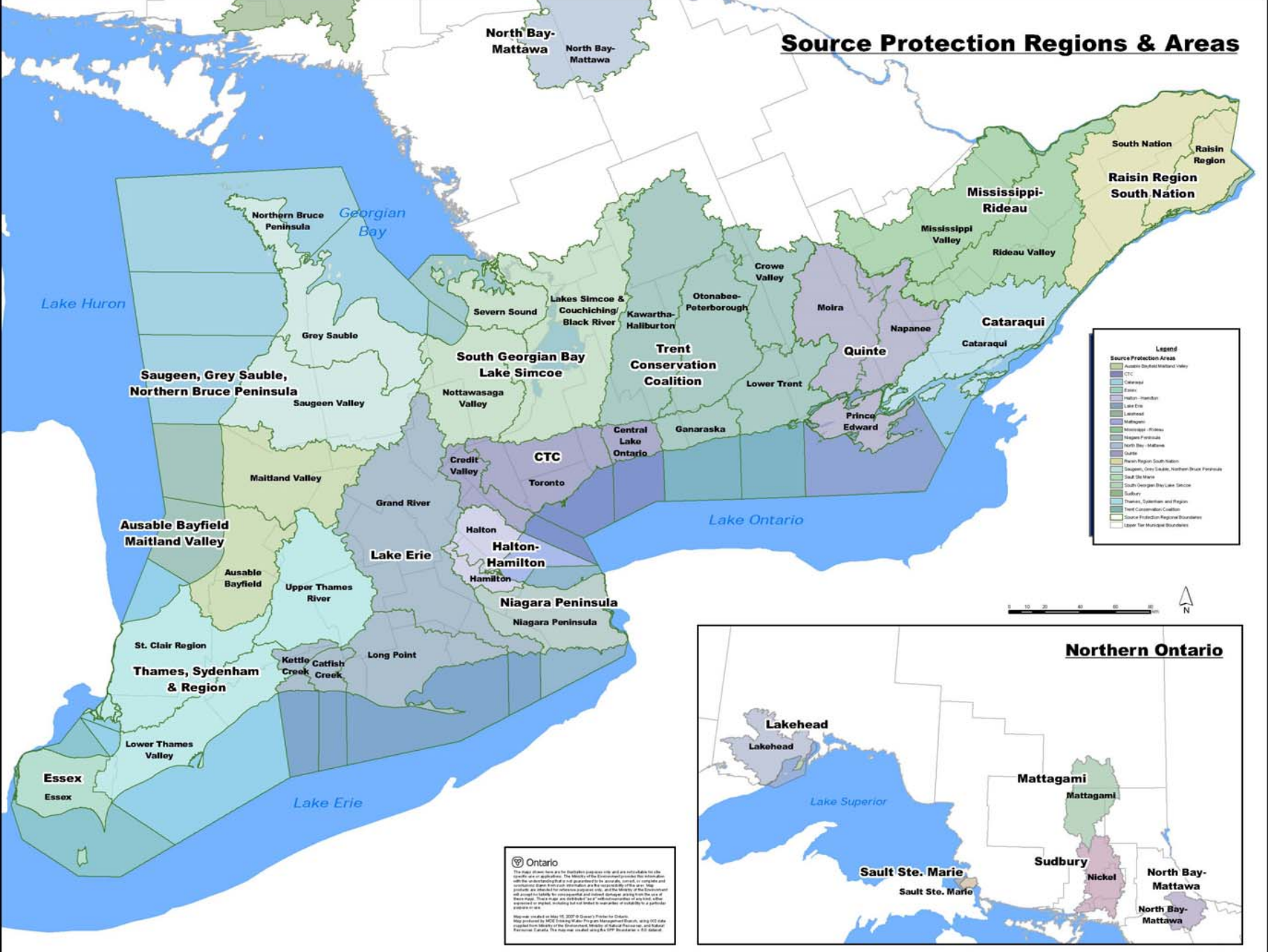
Distribution



Consumers

Source

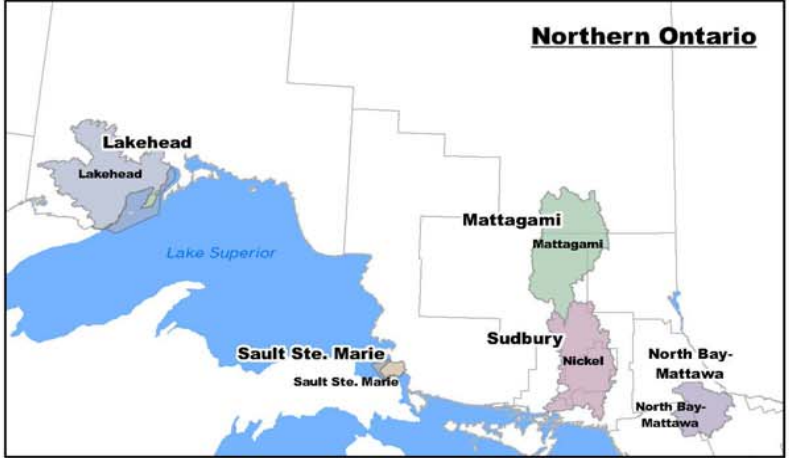
# Source Protection Regions & Areas



**Ontario**

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Map prepared by MCEC in May 15, 2007 for Ontario's Protection of Drinking Water Act. Map prepared by MCEC in May 15, 2007 for Ontario's Protection of Drinking Water Act. Map prepared by MCEC in May 15, 2007 for Ontario's Protection of Drinking Water Act. Map prepared by MCEC in May 15, 2007 for Ontario's Protection of Drinking Water Act.



