

## Memorandum

**Date:** January 30, 2019

**To:** Chris Angelo, City of Quinte West

**From:** Brent Parsons, Hutchinson Environmental Sciences Ltd.

**Re:** Preliminary Response to MOECC Comments

Further to recent correspondence, we have provided a memo that provides an update on Water Quality Assessment - Oak Lake (PW18-16). The summary provides an overview of work completed to date and a basic review of data collected to date. The Lake Management Plan will include a much more detailed data review based on data collected through all four sampling events.

### ***Field Investigations***

Hutchinson Environmental staff completed field investigations on August 16, 2018 and October 29, 2018. The following tasks were completed during those field investigations:

- Water samples collected from 11 sampling locations (Figure 1) and shipped to ALS Laboratories for analysis of general chemistry, bacteria, nutrients and trophic indicators, trace metals and cations;
- Sediment sample collected from 1 sampling location and analysed for Psenner fractionation at Guelph University for future calculation of internal nutrient loading;
- Scoped Level 1 septic system inspections at residences on Oak Lake; and
- Documented conditions and photographic record of culverts, and general characteristics of Oak Lake and the watershed.

### ***Preliminary Data Investigation***

#### 1) Water Quality Assessment

##### *General Chemistry*

- General water chemistry parameters were measured at 1 m depth intervals at OL-1. Oak Lake was thermally stratified on August 16, 2018 as temperatures quickly declined below 5 m. Dissolved oxygen concentrations were hypoxic (i.e. <1 mg/L) between 9 m and the lake bottom, indicating potential for internal loading of nutrients. Oak Lake was thermally mixed throughout the water column on October 29, 2018 and dissolved oxygen concentrations were >10 mg/L throughout the water column, indicating that the lake had turned over prior to sampling.

- Dissolved oxygen concentrations ranged between 5.93 – 8.34 mg/L on August 16, 2018 with depressed concentrations located at OL-7 and OL-9.

#### *Nutrients and Trophic Indicators*

- Phosphorus concentrations ranged from 0.005 – 0.044 mg/L, and averaged 0.016 mg/L, which corresponds with a trophic classification of meso-eutrophic<sup>1</sup> (i.e. moderately enriched). Elevated concentrations were located at OL-9 and off bottom, indicating internal loading.
- Total nitrogen:total phosphorus ratios show that Oak Lake is a phosphorus-limited system as ratios were >14<sup>2</sup>. The lowest ratios were located at OL-9.
- pH concentrations ranged from 7.97 – 8.81, indicating slightly alkaline conditions throughout the lake.
- Unionized ammonia concentrations were typically <0.01 mg/L but one elevated concentration of 0.025 mg/L was measured on August 16, 2018 at OL-1 which is greater than the unionized ammonia Provincial Water Quality Objective.
- Total Kjeldahl Nitrogen ranged from 0.46 – 0.65 mg/L, which indicates some limited organic loading.

#### *Bacteria*

- Bacteria concentrations were relatively low as E.coli and Fecal Coliforms ranged from 0 – 14 CFU/100 mL.

#### *Phytoplankton*

- 6 classes of phytoplankton were collected from OL-1. Blue Green algae (i.e. *Cyanophyceae*) were the most dominant class at 39%.

## 2) Septic System Inspections:

- A septic tank and distribution bed was the most common type of septic system on Oak Lake (72%), followed by a holding tank (24%).
- Setbacks between the lake and both the primary dwellings and septic system are smaller than is typical in Ontario. 56% of residences contain setbacks less than 10m, and the average setback for septic systems is 18.5 m. Buffer strips are rare (75% of properties don't contain a buffer strip) and properties are highly developed (the average property contains a development footprint of 47%).
- Some evidence of septic failure was noted such as divots in septic beds, but more concerning observations were the prevalence of systems in low-lying areas, old holding tanks and outhouses. Maintenance was also a concern as some residents have never performed maintenance on their septic systems.

<sup>1</sup> Wetzel, R.G. 2001. *Limnology: San Diego, Academic Press, 10006 p.*

<sup>2</sup> Downing, J.A. and E. McCauley. 1992. *The Nitrogen : Phosphorus Relationship in Lakes. Limnology Oceanography, 37(5), 936-945.*



