Sarnia • Lambton Environmental Association

Industries Working Together

# Drinking Water Sources in Lambton County

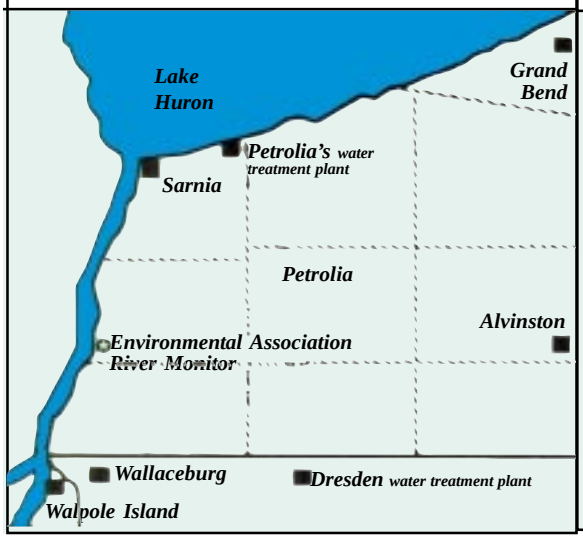
***This monograph, one in a series of single issue documents that deal with our local environment, has been prepared by the Sarnia-Lambton Environmental Association in co-operation with the School Boards of Lambton Kent***

## Introduction

Approximately 90% of Lambton County residents obtain their water from water treatment plants. These plants draw water from the head of the St. Clair River and from Lake Huron inlets located at Bright's Grove and Grand Bend. Potable water (suitable for drinking) is provided through basically six stages of treatment; it is pumped through some 350 km of pipeline which extend throughout much of Lambton County.

The population that is not served by pipelines relies on either shallow dug wells or deep, drilled wells that tap the aquifer. The aquifer is a bed of sand and gravel, combined with the top few metres of weathered bedrock usually 3 to 5 metres thick, though in some places it is entirely absent. Throughout Lambton County, water from the aquifer is available in variable quantity and quality. In some places the water is contaminated by naturally occurring oil and gas components. *Middleton, page 9*

***DWSP Monitors Water Treatment Plants***




***Drinking Water Sources - Lambton County***

**Lake Huron** serves 129,000 Lambton residents

- Some 200 parameters are monitored (chemical, biological, aesthetically)
- Test results show that area water treatment plants . . . routinely meet Ontario Government objectives

**Wells** serve 14,000 Lambton residents

- mineral content of water is generally high eg. iron salts cause discolouration
- gases that occur naturally require venting eg. methane and hydrogen sulphide
- bacterial counts, if high, are generally due to fecal material associated with poor well construction and/ or maintenance

## Key Words

*algae bloom* - a heavy growth of algae in and on a body of water; associated with high phosphate concentrations

*aquifer* - locally, a thin discontinuous layer of water-bearing gravel/sand 30 to 35 metres below ground level

*bedrock* - the solid rock underlying surface deposits

*glacial till* - a mixture of clay, sand, gravel and boulders, deposited by receding glaciers

*parameter* - a measurable or quantifiable characteristic or feature

*water table* - the upper surface of the zone which is saturated with ground water; it may be revealed by the level at which water stands in wells

## *Municipal Water Supply Systems*

Most Lambton County residents obtain their drinking water from Lake Huron. The Great Lakes Basin is home to one-quarter of the population of Canada and to more than a tenth of the U.S. population.

The Great Lakes form the largest system of fresh, surface water on earth; they contain roughly 18% of the world supply. Only the polar ice caps contain more fresh water.

