December 2013

HAMMOND REEF GOLD PROJECT

Water and Sediment Quality Technical Support Document

VERSION 2

Submitted to:
Osisko Hammond Reef Gold Ltd.
155 University Avenue, Suite 1440
Toronto, Ontario M5H 3B7

Project Number: 13-1118-0010
Document Number: DOC024
Distribution:

Alexandra Drapack, Director Sustainable Development
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Golder Associates

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PART A

Introduction

In support of the Osisko Hammond Reef Gold's (OHRG) Draft Environmental Impact Statement/Environmental Assessment (EIS/EA) Report, technical information related to water quality was provided in the following Technical Support Documents (TSD):

- **Water and Sediment Quality TSD** – provides a description of baseline water and sediment quality conditions within the Project site and surrounding waterbodies. This information is summarized in Section 3.0 of the EIS/EA Report.
- **Site Water Quality TSD** – provides predictions of potential changes to water quality within the mine study area as a result of the Project and information on site discharge volumes and water quality. The information and findings of this TSD are considered in other TSDs including the Lake Water Quality TSD and are summarized in Section 6.0 of the EIS/EA Report.
- **Lake Water Quality TSD** – provides a description of the predicted water quality conditions in the receiving water bodies, including Upper Marmion Reservoir, Lizard Lake and the discharge from Raft Lake Dam. The water quality analysis presented in this TSD considers site discharge water quality predictions presented in the Site Water Quality TSD, environmental processes such as hydrologic variability and hydrodynamic mixing within the receiving waters, and water level management activities at the Raft Lake Dam. The information presented in this TSD is summarized in Section 6.0 of the EIS/EA Report.

Version 1 of the Water and Sediment Quality TSD was published on February 15, 2013 as part of the Draft EIS/EA Report.

The Draft EIS/EA Report underwent a seven week public review comment period after which, on April 5, 2013 OHRG received comments from the public, Aboriginal groups and the Government Review Team (GRT) seeking clarification and requesting new information.

Approximately four comments regarding the Water and Sediment Quality TSD and the baseline water and sediment quality component of the EIS/EA Report were received from the GRT. Written responses were prepared for each comment and are provided in Appendix 1.IV of the EIS/EA Report.

Version 1 of the Water and Sediment Quality TSD has not been revised and no significant changes have been made to the baseline water and sediment quality component of the EIS/EA Report.

Version 2 of the Water and Sediment Quality TSD is comprised of the following:

- Part A: Introduction
- Part B: Supplemental Information Package. No supplemental information has been prepared for this Version 2 of the Water and Sediment Quality TSD. This Part B is included in Version 2 of the Water and Sediment Quality TSD for consistency in format with other TSDs.
- Part C: Version 1 of the Water and Sediment Quality TSD. Part C was issued in February 2013, and is available online on OHRG's website; it has not been re-printed as part of this Version 2 of the Water and Sediment Quality TSD. The Version 1 document should be reviewed within the context of this Version 2 document, and associated updated information as presented in Part A or Part B should be considered as correct should it differ from the information presented in Version 1.

Throughout the EIS/EA Report, unless otherwise noted, all references made to the Water and Sediment Quality TSD are to Part C.

PART B

Supplemental Information Package

(No supplemental information has been prepared for this Version 2 of the Water and Sediment Quality TSD)

PART C

Water and Sediment Quality Technical Support Document, Version 1

December 2013
Project No. 13-1118-0010
Hammond Reef Gold Project

February 2013

HAMMOND REEF GOLD PROJECT

Water and Sediment Quality Technical Support Document

VERSION 1

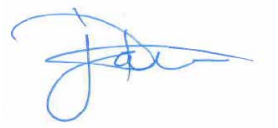
Submitted to:
Osisko Hammond Reef Gold Ltd.
155 University Avenue, Suite 1440
Toronto, Ontario M5H 3B7

Project Number: 10-1118-0020
Document Number: 2012-079
Distribution:

Alexandra Drapack, Director Sustainable Development
Cathryn Moffett, Project Manager Sustainable Development

Golder Associates

Hammond Reef Gold Project
Water and Sediment Quality Technical Support Document



Prepared by: Rachel James, M.Sc.
Environmental Specialist
Golder Associates Ltd.
Date: February 15, 2013

Reviewed by: Ken DeVos, M.Sc., P.Geo.
Principal, Project Director
Golder Associates Ltd.
Date: February 15, 2013

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APPENDICES

1.0 INTRODUCTION

Osisko Hammond Reef Gold Ltd. (OHRG) proposes the development of an open pit gold mine in north-western Ontario, herein referred to as the Hammond Reef Gold Project (Project). This Technical Support Document (TSD) is one of a series of reports in support of the Project's Environmental Impact Statement/Environmental Assessment Report (EIS/EA Report).

The following reports have been prepared to support the EIS/EA Report:

- Atmospheric Environment TSD.
- Geochemistry, Geology and Soil TSD.
- Hydrogeology TSD.
- Hydrology TSD.
- Water and Sediment Quality TSD.
- Site Water Quality TSD.
- Lake Water Quality TSD.
- Aquatic Environment TSD.
- Terrestrial Ecology TSD.
- Aboriginal Interests TSD.
- Cultural Heritage Resources TSD.
- Human Health and Ecological Risk Assessment TSD.
- Socio-economic Environment TSD.
- Alternatives Assessment Report.
- Conceptual Closure and Rehabilitation Plan.

The EIS/EA Report will summarize the findings of this TSD and of the above-listed supporting reports.

1.1 Purpose and Scope

The purpose of this TSD is to fulfill the assessment scope outlined in the Project's Terms of Reference (ToR) approved by the Ontario Minister of the Environment (July 2012), and in the Environmental Impact Statement Guidelines (EIS Guidelines) published by the Canadian Environmental Assessment Agency (CEA Agency) (December 2011).

As part of the requirements a water and sediment quality baseline program related to the Project Site was developed based on feedback from regulatory agencies, Aboriginal engagement, a review of existing data

sources, and sampling programs. Specifically, the water and sediment quality baseline study focuses on the defined study areas, and within these areas provides:

- A description of water quality and sediment sampling protocols and analytical methods and the quality assurance/quality control program followed.
- A summary of the collected surface water quality data compared to the relevant guidelines.
- An assessment of variation relative to historical data.

Due to seasonal variability, monitoring was conducted throughout the year, to determine annual trends and seasonal changes. To date, sampling has occurred from September 2010 to June 2011. This TSD provides description of the baseline water quality of the existing surface water quality. In addition to presentation of data for all defined sampling locations, the data is reported for the following main locations:

- Lizard Lake Water Quality.
- Marmion Reservoir Water Quality.
- Raft Lake Dam Discharge Water Quality.

These water bodies may collectively be referred to herein as “lake” or "lake water".

The overall objective of the programs completed and described in this TSD is to provide specific information at a level sufficient for inclusion in the EIS/EA Report in order to guide decision making regarding the potential for environmental effects of the Project, or to allow for further analyses as part of other TSDs or work related to the environmental assessment. The information and findings developed from this assessment of baseline lake water quality will be considered in other TSDs including the Lake Water Quality TSD and the Aquatic Environment TSD. This TSD provides the baseline information on surface water quality only. The assessment of environmental effects, the determination of significance of these effects, and the proposed mitigation measures will be addressed in the EIS/EA Report and the Human Health and Ecological Risk Assessment TSD. An explanation of this approach is provided in Section 1.4 of this report.

1.1.1 Study Objectives

Baseline data was collected to meet the requirements of the EIS Guidelines and to be consistent with provincial and federal requirements (CEA Agency 2011).

1.2 Report Organization

This TSD is structured as follows:

- Section 1 presents the purpose and scope of the TSD, an overview of the Project, the general assessment approach, incorporation of traditional knowledge, Valued Ecosystem Components and assessment boundaries of the TSD.
- Section 2 describes the methods used to identify baseline water sampling locations; collection and analyses water samples.

- Section 3 provides the baseline water quality results for all sample locations
- Section 4 summarizes the findings of this report.

1.3 Project Overview

The Project overview and Project description is provided in Chapter 5 of the EIS/EA Report. Project aspects that influence the lake water quality baseline data collection and evaluation are described in Sections 1.3 to 1.8.

1.3.1 Project Location

The Project is located within the Thunder Bay Mining District in north-western Ontario, approximately 170 kilometres (km) west of Thunder Bay and 23 km northeast of the town of Atikokan (Figure 1-1).

Access to the Hammond Reef property is presently via two routes: the Premier Lake Road, a gravel road that intersects Highway 623 near Sapawe and the Hardtack-Sawbill Road, a gravel road that intersects Highway 622 northwest of the Town of Atikokan. The Hammond Reef property is also accessible by water from the southwest end of the Marmion Reservoir at its access point from Highway 622. The existing Hardtack-Sawbill road located to the north of Finlayson Lake has been upgraded to provide an improved and more direct linkage to the Project Site in support of the expanded exploration program.

The Hammond Reef deposit is located mainly on a peninsula of land extending into the north end of the Upper Marmion Reservoir. The peninsula containing the deposit is surrounded by the Marmion Reservoir on three sides with Sawbill Bay to the northwest and Lynxhead Bay to the southeast. The Hammond Reef property also contains a number of smaller lakes. Mitta Lake is a small, steep-sided waterbody located atop mineralized zones of the deposit. Due to its location, the open pit mining activities require the draining of Mitta Lake. Lizard Lake is located immediately to the east of the proposed Project Site and drains into Marmion Reservoir.

1.3.2 Climate

The Project is located in a typical boreal climate region, which is characterized by long, usually very cold winters, and short, cool to mild summers. The annual temperature average is 1.6 degrees Celsius (°C) for Atikokan with a seasonal maximum of 16.2°C (average) for summer and a minimum of minus 15.4°C (average) for winter. Temperatures lower than minus 37°C have been recorded during the fall and winter. The annual normal total for precipitation is 788 millimetres (mm) (568 mm of rainfall and 220 mm of snowfall) for Atikokan with a seasonal maximum of 299 mm for the summer period.

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.;
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

100 0 100 200 300 400
SCALE 1:10,000,000 KILOMETRES

Golder Associates
Mississauga, Ontario

PROJECT No.	10-1118-0020	CHECK	REJ
SCALE	AS SHOWN	VERSION 1	REVIEW KJD
DATE	February, 2013		
DESIGN	CGE		
GIS	JO		

TITLE

PROJECT LOCATION

PROJECT HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

FIGURE: 1-1

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1.3.3 Project Phases

The Project comprises four phases: construction, operations, closure and post-closure. Additional details regarding activities expected to take place in each phase of the Project are provided in Chapter 5 of the EIS/EA Report. With regards to understanding baseline surface water quality the data needs to be collected prior to construction.

1.3.4 Project Components

The existing pre-construction conditions need to be understood when collecting baseline information collected including:

- Existing road access.
- Existing exploration camp and previous exploration activities.

An understanding of the project components and proposed locations is also necessary to ensure adequate spatial coverage of baseline information is obtained. The Project consists of eight main components:

- Mine, including two open pits (east pit and west pit).
- Waste Rock Management Facility (WRMF).
- Ore Processing Facility.
- Tailings Management Facility (TMF).
- Support and Ancillary Infrastructure.
- Water Management System.
- Linear Infrastructure.
- Borrow Sites.

Proposed Project components are shown in Figure 1-2. A detailed description of Project components is provided in Chapter 5 of the EIS/EA Report.

610000
615000
620000
5430000
5425000
5420000
N
Serpent Lake
Cornell Lake
Long Hike Lake
Vista Lake
Lizard Lake
Light Lake
Turtle Bay
Upper Seine Bay
Sawbill Bay
Lynxhead Bay
Trap Bay
Marmion Reservoir
Mitta Lake
PUMPING STATION
ACCOMMODATION CAMP
TAILINGS MANAGEMENT FACILITY
CAMP SITE EFFLUENT DISCHARGE POINT
FRESHWATER INTAKE CAMP SITE POTABLE
PUMPING STATION
DETONATOR STORAGE
EMULSION PLANT
CONCENTRATOR
PEBBLE CRUSHING STATION
PARKING LOT
SECURITY STATION
FRESHWATER INTAKE - PROCESS AND PLANT POTABLE
ORE STOCKPILE
TRUCK SHOP / MINE OFFICE
POWER SUBSTATION
PROPANE FARM
EFFLUENT TREATMENT PLANT
PARKING LOT
FUEL BAY
PROCESS PLANT COLLECTION POND
EAST PIT
GYRATORY CRUSHER PAD
WASTE ROCK STOCKPILE
WEST PIT
DISCHARGE LOCATION
LOW-GRADE ORE STOCKPILE
OVERBURDEN STOCKPILE

LEGEND

- Index Contour (5m interval)
- Road
- Trail
- Marsh/Swamp
- Ditch
- River/Stream
- Lake
- Wetland
- Discharge Location
- Effluent Discharge Point
- Freshwater Intake - Process and Plant Potable
- Freshwater Intake - Camp Site Potable
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Accommodation Camp
- Laydown Area
- Office and Truck Shop, Explosives Storage and Processing Plant
- Open Pits
- Ore Stockpile
- Overburden Stockpile
- Process Plant Collection Pond
- Pump Station
- Tailings Management Facility
- Tailings Management Facility Reclaim Pond
- Waste Rock Stockpile
- Project Boundary

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

500 0 500 1,000 1,500 2,000 2,500
SCALE 1:50,000 METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
SITE LAYOUT

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	6 Feb. 2013		
CHECK	REJ	6 Feb. 2013		
REVIEW	KJD	31 Jan. 2013		

FIGURE: 1-2

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1.4 General Assessment Approach

The Project has the potential to affect the lake water environment. The approach for this TSD follows the first four of six key steps provided below:

- Step 1: Screening of Project activities to determine which activities have the potential to produce changes to the lake water environment.
- Step 2: Identify temporal and spatial boundaries within which potential changes to lake water quality may occur.
- Step 3: Identify parameters used to characterize these potential changes.
- Step 4: Design and carry out field studies and/or background research to characterize the existing lake water quality, and to support the prediction of changes to lake water.
- Step 5: Carry out predictive modelling of potential changes to the lake water environment during Project phases identified as bounding scenarios (Site Water TSD and Lake Water Quality TSD).
- Step 6: Outline the monitoring requirements for each Project phase to confirm predicted changes to the environment and to ensure that requirements are being met for identified parameters.

This TSD is intended to support the EIS/EA Report and as such does not assess the significance of potential effects on lake water quality, nor does it identify mitigation measures. These topics are addressed in the EIS/EA Report and in other TSDs.

1.5 Incorporation of Traditional Knowledge

First Nations monitors participated in the collection of water and sediment quality samples in the June 2011 sampling campaign. Traditional knowledge in combination with other information sources is valuable in achieving a better understanding of the Project's potential effects on the biophysical and socio-economic environment. It also contributes to the description of the existing biophysical and human environment, natural cycles, resource distribution and abundance, and the use of land and water resources. Those aspects of traditional knowledge related to water quantity and water quality are important when considering the results of the lake water quality assessment, in particularly as it relates to use of the resources as defined in the Aquatic Environment TSD, Terrestrial Ecology TSD, Human Health and Ecological Risk Assessment TSD. A detailed discussion on traditional knowledge is included in the Aboriginal Interests TSD.

1.6 Selection of Valued Ecosystem Components

The Valued Ecosystem Component (VEC) selected for this TSD is Lake Water Quality. Table 1-1, provides the rationale for selection of the VEC along with proposed indicators and measures.

Table 1-1: Valued Ecosystem Components Selected for the Surface Water Quality Environment

Valued Ecosystem Component	Rationale for Selection	Indicators	Measures
Lake Water Quality	Potential for change to overall lake water quality as result of Project activities	Changes in concentrations of key parameters at key locations	Analytical data for key parameters at key locations

1.7 Effects Assessment

Changes to lake water quality may lead to or influence the assessment of effects of the Project, but are not in and of themselves the endpoints of the assessment. Therefore, potential effects of the Project on the VECs selected for water quality are not discussed in this TSD. The assessment of effects on the endpoints of changes to water quality is presented in the EIS/EA Report and in the following TSDs:

- Aquatic Environment TSD.
- Terrestrial Ecology TSD.
- Human Health and Ecological Risk Assessment TSD.
- Socio-economic Environment TSD.

1.8 Temporal and Spatial Boundaries

1.8.1 Temporal Boundaries

The temporal boundary to determine baseline conditions is pre-construction. Temporal boundaries for Project phases and the duration of these phases are:

- Construction phase: 30 months.
- Operations phase: 11 years.
- Closure phase: 2 years.
- Post-closure phase: duration of pit flooding (78 years) and release plus >10 years.

This TSD presents the pre-construction baseline water quality. The Site Water TSD and Lake Water Quality TSD address the Project's implications on water quality for the identified temporal boundaries.

1.8.2 Spatial Boundaries

Spatial boundaries define the geographical extents within which potential environmental changes may occur. As such, spatial boundaries become the Project's study area for the purposes of baseline water quality collection and evaluation. The study areas for the collection of lake water quality information were selected based on the following factors:

- The Project footprint.
- The proposed locations for water intakes and effluent discharges.
- The location of water users (Socio-economic Environment TSD).
- Location of major lakes, streams and watershed divides.

This TSD has three study areas, as described in the following sections.

1.8.2.1 Regional Study Area

The lake water and sediment quality Regional Study Area (RSA) is delineated in Figure 1-3. The Project Site is located in Ontario at approximately 150 km west of Thunder Bay and 23 km northeast of the Town of Atikokan. The RSA includes Upper and Lower Marmion Reservoir and the upstream catchment of the Seine River. The RSA extends south to Highway 622.

Upper Marmion Reservoir is separated from Lower Marmion Reservoir by a series of dams constructed in the early 1950s (Boileau 2004). Flow between the Upper and Lower Marmion Reservoir is regulated by the Marmion Sluiceway also constructed in the early 1950s. The Seine River is regulated by the Raft Dam located approximately 30 km from the site. The inflow from the Seine River into Upper Marmion Reservoir is also regulated by the Lac Des Mille Lacs Dam (built in 1952) located approximately 80 km upstream of the site (as described in the Hydrology TSD).

1.8.2.2 Local Study Area

The lake water and sediment quality Local Study Area (LSA) is delineated in Figure 1-4. The Project Site is located on the south-west corner of Sawbill Bay. The Mine is surrounded by Sawbill Bay on the north side and Seine River on the south side. The Seine River forms a series of basins separated by shallow areas collectively called Upper Marmion Reservoir as shown on Figure 1-3.

The LSA extends generally to the middle of Sawbill and Lynxhead Bays of Marmion Reservoir on the west and south sides respectively, the Lizard Lake catchment area to the east is also included.

1.8.2.3 Mine Study Area

The Mine Study Area encompasses the footprints of the Mine, the Waste Rock Management Facility, the Processing Plant, the Tailings Management Facility, and the Support and Ancillary Infrastructure (Figure 1-2). Borrow Pits are not included, as they are subject to a separate permitting process.

The components of the Project Site are relevant to the site water balance and water quality model and are described in detail in the Site Water Quality TSD. With respect to the Lake Water Quality TSD, the key components are the intake and discharge of water from the Project.