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## Components of an Assessment Report

An assessment report will be comprised of the following technical elements:

1. Watershed Characterization
2. **Groundwater Vulnerability**
3. **Surface Water Vulnerability**
4. **Threats and Issues - Water Quality**
5. Water Budgets and Water Quantity Threats

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## Groundwater Vulnerability

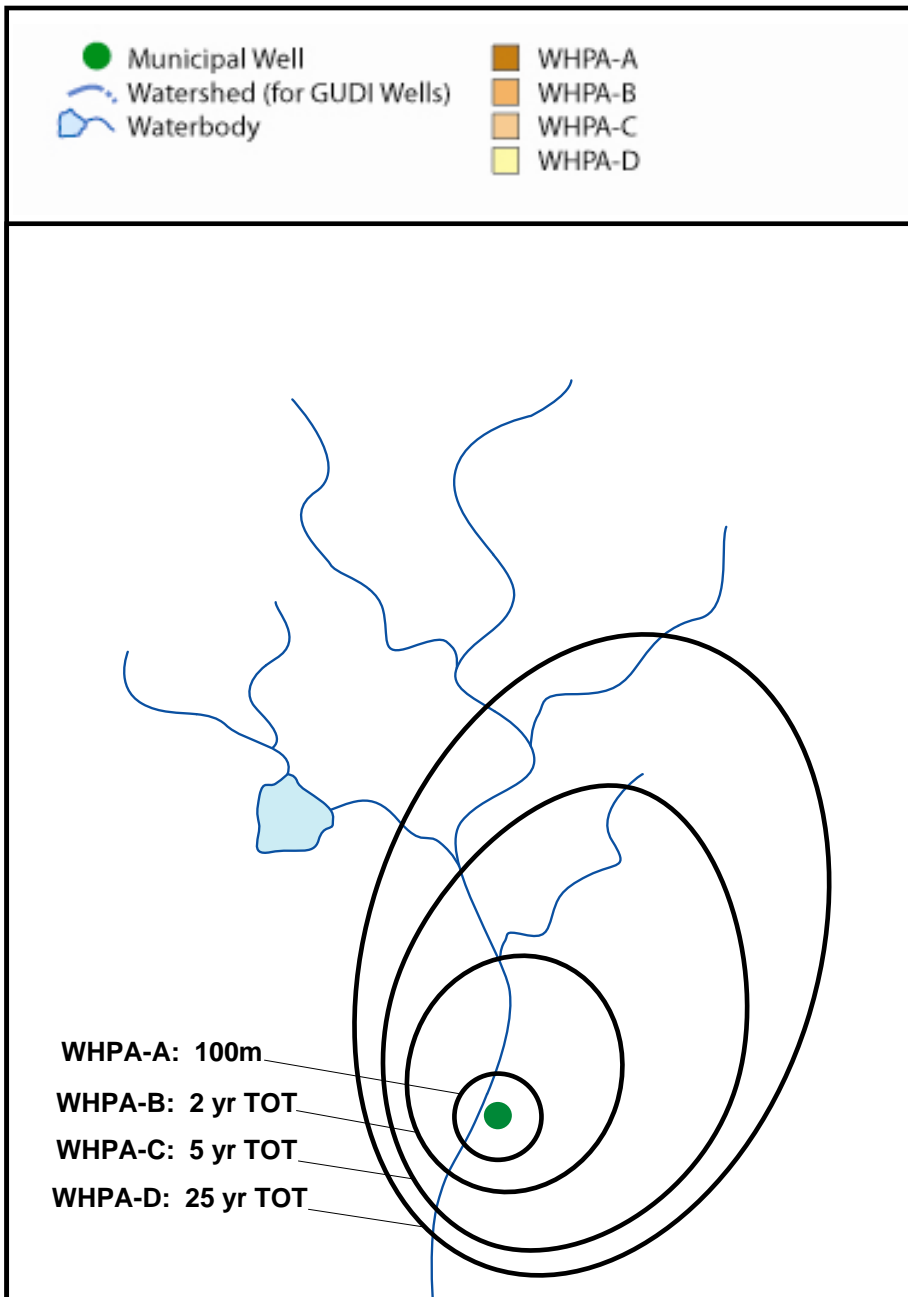
### Identifies and maps:

- Wellhead Protection Areas (WHPAs) associated with each existing and planned groundwater based drinking water system in the ToR;
- Highly Vulnerable Aquifers (HVAs); and
- Significant Groundwater Recharge Areas (SGRAs)

