

# Thames-Sydenham and Region - Assessment Reports

## Municipal Summary – Wheatley Water Supply System

### System Overview

<b>System</b>	Wheatley
<b>Operating Authority</b>	Municipality of Chatham-Kent Public Utilities Commission
<b>System Classification</b>	Drinking Water System – 1 (Large municipal residential)
<b>Rated (design) Capacity</b>	23,864 cubic meters/day
<b>Intake Location</b>	Lake Erie at Wheatley Harbor, south-west of Chatham
<b>Intake Depth</b>	Primary Intake 4.5 m Emergency Intake 0.9 m
<b>Distance of intake from shore</b>	Primary Intake 747 m Emergency Intake 291 m
<b>Classification of Intakes</b>	Type A - Great Lakes
<b>Number of Intakes</b>	Two (a primary intake, and an emergency intake for use during frazzle ice conditions)
<b>Approximate Population Served</b>	10,700
<b>Area served</b>	Wheatley, Tilbury, part of Lakeshore, part of Mersea Township, part of Romney and Wheatley Provincial Park



### Vulnerability Assessment

An intake protection zone is delineated around an intake. There are two intakes on Lake Erie, at Wheatley Harbour, that serve the Wheatley water treatment plant. One is the primary (regular) intake while the other is an emergency intake used only during frazzle ice conditions. The flow conditions at the intake are driven by lake currents and wind over the Lake. The intake is classified as a Great Lakes intake (Type A).

**IPZ-1:** On the Great Lakes an IPZ- 1 is a circle with a radius of 1 km, centered on where the intake draws its water from the lake. Where

the circle touches shore, the zone is extended 120 m or to the regulatory limit, where water from that area drains into the in-lake part of the IPZ-1.

**IPZ-2:** A second zone is delineated based on travel time to the intake being equal to or more than what is necessary for the operators to close the intake. Operators determined that they could close the intake within 2 hours of being notified of a situation which might cause a deterioration of the drinking water. A computer model was used to simulate currents within the Great Lakes and connecting channels and determine how far water could travel in 2 hours. Where the in-water portion of the IPZ-2 touches shore, the residual travel time is estimated to determine how far up water courses the zone should extend. Along these water courses the IPZ-2 extends 120m or to the extent of the regulatory limits. IPZ- 2 is also extended to include any storm sewersheds and areas where transport pathways allow water to drain to the IPZ-2. Transport Pathways could include natural or man-made pathways such as drains, creeks, agricultural tile drains, or overland flow.

**IPZ-3:** A third zone around intakes can also be developed for intakes. This zone includes areas which can contribute contaminants, under an extreme event, at a concentration which would result in a deterioration of the source water for the purposes of human consumption. The IPZ-3 work is yet to be undertaken and will be part of an amended Assessment Report.

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Within these zones the vulnerability must be assessed based on a number of factors. These factors include:

*Area Vulnerability factor:* IPZ-1 receives an area vulnerability score of 10, while IPZ-2 is between 7 and 9 dependant on the amount of land in the IPZ-2, land cover, soil type and permeability as well as the presence of transport pathways.

*Source Vulnerability factor:* For a Great Lake intake the source vulnerability factor is between 0.5 and 0.7, while for a connecting channel it is between 0.7 and 0.9. This is dependant on depth of the intake, distance from shore and the number of issues identified at the intake.

The Source Vulnerability factor is then multiplied by the Area Vulnerability factor to determine the Vulnerability Score of the zone, where a score of 10 indicates the highest vulnerability. Table 1 provides the factors and scores of the Wheatley IPZ-1 and IPZ-2. Figure 1 shows the delineated IPZ-1 and IPZ-2.

## Peer Review of Vulnerability Assessment

The Source Protection Committee established a peer review committee to review the assessment of vulnerability. This peer review committee included consultants and academics who are experts in surface water or groundwater modeling. The peer reviewers reviewed the technical reports and met with the consultants and staff who were involved with the work. The peer reviewers provided opinions as to whether the work met the appropriate rules and guidance and that it was scientifically valid. They also provided comments which the consultants used to improve the documentation of their work.