590000 600000 610000 620000

5430000 5420000 5410000

N

Serpent Lake
Cornell Lake
Sawbill Bay
Lynxhead Bay
Upper Marmion Reservoir
Lower Marmion Reservoir
Light Lake
Upper Seine Bay
Hawk Bay
Highway 622
Steep Rock Lake
Atikokan
Sapawe

LEGEND

- City/Town
- Small Community
- Provincial Highway
- Road
- Existing Railway
- Power Transmission Line
- River/Stream
- Lake
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Water Quality Regional Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

2 1 0 2 4 6 8
KILOMETRES

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
WATER QUALITY REGIONAL STUDY AREA

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	5 Feb. 2013		
CHECK	REJ	5 Feb. 2013		
REVIEW	KJD	5 Feb. 2013		

FIGURE: 1-3

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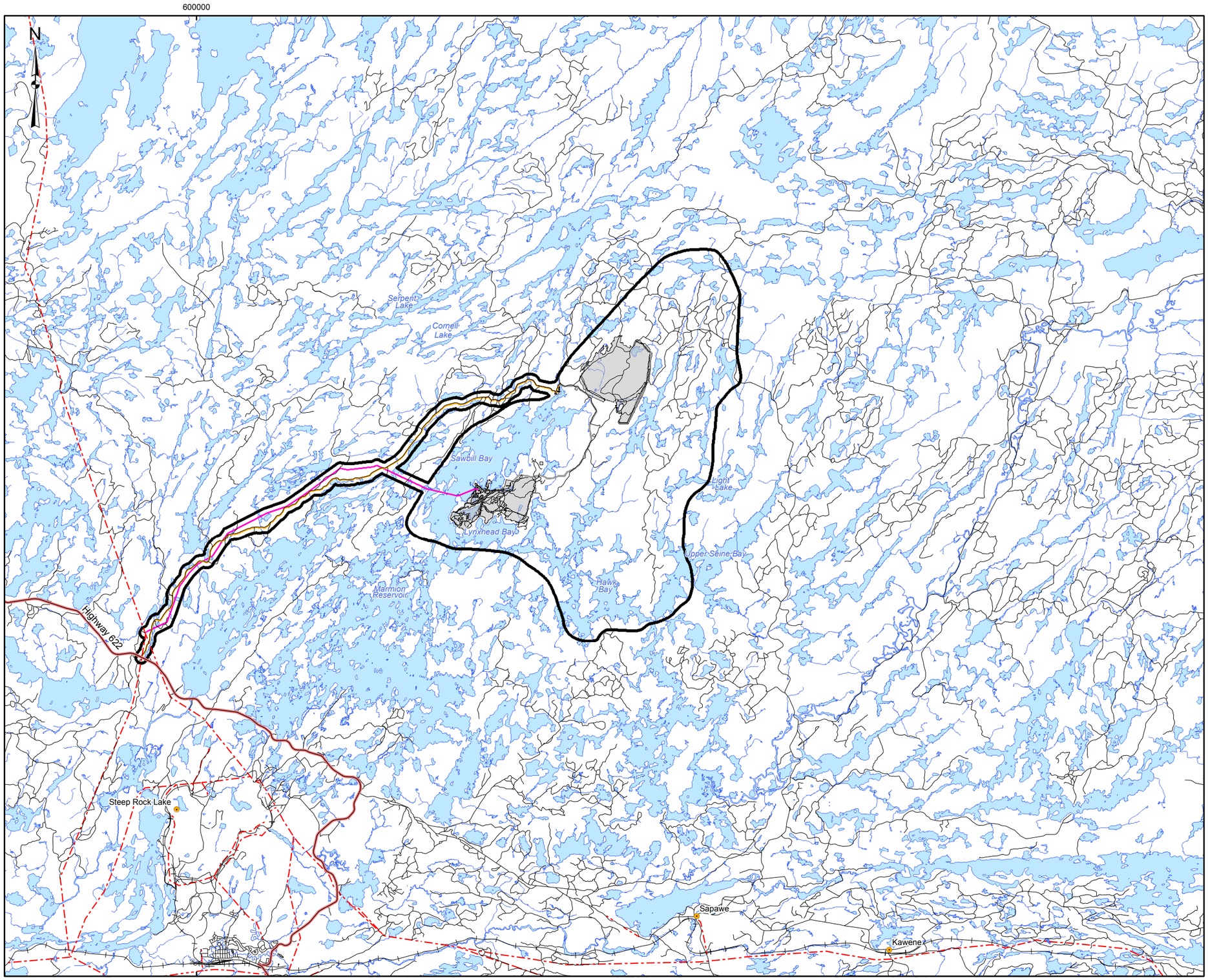

LEGEND

- Small Community
- Provincial Highway
- Road
- Existing Railway
- River/Stream
- Lake
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Water Quality Local Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

2.5 1.25 0 2.5 5 7.5
KILOMETRES

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
WATER QUALITY LOCAL STUDY AREA

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	27 Jun. 2012	FIGURE: 1-4	
GIS	JO	5 Feb. 2013		
CHECK	REJ	5 Feb. 2013		
REVIEW	KJD	5 Feb. 2013		

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2.0 METHODS

2.1 Secondary Data Review

Aside from one study of Mitta Lake, located directly above the ore body, no historical water or sediment quality information prior to baseline data collection was found. Water quality and an assessment of fish communities in Mitta Lake were provided in a report prepared by TBT Engineering Ltd. (TBT 2009). A summary of the water quality is as follows:

- Water quality was measured in June and July of 2009.
- Temperature, pH, dissolved oxygen (DO) and conductivity were measured at one metre (m) intervals throughout the water column at the deepest part of the lake (approximately 17 m):
  - The surface temperature was 23.2°C with a thermocline occurring at approximately 5 m in depth where the temperature dropped 5°C over a distance of one metre.
  - DO measured 7.5 parts per million (ppm) near the surface decreasing to 1.6 ppm at a depth of 6 m. A maximum of 11.3 ppm was recorded at a depth of 4 m. Readings in all depth strata below 6 m indicated an absence of oxygen.
  - pH values decreased from slightly alkaline near the surface (8.4) to mildly acidic in the lower depths of the lake (6.5 at lake bottom).
  - Conductivity increased with depth from approximately 37 to 62 microSiemens per centimetre (µS/cm).
- Water samples were taken at depths of 1.5 m and 12 m below surface. All measured parameter values were below Ontario Provincial Water Quality Objectives (PWQO) (PWQO 1999) with the exception of total phosphorus and iron the deepest sample.

2.2 Primary Data Collection

Water and sediment quality sampling for the Project has been conducted on a seasonal basis in order to monitor temporal changes in water and sediment quality. Sampling has also included assessment of limnological conditions through water column profiling. The baseline study was designed to capture the seasonality of the area and to include low- and high-flow periods. To date, the sampling has been performed during:

- September 2010 – Low flow conditions, summer.
- November 2010 – Prior to freeze-up.
- March 2011 – Low flow conditions, minimum temperature.
- June 2011 – Spring freshet.
- April 2012 – Spring freshet.

- August 2012 – Low flow conditions, summer.

The proposed suite of analytes, method detection limits and applicable receiving water guidelines for water and sediment quality are provided in Appendix 2.II.

2.2.1 Sampling Locations

Sample locations were chosen to characterize the existing environment at locations upstream and downstream of the Project. Specific locations reflect individual Project components such as the open pits, waste rock stockpile, exploration camp, previously proposed alternative tailings management facilities, downstream receptors and other infrastructure. Figure 2-1 shows all sampling locations.

Surface water samples were collected from 30 locations for the first four sampling campaigns. While an effort was made to collect sediment at each of the same 30 surface water locations, rocky substrate prevented sediment collection at some locations. Hence, a total of 19 sediment samples were collected. Eight additional locations (Mitta Lake, Sawbill Bay, Lizard Lake, Light Bay, Hawk Bay, Turtle Bay, Lynxhead Bay and Premier Lake) were sampled to provide a water column profile including both water and sediment quality and limnology.

Sampling at water column profile stations involved the collection of two water samples at each location (one near the top of the water column and one near the bottom of the water column). It was possible to collect sediment samples at each column profile location.

In March 2012 some of the strategic water sample locations were modified to address changes to the location of Project components. This included the removal of some existing and the addition of new surface water/sediment stations as follows:

- Nine surface water/sediment stations (HRWQ) previously monitored were removed from the baseline monitoring program (HRWQ-12, HRWQ-18, HRWQ-19, HRWQ-23, HRWQ-24, HRWQ-26, HRWQ-27, HRWQ-29, HRWQ-30).
- Two water column profile stations (HRWQP) previously monitored were removed from the baseline monitoring program (HRWQP-4, HRWQP-8).
- Nine new surface water/sediment stations were added to the baseline monitoring program (HRWQ-31 through HRWQ-39).

The modified sampling program (carried out in the April and August 2012 campaigns) included a total of 30 surface water stations and six water column profile stations (Mitta Lake, Sawbill Bay, Lizard Lake, Hawk Bay, Turtle Bay and Lynxhead Bay). Although it was not possible to collect sediment at all stations due to rocky substrate, sediment was collected at 18 surface water stations and at all six water column profile stations.

Field parameters (temperature, depth, pH, dissolved oxygen, oxygen-reduction potential, and conductivity) were measured at each surface water grab station, as well as throughout the entire depth of water column profile stations in one-metre intervals. It should be noted that the YSI multiparameter meter malfunctioned during some field events, resulting in reported values that were outside of an acceptable range of results from a quality assurance perspective. These results were removed from the complete data set and have been noted (Appendix 2.III).

610000
620000
630000
5430000
5420000
N
Serpent Lake
Cornell Lake
Sawbill Bay
Mitta Lake
Marmion Reservoir
Light Lake
Upper Seine Bay
Hawk Bay
HRWQ28
HRWQ35
HRWQ36
HRWQ-11
HRWQ37
HRWQ-1
HELIPAD
HRWQ-4
HRWQ-7
HRWQ-8
HRWQP-3
HRWQ-9
HRWQ-5
HRWQP-2
HRWQ-6
HRWQ32
HRWQ31
HRWQ-10
HRWQ-20
HRWQ-3
HRWQ25
HRWQ-21
HRWQ-17
HRWQ-2
HRWQ34
HRWQ33
HRWQP-6
HRWQP-1
HRWQ-14
HRWQP-7
HRWQ-15
HRWQ-16
HRWQ-22
HRWQ-13
HRWQP-5*

LEGEND

- Surface Water Sample Location
- Surface Water and Sediment Sample Location
- Profile Sample Location (Surface Water and Sediment)
- Raft Lake Cut Location
- Road
- Trail
- River/Stream
- Lake
- Wetland
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

1,000 0 1,000 2,000 3,000
SCALE 1:80,000 METRES

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
WATER QUALITY, SEDIMENT AND PROFILE SAMPLE LOCATIONS

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	6 Feb. 2013		
CHECK	REJ	6 Feb. 2013		
REVIEW	KJD	6 Feb. 2013		

FIGURE: 2-1

G:\Projects\2010\10-1118-0020_BrettResources_HammondReef\GIS\MXDs\Draft\WaterQuality\TSD\WaterQuality_Sediment_ProfileLocations.mxd

The coordinates for sampling locations and the number of times each location was sampled are summarized in Table 2-1. It should be noted that due to safety concerns, fewer locations were sampled in the winter (March 2011).

Table 2-1: Water and Sediment Sampling Summary

Locations[a,b]	UTM[c]		2010		2011		2012	
	Easting	Northing	September	November	March	June	April	August
Surface Water								
HRWQ-1	15616458	5427206	X	X	X	X	X	X
HRWQ-2	15612038	5421474	X(S)	X(S)	—	X(S)	X(S)	X(S)
HRWQ-3	15613852	5422474	X(S)	X(S)	X	X(S)	X(S)	X(S)
HRWQ-4	15617930	5426603	X(S)	X(S)	—	X(S)	X(S)	X(S)
HRWQ-5	15615961	5424918	X(S)	X(S)	—	X(S)	X(S)	X(S)
HRWQ-6	15615094	5423969	X(S)	X(S)	—	X(S)	X(S)	X(S)
HRWQ-7	15620926	5427042	X(S)	X(S)	—	X(S)	X(S)	X(S)
HRWQ-8	15620369	5426612	X(S)	X(S)	—	X(S)	X(S)	X(S)
HRWQ-9	15621047	5425242	X(S)	X(S)	—	X(S)	X(S)	X(S)
HRWQ-10	15619170	5423620	X	X	—	X	X	X
HRWQ-11	15621990	5428860	X(S)	X(S)	X	X(S)	X(S)	X(S)
HRWQ-12	15624198	5428901	X(S)	X(S)	X	X(S)	—	—
HRWQ-13	15610287	5419015	X	X	—	X	X	X
HRWQ-14	15614495	5420889	X	X	—	X	X	X
HRWQ-15	15613786	5419985	X	X	—	X	X	X
HRWQ-16	15615313	5419786	X	X	—	X	X	X
HRWQ-17	15617448	5421763	X(S)	X(S)	—	X(S)	X(S)	X(S)

Table 2-1: Water and Sediment Sampling Summary (Continued)

Locations[a,b]	UTM[c]		2010		2011		2012	
	Easting	Northing	September	November	March	June	April	August
HRWQ-18	15618559	5421551	X(S)	X	—	X(S)	—	—
HRWQ-19	15618476	5422456	X(S)	X	—	X(S)	—	—
HRWQ-20	15618024	5422899	X	X	—	X	X(S)	X
HRWQ-21	15615362	5422066	X	X	—	X	X	X
HRWQ-22	15606933	5419151	X	X	—	X	X	X
HRWQ-23	15621428	5421111	X(S)	X	—	X(S)	—	—
HRWQ-24	15621388	5420146	X	X	—	X	—	—
HRWQ-25	15612550	5422322	X(S)	X(S)	—	X(S)	X(S)	X(S)
HRWQ-26	15627322	5424365	X(S)	X(S)	X	X(S)	—	—
HRWQ-27	15626330	5427612	X(S)	X(S)	X	X(S)	—	—
HRWQ-28	15624004	5432463	X(S)	X(S)	X	X(S)	X(S)	X(S)
HRWQ-29	15628983	5428731	X(S)	X(S)	X	X(S)	—	—
HRWQ-30	15623070	5424168	X	X	–	X	—	—
HRWQ31	15614433	5423268	—	—	—	—	X(S)	X(S)
HRWQ32	15614371	5423406	—	—	—	—	X(S)	X(S)
HRWQ33	15613855	5421119	—	—	—	—	X	X
HRWQ34	15613552	5421195	—	—	—	—	X(S)	X(S)
HRWQ35	15619965	5429130	—	—	—	—	X	X

Table 2-1: Water and Sediment Sampling Summary (Continued)

Locations[a,b]	UTM[c]		2010		2011		2012	
	Easting	Northing	September	November	March	June	April	August
HRWQ36	15617133	5428323	—	—	—	—	X	X
HRWQ37	15614479	5427014	—	—	—	—	X(S)	X(S)
HRWQ38	15602922	5420754	—	—	—	—	X(S)	X(S)
HRWQ39	15601274	5413433	—	—	—	—	X(S)	X(S)
Water Column Profile								
HRWQP-1	15612566	5421293	X(S)	X(S)	X	X(S)	X(S)	X(S)
HRWQP-2	15613517	5423932	X(S)	X(S)	—	X(S)	X(S)	X(S)
HRWQP-3	15620522	5426008	X(S)	X(S)	—	X(S)	X(S)	X(S)
HRWQP-4	15622211	5418963	X(S)	X(S)	—	X(S)	—	—
HRWQP-5	15618879	5417736	X(S)	X(S)	—	X(S)	X(S)	X(S)
HRWQP-6	15618020	5421576	X(S)	X(S)	—	X(S)	X(S)	X(S)
HRWQP-7	15613056	5420391	X(S)	X(S)	—	X(S)	X(S)	X(S)
HRWQP-8	15624206	5427828	X(S)	X(S)	X	X	—	—

Notes:

(a) HRWQ: Hammond Reef water and sediment quality sample location.

(b) HRWQP: Hammond Reef water and sediment quality profile sample location.

(c) Universal Transverse Mercator (UTM).

(S) Denotes sediment sample was collected at this location.

— No sample was collected.

2.2.2 Sample Collection Methods

Sampling was performed in accordance with recognized standard methods (ASTM 2006), (MOEE 1996) and (U.S. EPA 1992). The following sections discuss the surface water and sediment sample collection field methods.

2.2.2.1 Surface Water Samples

Sterile gloves were worn during sample collection. Sample bottles were provided by the contract analytical laboratory and were pre-charged with preservatives at the analytical laboratory as required. Samples were stored in a cooler with ice packs and maintained in a cool state until shipped to the laboratories.

Surface water samples were collected both from boat and along the shores of rivers/streams. River and stream samples were collected as far from the bank as safely possible, carefully wading out to avoid disturbing the bottom sediment. Sampling was conducted facing upstream of the flow. Sample bottles were submerged below the water surface and facing upstream to avoid introducing any disturbed bottom sediment into the sample. The cap was removed under water and the bottle was let to fill. The bottle was recapped before lifting it out of the water. Bottles pre-charged with preservatives were filled by pouring off the contents of the General Parameters bottle.

Measurements of pH, oxygen-reduction potential (ORP), temperature, electrical conductivity and dissolved oxygen (DO) were collected in the field at the time of sampling using a YSI multiparameter meter (YSI). The YSI meter was calibrated by the supplier and in the field with calibration solutions provided by the supplier. Calibration for pH (two points: 4 and 7), electrical conductivity and ORP was carried out daily before sampling and documented in field notes. The YSI was placed downstream to equilibrate during the sampling procedure before measured parameters were recorded.

Water was collected approximately one metre below surface and one metre above lakebed using an eight-litre capacity plastic Van Dorn water sampler, tripped by a messenger weight. Limnology data (field parameter measurements) were collected using the YSI in one-metre intervals from the surface of the water column to the lakebed. All sample and data were collected from an anchored boat near the middle of the water body.

Water samples not requiring filtration (general parameter, major ions, nutrients, organics, microorganisms, total metals and total organic carbon) were decanted to individual sample bottles from a clean 500 millilitre (mL) sample bottle (rinsed three times with sample water). Samples requiring filtration (dissolved metals, dissolved organic carbon and dissolved inorganic carbon) were collected with a sterile syringe and passed through a 0.45 micrometre (µm) sterile filter into individual sample bottles.

2.2.2.2 Column Profile Samples

Water was collected approximately one metre below surface and one metre above lakebed using an 8 litres (L) capacity plastic Van Dorn water sampler, tripped by a messenger weight. Limnology data (field parameter measurements) were collected using the YSI in one-metre intervals from the surface of the water column to the lakebed. All sample and data were collected from an anchored boat near the middle of the water body.

2.2.2.3 Sediment Samples

Sediment at surface water stations was collected from the river/stream bed either by hand (gloved) or by scooping sediment using laboratory-provided glass sediment jars. Sediment at column profile stations was collected at the lakebed using a stainless steel Petit Ponar dredge sampler. Organics (detritus, rootlets, etc.) and large grain-sized sediment (gravel, pebbles, etc.) were removed by hand, and excess water was decanted from the sample jar.