### Assigns a Vulnerability Score for each area:

- Based on susceptibility to becoming contaminated
- Reflect surrounding environmental conditions, available data, and horizontal and vertical time of travel (TOT) through the subsurface

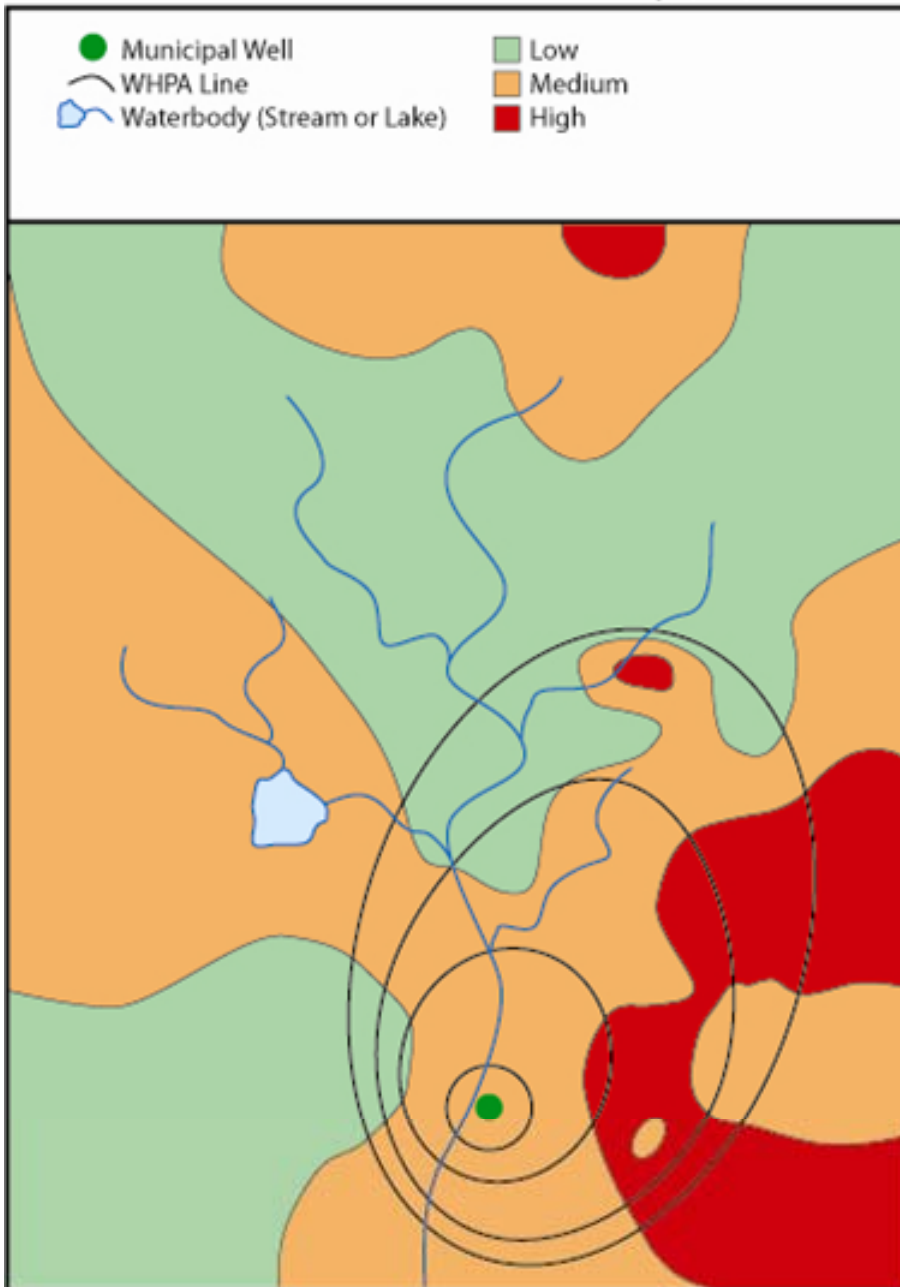
## Wellhead Protection Area (WHPA) Delineation