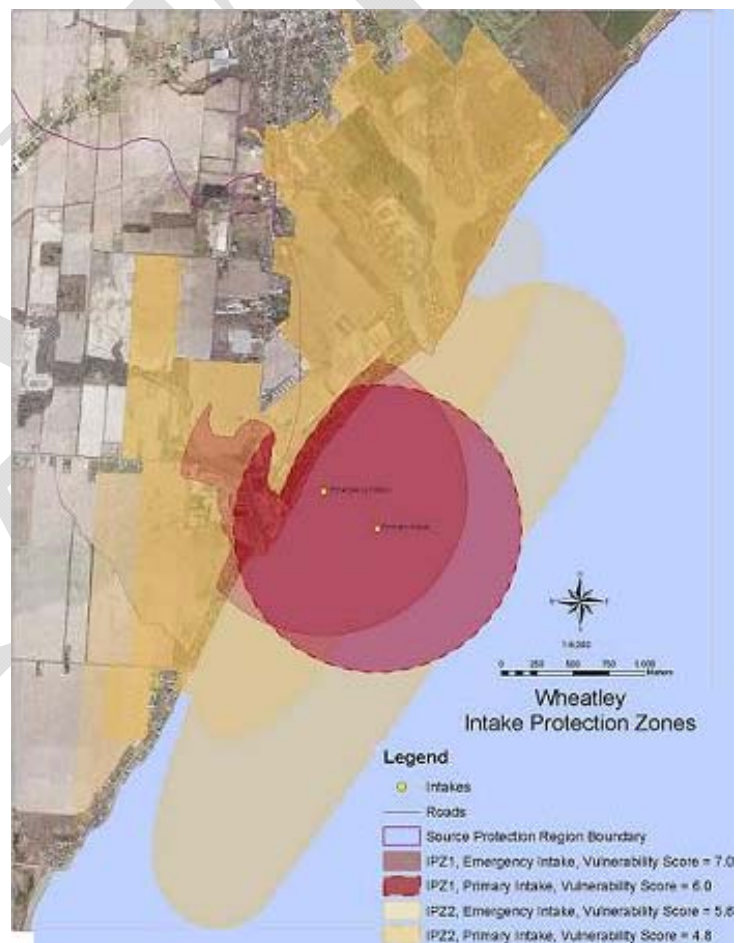
## Issues

A drinking water issue is a parameter or pathogen shown to deteriorate, or trends towards a deterioration of raw (untreated) water quality for the purposes of drinking. The parameters which can be considered are identified in the Safe Drinking Water Act. Parameters are described in the Issues Evaluation section of the Assessment Report.

Issues were identified by following the Thames-Sydenham and Region Issues Evaluation Methodology (May 14, 2009). The evaluation is a two step process. Firstly, raw (untreated) water quality data is screened based on a comparison against a benchmark. Secondly, an investigation of the parameters flagged through the first step is undertaken to identify an issue. This includes a review of trends and spikes, consideration of existing water treatment plant capabilities and discussions with the water treatment plant operating authority. The benchmarks for parameters are generally the half the

	Intake	Primary		Emergency	
	Zone	IPZ-1	IPZ-2	IPZ-1	IPZ-2
Source Vulnerability Factor		0.6	0.6	0.7	0.7
Area Vulnerability Factor		10.0	8.0	10.0	8.0
<b>Vulnerability Score</b>		<b>6.0</b>	<b>4.8</b>	<b>7.0</b>	<b>5.6</b>

Figure 1: Intake Protection Zones for Wheatley



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human health based Ontario drinking water standards (Maximum Acceptable Concentrations, or MAC), and the full levels of the aesthetic objectives (AO) and operational guidelines (OG).

Pathogens are evaluated differently. A known pathogen of concern that is flagged through the screening process must be subject to a microbial risk assessment to identify it as an issue. This assessment involves pathogen characterization, exposure assessment and risk characterization.

Should an issue be identified, the area and the activity contributing to a drinking water quality issue must also be identified. This work has yet to be completed and will be part of an amended Assessment Report. Further, the activities that contribute to the identified issue become a significant risk that must be reduced through the source protection plan.

The drinking water quality issues in the raw (untreated) water to the Wheatley intake are identified in the Table 2 below. The water quality data gaps are described in the Data Gaps section. Certain parameters may be due to anthropogenic sources, i.e. due to the activities on land, or naturally occurring, or both. No pathogens are identified as issues in the raw (untreated) source water in the Lower Thames Valley SPA.