2.2.2.4 Documentation

Field staff labelled samples with unique sample numbers and documented observations. Observations include:

- Field conditions: weather, surrounding vegetation, and substrate.
- Sediment observation: colour, odour, grain size and organic content.
- Water observation: colour, clarity and odour.

2.2.3 Laboratory Analysis

Water and sediment samples were analyzed at ALS Thunder Bay for all sampling events. Surface water quality samples were submitted for the following analysis:

- **Physical parameters:** pH, acidity, alkalinity, conductivity, hardness, temperature, total dissolved solids, total suspended solids, total organic carbon (TOC) and dissolved organic carbon (DOC).
- **Major ions:** calcium, magnesium, potassium, sodium, sulphate, chloride, fluoride and cyanide (free and total).
- **Nutrients:** nitrate, nitrite, ammonia (total and un-ionized), total phosphorus and orthophosphate.
- **Organics:** oil and grease and phenols.
- **Microorganisms:** E coli and total coliform.
- **Metals:** total and dissolved metals (milligrams per litre (mg/L)) including aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, titanium, tungsten, uranium, vanadium, zinc, and zirconium.

The following parameters were added to the surface water analytical suite as follows: carbonate, bicarbonate, orthophosphate (April and August 2012), and acidity (March 2011, June 2011, April 2012 and August 2012).

Due to consistently non detectable concentrations, the following parameters were removed from the surface water analytical suite: free cyanide, total cyanide, e-coli and total coliforms (April and August 2012) and oil and greases (August 2012). Also due to consistently non-detectable concentrations, polycyclic aromatic

hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) were removed from the sediment analytical suite (April and August 2012).

Sediment quality samples were submitted for the following analysis:

- **Metals** – total metals (milligrams per kilogram (mg/kg)) including aluminum, antimony, arsenic, barium, beryllium, bismuth, boron , cadmium, calcium, chromium, cobalt, copper, iron, lead, lithium, magnesium, manganese, mercury, molybdenum, nickel, phosphorus, potassium, selenium, silver, sodium, strontium, thallium, tin, titanium , uranium, vanadium, zinc, and zirconium.
- **Polycyclic aromatic hydrocarbons (PAHs)** (mg/kg) including 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Acridine, Anthracene, Benz(a)anthracene, Benzo(b&j)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Benzo(a)pyrene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Indeno(1,2,3-cd)pyrene, Naphthalene, Phenanthrene, Pyrene, and Quinoline.
- **Polychlorinated biphenyls (PCBs)** (mg/kg) including Aroclor 1254, Total PCBs, 2-Fluorobiphenyl, p-Terphenyl d14, Aroclor 1242, Aroclor 1248, Aroclor 1260, d14-Terphenyl, and Silicon.

Analytes were chosen to be consistent with the applicable guidelines (Section 2.3). In general, the analytical detection limits were selected to be less than the applicable guidelines. Exceptions to this, for which analytical detection limits exceeded guidelines, are as follows:

- Cadmium detection limits of 0.00009 mg/L and 0.00002 mg/L in surface water samples were greater than the Canadian Council of Ministers of the Environment, Canadian Water Quality Guidelines (CCME CWQG) (0.000017 mg/L) observed in September 2010 and November 2010, respectively.
- Mercury detection limit of 0.0001 mg/L in surface water samples as observed in September 2010 was greater than the CCME CWQG (0.000026 mg/L).
- Silver detection limit of 0.0002 mg/L in surface water samples as observed in November 2010 was greater than the CCME CWQG and PWQO guidelines (0.0001 mg/L).
- Selenium detection limit of 0.002 mg/L in surface water samples as observed in June 2011 was greater than the CCME CWQG (0.001 mg/L). Some samples collected in September 2010 also had a detection limit (0.005 mg/L) that was greater than the CCME CWQG.
- All PAHs in sediment quality samples had detection limits that were greater than the guidelines.

2.2.4 Quality Assurance and Quality Control

Quality Assurance/Quality Control (QA/QC) samples were collected during each sampling campaign. Duplicate samples were collected for approximately 10% of samples collected during each sampling campaign. In addition to the duplicate samples, the laboratory provided a field blank (de-ionized water decanted into sample bottles at the Project Site). These QA/QC procedures are in addition to the internal QA/QC requirements and programs of the analytical laboratory.

As part of data review, the following were considered with respect to Quality Assurance/Quality Control (QA/QC) issues:

- Lab, field and/or trip blank(s) showed contamination.
- Dissolved metal concentrations were substantially greater than the total concentrations.
- Total metal concentrations were greater than total suspended solids.
- Uncharacteristically high, anomalous concentrations.

Results reported by ALS Thunder Bay prior to January 2012 reported some detection limits that were lower for total metals than dissolved metals. Statistical calculations of data which assign a value equal to the detection limit to those values below detection resulted in an overestimation of the concentration of dissolved species. This was a reporting error that has since been corrected by the analytical laboratory. A letter from ALS Thunder Bay that qualifies and explains the reason for this occurrence (reportedly due to ultra low detections) is attached in Appendix 2.I.

The surface water laboratory, field and/or trip blank(s) that had detectable parameters, and/or values that were not within acceptable CCME CWQG and PWQO ranges are as follows:

- Aluminum concentration (0.027 mg/L) greater than both the CCME CWQG (0.005 mg/L) and PWQO (0.015 mg/L) guidelines observed in field blank in September 2010.
- Lead concentration (0.0019 mg/L) greater than both the CCME CWQG (0.001 mg/L) and PWQO (0.001 mg/L) guidelines observed in field blank in September 2010.
- Mercury concentration 0.00004 mg/L greater than the CCME CWQG (0.000026 mg/L) observed in trip blank in March 2011.

This indicates that sampling or analytical error may have occurred for these sampling periods. As such, the verification and evaluation of data with respect to regulatory guidelines was taken into consideration for aluminum, lead and mercury for results reported in this time period.

2.3 Guidelines and Indicators

The following describes the guidelines used to compare the water and sediment quality results.

The results of the baseline water quality program were compared to:

- Ontario Provincial Water Quality Objectives (PWQO) (PWQO 1999).
- Canadian Council of Ministers of the Environment, Canadian Water Quality Guidelines (CCME CWQG) for the protection of aquatic life (CCME, 2007). Only total concentrations were compared to the guidelines.
- Ontario Drinking Water Standards (ODWS) Maximum Acceptable Concentration (MAC), Interim Maximum Acceptable Concentration (IMAC), Aesthetic Objective (AO) and Operational Guidelines (OG) (ODWS 2006). The most conservative (lowest) values were used from this list of four guidelines in the screening of results.

The results of the baseline sediment quality program were compared to:

- Canadian Council of Environment Ministers (CCME) sediment quality guidelines for the protection of aquatic life Probable Effect Level (PEL) and Interim Sediment Quality Guideline (ISQG) (CCME 2002).
- Ontario Provincial Sediment Quality Guidelines (PSQG) Lowest Effect Level (LEL) and Severe Effect Level (SEL) (MOEE 1993).

The complete analyte list and guidelines for surface water quality are provided in Appendix 2.II. The complete analyte list and guidelines for sediment quality are provided in Appendix 2.IV.

It should be noted that these are guidelines used for the baseline results and are not related to the impact assessment. Guidelines used to assess the magnitude and significance of impact will be developed as part of the effects assessment and provided in Chapter 6 of the EIS/EA Report. They may include the guidelines listed above for the baseline program as well as the actual baseline results. Similarly, indicators will also be developed as the impact assessment proceeds.

3.0 BASELINE RESULTS (EXISTING CONDITIONS)

3.1 General Conditions and Comparison to Receiving Water Guidelines (CCME CWQG and PWQO)

3.1.1 Surface Water Samples

A total of 173 surface water grab samples including 14 duplicate samples were collected from 39 locations during six sampling campaigns. In general, the surface water quality can be characterized by the following:

- Slightly acidic to slightly alkaline pH values.
- 28% and 34% of total aluminum concentrations greater than the CCME CWQG and PWQO guidelines, respectively.
- 36% of total iron concentrations greater than both the CCME CWQG and PWQO guidelines.
- Sporadic concentrations of total arsenic, cadmium, cobalt, copper, and lead greater than the CCME CWQG and/or PWQO guidelines.
- Only one total mercury concentration greater than the CCME CWQG.
- 14% and 10% of phenol concentrations greater than the CCME CWQG and PWQO guidelines, respectively.

The summary of results with percentages greater than the guidelines can be found in Table 3-1. Full water quality results including a statistical summary for count, minimum, maximum, average, median and 95th percentile are presented in Appendix 2.III.

Table 3-1: Summary of CCME CWQG and PWQO Screening of Results for Surface Water Grab Sample

Parameters	Guidelines		Total Number	Values not meeting guidelines				Locations	
				CCME CWQG		PWQO			
	CCME CWQG	PWQO		Number	Percent	Number	Percent	CCME CWQG	PWQO
pH	6.5-9	6.5-8.5	172	32	19%	32	19%	HRWQ-1, 2, 6, 7[(b)], 8[(b)], 9[(b)], 10, 11[(b)], 13, 14[(b)], 16, 17[(b)], 18[(b)], 19, 20, 23, 26, 27[(b)], 28, 30, 35[(b)]	HRWQ-1, 2, 6, 7[(b)], 8[(b)], 9[(b)], 10, 11[(b)], 13, 14[(b)], 16, 17[(b)], 18[(b)], 19, 20, 23, 26, 27[(b)], 28, 35[(b)]
Dissolved Oxygen	5.5-9.5	4-8	138	9	7%	5	4%	HRWQ-6, 7, 8,11[(b)], 17, 27, 36, 35	HRWQ-7, 11[(b)], 27, 35
Phosphorus	—	0.02	173	—	—	15	9%	—	HRWQ-3, 7, 11[(b)], 15[(b)], 17[(b)], 18, 19, 20[(b)], 25, 27
Phenols	0.004	0.005	173	24	14%	17	10%	HRWQ-3, 4, 5, 8, 9, 11, 12, 13, 15, 17, 18, 19, 20, 21, 22[(b)], 25, 26, 27, 28, 29[(b)], 30	HRWQ-4, 8, 11, 12, 13, 15, 18, 19, 21, 22[(b)], 26, 27, 28, 29[(b)]
Aluminum (total)	0.005-0.1	0.015-0.075	172	48	28%	58	34%	HRWQ-1,2[(b)], 3, 4, 6[(b)], 7[(b)], 8[(b)], 9[(b)], 10, 11[(b)], 13, 14[(b)], 16, 17[(b)], 18[(b)], 19[(b)], 20[(b)], 23, 25[(b)], 26, 27[(b)], 28, 35[(b)]	HRWQ-1, 2[(b)], 3, 4[(b)], 6[(b)], 7[(b)], 8[(b)], 9[(b)], 10, 11[(b)], 13, 14[(b)], 16, 17[(b)], 18[(b)], 19[(b)], 20[(b)], 23, 25[(b)], 26[(b)], 27[(b)], 28, 35[(b)], 38
Arsenic (total)	0.005	0.1	172	1	1%	0	0%	HRWQ-31	—
Cadmium (total)	0.0000041-0.000042	0.0001-0.0005	172	18	10%	1	1%	HRWQ-1	HRWQ-3
Cobalt (total)	—	0.0009	172	—	—	5	3%	—	HRWQ-3[(b)],7, 11[(b)]
Copper (total)	0.002-0.004	0.001-0.005	172	5	3%	11	6%	HRWQ-3, 22, 27, 31[(b)]	HRWQ-3, 11, 13, 22[(b)], 23, 27[(b)], 31, 33
Iron (total)	0.3	0.3	171	62	36%	62	36%	HRWQ-3[(b)], 4[(b)], 6, 7[(b)], 8[(b)], 9[(b)], 11[(b)], 13[(b)], 15[(b)], 16[(b)], 17[(b)], 18[(b)], 19, 20, 21[(b)], 22[(b)], 24, 25[(b)], 27[(b)], 31, 33[(b)], 34[(b)]	HRWQ-3[(b)], 4[(b)], 6, 7[(b)], 8[(b)], 9[(b)], 11[(b)], 13[(b)], 15[(b)], 16[(b)], 17[(b)], 18[(b)], 19, 20, 21[(b)], 22[(b)], 24, 25[(b)], 27[(b)], 31, 33[(b)], 34[(b)]
Lead (total)	0.001-0.007	0.001-0.005	172	1	1%	0	0%	HRWQ-3	—
Mercury (total)	0.000026	0.0002	173	1	1%	0	0%	HRWQ-1	—

Notes:

(a) Refer to Appendix 2.III for the time period details.

(b) Surface water quality locations that had concentrations greater than the guideline in at least two occurrences during the baseline investigation.

(c) Parameters were greater than the guidelines for all seasons of the baseline investigation.

— Site water quality data was not modelled for this parameter

The following parameters did not meet the CCME CWQG and/or the PWQO guidelines:

- pH values ranged from 5.6 to 8.3, ranging from slightly acidic to slightly alkaline. Thirty-two values were below the lower values range of both the CCME CWQG and PWQO guidelines (6.5).
- Total aluminum concentrations ranged from 0.0048 to 3.0 mg/L. Fifty-eight concentrations were greater than the PWQO guideline (0.015-0.075 mg/L, pH dependent), of which 48 were also greater than the CCME CWQG (0.005-0.1 mg/L, pH dependent). The maximum was observed at HRWQ-3 in March 2011.
- Total arsenic concentrations ranged from 0.000199 to 0.00553 mg/L. One concentration was greater than the CCME CWQG (0.005 mg/L). The maximum was observed at HRWQ-31 in August 2012.
- Total iron concentrations ranged from 0.00007 to 18.0 mg/L. Sixty-two concentrations were greater than both the CCME CWQG and PWQO (both values are 0.3 mg/L) guidelines. The maximum was observed at HRWQ-3 in March 2011.
- Total copper concentrations ranged from 0.00015 to 0.006 mg/L. Eleven concentrations were greater than the PWQO guideline (0.001-0.005 mg/L, hardness dependent), of which five were also greater than the CCME CWQG (0.002-0.004 mg/L, hardness dependent). The maximum was observed at HRWQ-3 in March 2011.
- Total cadmium concentrations ranged from 0.000002 to 0.00022 mg/L. Eighteen concentrations were greater than the CCME CWQG (0.0000041-0.000042 mg/L, hardness dependent), of which one was also greater than the PWQO guideline (0.0001-0.0005 mg/L, hardness dependent). The maximum was observed at HRWQ-3 in November 2010.
- Total cobalt concentrations ranged from 0.000012 to 0.0063 mg/L. Five concentrations were greater than the PWQO guidelines (0.0009 mg/L). The maximum was observed at HRWQ-3 in March 2011.
- Total lead concentrations ranged from 0.00002 to 0.0032 mg/L. One concentration was greater than the CCME CWQG (0.001-0.007 mg/L, hardness dependent) observed at HRWQ-3 in March 2011.
- Total mercury concentrations ranged from < 0.00001 to 0.00004 mg/L. One sample was greater than the CCME CWQG (0.000026 mg/L) observed at HRWQ-1 in March 2011.
- All other total metal concentrations were below CCME CWQG and PWQO guidelines.
- Dissolved oxygen concentrations ranged from 1.3 to 14.0 mg/L. Nine concentrations were below the accepted CCME CWQG (5.5 mg/L), of which five were also below the accepted PWQO guideline (4 mg/L). The minimum was observed at HRWQ7 in August 2012.
- Phenol concentrations ranged from < 0.001 to 0.024 mg/L. Twenty-four concentrations were above the CCME CWQG (0.004 mg/L), of which seventeen were also greater than the PWQO guideline (0.005 mg/L).
- Phosphorus concentrations ranged from < 0.005 to 0.31 mg/L with 15 samples having values greater than the PWQO guideline (0.02 mg/L).

3.1.2 Water Column Profiles

Field parameters were measured throughout the water column in eight locations (Mitta Lake, Sawbill Bay, Lizard Lake, Light Bay, Hawk Bay, Turtle Bay, Lynxhead Bay and Premier Lake) during the first four sampling campaigns and in six locations (Mitta Lake, Sawbill Bay, Lizard Lake, Hawk Bay, Turtle Bay, and Lynxhead Bay) during the last two sampling campaigns. The results for each water column profile are presented in Appendix 3.I.

Due to unsafe ice conditions, sampling in March 2011 was not possible at stations HRWQP-2 to HRWQP-7 (Sawbill Bay, Lizard Lake, Light Bay, Hawk Bay, Turtle Bay and Lynxhead Bay).

A total of 84 water samples including eight samples for QA/QC were collected from top and bottom of the eight bodies of water. The summary of results and number of samples greater than the guidelines can be found in Table 3-2. Detailed profile water quality results including a statistical summary for count, minimum, maximum, average, median and 95th percentile are presented in Appendix 2.III.

Table 3-2: Summary of CCME CWQG and PWQO Screening of Results for Water Samples collected from Profile Stations

Parameters	Guidelines		Total Number	Values not meeting guidelines				Location[a]	
	CCME CWQG	PWQO		CCME CWQG		PWQO		CCME CWQG	PWQO
				Number	Percent	Number	Percent		
pH	6.5-9	6.5-8.5	84	20	24%	20	24%	HRWQP-1A, 1B[(b)], 2A, 2B[(b)], 3A[(b)], 4B, 5B[(b)], 6A, 6B, 7A[(b)], 7B[(b)],8B	HRWQP-1A, 1B[(b)], 2A, 2B[(b)], 3A[(b)], 4B, 5B[(b)], 6A, 6B, 7A[(b)], 7B[(b)], 8B
Dissolved Oxygen	5.5-9.5	4-8	72	9	13%	7	10%	HRWQP-1B[(b)], 2B, 5B[(b)], 7B	HRWQP-1B[(b)], 5B[(b)]
Phosphorus	—	0.02	84	—	—	12	14%	—	HRWQP-1B[(b)], 4B, 5B[(b)], 6A, 7B, 8A
Phenols	0.004	0.005	84	12	14%	6	7%	HRWQP-1A[(b)], 1B, 4A, 4B, 6B, 7A, 7B[(b)], 8A, 8B	HRWQP-1B, 4B, 7A, 7B, 8A, 8B
Aluminum (total)	0.005-0.1	0.015-0.075	84	30	36%	29	35%	HRWQP-1A[(b)], 1B[(b)], 2A[(b)], 2B[(b)], 3A[(b)], 4B[(b)], 5B[(b)], 6A[(b)], 6B, 7A[(b)], 7B[(b)], 8B	HRWQP-1A[(b)], 1B[(b)], 2A[(b)], 2B[(b)], 3A[(b)], 4B[(b)], 5B[(b)], 6A[(b)], 6B, 7A, 7B[(b)], 8B
Cadmium (total)	0.0000041-0.000042	0.0001-0.0005	84	4	5%	0	0%	HRWQP-5B, 6A, 7B, 8B	—
Cobalt (total)	—	0.0009	84	—	—	1	1%	—	HRWQP-7B
Copper (total)	0.002-0.004	0.001-0.005	84	1	1%	3	4%	HRWQP-1B	HRWQP-5B, 7A, 7B
Iron (total)	0.3	0.3	84	32	38%	32	38%	HRWQP-1B[(b)], 2B[(b)], 4A, 4B[(b)], 5A[(b)], 5B[(b)], 6A, 7A[(b)], 7B[(b)]	HRWQP-1B[(b)], 2B[(b)], 4A, 4B[(b)], 5A[(b)], 5B[(b)], 6A, 7A[(b)], 7B[(b)]
Mercury (total)	0.000026	0.0002	84	1	1%	0	0%	HRWQP-1A	—
Zinc (total)	0.03	0.02	84	0	0%	1	1%	—	HRWQP-1A

Notes:

[(a)] Refer to Appendix 3.I for the time period details.