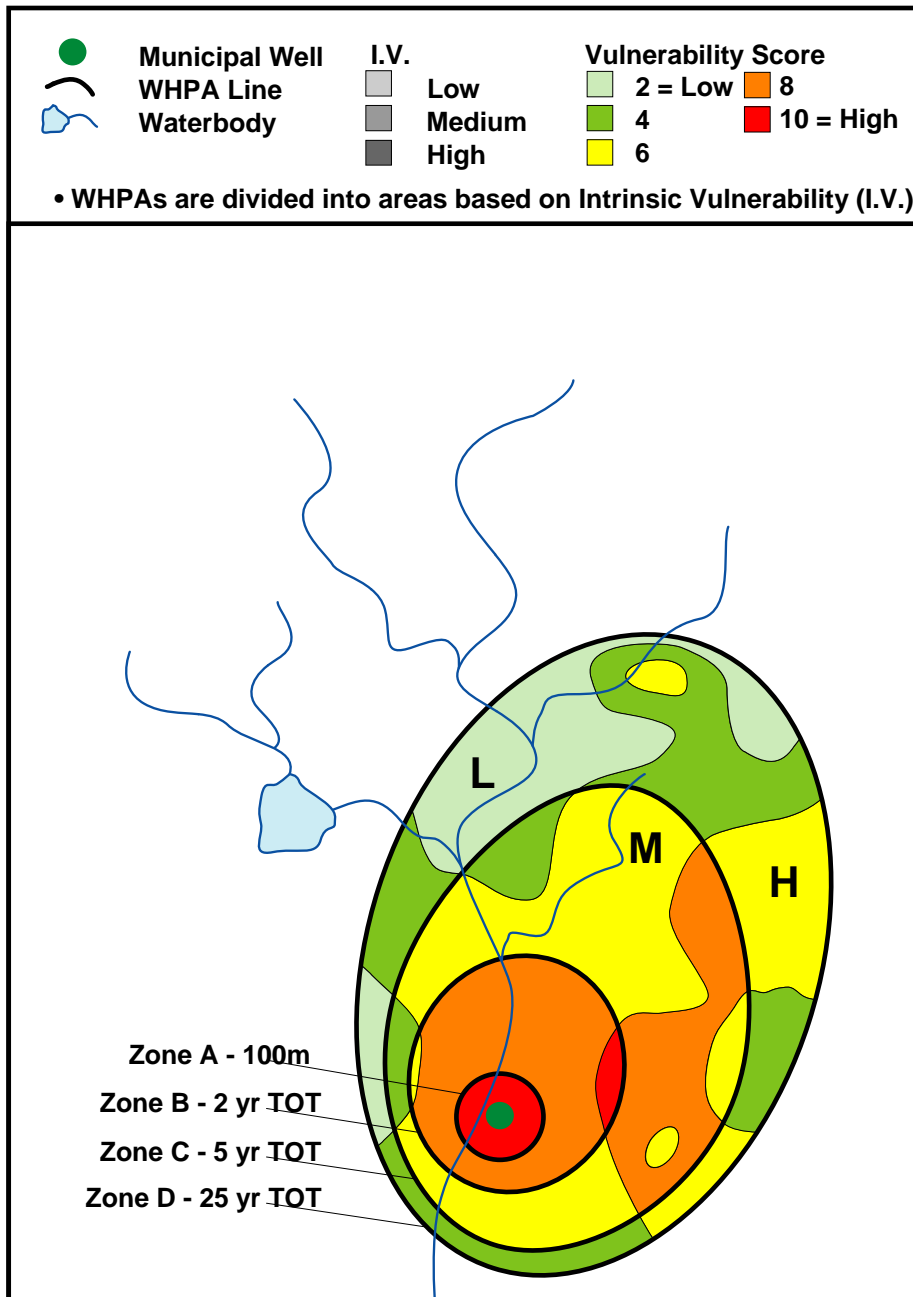
- WHPAs are typically computer-modelled times of travel (TOT) to a well within the aquifer
- Four zones oriented around the well:
  - WHPA-A: 100m radius
  - WHPA-B: 2 yr. TOT
  - WHPA-C: 5 yr. TOT
  - WHPA-D: 25 yr. TOT



## Intrinsic Vulnerability



- Natural vulnerability of aquifers based upon the type and thickness of overlying strata
- Based upon water well records, local geology and other hydrogeological data
- Results define high, medium and low vulnerability across the landscape
- High vulnerability areas are delineated and mapped as Highly Vulnerable Aquifers (HVAs)



## WHPA Vulnerability Scoring

- Consistent with TEC principles
- Overlay WHPA zones with intrinsic vulnerabilities of low, medium and high
- Scoring decreases away from the well and with decreasing aquifer vulnerability
- Always score 10 in Zone A
- WHPA-B scores 10, 8 and 6 with high, medium and low vulnerability, respectively
- WHPA-C scores 8, 6 and 4
- WHPA-D scores 6, 4 and 2