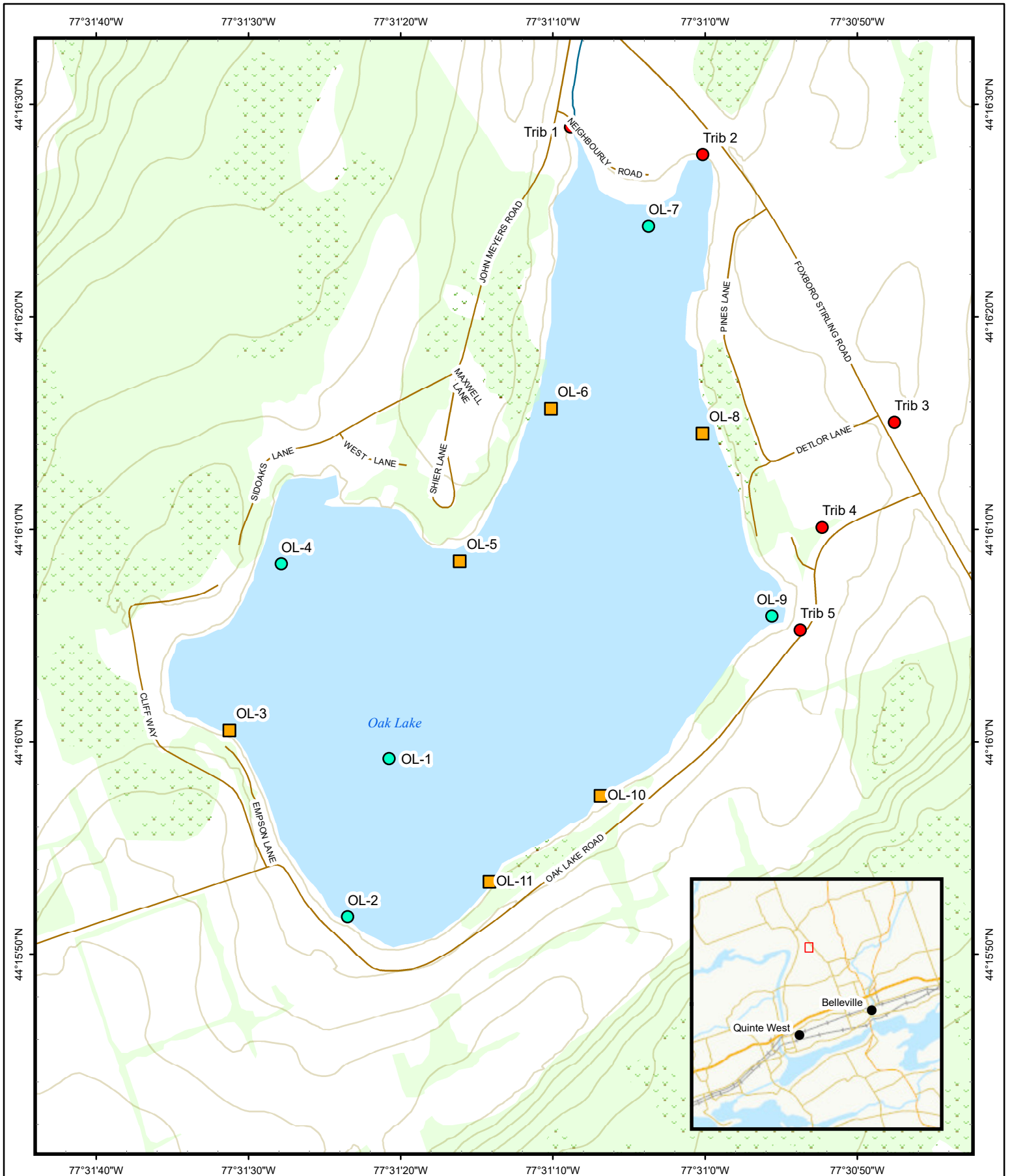
## **Next Steps**

Hutchinson Environmental Sciences Ltd. staff will be collecting water samples from the same 11 sampling locations in February to describe winter conditions and in the spring following freshet. We will also collect water quality samples from inflowing tributaries (Trib 1 – 5) during the spring sampling event (Figure 1). Hutchinson Environmental Sciences staff will summarize all information after the data from the last sampling event is received and complete the Lake Management Plan as originally proposed. The draft Lake Management Plan will include:

- A summary of background (e.g. MOECC) and current water quality information, including comparison with historical data and identification of target indicator parameters;
- Septic System survey results;
- Culvert inspection results, and recommendations for improvement;
- Identification of the point and non-point sources discharges to Oak Lake, including those from agricultural runoff and discharges, septic systems and internal loading;
- Review of the existing drainage into and out of the lake and propose options, if any, for improvement; and
- Recommended management and enhancement opportunities.

A public presentation will be completed to summarize the draft Lake Management Plan and seek input for the final version of the Lake Management Plan.





Run-off Sites	Roads	
Bacteria Only Stations	Wooded	
Water Quality Stations	Wetland	
Rivers	Lakes	

0 0.1 0.2 0.4 km

**Scale = 1:10,000**

Project #: 180050 Projection: Mercator  
 Drafted: K. Hadley Datum: WGS 1984  
 Reviewed: B. Parsons Date: Jan 30, 2019

**Figure 1**  
 Oak Lake Monitoring Program  
 Proposed 2018/2019  
 Sampling Stations