[(b)] Indicates concentrations greater than the guideline in at least 2 occurrences during the baseline investigation.

— Site water quality data was not modelled for this parameter

3.1.2.1 Mitta Lake

The limnology trends for Mitta Lake are summarized below and detailed results of limnology are presented in Appendix 3.I, Figure 1:

- Mitta Lake is a small (about 17 Ha) lake and is generally steep-sided with a limited catchment area of approximately 82 hectares (ha) indicating minimal inputs from surface runoff. Some portion of water inputs may be provided by groundwater recharge.
- A distinct thermocline was recorded at a depth of between 4 and 7 m in both September 2010 and August 2012, where the temperature decreased by greater than 5°C over a 1 m interval.
- A less distinct thermocline was recorded at a depth of approximately 2 m in June 2011 where the temperature decreased by nearly 2°C over a 1 m interval.
- As observed from the temperature profile, Mitta Lake was stratified in September 2010, June 2011 and August 2012. Stratification was not observed in November 2010 or March 2011.
- In general a gradual decrease of dissolved oxygen with depth was observed (corresponding to temperature in all seasons but March 2011).
  - Dissolved oxygen was outside of the acceptable guidelines range in 75% of observations based on the CCME CWQG range (5.5 to 9.5 mg/L), and 91.6% of observations based on the PWQO guideline range (4 to 8 mg/L).
- The lake was depleted of dissolved oxygen below a depth of 6 m (to a total depth of 12 m) in September 2010. Similarly, the concentration of dissolved oxygen rapidly decreased below a depth of 6 m to a concentration of approximately 2 mg/L in March 2011, June 2011, and August 2012.
- The pH trended from a slightly acidic pH of 6.0 (August 2012, at bottom) to a slightly alkaline pH of 8.0 (August 2012, at surface).
  - The pH generally increased with depth in June 2011, and conversely, decreased with depth in the other five seasons.
- Conductivity readings increased with depth ranging from the lowest concentration (measured in September 2010) of 46 µS/cm at one-metre depth, to the highest concentration (measured in April 2012) of 91 µS/cm at 12 m.

3.1.2.2 Lizard Lake

The limnology trends for Lizard Lake are summarized below and detailed results of limnology are presented in Figure 2 of Appendix 3.I:

- Lizard Lake has a surface length that is approximately 5 times greater than the surface width (indicating a large fetch, i.e. potential for significant impact from wind action), in a northeast to southwest orientation (top to bottom), with a surface area of approximately 2.04 square kilometres (km^2).

- The lake is well-mixed with a maximum depth of approximately 7 meters.
- The temperature ranged from 5.1°C (observed at surface in November 2011) to 22.1°C (observed at surface in August 2012).
- Dissolved oxygen ranged from 7.6 mg/L (observed at bottom in August 2012) to 12.3 mg/L (observed at surface in November 2012).
  - Dissolved oxygen was greater than the acceptable guidelines range in 50% of observations based on the CCME CWQG (9.5 mg/L), and 90% of observations based on the PWQO guideline (8 mg/L).
- pH ranged from 6.28 (observed at 2m depth in June 2011) to 7.57 (observed at surface in August 2012).
  - pH values were below both the CCME CWQG and PWQO guidelines in the entire 5 meters of the water column in June 2011. All other pH results were within the CCME CWQG and PWQO guidelines except for one surface value in September 2010.
- Conductivity ranged from 59 µS/cm (observed throughout the majority of the water column in April 2012) to 76 µS/cm (observed at meter 5 in June 2011).

3.1.2.3 Sawbill Bay, Lizard Lake, Light Bay, Hawk Bay, Turtle Bay, Lynxhead Bay and Premier Lake

The remaining seven water bodies can be categorized as either stratified or non-stratified with general trends as described below. Detailed results of limnology are presented in Figures 3 through 8 of Appendices 3.I.

- Thermal stratification was observed in Sawbill Bay, Light Bay, Hawk Bay and Premier Lake (approximate depths of 24 m, 10 m, 14 m, and 8 m, respectively), with similar trends to Mitta Lake as follows:
  - Distinct thermoclines observed in September 2010, June 2011 and August 2012 were observed for these locations, with the exception of Light Bay (only stratified in June 2011) and Hawk Bay (only stratified in September 2010 and June 2011).
  - When stratified, there is a general decrease in temperature and dissolved oxygen with depth.
  - Generally a circumneutral pH.
- Lizard Lake, Turtle Bay and Lynxhead Bay (approximate depths of 5 m, 2 m, and 12 m, respectively) are well-mixed (non-stratified), and present similar values for conductivity, dissolved oxygen and pH with depth throughout the water column. However it should be noted that stratification of Lynxhead Bay waters was observed at the deepest measurement (12 m) in September 2010.

3.1.2.4 Profile Water Quality

A total of 84 water samples of surface and bottom water were taken during six sampling events, including eight duplicate samples collected for QA/QC. The following parameters did not meet the CCME CWQG and/or the PWQO guidelines:

- pH values ranged from 5.2 (bottom) to 8.0 (surface), and can be considered acidic to slightly alkaline. Twenty values were below the lowest accepted range for both the CCME CWQG and PWQO guidelines (6.5).
- Total aluminum concentrations ranged from 0.014 to 1.2 mg/L. Thirty concentrations were greater than the CCME CWQG (0.005-0.1 mg/L, pH dependent), of which 29 were also greater than the PWQO guideline (0.015-0.075 mg/L, pH dependent). The maximum concentration was observed in Mitta Lake bottom sample in April 2012.
- Total iron concentrations ranged from 0.02 to 4.0 mg/L. Thirty-two concentrations were greater than both the CCME CWQG and PWQO guidelines (both values are 0.3 mg/L). The maximum concentration was observed in Lynxhead Bay bottom sample in August 2012.
- Total mercury concentration was 0.0074 mg/L. One concentration was greater than the CCME CWQG (0.000026 mg/L), and less than the PWQO guideline (0.0002 mg/L). The maximum was observed in Mitta Lake top in April 2012.
- Total copper concentrations ranged from 0.0004 to 0.0025 mg/L. Three concentrations were greater than the PWQO guidelines (0.001-0.005 mg/L, hardness dependent), of which one concentration was also greater than the CCME CWQG (0.002-0.004 mg/L, hardness dependent). The maximum was observed in Mitta Lake bottom samples in April 2012.
- Total zinc concentrations ranged from 0.00025 to 0.024 mg/L. One concentration was greater than the PWQO (0.02 mg/L), observed in Mitta Lake top sample in September 2010.
- Dissolved oxygen concentrations ranged from 0.47 to 14 mg/L. Nine concentrations were below accepted oxygen level defined by CCME CWQG (5.5 mg/L), of which seven were also below PWQO (4 mg/L) accepted level.
- Phenol concentrations ranged from < 0.001 to 0.018 mg/L. Twelve concentrations were greater than the CCME CWQG (0.004 mg/L), of which six were also greater than the PWQO guideline (0.005 mg/L). The maximum was observed in Premier lake top sample in March 2011.
- Phosphorus concentrations ranged from 0.0055 to 0.072 mg/L. Twelve concentrations were greater than the PWQO guideline (0.02 mg/L). The maximum was observed in Lynxhead Bay bottom sample in August 2012.

3.1.3 Marmion Reservoir

Sampling locations chosen to represent Marmion Reservoir water quality include the following surface water and column profile stations: HRWQ-13, HRWQ-15, HRWQ-16, HRWQ-22, HRWQ-24, HRWQP-2A/2B (Sawbill Bay top and bottom), HRWQP-4A/B (Light Bay top and bottom), HRWQP-5A/B (Hawk Bay top and bottom), and HRWQP-6A/B (Turtle Bay top and bottom) and HRWQP-7A/B (Lynxhead Bay top and bottom).

The summary of results and number of samples greater than the guidelines can be found in Table 3-3. The statistical summary for count, minimum, maximum, average, median and 95th percentile is presented in Appendix 2.III:

Table 3-3: Summary of CCME CWQG and PWQO Screening of Results for Water Samples collected from Marmion Reservoir

Parameters	Guidelines		Total Number	Values not meeting guidelines				Location[(a)]
	CCME CWQG	PWQO		CCME CWQG		PWQO		
				Number	Percent	Number	Percent	
pH	6.5-9	6.5-8.5	77	16	21%	16	21%	HRWQ-7,13,16 and HRWQP-2A2B,4B,5B,6A6B
Dissolved Oxygen	5.5-9.5	4-8	64	4	6%	2	3%	HRWQP-2B, 5B,7B
Phosphorus	—	0.02	77	—	—	7	9%	HRWQ-7,15 and HRWQP-4B,5B,6A
Phenols	0.004	0.005	77	12	16%	8	10%	HRWQ-13,15,22 and HRWQP-4A,4B,6B
Aluminum (total)	0.005-0.1	0.015-0.075	77	8	10%	9	12%	HRWQ-7,13,16 and HRWQP-2A,2B,4B,5B,6A,6B
Cadmium (total)	0.0000041-0.000042	0.0001-0.0005	77	4	5%	0	0%	HRWQ-16 and HRWQP-5B,6A,7B
Chromium (total)	0.001	0.001	77	2	3%	2	3%	HRWQP- 6A,7B
Cobalt (total)	—	0.0009	77	—	—	1	1%	HRWQP-7
Copper (total)	0.002-0.004	0.001-0.005	77	1	1%	7	9%	HRWQ-13,22 and HRWQP-5B,7A,7B
Iron (total)	0.3	0.3	76	45	59%	45	59%	HRWQ-13,15,16,22,24 and HRWQP-2B,4A,4B,5A,5B,6A,7A,7B

Notes:

— Site water quality data was not modelled for this parameter

(a) Refer to Appendix 2.III for the time period details.

The following parameters within Marmion Reservoir did not meet the CCME CWQG and/or PWQO guidelines:

- pH values ranged from 5.2 to 7.7, ranging from slightly acidic to circumneutral. Sixteen values were below the lower values range of both the CCME CWQG and PWQO guidelines (6.5).
- Total iron concentrations ranged from 0.112 to 4 mg/L. Forty-five concentrations were greater than both the CCME CWQG and PWQO (both values are 0.3 mg/L) guidelines. The maximum was observed at HRWQP-7 in August 2012.
- Total aluminum concentrations ranged from 0.026 to 0.8 mg/L. Eight concentrations were greater than the CCME CWQG (0.005-0.1 mg/L, pH dependent) and nine concentrations were also greater than the PWQO guideline (0.015-0.075 mg/L, pH dependent). The maximum was observed at HRWQP-6A in August 2012.
- Total cadmium concentrations ranged from <0.00001 to 0.00005 mg/L. Four concentrations were greater than the CCME CWQG (0.0000041-0.000042 mg/L, hardness dependent). The maximum was observed at HRWQP-7 in August 2012.
- Total copper concentrations ranged from <0.0007 to 0.0021 mg/L. Seven concentrations were greater than the PWQO guideline (0.001-0.005 mg/L, hardness dependent), of which one was also greater than the CCME CWQG (0.002-0.004 mg/L, hardness dependent). The maximum was observed at HRWQ-22 in November 2010.
- Total chromium concentrations ranged from <0.00005 to 0.0014 mg/L. Two concentrations were greater than both the PWQO and CCME CWQG (0.001 mg/L) guideline. The maximum was observed at HRWQP-7B in August 2012.
- Total cobalt concentrations ranged from < 0.00005 to 0.0014 mg/L. One concentration was greater than the PWQO guidelines (0.0009 mg/L). The maximum was observed at HRWQ-7 in August 2012.
- All other total metal concentrations were below CCME CWQG and PWQO guidelines.
- Dissolved oxygen concentrations ranged from 0.47 to 14.0 mg/L. Four concentrations were below the accepted CCME CWQG (5.5 mg/L), of which two were also below the accepted PWQO guideline (4 mg/L). The minimum was observed in a Hawk Bay bottom sample in August 2012.
- Phenol concentrations ranged from < 0.001 to 0.012 mg/L. Twelve concentrations were above the CCME CWQG (0.004 mg/L), of which eight were also greater than the PWQO guideline (0.005 mg/L). The maximum was observed at a Light Bay bottom sample in June 2011.
- Phosphorus concentrations ranged from 0.0065 to 0.072 mg/L with seven samples having values greater than the PWQO guideline (0.02 mg/L). The maximum was observed at a Turtle Bay surface sample in August 2012.

3.2 Sediment Quality

A total of 134 samples including seven duplicate samples were collected during six sampling campaigns. The summary of results with values and percentages greater than the most conservative guidelines can be found in Table 3-4. Full sediment quality results including a statistical summary for count, minimum, maximum, average, median and 95th percentile are presented in Appendix 2.IV. It should be noted that both the grab and Lake Profile sediment results are included in this discussion, Table 3-4 and Appendix 2.IV.

The following parameters did not meet the CCME and PSQG guidelines:

- Arsenic concentrations can be summarized as follows:
  - Concentrations ranged from < 1 to 60.9 mg/kg.
  - Thirty-four concentrations were greater than the CCME ISQG guideline (5.9 mg/kg).
  - Thirty-four samples were greater than the PSQG LEL (6 mg/kg).
  - Eleven samples were greater than the CCME PEL (17 mg/kg).
  - Two samples were greater than the PSQG SEL guideline (33 mg/kg).
  - The maximum was observed at HRWQ-25 in June 2011.
- Cadmium concentrations ranged from < 0.5 to 5.4 mg/kg. Thirty-six concentrations were greater than the PSQG LEL and CCME ISQG guidelines (0.6 mg/kg), of which two were also greater than the CCME PEL guideline (3.5 mg/kg). The maximum was observed at HRWQP-7B in September 2010.
- Chromium concentrations ranged from 3 to 216 mg/kg. Thirty-five concentrations were greater than the PSQG LEL guideline (26 mg/kg), of which 14 were also greater than the CCME ISQG guideline (37.3 mg/kg), and one was greater than both the CCME PEL guideline (90 mg/kg) and Ontario Ministry of the Environment and Energy (MOEE) SEL guideline (110 mg/kg). The maximum was observed at HRWQ-38 in August 2012.
- Cobalt concentrations ranged from 1.7 to 69.9 mg/kg. Two concentrations were greater than the MOEE SEL guideline (50 mg/kg). The maximum was observed at HRWQP-7B in September 2010.
- Copper concentrations ranged from < 1 to 67.9 mg/kg. Sixty-eight concentrations were greater than the PSQG LEL guideline (16 mg/kg), of which four were also greater than the CCME ISQG guideline (35.7 mg/kg). The maximum was observed at HRWQ-39 in August 2012.
- Iron concentrations ranged from 1,630 to 137,000 mg/kg. Thirty-three concentrations were greater than the PSQG LEL guideline (20,000 mg/kg), of which twenty-one were also greater than the PSQG SEL guideline (40,000 mg/kg). The maximum was observed at HRWQP-2B in June 2011.

- Lead concentrations ranged from < 1 to 68.1 mg/kg. Fifteen concentrations were greater than the MOEE LEL guideline (31 mg/kg), of which nine were also greater than the CCME ISQG guideline (35 mg/kg). The maximum was observed at HRWQP-1B in September 2010.
- Manganese concentrations ranged from 0.061 to 80,900 mg/kg. Forty-four concentrations were greater than the PSQG LEL guideline (460 mg/kg), of which twenty-four were also greater than the PSQG SEL guideline (1100 mg/kg). The maximum was observed at HRWQP-7B in September 2010.
- Mercury concentrations ranged from 0.01 to 256 mg/kg. Eleven concentrations were greater than the CCME ISQG guideline (0.17 mg/kg), of which ten were also greater than the MOEE LEL guideline (0.2 mg/kg), nine were greater than the CCME PEL guideline (0.486 mg/kg) and five were greater than the MOEE SEL guideline (2 mg/kg). The maximum was observed at HRWQ-9 in November 2010.
- Nickel concentrations ranged from < 1 to 104 mg/kg. Forty-seven concentrations were greater than the PSQG LEL guideline (16 mg/kg), of which 37 were also greater than the CCME ISQG guideline (18 mg/kg), three were greater than CCME PEL guideline (36 mg/kg) and one was greater than the MOEE SEL guideline (75 mg/kg). The maximum was observed at HRWQ-38 in August 2012.
- Silver concentrations ranged from < 0.2 to 201 mg/kg. Six concentrations were greater than the MOEE SEL guideline (0.5 mg/kg). The maximum was observed at HRWQ-27 in November 2010.
- Zinc concentrations ranged from < 1 to 213 mg/kg. Seven concentrations were greater than the MOEE LEL guideline (120 mg/kg), of which six were also greater than the CCME ISQG guideline (123 mg/kg). The maximum was observed at HRWQP-7B in September 2010.
- PAHs concentration can be discussed as follows:
  - Four benzo(k)fluoranthene concentrations were greater than the PSQG LEL (0.00034 mg/kg), of which one was also greater than the CCME ISQG (0.0571 mg/kg).
  - Three benzo(a)pyrene concentrations were greater than the PSQG LEL (0.00006 mg/kg) and CCME ISQG (0.00622 mg/kg) guidelines, of which one was also greater than the PSQG SEL (0.13 mg/kg) and CCME PEL (0.135 mg/kg) guidelines.
  - Two 2-methylnaphthalene concentrations were greater than the CCME ISQG guideline (0.00587 mg/kg), of which one is also greater than the CCME PEL guideline (0.128 mg/kg).
  - One concentration of benzo(b&j)fluoranthene, fluoranthene, ideno(1,2,3-cd)pyrene, pyrene and 1-methylnaphthalene was greater than at least one of the guidelines.