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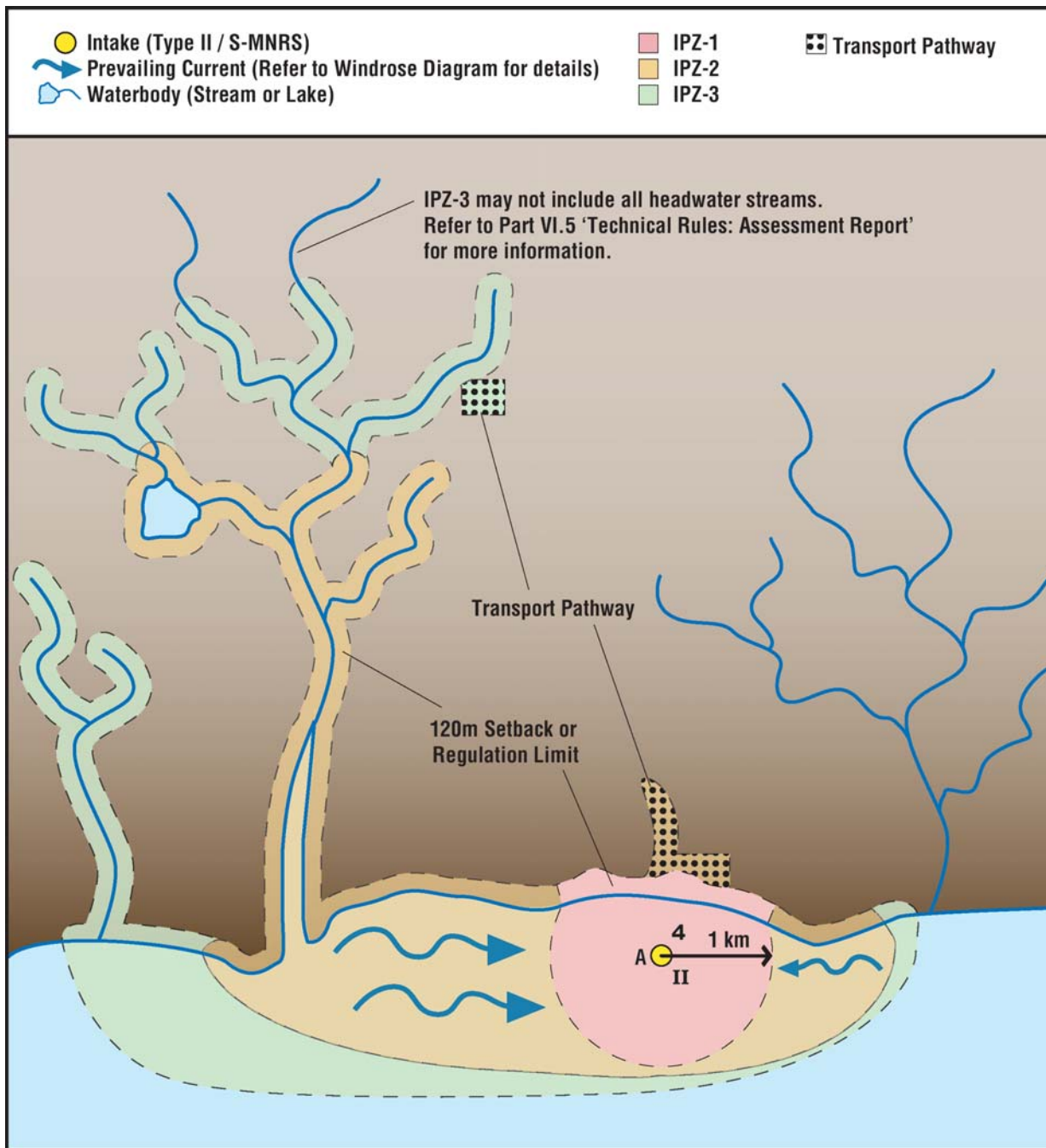
## Surface Water Vulnerability

### Identifies and maps:

- Intake Protection Zones (IPZs) associated with each existing and planned surface water based drinking water system in the ToR;

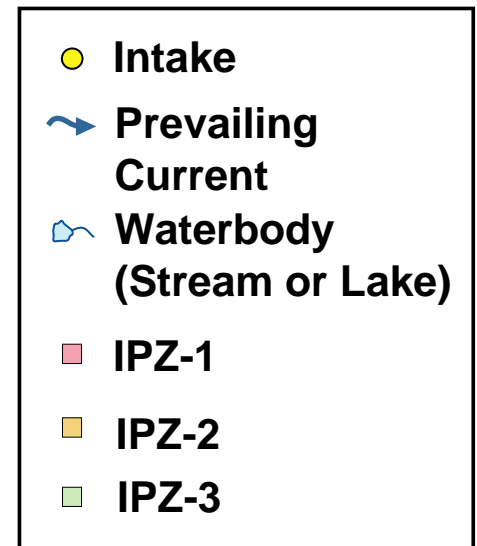
### Assigns a Vulnerability Score for each area:

- Based on susceptibility to becoming contaminated
- Reflect surrounding environmental conditions, available data