*Govt. of Canada, 1995, page 3*

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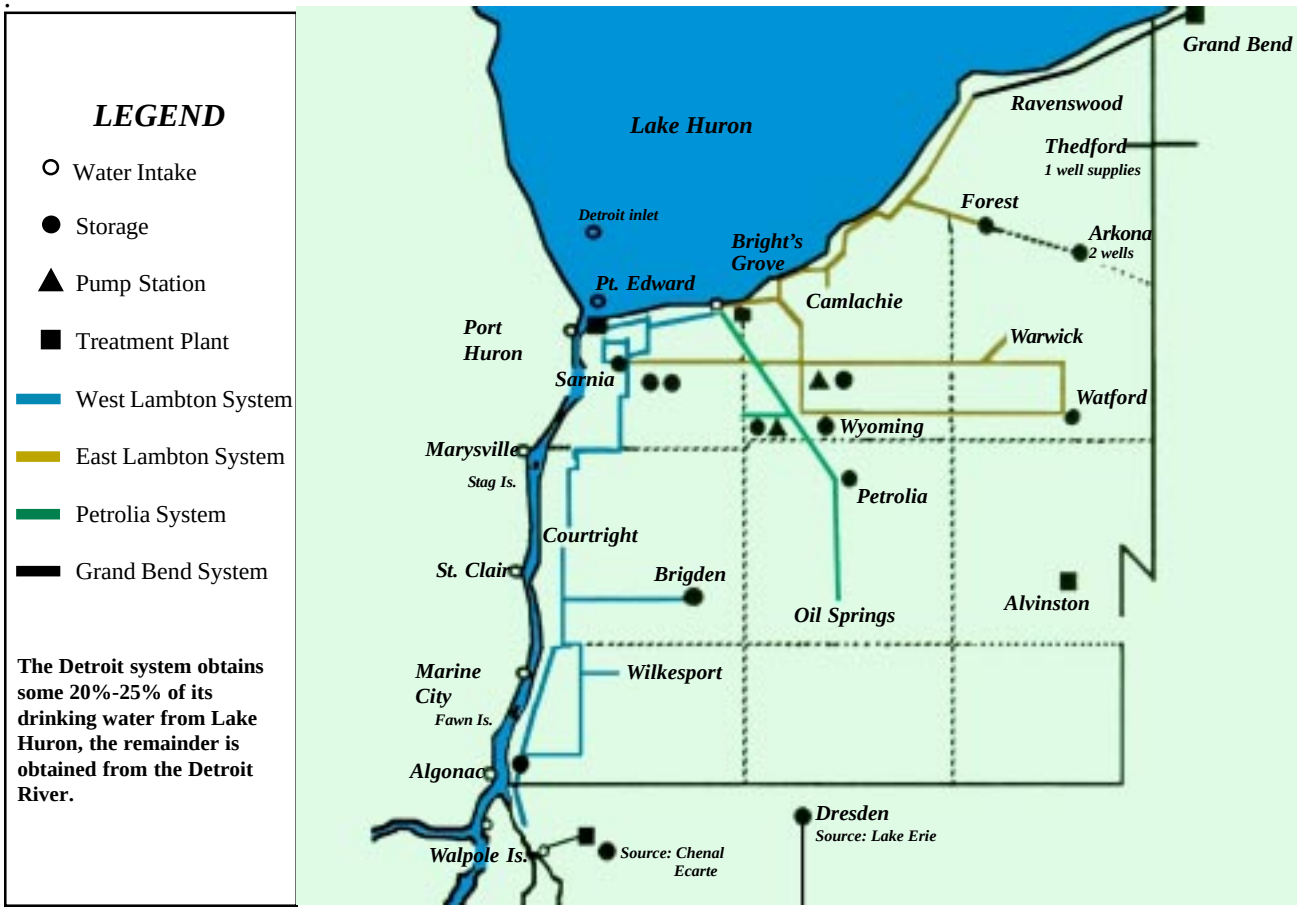



## *Water Treatment Plants - Some History*

1875 Sarnia's water treatment plant, the Water Works, was built. Coal-fired boilers supplied steam for four engines which had a pumping capacity approximately 1/25th that of the present Lambton Treatment Plant.

1896 Petrolia's water treatment plant, located at Bright's Grove, was built. The plant and connecting pipelinecosts totalled $152,000, a very expensive project for its time. Naturally occurring oil and gum deposits made the aquisition of potable groundwater very unpredictable; the Geological Survey of Canada (1851) describes the occurrence of gum beds in Enniskillen Township. *Ford R.W., 2000, page 2*

1913 A new pumping station was built in Point Edward at the site of the present Lambton Water Treatment Plant. Chlorination was introduced following outbreaks of typhoid fever, diphtheria and scarlet fever.