Table 3-4: Summary of CCME and PSQG Screening of Sediment Quality Results (Grab and Lake Bottom Samples)

Parameters	Lowest Receiving Guidelines [a]	Total Number	Values Not Meeting Guidelines		Location
			Number	Percent	
Arsenic	5.9	134	34	25%	HRWQP-1,2,4,5,7,8 and HRWQ-2,25,31,38,39[b]
Cadmium	0.6	134	36	27%	HRWQP-1,2-5,7,8 and HRWQ-2,25,29,38,39[b]
Chromium (total)	26	134	35	26%	HRWQP-2-8 and HRWQ-3,6,17,20,38[b]
Cobalt	50	134	2	1%	HRWQP-7 (Sep 2010)
Copper	16	134	68	51%	HRWQP-1-8 and HRWQ-2,3,5,6,8,9,17,18,20,25,26,29,31,32,37-39[b]
Iron (total)	20000	134	33	25%	HRWQP-1-5,7,8 and HRWQ-17,20,25,38,39[b]
Lead	31	134	15	11%	HRWQP-1,2,5,7 and HRWQ-25,29,38[b]
Manganese	460	134	44	33%	HRWQP-1-5,7,8 and HRWQ-2,3,5,6,11,20,25,26,34,38,39[b]
Mercury	0.17	134	11	8%	HRWQ-3,6,9,27,31,32[b]
Nickel	16	134	47	35%	HRWQP-1-8 and HRWQ-2,3,5,6,8,17,20,38,39[b]
Silver	0.5	134	6	4%	HRWQP-1 (Nov. 2010), HRWQP-7 (Nov. 2010), HRWQ-2 (Aug. 2012), HRWQ-27 (Nov. 2010)
Zinc	120	134	7	5%	HRWQP-3,5,7 and HRWQP-8,38[b]
1-Methylnaphthalene	0.00671	84	1	1%	HRWQ-27 (Nov. 2010)
2-Methylnaphthalene	0.00587	84	2	2%	HRWQ-11 (Nov. 2010), HRWQ-27 (Nov. 2010)
Benzo(k)fluoranthene	0.00034	84	4	5%	HRWQP-2 (Nov. 2010), HRWQ-4 (Nov. 2010), HRWQ-5 (Nov. 2010), HRWQ-11 (Nov. 2010)
Benzo(b&j)fluoranthene	0.00037	84	1	1%	HRWQP-5 (Nov. 2010)
Benzo(a)pyrene	0.00006	84	3	4%	HRWQP-2 (June 2011), HRWQP-4 (Nov. 2010), HRWQP-5 (Nov. 2010)
Fluoranthene	0.0002	84	1	1%	HRWQP-5 (Nov. 2010)
Indeno(1,2,3-cd)pyrene	0.0202	84	1	1%	HRWQP-5 (Nov. 2010)
Pyrene	0.00049	84	1	1%	HRWQP-5 (Nov. 2010)

Notes:

[a] The most conservative value was taken from four guidelines: CCME PEL, CCME ISQG, PSQG LEL and PSQG SEL.

[b] Refer to Appendix 2.IV for the time period details.

3.3 Comparison to Ontario Drinking Water Standards

Screening of surface water quality with respect to the Ontario Drinking Water Standards (ODWS) was carried out to evaluate the baseline water quality of surface water that may currently be used for human consumption.

The summary of surface water quality results with number and percentages of values greater than the guidelines can be found in Table 3-5. Full surface water quality results with respect to ODWS including a statistical summary for count, minimum, maximum, average, median and 95th percentile are presented in Appendix 2.III.

Table 3-5: Summary of ODWS Screening of Results for Surface Water Samples

Parameters	Guidelines	Total Number	Values not meeting guidelines		Location (ODWS)[(b)]
	ODWS[(a)]		ODWS		
			Number	Percent	
pH	6.5−8.5	172	32	19%	HRWQ-1,2,6,7,8,9,10,11,13,14,16,17,18,19,20,23,26, 27,28,30,35
DOC	5	173	167	97%	All stations
Alkalinity	30−500	173	144	83%	HRWQ-1,2,4,5,7,8,9,10,11,12,13,14,15,16,17,18,19, 20,21,22,23,25,26,27,28,29,30,32,33,34,35,36,37,38,39
Hardness	80−100	170	169	99%	All stations
Aluminum	0.1	172	28	16%	HRWQ-2,3,4,6,7,9,11,17,18,19,20,25,27
Iron (total)	0.3	172	62	36%	HRWQ-3,4,6,7,8,9,11,13,15,16,17,18,19, 20,21,22,24,25,27,31,33,34
Manganese	0.05	172	31	18%	HRWQ-3,4,6,7,11,12,14,15,16,17,21,25,27,31,33,34, 35,37,39

Notes:

(a) The most conservative value was taken from four guidelines: ODWS MAC: Maximum Acceptable Concentration; IMAC: Interim Maximum Acceptable Concentration; AO: Aesthetic Objective; OG: Operational Guideline.

(b) Values do not meet guidelines for more than one time period. See Appendix 2.III for details.

The surface water quality with respect to ODWS guidelines can be summarized as:

- Slightly acidic to slightly alkaline pH values with 19% of measured values lower than the ODWS guidelines (6.5) at several sample locations.
- 97% of DOC values were greater than the ODWS guidelines (5 weight percent solution (wt %)) at all sample locations.
- 83% of alkalinity concentrations were below the lower bound ODWS guidelines (30 milligrams per litre as calcium carbonate (mg $CaCO_3$/L)) at several sample locations.

- 99% of hardness concentrations were outside of the ODWS optimum range (80 to 100 mg $CaCO_3$/L) at all sample locations.
- 16% of aluminum concentrations were greater than the ODWS guidelines (0.1 mg/L) at several sample locations.
- 36% of iron concentrations were greater than the ODWS guidelines (0.3 mg/L) at several sample locations.
- 18% of manganese concentrations were greater than the ODWS guidelines (0.05 mg/L) at several sample locations.

The summary of profile water quality results with number and percentage of values greater than the ODWS guidelines can be found in Table 3-6. Full profile water quality results with respect to ODWS including a statistical summary for count, minimum, maximum, average, median and 95th percentile are presented in Appendix 2.III.

Table 3-6: Summary of ODWS Screening of Results for Profile Water Samples

Parameters	Guidelines	Total Number	Values not meeting guidelines		Location (ODWS) [b]
	ODWS[a]		ODWS		
			Number	Percent	
pH	6.5−8.5	84	20	24%	HRWQP-1A,1B[c],2A,2B[c],3A[c],4B,5B[c],6A,6B,7A[c], 7B[c],8B
DOC	5	84	84	100%	All stations
Alkalinity	30−500	84	80	95%	All stations
Hardness	80−100	79	79	100%	All stations
Aluminum	0.1	84	12	14%	HRWQP-1A,1B[c],2A,4B,5B,6A,7B
Iron (total)	0.3	84	32	38%	HRWQP-1B[c],2B[c],4A,4B[c],5A[c],5B[c],6A,7A[c], 7B[c]
Manganese	0.05	84	15	18%	HRWQP-1A,1B[c],4A,4B,5A,5B[c],7A,7B

Notes:

(a) The most conservative value was taken from four guidelines: ODWS MAC: Maximum Acceptable Concentration; IMAC: Interim Maximum Acceptable Concentration; AO: Aesthetic Objective; OG: Operational Guideline.
(b) See appendix 2.III for the time period details.
(c) Indicates parameters greater than the guidelines more than one occurrence during baseline investigation

The profile water quality with respect to ODWS guidelines can be summarized as:

- Slightly acidic to circumneutral pH values with 24% of measured values lower than the ODWS guidelines (6.5) at several sample locations.
- 100% of DOC values were greater than the ODWS guidelines (5 wt %) at all sample locations.

- 95% of alkalinity concentrations were below the lower bound ODWS guidelines (30 mg $CaCO_3$/L) at all sample locations.
- 100% of hardness concentrations were outside of the ODWS optimum range (80 to 100 mg $CaCO_3$/L) at all sample locations.
- 14% of aluminum concentrations were greater than the ODWS guidelines (0.1 mg/L) at several sample locations.
- 38% of iron concentrations were greater than the ODWS guidelines (0.3 mg/L) at several sample locations.
- 18% of manganese concentrations were greater than the ODWS guidelines (0.05 mg/L) at several sample locations.

4.0 SUMMARY OF EXISTING CONDITIONS

As discussed in Section 1, this TSD provides information on the existing or baseline conditions only. The application of this information, predicted changes, and final lake water concentrations for the project under the various project stages are provided in the Site Water TSD and the Lake Water Quality TSD.

CCME CWQG and PWQO

Baseline water quality was collected six times between September 2010 and August 2012, from 39 surface water locations and eight water profile locations. The results were compared to CCME CWQG and PWQO guidelines.

In general, the baseline surface water samples can be characterized with respect to CCME CWQG and PWQO guidelines as follows:

- Slightly acidic to slightly alkaline values with approximately 19% of measured values lower than the CCME CWQG and PWQO guidelines (6.5).
- 28% and 34% of total aluminum concentrations were greater than the CCME CWQG and PWQO guidelines, respectively, at all sample locations.
- 36% of total iron concentrations were greater than both the CCME CWQG and PWQO guidelines.
- Sporadic concentrations of total arsenic, cadmium, cobalt, copper, lead greater than the CCME CWQG and/or PWQO guidelines.
- Only one total mercury concentration was greater than the CCME CWQG.
- 14% and 10% of phenol concentrations were greater than the CCME CWQG and PWQO guidelines, respectively.
- 9% of phosphorus concentrations were greater than the PWQO guidelines.

The results of the baseline lake profile measurements indicated:

- Stratification in Mitta Lake, Sawbill Bay, Light Bay, Hawk Bay and Premier Lake was observed for some portion of the year, with the strongest stratification observed in September 2010, June 2011 and August 2012. In general decreasing temperature, pH and dissolved oxygen concentrations at depth, with increasing conductivity were observed.
- Weak to no stratification was observed in Lizard Lake, Turtle Bay and Lynxhead Bay with near constant temperature, conductivity pH and dissolved oxygen values throughout the profile.

The baseline column profile samples can be characterized with respect to CCME CWQG and PWQO guidelines as follows:

- pH values range from slightly acidic to slightly alkaline with 24% of the observed values below the lowest range for both the CCME CWQG and PWQO guidelines (6.5).
- 36% and 35% of total aluminum concentrations were greater than the CCME CWQG and PWQO guidelines, respectively.
- 38% of total iron concentrations were greater than the CCME CWQG and PWQO guidelines.
- One total mercury concentration measured in top samples from Mitta Lake was greater than the CCME CWQG guideline.
- Sporadic concentrations of total cadmium, total cobalt, total copper, total zinc and dissolved oxygen did not meet CCME CWQG and/or PWQO guidelines.
- Up to 14% of measured phenol concentrations were greater than the CCME CWQG and/or PWQO guidelines.

Sediment concentrations were compared to CCME PEL ISQG and PSQG LEL/SEL guidelines. The baseline concentration of arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, silver and zinc were greater than one or more of the sediment guidelines. In addition, some PAH concentrations in sediments were also greater than the sediment guidelines.

ODWS

In general, the baseline surface water samples can be characterized with respect to ODWS guidelines as follows:

- Several DOC, alkalinity and hardness values were greater than the ODWS guidelines at several sample locations.
- Some iron, aluminum and manganese concentrations were greater than the ODWS guidelines at several sample locations.

The baseline column profile water samples can be characterized with respect to ODWS guidelines as follows:

- All DOC and hardness values were greater than the ODWS guidelines.
- Several alkalinity concentrations were below the lower bound ODWS guidelines at all sample locations.
- Some iron, aluminum and manganese concentrations were greater than the ODWS guidelines at several sample locations.

5.0 LIST OF REFERENCES

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6.0 GLOSSARY OF TERMS

Table 6-1: Glossary of Terms

Term	Definition
Alkaline	Having a pH of 7.0 or above. The condition of water or soil which contains a sufficient amount of alkali substances to raise the pH above 7.0. The quality of being bitter due to alkaline content. (U.S. Department of the Interior 2012)
Catchment	An area having a common outlet for its surface runoff (NOAA 2012)
Coliform	Organisms common to the intestinal tract of humans and animals; the organisms' presence in waste water is an indicator of pollution. (U.S. Department of the Interior 2012)
Discharge	The release or extraction of water from an aquifer. Typical mechanisms of natural discharge are evapotranspiration by phreatophytes, springs, and drains to surface water bodies. Pumping is a man-caused discharge. (University of Idaho 2012)
Effluent	Partially or completely treated wastewater flowing out of a treatment facility, reservoir, or basin. (U.S. Department of the Interior 2012)
Limnology	Scientific study of the physical characteristics and biology of lakes, ponds, and streams. (U.S. Department of the Interior 2012)
Mineralization	The conversion of organic compounds into inorganic, plant-available compounds such as ammonium. This is accomplished by soil organisms as they consume organic matter and excrete wastes. (USDA 2012)
Recharge	Mechanisms of inflow to the aquifer. Typical sources of recharge are precipitation, applied irrigation water, underflow from tributary basins and seepage from surface water bodies. (University of Idaho 2012)
Sluiceway	An opening in a diversion dam used to discharge heavy floating debris safely past the dam. (U.S. Department of the Interior 2012)
Stratification	Thermal layering of water in lakes and streams. Lakes usually have three zones of varying temperature, the epilimnion, the metalimnion, and the hypolimnion. The formation of separate layers (of temperature, plant, or animal life) in a lake or reservoir. (U.S. Department of the Interior 2012)
Substrate	Surface on which a plant or animal grows or is attached. The base on which an organism lives; a substance acted upon. (U.S. Department of the Interior 2012)
Thermocline	The middle layer of a lake, separating the upper, warmer portion (epilimnion) from the lower, colder portion (hypolimnion). The middle layer in a thermally stratified lake or reservoir. In this layer there is a rapid decrease in temperature with depth. (U.S. Department of the Interior 2012)

7.0 ABBREVIATIONS, ACRONYMS AND INITIALISMS

Table 7-1: List of Abbreviations, Acronyms and Initialisms

Acronym	Definition
ALS	ALS Environmental
ASTM	American Society for Testing and Materials
CCME CWQG	Canadian Council of Ministers of the Environment, Canadian Water Quality Guidelines
CEA Agency	Canadian Environmental Assessment Agency
DO	Dissolved oxygen
DOC	Dissolved organic carbon
EA	Environmental Assessment
EIS	Environmental Impact Statement
U.S. EPA	Unites States Environmental Protection Agency
Golder	Golder Associates Ltd.
HRWQ	Hammond Reef Gold Project surface water/sediment stations
HRWQP	Hammond Reef Gold Project water column profile stations
IMAC	Interim Maximum Acceptable Concentration
ISQG	Interim Sediment Quality Guideline
LEL	Lowest Effect Level
LSA	Local study area
MAC	Maximum Acceptable Concentration
MOE	Ontario Ministry of the Environment
MOEE	Ontario Ministry of the Environment and Energy
NOAA	National Oceanic and Atmospheric Administration
ODWS	Ontario Drinking Water Standards
OG	Operational Guideline

Table 7-1: List of Abbreviations, Acronyms and Initialisms (Continued)

Acronym	Definition
OHRG	Osisko Hammond Reef Gold Ltd.
ORP	Oxygen-reduction potential
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PEL	Probable effect level
PSQG	Ontario Provincial Sediment Quality Guidelines
PWQO	Ontario Provincial Water Quality Objectives
QA/QC	Quality assurance/Quality control
RSA	Regional study area
SEL	Severe effect level
TBT	TBT Engineering Ltd.
TMF	Tailings Management Facility
TOC	Total organic carbon
ToR	Terms of Reference
TSD	Technical Support Document
USDA	United States Department of Agriculture
UTM	Universal Transverse Mercator (coordinate system)
VEC	Valued Ecosystem Component
WRMF	Waste Rock Management Facility

8.0 UNITS

Table 8-1: List of Units

Abbreviation	Unit
%	percent
<	less than
°C	degrees Celsius
µm	micrometre
µS/cm	microSiemens per centimetre
ha	hectare
km	kilometre
km^2	square kilometres
L	litre
m	metre
mg $CaCO_3$/L	milligrams per litre as calcium carbonate
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
mL	millilitre
mm	millimetre
ppm	parts per million
wt %	weight percent solution

APPENDIX 2.I

ALS Thunder Bay Letter

February 1, 2013

Rachel James
Golder Associates Ltd.
Mississauga, ON L5N 7K2

RE: Metal Detection Limits

Dear Ms. James

In response to your request for an explanation for detection limit variations between total and dissolved metals detection limits for the 10-1118-0020 8000 Campaign, ALS Limits of Reporting (LORs) are established using rigorous experimental and statistical procedures that begin with the determination of the Method Detection Limit (MDL) at 99% confidence. The MDL takes into account several factors, including long term Method Blanks, low level Sample Duplicates, and low-level Spiked Samples. However, the MDL is based on "typical" sample types in the absence of sample-specific problems, and doesn't apply in all circumstances.

Prior to January 2012, ALS Thunder Bay provided Golder Associates with low level metal detection limits. The low level detection limits were the absolute lowest detection limit that the instrument could achieve. These limits were well below any guideline. Due to the fact that the absolute lowest limits were provided in the 10-1118-0020 8000 campaign, there are some parameters that have Dissolved Detection limits that are higher than the total metal Detection limits.

After January 2012, ALS took a conservative approach to detection limits. All detection limits for low level metals for both total and dissolved metals are now equal.

Yours sincerely

Tricia Sampson

Tricia Sampson
Client Services Supervisor

APPENDIX 2.II

Water Quality – Proposed Suite of Analytes, Method Detection Limits and Applicable Receiving Water Guidelines

February 2013
Project No. 10-1118-0020
Hammond Reef Gold Project

TABLE 1
Proposed Suite of Analytes, Method Detection Limits and Applicable Receiving Water Guidelines

Parameter[a]	Unit	Receiving WQ Guidelines					
		ONTARIO DRINKING WATER STANDARDS[b][c]				CCME Water Guidelines[d]	PWQO[e]
		MAC	IMAC	AO	OG		
Field Parameters							
Temperature	°C	—	—	—	—	—	±10[f]
pH	—	—	—	—	6.5–8.5	6.5-9	6.5-8.5
Conductivity	uS/cm	—	—	—	—	—	—
Dissolved Oxygen	mg/L	—	—	—	—	5.5-9.5[g]	4-8[h]
ORP	mV	—	—	—	—	—	—
Physical-Chemical							
pH	—	—	—	—	—	6.5-9	6.5-8.5
DOC	% wt	—	—	5	—	—	—
TOC	% wt	—	—	—	—	—	—
Acidity	mg($CaCO_3$)/L	—	—	—	—	—	—
Alkalinity	mg($CaCO_3$)/L	—	—	—	30–500	—	-25%[f]
Conductivity	µS/cm	—	—	—	—	—	—
Total Suspended Solids	mg/L	—	—	—	—	+5-25[f][i]	—
Total Dissolved Solids	mg/L	—	—	500	—	—	—
Major Ions							
Calcium	mg/L	—	—	—	—	—	—
Chloride	mg/L	—	—	250	—	120-640	—
Fluoride	mg/L	1.5[j]	—	—	—	—	—
Magnesium	mg/L	—	—	—	—	—	—
Potassium	mg/L	—	—	—	—	—	—
Sodium	mg/L	—	—	200[k]	—	—	—
Sulphate	mg/L	—	—	500[l]	—	—	—
Carbonate (CO_3^{2-})	mg/L	—	—	—	—	—	—
Bicarbonate ($H(CO_3)^-$)	mg/L	—	—	—	—	—	—
Hardness	mg($CaCO_3$)/L	—	—	—	80–100	—	—
Cyanide (free)	mg/L	0.2	—	—	—	0.005	0.005
Cyanide (total)	mg/L	—	—	—	—	—	—
Nutrients							
Nitrate-N	mg/L	10[m]	—	—	—	13[n][o]-550	—
Nitrite-N	mg/L	1[m]	—	—	—	0.06[p]	—
Ammonia-N	mg/L	—	—	—	—	0.019[q]	0.02[r]
Un-ionized ammonia	mg/L	—	—	—	—	—[q]	—[r]
Phosphate	mg/L	—	—	—	—	—	—
ortho-Phosphate	mg/L	—	—	—	—	—	—
Phosphorus	mg/L	—	—	—	—	0.004-0.1[s]	0.02[n]
Organics							
Oil and Greases	mg/L	—	—	—	—	—	physically non-detect
Phenols	mg/L	—	—	—	—	0.004	0.005[n]
Micro-organisms[t]							
Escherichia coli	per 100 mL	—	—	—	—	—	100[u]
Total coliforms	per 100 mL	—	—	—	—	—	—