# Intake Protection Zones

## Type A Intakes: Great Lakes

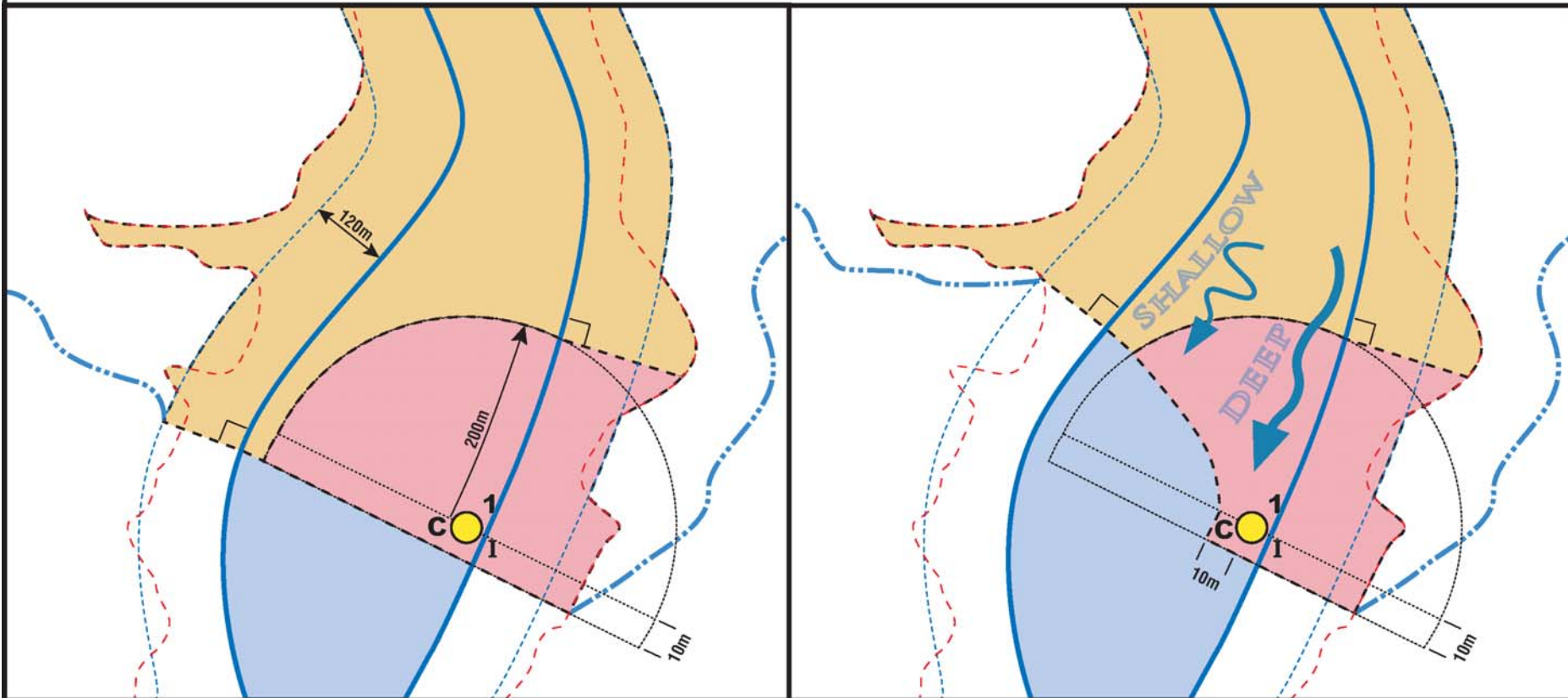


# Intake Protection Zones Type C Intakes: Rivers

Wide River (> 200m):

Flow Direction and Velocity :

- Intake
- Watershed
- Waterbody
- Regulation Limit
- 120m Minimum Setback
- Semi-Circle Dimensions
- IPZ-1
- IPZ-2
- Prevailing Flow Direction (Size  $\propto$  speed, Sinuosity  $\propto$  turbulence)  
Alternative Delineation Based on Varying Channel Velocity and Turbulence (influenced by stream depth & bed characteristics)