1976 The present Lambton Water Treatment Plant was officially opened.

1998 An activated carbon system was installed to care for taste and odour concerns caused by algae blooms.

2004 The average combined daily intake of the Pt. Edward and Petrolia plants varied from a low of 59,000 $m^3$ (mid winter) to a maximum of 125,000 $m^3$ (mid summer). The maximum daily flow would fill an olympic- size pool more than 60 times. Conservation programs have decreased daily water use.

## *Near Surface Well Water in Lambton County*

90 % of the wells in Lambton County are drilled to the interface aquifer, the remainder intersect local sandy deposits at shallower depths within the glacial till. Typical aquifer well flow-rates are 0.1 to 0.8 litres/sec. *Weaver, page 112*

433 water well files supply information on the fresh water aquifer. Fresh water is generally found near the base of glacial deposits. *Hughes-Pearl J., page 7*

## *A Geological Cross Section of Lambton County*

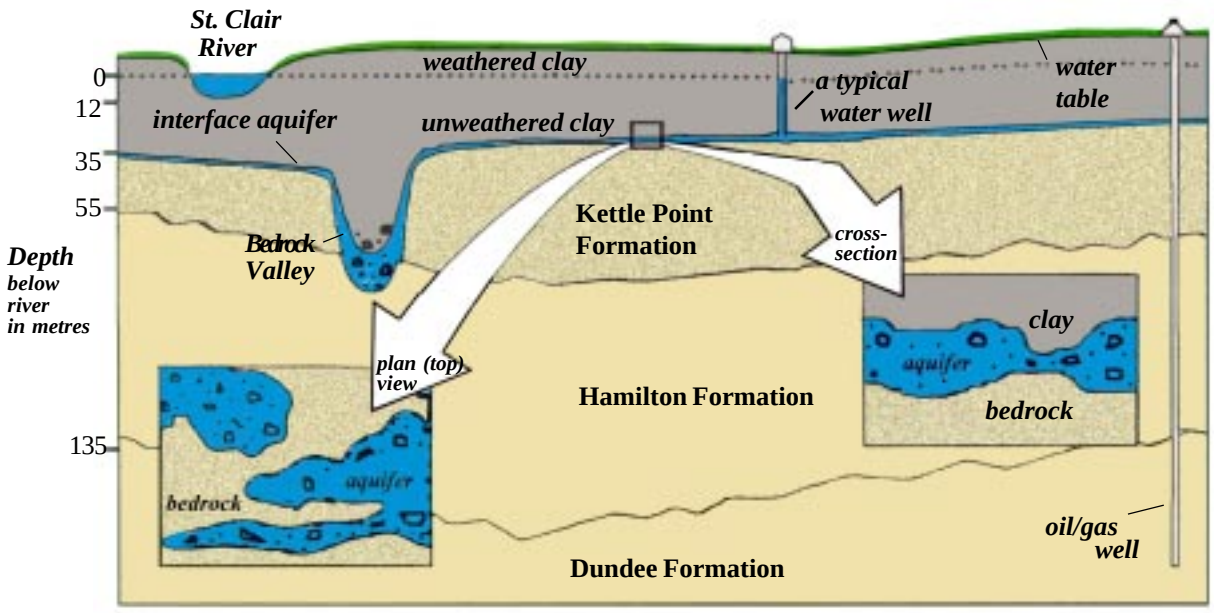
***Formations:*** earthy, mineral or rock masses having common physical characteristics or similar origin

*Kettle Point clay* - forms the bedrock surface for most of Lambton County; mainly black, bituminous

*Hamilton* - forms the bedrock surface where the Kettle Point formation is absent; a series of blue-grey shales and interbedded limestones

*Dundee* - produce soil and gas;mainly fine-grained limestones ranging in colour from tan to dark brown

*Bedrock Valley* - a section of clay that is unusually deep *Middleton T.A., 1988, pages 5 -7*




**The inset on the left is a plan view representing the aquifer's discontinuous nature. "Gaps" in the aquifer account for variations in quality and quantity of water.**