TABLE 1
Proposed Suite of Analytes, Method Detection Limits and Applicable Receiving Water Guidelines

Parameter[a]	Unit	Receiving WQ Guidelines					
		ONTARIO DRINKING WATER STANDARDS[b][c]				CCME Water Guidelines[d]	PWQO[e]
		MAC	IMAC	AO	OG		
Metals[v]							
Aluminum	mg/L	—	—	—	0.1	0.005-0.1[w]	0.015-0.075[n][x]
Antimony	mg/L	—	0.006	—	—	—	0.02[n]
Arsenic	mg/L	—	0.025	—	—	0.005	0.1
Barium	mg/L	1	—	—	—	—	—
Beryllium	mg/L	—	—	—	—	—	0.011-1.1[y]
Bismuth	mg/L	—	—	—	—	—	—
Boron	mg/L	—	5	—	—	1.5-29[z]	0.2[n]
Cadmium	mg/L	—	0.005	—	—	0.000017[n][aa]	0.0001-0.0005[n][ab]
Chromium (VI)	mg/L	—	—	—	—	0.001	0.001
Chromium (III)	mg/L	—	—	—	—	0.0089	0.0089
Chromium (total)	mg/L	0.05	—	—	—	—	—
Cobalt	mg/L	—	—	—	—	—	0.0009
Copper	mg/L	—	—	1	—	0.002-0.004[ac]	0.001-0.005[n][ad]
Iron (total)	mg/L	—	—	0.3	—	0.3	0.3
Lead	mg/L	0.01[ae]	—	—	—	0.001-0.007[af]	0.001-0.005[n][ag]
Manganese	mg/L	—	—	0.05	—	—	—
Mercury	mg/L	0.001	—	—	—	0.000026	0.0002
Methyl mercury	mg/L	—	—	—	—	0.000004[n]	—
Molybdenum	mg/L	—	—	—	—	0.073[n]	0.04[n]
Nickel	mg/L	—	—	—	—	0.025-0.15[ah]	0.025
Selenium	mg/L	0.01	—	—	—	0.001	0.1
Silicon	mg/L	—	—	—	—	—	—
Silver	mg/L	—	—	—	—	0.0001	0.0001
Strontium	mg/L	—	—	—	—	—	—
Thallium	mg/L	—	—	—	—	0.0008	0.0003[n]
Tin	mg/L	—	—	—	—	—	—
Titanium	mg/L	—	—	—	—	—	—
Tungsten	mg/L	—	—	—	—	—	0.03[n]
Uranium	mg/L	0.02	—	—	—	0.015-0.033	0.005[n]
Vanadium	mg/L	—	—	—	—	—	0.006[n]
Zinc	mg/L	—	—	5	—	0.03	0.02[n]
Zirconium	mg/L	—	—	—	—	—	0.004[n]
Strontium	mg/L	—	—	—	—	—	—
Thallium	mg/L	—	—	—	—	—	—
Tin	mg/L	—	—	—	—	—	—
Titanium	mg/L	—	—	—	—	—	—
Tungsten	mg/L	—	—	—	—	—	—
Uranium	mg/L	—	—	—	—	—	—
Vanadium	mg/L	—	—	—	—	—	—
Zinc	mg/L	—	—	—	—	—	—
Zirconium	mg/L	—	—	—	—	—	—

TABLE 1
Proposed Suite of Analytes, Method Detection Limits and Applicable Receiving Water Guidelines (Notes)

Notes:

— = A dash indicates that guidelines do not apply for this parameter.

Applicable guideline:

(a) Total concentrations are assumed, unless stated otherwise.

(b) Ontario Regulation (O.Reg.) 169/03: Ontario Drinking Water Standards (ODWS). Last amendment: O.Reg. 327/08.
http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_030169_e.htm.

(c) MAC: Maximum Acceptable Concentration; IMAC: Interim Maximum Acceptable Concentration; AO: Aesthetic Objective; OG: Operational Guideline.
The lowest values of the four sub-guideline for Ontario Drinking Water Standards were used in the results appendix (1.II) to simplify the screening of values.

(d) - Canadian Council of Ministers of the Environment, Canadian Water Quality Guidelines for the Protection of Aquatic Life, Update 7.1 (December 2007). Update
publications at www.http://ceqg-rcqe.ccme.ca/, visited 17 Janurary 2013.

(e) Provincial Water Quality Objectives, Ministry of Environment and Energy (February 1999).

(f) Compared to baseline conditions.

(g) Dissolved oxygen for warm-water biota: early life stages = 6000 µg·L-1; other life stages = 5500 µg·L-1
for cold-water biota: early life stages = 9500 µg·L-1; other life stages = 6500 µg·L-1

(h)

Dissolved Oxygen Concentration				
Temperature	Cold Water Biota		Warm Water Biota	
°C	% Saturation	mg/L	% Saturation	mg/L
0	54	8	47	7
5	54	7	47	6
10	54	6	47	5
15	54	6	47	5
20	57	5	47	4
25	63	5	48	4

(i) Under clear flow: + 25 mg·L-1 from background levels for any short-term exposure (e.g., 24-h period).
average + 5 mg·L-1 from background levels for longer term exposures (24 h<discharge<30 d).
Under high flow: + 25 mg·L-1 from background levels at any time when background levels between 25 and 250 mg·L-1.
+ 10% of background levels when background is >250 mg·L-1.

(j) Where Fluoride is added to drinking water, it is recommended that the concentration be adjusted to 0.5-0.8 mg/L the optimum level for control of tooth decay.
contain naturally occurring fluoride at levels highers than 1.5 mg/L but less than 2.4 mg/L the Ministry of Health and Long Term Care recommends an approach thr
boards of health to raise public and professional awareness to control excessive exposre to fluoride from other sources.

(k) The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds
this information may be communicated to local physicians for their use with patients on sodium restricted diets.

(l) When sulphate levels exceed 500 mg/L, water may have a laxative effect on some people.
(m) Where both nitrate and nitrite are present, the total of the two should not exceed 10 mg/L (as nitrogen).

(n) Interim Guideline
(o) Guidelines are expressed in µg nitrate·L-1. These values are equivalent to 2900 µg nitrate-nitrogen·L-1, and 3600 µg nitrate-nitrogen·L-1, for freshwater and ma
respectively.

(p) Guideline is expressed as µg nitrite-nitrogen·L-1. This value is equivalent to 197 µg nitrite·L-1.

TABLE 1
Proposed Suite of Analytes, Method Detection Limits and Applicable Receiving Water Guidelines (Notes)

(q) Un-ionized ammonia. Total ammonia:

Temp (°C)	pH							
	6.0	6.5	7.0	7.5	8.0	8.5	9.0	10
0	231	73.0	23.1	7.32	2.33	0.749	0.250	0.042
5	153	48.3	15.3	4.84	1.54	0.502	0.172	0.034
10	102	32.4	10.3	3.26	1.04	0.343	0.121	0.029
15	69.7	22.0	6.98	2.22	0.715	0.239	0.089	0.026
20	48.0	15.2	4.82	1.54	0.499	0.171	0.067	0.024
25	33.5	10.6	3.37	1.08	0.354	0.125	0.053	0.022
30	23.7	7.50	2.39	0.767	0.256	0.094	0.043	0.021

(r) ƒ = 1/(10pKa-pH +1), where ƒ is the fraction of NH3; pKa = 0.09018 + 2729.92/T; T = ambient water temperature in Kelvin (K = °C + 273.16)

(s) Ultra-oligotrophic <4 µg·.L-1; oligotrophic 4-10 µg·.L-1; mesotrophic 10-20 µg·.L-1; meso-eutrophic 20-35 µg·.L-1; eutrophic 35-100 µg·.L-1; hyper-eutrophic >10

(t) Not applicable to groundwater quality samples.

(u) Based on a geometric mean of at least 5 samples; based on a recreational water quality guideline.

(v) Guidelines apply to total metal concentrations , however, application of guidelines to dissolved metal concentrations can be employed as a screening tool.

(w) Aluminium guideline = 5 µg.L-1 at pH<6.5
= 100 µg.L-1 at pH>=6.5

(x) Aluminium guideline = 15 µg.L-1 at 4.5<pH<5.5
= +10% of background at 5.5<pH<6.5
= 75 µg/L-1 at 6.5<pH<9

(y) Beryllium guideline = 11 µg/L-1 at hardness<75 mgCaCO3/L
= 1100 µg/L-1 at hardness>75 mgCaCO3/L

(z) Respectively for long term and short term exposure.

(aa) Guideline based on Cd=10^{0.86[log(hardness)]-3.2}

(ab) Cadmium guideline = 0.1 µg/L-1 at hardness<100 mgCaCO3/L
= 0.5 µg/L-1 at hardness>100 mgCaCO3/L

(ac) Copper guideline = 2 µg·L-1 at a water hardness of 0–120 mg·L-1 (soft to medium) as CaCO3
= 3 µg·L-1 at a water harness of 120–180 mg·L-1 (hard) as CaCO3
= 4 µg·L-1 at a water harness >180 mg·L-1 (very hard) as CaCO3

(ad) Copper guideline = 1 µg/L-1 at hardness<20 mgCaCO3/L
= 5 µg/L-1 at hardness>20 mgCaCO3/L

(ae) This standard applies to water at the point of consumption. Since lead is a component in some plumbing systems, first flush water may contain higher concentrations of lead than watre that has been flushed for five minutes.

(af) Lead guideline = 1 µg·L-1 at a water harness of 0–60 mg·L-1 (soft) as CaCO3
= 2 µg·L-1 at a water harness of 60–120 mg·L-1 (medium) as CaCO3
= 4 µg·L-1 at a water harness of 120–180 mg·L-1 (hard) as CaCO3
= 7 µg·L-1 at a water harness >180 mg·L-1 (very hard) as CaCO3

(ag) Lead guideline = 1 µg/L-1 at hardness<30 mgCaCO3/L
= 3 µg/L-1 at 30<hardness<80 mgCaCO3/L
= 5 µg/L-1 at hardness>80 mgCaCO3/L

(ah) Nickel guideline = 25 µg·L-1 at a water hardness of 0–60 mg·L-1 (soft) as CaCO3
= 65 µg·L-1 at a water hardness of 60–120 mg·L-1 (medium) as CaCO3
= 110 µg·L-1 at a water hardness of 120–180 mg·L-1 (hard) as CaCO3
= 150 µg·L-1 at a water hardness >180 mg·L-1 (very hard) as CaCO3