# Surface Water Vulnerable Areas

Intake Protection Zone 1  
Vulnerability 10

Intake Protection Zone 2  
Vulnerability 9

**Vulnerability Score =**  
**Area Vulnerability Factor X Source Vulnerability Factor**

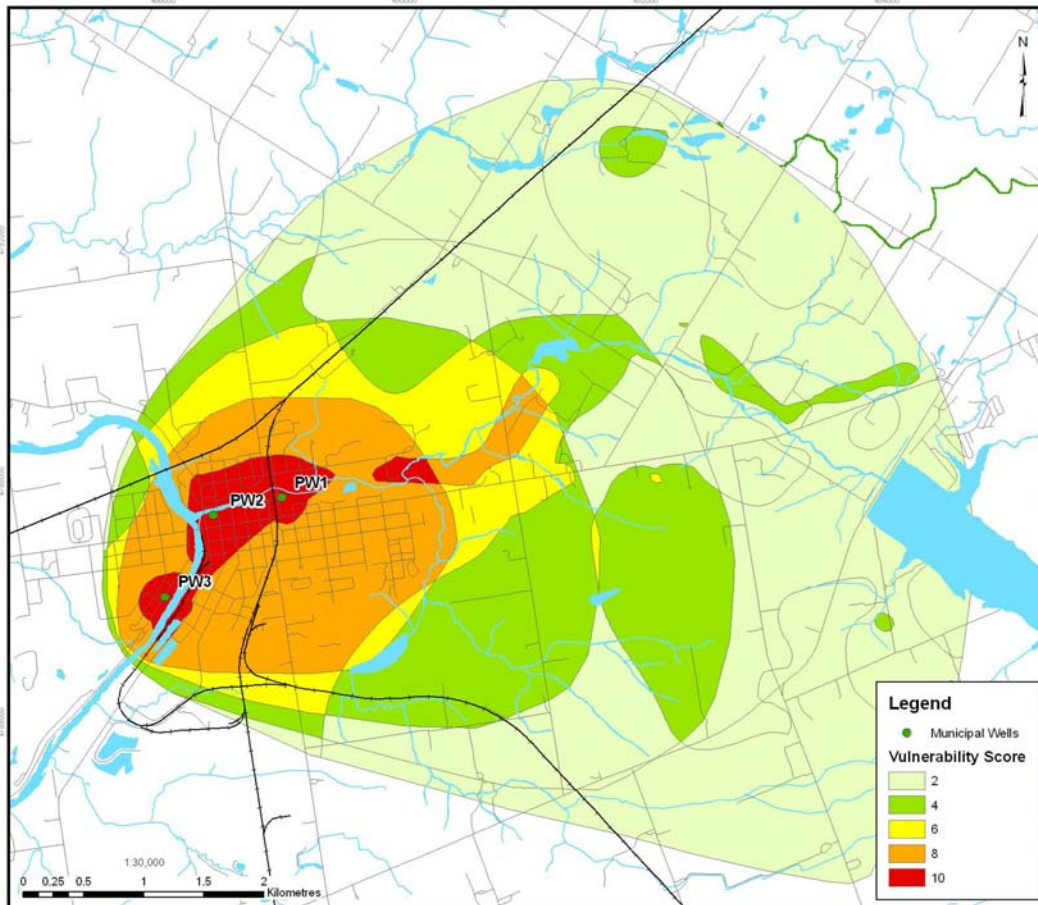
1 0.5 0 1 km



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## Drinking Water Quality Threats Approach 1



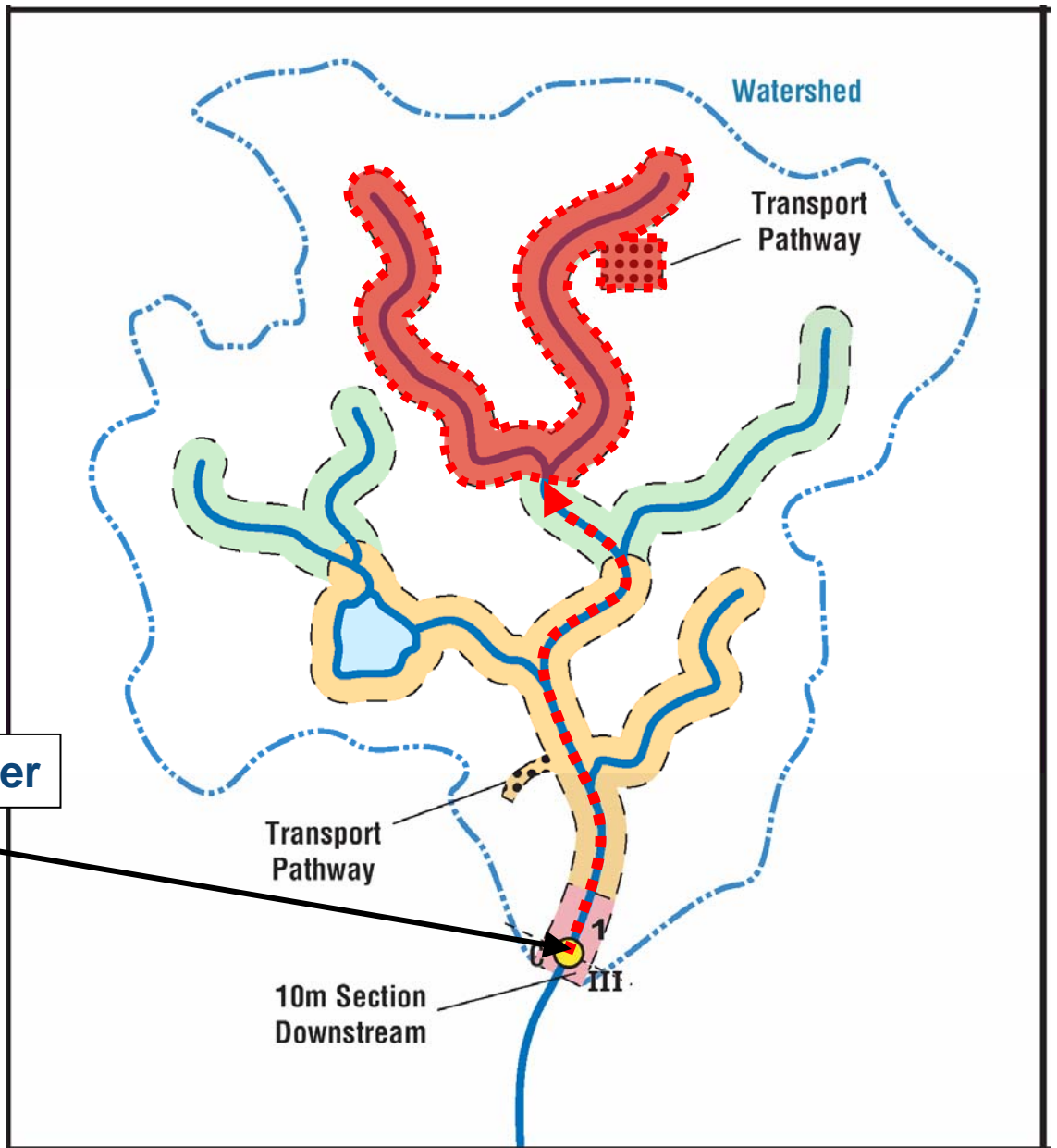
Province provides lists of significant, moderate and low drinking water threats