Parameter	Description	Natural/Anthropogenic
Turbidity	Over 3 years, 44 raw (untreated) water samples were collected and tested for turbidity. About 86% of the sampling results measure above the treated water AO of 5 NTU, with a highest value of 59 NTU. Prolonged elevated levels of turbidity are a cause of concern to the plant operator.	Possibly both natural and anthropogenic causes, further investigation required

## Conditions

A condition is the result of a past activity which has the potential to pose a risk to a drinking water source. The Source Protection Committee is required to list it as a drinking water threat any "Condition" that it is aware of. The Technical Rules: Assessment Report identifies the type of situations which can be considered a condition and are summarized below as they pertain to an Intake Protection Zone:

- the presence of a single mass of more than 100 litres of one or more dense non-aqueous phase liquids in surface water in a surface water intake protection zone
- the presence of a contaminant in surface soil in an intake protection zone if, the contaminant is listed in Table 4 of the Soil, Ground Water and Sediment Standards is present at a concentration that exceeds the surface soil standard for industrial/commercial/community property use set out for the contaminant in that Table; and
- the presence of a contaminant in sediment, if the contaminant is listed in Table 1 of the Soil, Ground Water and Sediment Standards and is present at a concentration that exceeds the sediment standard set out for the contaminant in that Table.

At the time of drafting of this Assessment Report, the Source Protection Committee has not completed an extensive investigation to determine if there are any situations which should be assessed as conditions. Wheatley Harbour is within the Intake Protection Zones for this drinking water system and is identified as an Area of Concern (AOC) under the Canada Ontario Water Quality Agreement. As a result, a Remedial Action Plan (RAP) has been established. The AOC is nearing the point where it is being considered for delisting. Existing information on sediment and water quality needs further consideration to determine if it should be considered a Concern in the Assessment Report for the Lower Thames Valley Source Protection Authority. More work will be undertaken on identifying and assessing conditions and, if necessary, the Assessment Report will be amended.

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## Threats and Risk Assessment

The Clean Water Act prescribes activities which may be considered drinking water threats. The activities associated with drinking water quality are summarized in the Threats and Risk Assessment Section of the Assessment Report. Risk Assessment is the process of assessing the threats to determine their relative risk to the drinking water source.

An activity can only be identified as a threat if it is occurring in a vulnerable area and the vulnerability score of the area is greater than 4.

Figure 2a shows where activities related to chemical may pose a significant, moderate or low risk to the drinking water source at the primary intake. Figure 2b identifies the areas where an activity related to pathogens could pose a significant moderate or low risk at the primary intake. Similarly, Figure 2c and 2d respectively identify areas where an activity related to chemicals and pathogens could pose a threat at the emergency intake.

The circumstances under which the activity is undertaken are important in determining the level of risk associated with the activity in these areas. The circumstances to be considered include the type of material, the quantity of material and whether it might be released to surface water or groundwater. The MOE has developed a "Tables of Drinking Water Threats" which identify the level of risk associated with an activity. The level of risk is dependant on the vulnerability score of the area that it is occurring in and the circumstances under which the activity is occurring. Pathogens and chemical are considered in separate tables. Table 3 provides counts of significant threats that may occur in the vulnerable areas for both the primary and emergency intakes. Due to the low to moderate vulnerability of these areas there are no significant threats in either IPZ-1 or 2 of both intakes.

Table 3 – Number of Locations of Significant Threats

	Chemicals	Pathogens
IPZ-1 (both intakes)	0	0
IPZ-2 (both intakes)	0	0

Note: Threats associated with the application of agricultural and non-agricultural source material to land, and the application of commercial fertilizer and road salt to land have not been enumerated

## Local Drinking Water Threats

The Clean Water Act also allows the Source Protection Committee to identify other activities which they consider threats to drinking water but are not listed in the MOE threats table referenced above. For activities identified in the MOE threats tables the Source Protection Committee can also identify additional circumstances under which they consider the activity a drinking water threat. The Source Protection Committee has not identified any local threats or circumstances at this point.