APPENDIX 2.III

Surface Water Quality Results

TABLE 1
Surface Water Quality Results

Parameter	Unit	Receiving WQ Guidelines[a]			Surface Water - Grab samples																										
		ODWS	CCME	PWQO	HRWQ-1	HRWQ-1	HRWQ-1	HRWQ-1	HRWQ-1	HRWQ-1	HRWQ-2	HRWQ-2	HRWQ-2	HRWQ-2	HRWQ-3	HRWQ-3	HRWQ-3	HRWQ-3	HRWQ-3	HRWQ-4	HRWQ-4	HRWQ-4	HRWQ-4D	HRWQ4	HRWQ-4D	HRWQ-4	HRWQ-4D	HRWQ-5	HRWQ-5	HRWQ-5	HRWQ-5	HRWQ-5
					Sep-10	Nov-10	Mar-11	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Mar-11	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Jun-11	Apr-12	Apr-12	Aug-12	Aug-12	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12
Field Parameters																															
Temperature	°C	—	—	±10	12.3	5.16	-0.08	16.59	5.64	20.61	12.53	6.11	18.27	6.29	19.47	12.13	3.75	-0.03	10.49	6.13	19.38	10.66	3.14	12.41	12.41	1.27	1.27	15.75	15.75	14.25	6.08	16.4	6.92	21.65
pH	—	6.5–8.5	6.5-9	6.5-8.5	***6.4***	7.71	7.93	7.61	6.94	7.21	6.7	7.18	***6.42***	7.12	7.75	6.85	7.28	6.99	6.94	7.07	6.75	6.98	7.74	7.33	7.33	6.59	6.59	7.08	7.08	7.41	7.8	6.76	6.86	7.42
Conductivity	µS/cm	—	—	—	42		46	38	38		43		64	65		118		248	179	92		58		47	47	38	38			46		46	41	
Dissolved Oxygen	mg/L	—	5.5-9.5	4-8	9.98	13.18	13.15	7.07		7.96	6.93	7.67	10.1		9.24	7.66	12.03	9.6	7.11		5.92	9.4	13.27	6.9	6.9			6.99	6.99	8.9	11.61	9.27		8.94
ORP	mV	—	—	—		111		163.7	88.3	77.6		90.5		84.3	75.5		69.3		119.1	94.4	-1.5		84.6	110.6	110.6	91.7	91.7	61.2	61.2		140.6	195	85.9	75.4
Physical-Chemical																																	
pH	—	6.5–8.5	6.5-9	6.5-8.5	7.31	7.28	7.08	7.26	7.24	7.21	6.86	6.7	7.4	7.31	7.75	7.17	7.49	7.23	7.25	7.4	6.75	7.06	7.16	***6.49***	7.03	6.91	6.89	7.08	7.08	7.25	7.05	7.14	7.05	7.42
DOC	% wt	5	—	—	6.7	5.6	7.3	5.7	5.9	5.5	5.8	4.8	7	6.9	6.2	10.5	6.2	5.7	8	8	8	13.2	9.2	10.1	10.7	9.3	9	10.1	10.8	9.7	7	8.8	7.3	7.9
TOC	% wt	—	—	—	6.5	5.9	6.9	6.3	5.6	5.8	5.6	5.6	10	6.8	7.3	10.6	6.3	6.2	10.1	7.9	8.8	13.9	9.3	10.4	11.3	10	9.3	10.7	11.8	8.7	8.3	10.8	7.9	8.2
Acidity	mg/L	—	—	—			2.8	2.4	2.4	2.2			2	2.4	2.2			6	4	3.8	5			3	2.4	5.2	4.6	2.8	2.6			3.2	2.4	2
Alkalinity	mg(CaCO3)/L	30–500	—	-25%	19.4	17.2	17.9	15.8	15.4	19.3	18.8	23.2	21.6	28.6	31.6	57.1	55.5	102	86.6	33.1	123	27	21.5	14.2	21.5	13.8	14.3	58.6	58.9	18.4	21.1	17.4	15.1	16.6
Conductivity	µS/cm	—	—	—	43.7	43.2	45.2	39.2	43.4	46.4	44.4	51.5	51.2	72.7	72.9	119	120	225	180	100	289	59.8	50	54.4	49.1	42.3	43	121	120	47.3	48.9	46.1	47.7	45
Total Suspended Solids	mg/L	—	+5-25	—	<2.0	<2.0	27	<2.0	3.4	<2.0	3	3.7	3.7	2.9	2.1	<2.0	<2.0	142	2.1	3.4	<2.0	6.1	3.3	<2.0	2.4	3.4	4.6	7.3	5.9	3.5	<2.0	<2.0	<2.0	<2.0
Total Dissolved Solids	mg/L	500	—	—	59	60	<2.0	31	38	68	46	41	40	50	71	113	103	375	133	81	214	84	79	64	58	42	49	130	110	61	45	62	43	64
Major Ions																																	
Calcium	mg/L	—	—	—	6.44	6.87	6.13	5.8	5.41	6.12	6.4	8.33	7.48	9.14	10.1	20.7	20.3	33.8	25.9	14.1	41.5	10.9	9.21	7.13	8.79	6.45	6.1	19	18.3	6.16	6.72	5.74	5.3	5.54
Chloride	mg/L	250	120	—	0.42	0.2	0.4	<0.10	0.21	0.17	0.81	0.5	0.92	1.05	1.14	0.61	0.58	2.84	4.48	4.29	14.5	0.41	0.34	<0.10	0.34	0.28	0.34	0.27	0.32	1.24	1.08	1.28	1.31	1.1
Fluoride	mg/L	1.5	—	—	<0.030	<0.030	0.032	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.031	<0.030	<0.030	0.041	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.052	0.051	<0.030	<0.030	<0.030	<0.030	<0.030
Magnesium	mg/L	—	—	—	0.91	0.88	0.914	0.862	0.785	0.773	1.04	1.22	1.11	1.43	1.52	3.3	3.35	7.7	5.03	1.84	7.88	1.34	1.1	0.888	1.12	0.81	0.773	2.33	2.23	1.41	1.42	1.25	0.982	1.24
Potassium	mg/L	—	—	—	<1.0	<1.0	0.392	0.33	0.372	0.33	<1.0	<1.0	0.559	0.745	0.894	<1.0	<1.0	0.932	0.521	0.255	0.447	<1.0	<1.0	0.129	0.187	0.184	0.175	0.281	0.281	<1.0	<1.0	0.428	0.321	0.43
Sodium	mg/L	200	—	—	0.69	0.7	0.622	0.545	0.646	0.71	0.86	0.98	1.03	1.56	1.82	1.22	1.38	2.79	2.89	2.14	5.35	0.9	0.84	0.75	0.896	0.84	0.804	0.9	0.901	1.31	1.41	1.38	1.11	1.33
Sulphate	mg/L	500	—	—	2.58	2.02	2.21	2.31	2.03	1.89	1.21	1.4	1.51	1.34	1.33	1.74	2.59	6	1.5	3.89	0.34	0.4	0.88	1.16	1.13	2.01	2.03	<0.30	<0.30	1.7	1.44	2.58	1.61	1.39
Carbonate (CO_3^{--})	mg/L	—	—	—					<5.0	<5.0				<5.0	<5.0						<5.0	<5.0				<5.0	<5.0	<5.0	<5.0				<5.0	<5.0
Bicarbonate (HCO_3^-)	mg/L	—	—	—					18.8	19.3				34.9	31.6						40.3	123					16.8	17.4	58.6	58.9				18.4	16.6
Hardness	mg(CaCO3)/L	80–100	—	—	19	21	19.2	17.9	17.6	20.8	19	26	25.9	29.2	33.6	62	64	115	91.2	45.5	132	31	28	23.2		19.6	19.4	63.6	64.4	21	23	20.1	19.4	18.3
Cyanide (free)	mg/L	0.2	0.005	0.005	<0.0050	<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050	<0.0050					<0.0050	<0.0050	<0.0050		
Cyanide (total)	mg/L	—	—	—	<0.0020	<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020	<0.0020					<0.0020	<0.0020	<0.0020		
Nutrients																																	
Nitrate-N	mg/L	10	13	—	<0.030	<0.030	0.101	0.043	0.063	0.034	0.034	0.088	0.113	<0.030	0.137	<0.030	<0.030	0.153	<0.030	<0.030	<0.030	<0.030	<0.030	1.67	<0.030	0.072	0.073	<0.030	0.031	0.05	0.041	0.146	0.04	<0.030
Nitrite-N	mg/L	1	0.06	—	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Ammonia-N	mg/L	—	—	—	<0.020	0.03	<0.020	<0.020	<0.020	0.026	<0.020	0.023	0.024	0.163	<0.020	<0.020	<0.020	0.028	<0.020	<0.020	<0.020	<0.020	0.035	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.023	<0.020	<0.020	<0.020
Un-ionized ammonia	mg/L	—	0.019	0.02	1.12E-05	1.93E-04	1.38E-04	2.48E-04	2.28E-05	1.73E-04	2.26E-05	4.74E-05	2.20E-05	2.97E-04	4.19E-04	3.10E-05	6.63E-05	2.25E-05	3.36E-05	3.20E-05	4.25E-05	3.73E-05	2.05E-04	9.53E-05	9.53E-05	7.13E-06	7.13E-06	6.92E-05	6.92E-05	1.32E-04	1.96E-04	3.49E-05	2.11E-05	2.32E-04
ortho-Phosphate	mg/L	—	—	—					<0.0050	<0.0050				<0.0050	<0.0050						<0.0050	<0.0050				<0.0050	<0.0050	<0.0050	<0.0050				<0.0050	<0.0050
Phosphorus	mg/L	—	—	0.02	0.0057	<0.0050	0.0051	0.0113	<0.0050	0.0059	0.0077	0.0129	0.0105	0.0135	0.0073	0.0054	<0.0050	0.306	0.0089	0.0054	<0.005	0.0082	0.0068	0.008	0.0069	0.0071	0.0065	0.0152	0.0154	0.0122	0.0104	0.0106	0.0125	0.0116
Organics																																	
Oil and Greases	mg/L	—	—	physically non detect	<2.0	<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<2.0	<2.0	<4.0	<4.0			<2.0	<2.0	<2.0	<4.0	
Phenols	mg/L	—	0.004	0.005	<0.0010	<0.0010	0.002	<0.0010	<0.0010	0.0037	<0.0010	<0.0010	0.0032	<0.0010	0.0018	<0.0010	<0.0010	0.0025	***0.005***	<0.0010	0.0019	0.0018	<0.0010	0.0024	0.0035	<0.0010	<0.0010	0.0034	***0.0084***	0.0014	<0.0010	0.0013	<0.0010	<0.0010
Micro-organisms																																	
Escherichia coli	per 100mL	—	—	100	2	0	0	2			7	0	0			6	1	1	44			50	2	0	0					3	2	0		
Total coliforms	per 100mL	—	—	—	> 2420	2400	140	690			610	870	61			1600	550	390	770			770	340	410	340					300	96	51		
Total Metals																																	
Aluminum[b]	mg/L	0.1	0.005-0.1	0.015-0.075	***0.042***	0.028	0.0284	0.0328	0.0347	0.0322	0.014	0.0325	***0.0357***	***0.2***	0.0375	0.026	0.0205	***2.97***	0.043	0.0346	0.0288	***0.111***	0.065	0.0522	0.0698	0.0996	0.0968	0.0528	0.0523	0.038	0.0335	0.0347	0.0669	0.0498
Antimony	mg/L	0.006	—	0.02	<0.0050	<0.0002	0.00002	<0.000030	<0.00010	<0.00010	<0.0050	<0.0002	<0.00030	<0.00010	<0.00010	<0.0050	<0.0002	0.000085	<0.000030	<0.00010	<0.00010	<0.0050	<0.0002	<0.000030	0.000088	<0.00010	<0.00010	<0.00010	<0.00010	<0.0050	<0.0002	<0.000030	<0.00010	<0.00010
Arsenic	mg/L	0.025	0.005	0.1	<0.0010	0.00026	0.000238	0.000317	0.00025	0.00026	<0.0010	0.00034	0.000333	0.00039	0.0004	<0.0010	0.00042	0.00198	0.000341	0.00028	0.00044	<0.0010	0.00028	0.000221	0.000316	0.00028	0.00027	0.0004	0.00041	<0.0010	0.0003	0.000306	0.00028	0.0004
Barium	mg/L	1	—	—	<0.010	<0.01	0.00465	0.00469	0.00375	0.00442	<0.010	<0.01	0.00842	0.0186	0.017	0.011	<0.01	0.0724	0.0117	0.00614	0.0243	<0.010	<0.01	0.00406	0.00495	0.00365	0.00354	0.00814	0.00767	<0.010	<0.01	0.00386	0.00419	0.00487
Beryllium	mg/L	—	0.011-1.1	—	<0.0010	<0.0001	<0.00001	<0.000040	<0.000060	<0.000060	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.000040	<0.000040	<0.000060	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060
Bismuth	mg/L	—	—	—	<0.0010	<0.001	<0.000005	<0.000020	<0.00020	<0.00020	<0.0010	<0.001	<0.000020	<0.00020	<0.00020	<0.0010	0.002	<0.000005	<0.000020	<0.00020	<0.00020	<0.0010	<0.001	<0.000020	<0.000020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.001	<0.000020	<0.00020	<0.00020
Boron	mg/L	5	1.5	0.2	<0.050	0.004	0.0038	0.00369	0.0038	0.004	<0.050	0.006	0.0054	0.0055	0.006	<0.050	<0.050	<0.002	0.0036	0.00236	0.0024	0.007	<0.050	<0.002	0.00314	0.00429	<0.0020	<0.0020	0.0024	0.0023	<0.050	0.004	0.00323	0.0025	0.0042
Cadmium[c]	mg/L	0.005	0.0000041-0.000042	0.0001-0.0005	<0.0000090	<0.00002	<0.000002	<0.0000090	<0.0000010	<0.0000010	<0.000090	<0.00002	<0.0000090	***0.00003***	<0.0000010	<0.000090	***0.00022***	***0.000072***	<0.0000090	<0.0000010	<0.0000010	<0.000090	<0.00002	<0.0000090	<0.0000090	<0.0000010	<0.0000010	<0.0000010	<0.0000010	<0.000090	<0.00002	<0.0000090	<0.0000010	<0.0000010
Chromium (total)	mg/L	0.05	0.009	0.009	<0.0010	0.0001	<0.0002	<0.00090	<0.00050	<0.00050	<0.0010	<0.0001	<0.00090	<0.00050	<0.00050	<0.0010	0.0003	0.0046	<0.00090	<0.00050	<0.00050	<0.0010	<0.0001	<0.00090	<0.00090	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	0.0002	<0.00090	<0.00050	<0.00050
Cobalt	mg/L	—	—	0.0009	<0.00050	<0.00005	0.000012	<0.000020	<0.000050	<0.000050	<0.00050	<0.00005	0.000026	0.000071	<0.000050	<0.00050	0.0001	0.00628	0.000305	<0.000050	0.00121	<0.00050	<0.00005	0.000059	0.000082	0.00006	0.000066	0.000151	0.000132	<0.00050	<0.00005	0.000027	<0.000050	<0.000050
Copper[d1]	mg/L	1	0.002-0.004	0.001-0.005	<0.0010	0.0005	0.0004	<0.00070	<0.00070	0.00074	<0.0010	0.0004	<0.00070	0.00122	0.00110	<0.0010	0.00075	***0.006***	0.00072	0.00101	<0.00070	<0.0010	0.0003	<0.00070	0.00071	<0.00070	<0.00070	<0.00070	<0.00070	<0.0010	0.0008	<0.00070	<0.00070	0.00099
Iron (total)	mg/L	0.3	0.3	0.3	0.078	0.064	0.054	0.0462	0.052	0.059	0.079	0.228	0.0626	0.294	0.02	***0.468***	0.204	***17.7***	***0.453***	0.088	***1.6***	0.3	0.284	0.158	0.197	0.167	0.159	***0.623***	***0.599***	0.237	0.212	0.156	0.2	0.227
Lead[d2]	mg/L	0.01	0.001-0.007	0.001-0.005	<0.0010	<0.00005	0.00002	<0.000060	<0.00010	<0.00010	<0.0010	0.0001	<0.000060	0.00011	<0.00010	<0.0010	0.00025	***0.00317***	<0.000060	<0.00010	<0.00010	<0.0010	0.00005	<0.000060	<0.000060	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	0.00005	<0.000060	<0.00010	<0.00010
Manganese	mg/L	0.05	—	—	0.0091	0.008	0.00288	0.00702	0.0046	0.016	0.0092	0.043	0.0134	0.0774	0.00897	0.0755	0.031	2.05	0.146	0.00972	1.05	0.0149	0.03	0.0124	0.0162	0.0069	0.00634	0.071	0.0683	0.0105	0.01	0.00677	0.0146	0.0104
Mercury	mg/L	0.001	0.000026	0.0002	<0.00010	<0.000010	***0.00004***	<0.0000010	<0.0000010	<0.0000010	<0.00010	<0.0000010	<0.0000010	<0.0000010	<0.0000010	<0.00010	<0.0000010	<0.00001	<0.0000010	<0.00010	<0.0000010	<0.00001	<0.0000010	<0.0000010	<0.0000010	<0.0000010	<0.0000010	<0.0000010	<0.0000010	<0.00001	<0.0000010	<0.0000010	<0.0000010	<0.0000010
Molybdenum	mg/L	—	0.073	0.04	<0.0010	<0.0002	<0.00002	<0.000090	<0.00020	<0.00020	<0.0010	<0.0002	0.000201	0.00057	0.00072	<0.0010	0.0004	0.00188	0.000981	<0.00020	0.00096	<0.0010	<0.0002	<0.000090	0.000142	<0.00020	<0.00020	0.00068	0.00065	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020
Nickel[d3]	mg/L	—	0.025-0.15	0.025	<0.0020	<0.0001	<0.00002	<0.0010	<0.0010	<0.0010	<0.0020	<0.0001	<0.00002	<0.0010	<0.0010	<0.0020	<0.0001	<0.00002	<0.0010	<0.0020	<0.0001	<0.00002	<0.0001	<0.0010	<0.0010	<0.0020	<0.0020	<0.0010	<0.0010	<0.0020	<0.0001	<0.00002	<0.0020	<0.0020
Selenium	mg/L	0.01	0.001	0.1	<0.00040	0.0001	0.0004	<0.00020	<0.00050	<0.00050	<0.00040	0.0002	<0.0020	<0.00050	<0.00050	<0.00040	0.0005	<0.0020	<0.00050	<0.00040	0.0002	<0.0020	<0.00050	<0.00040	0.0002	<0.0020	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00040	<0.0020	<0.00050	<0.00050
Silicon	mg/L	—	—	—	2	1.7	1.7			<1.0	0.4				5.6	4.3	4.8				6.2	4.2								3	2.7			
Silver	mg/L	—	0.0001	0.0001	<0.00010	<0.0002	<0.000002	<0.0000070	<0.000050	<0.000050	<0.00010	<0.0002	<0.0000070	<0.000050	<0.000050	<0.00010	<0.0002	<0.0000070	<0.000050	<0.000050	<0.000050	<0.00010	<0.0002	<0.0000070	0.000009	<0.000050	<0.000050	<0.000050	<0.000050	<0.00010	<0.0002	<0.0000070	<0.000050	<0.000050
Strontium	mg/L	—	—	—	0.013	0.0139	0.0123	0.0129	0.0115	0.0118	0.019	0.0243	0.0236	0.032	0.0311	0.0578	0.0506	0.106	0.0744	0.0396	0.13	0.0246	0.0197	0.0156	0.0203	0.0141	0.0138	0.0422	0.0394	0.0136	0.0144	0.012	0.0131	0.0116
Thallium	mg/L	—	0.0008	0.0003	<0.000030	<0.00002	<0.000001	<0.0000040	<0.0000030	<0.0000030	<0.00030	<0.00002	<0.0000040	<0.0000030	<0.0000030	<0.00030	0.0002	0.0000227	<0.0000040	<0.0000030	<0.0000030	<0.00030	<0.00002	<0.0000040	<0.0000040	<0.0000030	<0.0000030	<0.0000030	<0.0000030	<0.00030	<0.00002	<0.0000040	<0.0000030	<0.0000030
Tin	mg/L	—	—	—	<0.0010	<0.001	<0.00005	<0.000040	<0.00010	<0.00010	<0.0010	<0.001	<0.00005	<0.00010	<0.00010	<0.0010	<0.001	<0.00005	<0.00010	<0.00010	<0.00010	<0.0010	<0.001	<0.00005	0.000055	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.001	<0.00010	<0.00010	<0.00010
Titanium	mg/L	—	—	—	<0.0020	<0.002	<0.0001	<0.00050	<0.00050	<0.00050	<0.0020	<0.002	<0.00050	<0.00050	<0.00050	<0.0020	<0.002	<0.0001	<0.00050	<0.00050	<0.00050	<0.0020	<0.002	<0.00050	<0.00050	0.00055	0.00053	0.00058	<0.00050	<0.0020	<0.002	<0.00050	0.00061	0.0005
Tungsten	mg/L	—	—	—	<0.010	<0.01	<0.000002	0.000025	<0.00010	<0.00010	<0.010	<0.01	0.000472	0.00118	0.0021	<0.010	<0.01	<0.000002	<0.000010	<0.00010	<0.00010	<0.010	<0.01	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010	<0.010	<0.01	<0.000010	<0.00010	<0.00010
Uranium	mg/L	—	—	—	<0.0050	<0.005	0.000024	0.0000243	0.000026	0.00002	<0.0050	<0.005	0.0000298	0.000044	0.000045	<0.0050	<0.005	0.000186	0.0000863	0.000019	0.000059	<0.0050	<0.005	0.0000541	0.0000532	0.00005	0.000047	0.000078	0.000078	<0.0050	<0.005	0.0000254	0.000029	0.000025
Vanadium	mg/L	—	—	—	<0.0010	0.00005	<0.000005	<0.00010	<0.00020	<0.00020	<0.0010	<0.00005	<0.00010	<0.00020	<0.00020	<0.0010	<0.00005	0.00005	<0.00010	<0.00020	<0.00020	<0.0010	0.00015	0.00017	0.00019	<0.00020	<0.00020	0.00042	0.00038	<0.0010	0.0003	0.00018	<0.00020	0.00039
Zinc	mg/L	—	—	—	0.0047	0.0006	0.0008	0.0078	0.0059	0.0031	<0.0030	0.0092	0.0024	0.0058	0.0062	0.0035	0.002	0.0022	0.0024	0.0042	<0.0020	0.0047	0.0008	<0.0020	<0.0020	<0.0020	0.0058	0.0073	0.0076	<0.0030	0.001	0.0038	0.0054	0.0027
Zirconium	mg/L	—	—	—	<0.0040	<0.004	0.000066	0.000084	<0.00010	<0.00010	<0.0040	<0.004	0.000039	<0.00010	<0.00010	<0.0040	<0.004	0.000032	0.000057	<0.00010	<0.00010	<0.0040	<0.004	0.0000777	0.000076	<0.00010	0.0001	0.0001	<0.00010	<0.0040	<0.004	0.000075	0.00011	<0.00010

Notes:

(a) See Appendix 1.I for detailed notes for water quality guidelines.

(b) CCME and PWQO receiving water quality guidelines for aluminum have been calculated based on pH. See Appendix 1.I for details.

(c) CCME and/or PWQO receiving water quality guidelines for these parameters have been calculated based on hardness. See Appendix 1.I for details.

1.0 Values highlighted in yellow greater than the Ontario Drinking Water Standards (ODWS), Ontario Regulation (O.Reg.) 169/03: Ontario Drinking Water Standards (ODWS) (Revised June 2006).

1.0 Values greater than the Canadian Council of Ministers of the Environment (CCME), Canadian Water Quality Guidelines for the Protection of Aquatic Life, Update 7.1 (December 2007).

1.0 Values greater than the Provincial Water Quality Objectives (PWQO), Ministry of Environment and Energy

Where cells are blank, data has been removed, or was not recorded due to field instrument error.

Where cells are blank, analysis was not performed during this time period. Some parameters were added to the sampling program later in the campaign, while others were removed from the sampling campaign due to non detection.

— = A dash indicates that guideline criteria are not available for this parameter.

"D" = A "D" next to the station name indicates that this is a duplicate sample.