SPCs identify which lists pertain to their area based on vulnerability

Significant drinking water threats in most vulnerable areas

## Approach 2

## Describing Drinking Water Quality Issues

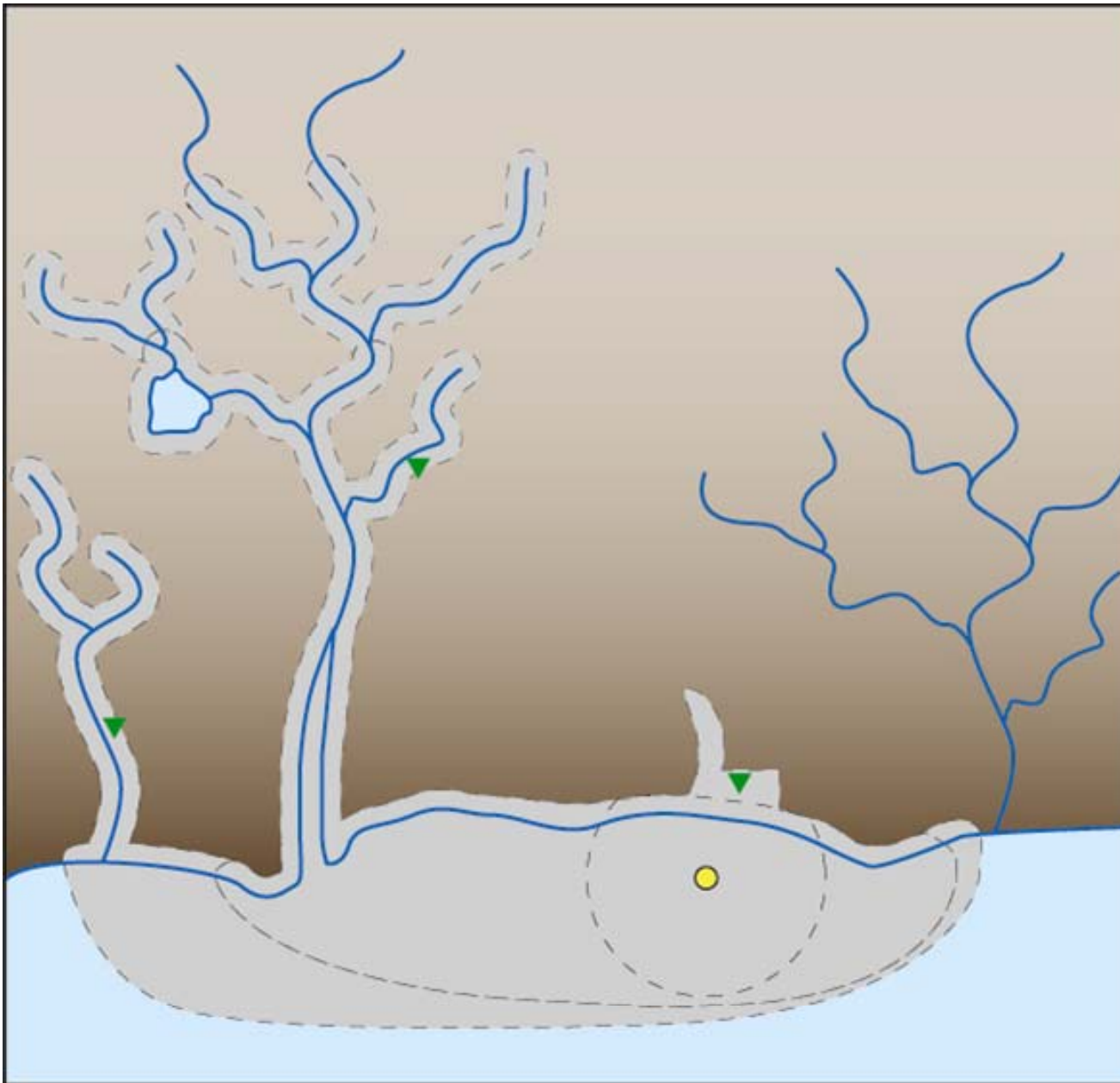


Issue: Nitrate in Source Water



## Approach 3

### Modelling Approach for Identifying Significant Drinking Water Quality Threats



- Intake
- ▼ threat
- Intake Protection Zone (IPZ-1, IPZ-2, IPZ-3)

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## Where Do I get More Information?

The Clean Water Act Website:  
[www.ontario.ca/cleanwater](http://www.ontario.ca/cleanwater)

Drinking Water Ontario:  
[www.ontario.ca/drinkingwater](http://www.ontario.ca/drinkingwater)

Ask The Expert E-Mail at:  
[source.protection@ontario.ca](mailto:source.protection@ontario.ca)