Figure 2a – Areas Where Activities Related to Chemical can be Threats – Primary Intake

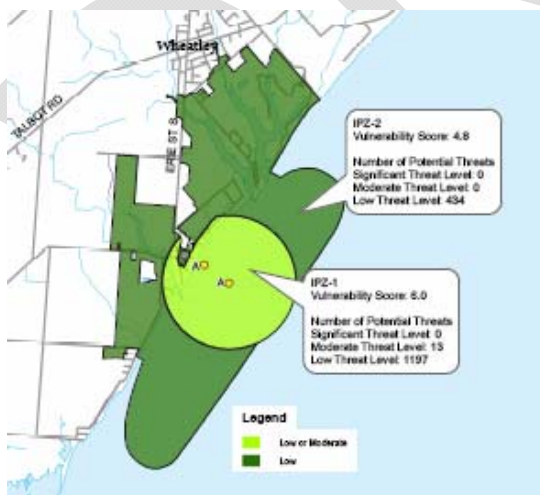
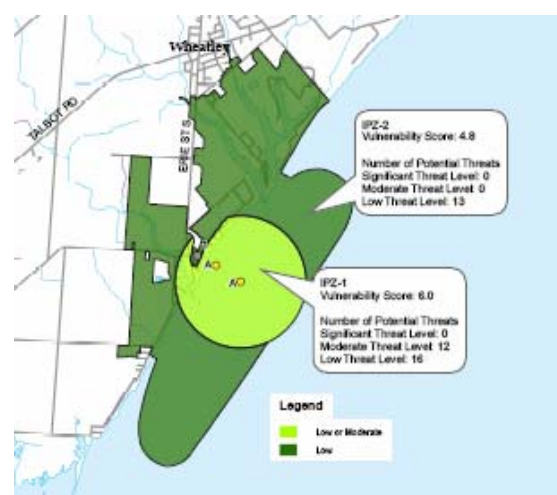


Figure 2b – Areas Where Activities Related to Pathogen can be Threats – Primary Intake



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Figure 2c – Areas Where Activities Related to Chemical can be Threats – Emergency Intake

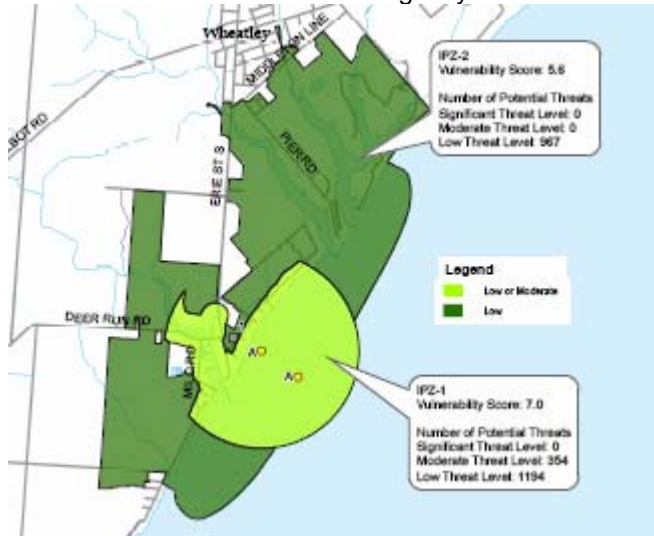
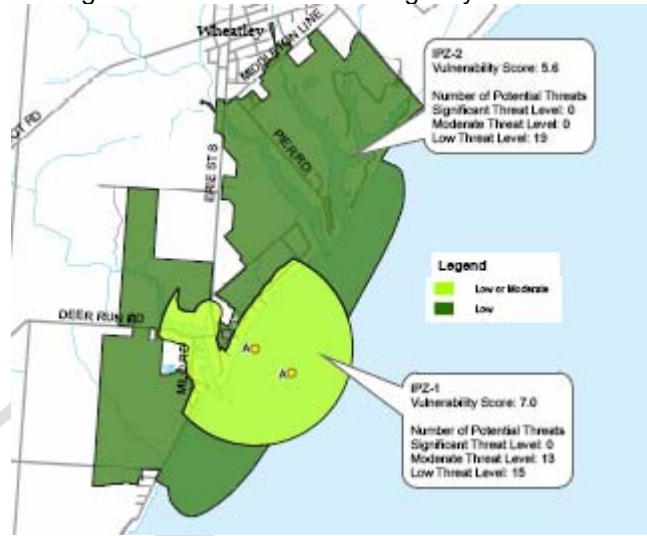


Figure 2d – Areas Where Activities Related to Pathogen can be Threats – Emergency Intake



## Data Gaps

Schedule 2 and 3 (chemical and radiological) data for the Wheatley intake raw water were not available. Additional data collection would facilitate future issues evaluation.

At the time of completion of the Threats and Risk Assessment the percent of impervious area, managed lands and livestock density calculations were not available. As a result the level of threat associated with the application of agricultural and non-agricultural source material to land, and the application of commercial fertilizer and road salt to land have not been determined yet.