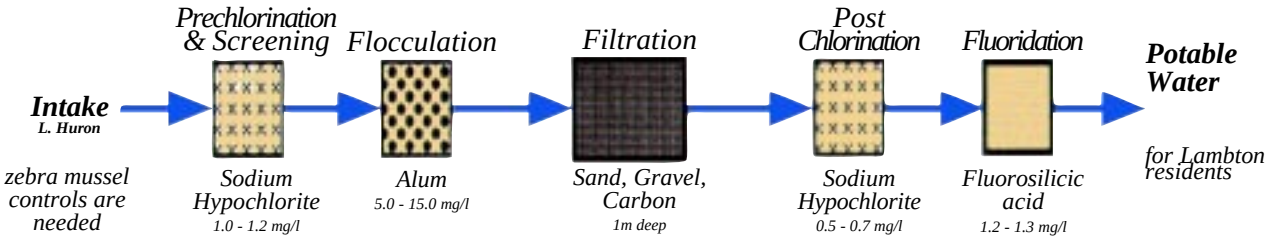
**The inset on the right is a representative vertical cross-section of the interface aquifer, bounded below by the bedrock surface and above by a thick layer of low-permeability clay.**

***Groundwater Flow: typical rates,*** actual rates vary with location within unweathered clay,1 x $10^{-10}$ metres/sec. or 3 millimetres/year ave. within interface aquifer, 1 x $10^{-7}$ metres/sec. or a few metres/year ave. within Kettle Point shale, 1 x $10^{-10}$ metres/sec. or 3 millimetres/year ave. *Weaver, 1994, pages 19, 91, 125*

The MOE office in London has records of 7166 water wells in Lambton County. *MOE, London Office*

***Groundwater Age:*** The elapsed time since water moved deep enough into the ground to be isolated from the earth's atmosphere is called groundwater age. Isotopic (oxygen) studies of the aquifer show younger water in recharge areas in the east and older water in the western part of the county. The oldest water is the same age as the overlying glacial deposits, approximately 10,000 years. *Middleton, pages 11, 13*

## *Drinking Water - Six Basic Stages of Treatment*




***Great Lakes Retention Time***
*a measure based on the volume of water in each lake and the average rate of outflow*

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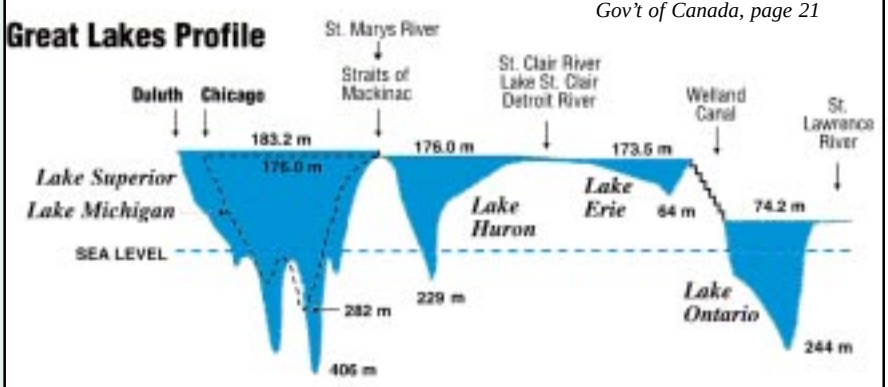
|---|---|
| Superior | 191 years |
| Michigan | 99 years |
| Huron | 22 years |
| St. Clair | 5-7 days |
| Erie | 2.6 years |
| Ontario | 6 years |

*Gov't of Canada, page 4*

*Gov't of Canada, page 21*




Note: 1. The profile is taken along axes of the lakes; the vertical exaggeration is 2000

## *Conclusion*

This monograph just begins to describe the topic of drinking water sources along with the monitoring and treatment required to provide a continuing supply of potable water. More information is readily available in the resources listed below.

## *Resources*


Gov't. of Canada, 1995. The Great Lakes, Environment Atlas and Resource Book

Ford, R. W., 2000. A History of the Chemical Industry in Lambton County

Freeze A., Cherry J., 1979. Groundwater

Hughes-Pearl J. et al., 1993. Lambton County Hydrogeological Data Base

Middleton, T.A. et al, 1988.The Hydrogeology of Lambton County

T. Weaver, University of Waterloo, 1994, Groundwater Flow and Solute Transport in Shallow Devonian Bedrock Formations and Overlying Pleistocene Units, S.W. Ontario

M. Husain, University of Waterloo, 1996, Origin and Persistence of Pleistocene and Helocene Water in a Regional Clayey Aquitard and Underlying Aquifer in S. W. Ontario



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*Monograph L2* **2005**
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