TABLE 1
Surface Water Quality Results

Parameter	Unit	ODWS	CCME	PWQO	HRWQ-5D	HRWQ-6	HRWQ-6	HRWQ-6	HRWQ-6	HRWQ-6	HRWQ-7	HRWQ-7	HRWQ-7	HRWQ-7	HRWQ-7	HRWQ-8	HRWQ-8	HRWQ-8	HRWQ-8	HRWQ-8	HRWQ-9	HRWQ-9	HRWQ-9	HRWQ-9	HRWQ-9	HRWQ-10	HRWQ-10	HRWQ-10	HRWQ-10	HRWQ-10	HRWQ-11	HRWQ-11	HRWQ-11	HRWQ-11
		Receiving WQ Guidelines[a]			Aug-12	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Mar-11	Jun-11
Field Parameters																																		
Temperature	°C	—	—	±10	21.65	8.35	3.64	9.03	2.6	14.66	10.93	2.63	17.44	9.54	17.37	10.92	1.38	16.31	10.84	22.2	7.42	1.04	17.6	9.25	19.8	14.17	5.22	16.23	5.86	21.86	8.35	3.59	-0.11	16.17
pH	—	6.5–8.5	6.5-9	6.5-8.5	7.42	7.2	7.53	6.61	6.72	***6.43***	7.11	6.81	***6.25***	6.61	***6.32***	***6.46***	***6.31***	***6.4***	7.12	6.83	6.51	7.01	***6.49***	***6.36***	6.57	7.01	7.2	***6.22***	6.92	7.17	6.77	6.99	6.7	6.88
Conductivity	µS/cm	—	—	—		95		98	70		48		62	44		26		33	50		27		37	25		59		72	58		44	706	89	36
Dissolved Oxygen	mg/L	—	5.5-9.5	4-8	8.94	6.37	9.37	***5.47***		5.79	7.27	9.09	6.56		***1.27***	8.5	11.54	***5***		8.12	9.12	12.64	8.12		8.16	8.55	11.53	9.89		8.35	8.2	11.52	***3.82***	5.78
ORP	mV	—	—	—	75.4		146.6	253.2	88.7	99.5		92		130.6	1		121.8		106	80		117.7		117.7	92		106.4		115	69		105.1		115.6
Physical-Chemical																																		
pH	—	6.5–8.5	6.5-9	6.5-8.5	7.42	7.04	6.9	6.93	7.17	***6.43***	6.86	6.62	6.83	7.04	***6.32***	***6.03***	***6.01***	***5.93***	7.28	6.83	6.63	6.55	6.79	6.64	6.57	7.28	7.16	7.4	7.26	7.17	6.59	6.66	***6.41***	6.59
DOC	% wt	5	—	—	8	5.7	3.8	5.2	6.9	4.7	11.1	10.2	10.6	9.5	9.3	21.9	16.1	18.2	8.5	22.2	9.6	10.2	10.7	8.9	8.6	8.5	8.6	9.1	6.7	7.2	14.9	10.1	20.1	10.3
TOC	% wt	—	—	—	7.8	6.4	4.3	6.6	6.2	4.7	11.4	10.6	10.8	9.7	10.9	22.8	16.4	18.6	9	23.1	10.2	10.4	11.3	9.5	9.7	8.6	8.9	9.5	7.3	8	15.1	9.9	20.3	11.6
Acidity	mg/L	—	—	—	2			11.4	6	10.6			5	4	5.4			11.2	3.4	2			4	3.8	2			2.8	3.4	2			7	3
Alkalinity	mg($CaCO_3$)/L	30–500	—	-25%	16.3	46.8	46.7	48.6	34.1	67.6	22.4	18.8	21.9	18.8	29.2	8.2	8.8	8.3	21.4	18.8	11.9	11	11.7	8.8	11.5	26.6	27.1	25.5	25.5	28.8	19	15.9	29.8	15.1
Conductivity	µS/cm	—	—	—	46	96.9	96.2	101	85.4	138	49.3	43.3	49.4	50.9	64.1	26.7	23.3	25.8	55.9	46.6	28.8	28.5	30.1	30.3	28.7	60.8	61.2	58.5	65.5	64.2	45.7	36.8	77.8	37.5
Total Suspended Solids	mg/L	—	+5-25	—	2.7	<2.0	3.3	2.8	10.6	5.8	2.2	<2.0	<2.0	<2.0	31.4	<2.0	<2.0	2.4	6.7	2.9	2.5	<2.0	5	2.3	<2.0	<2.0	<2.0	<2.0	<2.0	3.3	5.1	4.5	93	3.4
Total Dissolved Solids	mg/L	500	—	—	63	79	73	77	46	103	74	50	45	50	106	93	68	58	50	126	32	32	40	35	60	49	81	45	29	72	86	55	5.2	53
Major Ions																																		
Calcium	mg/L	—	—	—	5.62	16.5	17.3	17.2	12.4	24.5	8.62	6.71	9.03	7.45	11.5	4.96	3.92	4.66	8.32	9.69	4.17	3.45	4.19	3.26	3.87	10.7	9.68	10.1	9.37	11.2	8.71	7.05	9.32	5.93
Chloride	mg/L	250	120	—	1.1	0.46	0.18	0.28	0.24	<0.10	0.45	0.26	0.18	0.13	0.15	0.42	0.25	0.12	0.14	<0.10	0.42	0.22	0.24	0.14	<0.10	0.42	0.32	0.28	0.16	0.22	0.42	0.14	0.59	0.24
Fluoride	mg/L	1.5	—	—	<0.030	<0.030	<0.030	0.055	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.032	0.038	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.033	<0.030
Magnesium	mg/L	—	—	—	1.26	1.71	1.73	1.72	1.31	2.3	0.99	0.82	0.991	0.785	1.12	0.76	0.59	0.73	0.768	1.34	0.79	0.73	0.842	0.711	0.719	1.01	0.88	0.925	0.83	0.915	0.88	0.68	1.73	0.665
Potassium	mg/L	—	—	—	0.429	<1.0	<1.0	0.253	0.229	<0.050	<1.0	<1.0	0.191	0.254	0.185	<1.0	<1.0	0.061	0.31	<0.050	<1.0	<1.0	0.34	0.421	0.142	<1.0	<1.0	0.34	0.33	0.261	<1.0	<1.0	1.66	0.033
Sodium	mg/L	200	—	—	1.34	1.02	1.11	1.08	0.957	1.19	0.73	0.68	0.648	0.654	0.747	0.58	0.55	0.598	0.616	0.576	0.75	0.77	0.784	0.775	0.785	0.73	0.66	0.62	0.631	0.678	0.64	0.6	1.19	0.569
Sulphate	mg/L	500	—	—	1.38	1.14	1.83	2.56	3.17	<0.30	0.62	1.1	1.23	1.4	0.37	<0.30	0.5	0.36	1.52	<0.30	1.1	1.31	1.32	1.41	0.91	1.82	1.98	2.05	1.73	1.67	<0.30	0.78	2.64	1.15
Carbonate (CO_3^{2-})	mg/L	—	—	—	<5.0				<5.0	<5.0				<5.0	<5.0				<5.0	<5.0				<5.0	<5.0				<5.0	<5.0				
Bicarbonate ($H(CO_3)^-$)	mg/L	—	—	—	16.3				41.7	67.6				23	29.2				26.2	18.8				10.8	11.5				31.1	28.8				
Hardness	mg($CaCO_3$)/L	80–100	—	—	17.9	49	50	50.1	38.3	67.1	25	21	27.7	23.5	33.1	15	14	13.4	25.8	31	14.1	13	15	11.7	13.7	31	30	26.7	30.1	33.5	26.9	20	33.8	19.7
Cyanide (free)	mg/L	0.2	0.005	0.005		<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050	<0.0050
Cyanide (total)	mg/L	—	—	—		<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020	<0.0020
Nutrients																																		
Nitrate-N	mg/L	10	13	—	0.031	0.033	<0.030	0.048	<0.030	<0.030	<0.030	0.052	<0.030	0.054	0.067	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.072	<0.030	0.098	<0.030	<0.030	0.036	<0.030	0.061	<0.030	<0.030	<0.030	<0.030	0.096
Nitrite-N	mg/L	1	0.06	—	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Ammonia-N	mg/L	—	—	—	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.036	<0.020	<0.020	0.073	<0.020	0.026	<0.020	<0.020	<0.020	0.023	0.045	<0.020	0.058	<0.020	<0.020	0.026	<0.020	<0.020	<0.020	0.022	0.023	0.257	0.027
Un-ionized ammonia	mg/L	—	0.019	0.02	2.32E-04	5.16E-05	7.53E-05	1.40E-05	1.07E-05	1.43E-05	5.13E-05	2.38E-05	1.17E-05	1.46E-05	4.97E-05	1.15E-05	4.91E-06	1.51E-05	5.22E-05	6.26E-05	1.13E-05	4.14E-05	2.05E-05	2.33E-05	2.90E-05	5.23E-05	5.22E-05	9.94E-06	2.22E-05	1.33E-04	2.11E-05	2.49E-05	1.05E-04	6.09E-05
ortho-Phosphate	mg/L	—	—	—	<0.0050				<0.0050	<0.0050				<0.0050	<0.0050				<0.0050	<0.0050				<0.0050	<0.0050				<0.0050	<0.0050				
Phosphorus	mg/L	—	—	0.02	0.0093	0.0064	0.0059	0.0172	0.0093	0.0065	0.0098	0.0125	0.0075	0.0065	0.0343	0.0067	0.0085	0.0123	0.013	0.0096	0.0088	0.0125	0.0178	0.0119	0.0114	0.0056	0.0069	0.0136	0.0074	0.0063	0.0097	0.0082	0.0637	0.0119
Organics																																		
Oil and Greases	mg/L	—	—	physically non detect		<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<2.0	<2.0
Phenols	mg/L	—	0.004	0.005	***0.0045***	<0.0010	0.0031	0.0019	<0.0010	0.0019	<0.0010	0.0017	0.0037	<0.0010	0.0026	<0.0010	0.0025	***0.0052***	<0.0010	0.0035	0.0013	0.0015	***0.0041***	0.001	0.0027	<0.0010	<0.0010	0.0036	<0.0010	0.0034	0.0013	0.0014	***0.0243***	0.002
Micro-organisms																																		
Escherichia coli	per 100mL	—	—	100		1	0	0			20	1	4			3	1	83			10	0	12			0	1	21			7	3	0	0
Total coliforms	per 100mL	—	—	—		190	70	47			650	460	520			920	> 2420	1100			2000	610	> 2420			160	36	410			2400	770	> 2420	2400
Total Metals																																		
Aluminum[b]	mg/L	0.1	0.005-0.1	0.015-0.075	0.048	0.02	0.026	***0.231***	0.0768	***0.0437***	0.052	0.053	***0.0309***	0.0504	***0.169***	***0.092***	***0.0785***	***0.074***	0.0672	0.0548	***0.126***	***0.144***	***0.117***	***0.164***	***0.12***	0.021	0.0175	***0.022***	0.0328	0.0249	0.082	0.0965	0.0732	0.0685
Antimony	mg/L	0.006	—	0.02	<0.00010	<0.0050	<0.0002	<0.000030	<0.00010	<0.00010	<0.0050	<0.0002	<0.000030	<0.00010	<0.00010	<0.0050	<0.0002	<0.000030	<0.00010	<0.00010	<0.00060	<0.0002	<0.000030	<0.00010	<0.00010	<0.0050	<0.0002	<0.000030	<0.00010	<0.00010	<0.00060	<0.0002	0.00032	<0.000030
Arsenic	mg/L	0.025	0.005	0.1	0.00039	<0.0010	0.0002	0.000274	0.00025	0.00031	<0.0010	0.00032	0.000394	0.00032	0.00163	<0.0010	0.00052	0.000583	0.00033	0.00122	<0.0010	0.00032	0.000424	0.00034	0.00038	<0.0010	0.0003	0.000295	0.00027	0.0004	<0.0010	0.00028	0.000466	0.000299
Barium	mg/L	1	—	—	0.00502	<0.010	<0.01	0.0074	0.00524	0.00736	<0.010	<0.01	0.00369	0.00422	0.0104	<0.010	<0.01	0.005	0.00421	0.00359	<0.010	<0.01	0.00378	0.00498	0.00401	<0.010	<0.01	0.00286	0.0042	0.004	<0.010	<0.01	0.0149	0.00573
Beryllium	mg/L	—	—	0.011-1.1	<0.000060	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060	<0.0010	<0.0001	<0.00001	<0.000040
Bismuth	mg/L	—	—	—	<0.00020	<0.0010	<0.001	<0.000020	<0.00020	<0.00020	<0.0010	<0.001	<0.000020	<0.00020	<0.00020	<0.0010	<0.001	<0.000020	<0.00020	<0.00020	<0.0010	<0.001	<0.000020	<0.00020	<0.00020	<0.0010	<0.001	<0.000020	<0.00020	<0.00020	<0.0010	<0.001	<0.000005	<0.000020
Boron	mg/L	5	1.5	0.2	0.0042	<0.050	0.002	0.00209	0.002	0.0027	<0.050	0.004	0.00215	0.0028	0.0033	<0.050	0.002	0.00286	0.0027	<0.0020	<0.050	0.004	0.00206	0.0025	0.0035	<0.050	0.004	0.00246	0.0027	0.0037	<0.050	<0.002	0.0054	0.0026
Cadmium[c]	mg/L	0.005	0.0000041-0.000042	0.0001-0.0005	<0.000010	<0.000090	<0.00002	<0.0000090	<0.000010	<0.000010	<0.000090	<0.00002	<0.0000090	<0.000010	0.000011	<0.000090	<0.00002	<0.0000090	<0.000010	***0.000017***	<0.000090	<0.00002	<0.0000090	<0.000010	<0.000010	<0.000090	<0.00002	<0.0000090	<0.000010	<0.000010	<0.000090	<0.00002	***0.000066***	<0.0000090
Chromium (total)	mg/L	0.05	0.009	0.009	<0.00050	<0.0010	<0.0001	<0.00090	<0.00050	<0.00050	<0.0010	0.0001	<0.00090	<0.00050	0.0005	<0.0010	0.0002	<0.00090	<0.00050	<0.00050	<0.0010	0.0002	<0.00090	<0.00050	<0.00050	<0.0010	0.0002	<0.00090	<0.00050	<0.00050	<0.0010	0.0001	0.0002	<0.00090
Cobalt	mg/L	—	—	0.0009	<0.000050	<0.00050	<0.00005	0.000174	0.000102	0.000067	<0.00050	<0.00005	0.000045	<0.000050	0.0014	<0.00050	<0.00005	0.000174	0.000057	0.000129	<0.00050	<0.00005	0.000184	0.000147	0.000134	<0.00050	<0.00005	<0.000020	<0.000050	<0.000050	<0.00050	0.0001	0.00185	0.000109
Copper[c]	mg/L	1	0.002-0.004	0.001-0.005	0.00094	<0.0010	0.0003	<0.00070	<0.00070	<0.00070	<0.0010	0.0003	<0.00070	<0.00070	<0.00070	<0.0010	0.00015	<0.00070	<0.00070	<0.00070	<0.0010	0.00055	<0.00070	0.00076	0.00071	<0.0010	0.00045	<0.00070	<0.00070	0.0007	<0.0010	0.00035	0.0012	0.0011
Iron (total)	mg/L	0.3	0.3	0.3	0.225	0.063	0.112	***0.352***	0.136	0.191	***0.555***	***0.444***	0.252	0.24	***4.73***	***0.833***	***0.542***	***0.563***	0.272	***1.64***	0.264	0.28	0.239	***0.315***	***0.31***	0.144	0.17	0.0662	0.183	0.065	***0.957***	***0.756***	***1.9***	***0.373***
Lead[c]	mg/L	0.01	0.001-0.007	0.001-0.005	<0.00010	<0.0010	<0.00005	0.00015	<0.00010	<0.00010	<0.0010	0.0001	0.000062	<0.00010	0.00018	<0.0010	0.00015	0.000179	<0.00010	0.00013	<0.0010	0.00005	0.00009	<0.00010	<0.00010	<0.0010	<0.00005	<0.000060	<0.00010	<0.00010	<0.0010	0.00005	0.00014	0.000099
Manganese	mg/L	0.05	—	—	0.0102	0.0192	0.091	0.0621	0.11	0.0602	0.019	0.036	0.0185	0.00316	0.621	0.0269	0.018	0.0376	0.0211	0.0377	0.0098	0.007	0.0132	0.0132	0.0139	0.0206	0.032	0.00503	0.0298	0.0294	0.0488	0.039	0.948	0.0204
Mercury	mg/L	0.001	0.000026	0.0002	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	<0.00001	<0.000010
Molybdenum	mg/L	—	0.073	0.04	<0.00020	<0.0010	0.0004	0.000169	<0.00020	0.00021	<0.0010	<0.0002	0.000101	<0.00020	0.00044	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	<0.0010	<0.0002	0.000109	<0.00020	<0.00020	<0.0010	<0.0002	<0.000090	<0.00020	0.0002	<0.0010	<0.0002	0.00052	<0.000090
Nickel[c]	mg/L	—	0.025-0.15	0.025	<0.0010	<0.0020	<0.0001	<0.0010	<0.0010	<0.0010	<0.0020	0.0001	<0.0010	<0.0010	<0.0010	<0.0020	0.0002	<0.0010	<0.0010	<0.0010	<0.0020	0.0002	<0.0010	<0.0010	<0.0010	<0.0020	<0.0001	<0.0010	<0.0010	<0.0010	<0.0020	0.0002	0.0004	<0.0010
Selenium	mg/L	0.01	0.001	0.1	<0.00050	<0.00040	<0.0001	<0.0020	<0.00050	<0.00050	<0.00040	0.0005	<0.0020	<0.00050	<0.00050	<0.00040	0.0005	<0.0020	<0.00050	<0.00050	<0.0050	0.0003	<0.0020	<0.00050	<0.00050	<0.00040	0.0004	<0.0020	<0.00050	<0.00050	<0.0050	<0.0001	<0.0002	<0.0020
Silicon	mg/L	—	—	—		3.6	2				3.9	3				6.1	3.5				1.78	2.1				2.8	2.2				4.93	4.4	2.5	
Silver	mg/L	—	0.0001	0.0001	<0.000050	<0.00010	<0.0002	<0.0000070	<0.000050	<0.000050	<0.00010	<0.0002	<0.0000070	<0.000050	<0.000050	<0.00010	<0.0002	0.0000134	<0.000050	<0.000050	<0.00010	<0.0002	<0.0000070	<0.000050	<0.000050	<0.00010	<0.0002	<0.0000070	<0.000050	<0.000050	<0.00010	<0.0002	<0.000002	<0.0000070
Strontium	mg/L	—	—	—	0.0118	0.0462	0.046	0.0445	0.0339	0.0702	0.0181	0.0139	0.0183	0.0157	0.0229	0.013	0.0096	0.00938	0.0128	0.0238	0.0111	0.0112	0.00882	0.0108	0.0106	0.0158	0.0151	0.0147	0.0141	0.015	0.0175	0.0149	0.0271	0.0131
Thallium	mg/L	—	0.0008	0.0003	<0.000030	<0.00030	<0.00002	<0.0000040	<0.000030	<0.000030	<0.00030	<0.00002	<0.0000040	<0.000030	<0.000030	<0.00030	<0.00002	<0.0000040	<0.000030	<0.000030	<0.00030	<0.00002	<0.0000040	<0.000030	<0.000030	<0.00030	<0.00002	<0.0000040	<0.000030	<0.000030	<0.00030	<0.00002	0.000008	<0.0000040
Tin	mg/L	—	—	—	<0.00010	<0.0010	<0.001	0.000041	<0.00010	<0.00010	<0.0010	<0.001	<0.000040	<0.00010	<0.00010	<0.0010	<0.001	<0.000040	<0.00010	<0.00010	<0.0010	<0.001	0.000041	<0.00010	<0.00010	<0.0010	<0.001	<0.000040	<0.00010	<0.00010	<0.0010	<0.001	0.000035	<0.000040
Titanium	mg/L	—	—	—	0.00093	<0.0020	<0.002	0.00685	0.00151	0.00078	<0.0020	<0.002	<0.00060	0.0007	0.00569	<0.0020	<0.002	0.00094	0.0012	0.00132	<0.0020	<0.002	0.00191	0.00179	0.00152	<0.0020	<0.002	<0.00060	<0.00050	<0.00050	<0.0020	0.002	0.0013	0.0009
Tungsten	mg/L	—	—	0.03	<0.00010	<0.010	<0.01	<0.000040	<0.00010	<0.00010	<0.010	<0.01	<0.000040	<0.00010	<0.00010	<0.010	<0.01	<0.000040	<0.00010	<0.00010	<0.010	<0.01	<0.000040	<0.00010	<0.00010	<0.010	<0.01	<0.000040	<0.00010	<0.00010	<0.010	<0.01	<0.000002	<0.000040
Uranium	mg/L	0.02	0.015	0.005	0.000031	<0.0050	<0.002	0.000156	0.000081	0.000061	<0.0050	<0.002	0.0000403	0.000041	0.000057	<0.0050	<0.002	<0.0000030	0.00002	0.00001	<0.0050	<0.002	0.0000266	0.000034	0.000033	<0.0050	<0.002	0.000015	0.000019	0.000022	<0.0050	<0.002	0.0000155	0.0000085
Vanadium	mg/L	—	—	0.006	0.00047	<0.0010	0.0001	0.000616	0.00022	<0.00020	<0.0010	0.00055	0.000103	<0.00020	0.00102	<0.0010	0.0001	0.000118	<0.00020	0.00035	<0.0010	0.00025	0.000221	0.0003	0.00038	<0.0010	0.00015	<0.000030	<0.00020	0.00021	<0.0010	0.0003	0.00065	0.000158
Zinc	mg/L	5	0.03	0.02	0.0021	<0.0030	0.0012	<0.0030	<0.0020	<0.0020	<0.0030	0.002	<0.0030	<0.0020	0.002	<0.0030	0.002	<0.0030	<0.0020	0.0026	<0.0030	0.0018	<0.0030	<0.0020	0.0022	<0.0030	0.001	<0.0030	<0.0020	<0.0020	<0.0030	0.002	0.0155	<0.0030
Zirconium	mg/L	—	—	0.004	<0.00010	<0.0040	<0.004	<0.00020	0.0001	<0.00010	<0.0040	<0.004	<0.00020	<0.00010	0.00011	<0.0040	<0.004	<0.00020	<0.00010	<0.00010	<0.0010	<0.004	<0.00020	0.00013	0.00011	<0.0040	<0.004	<0.00020	<0.00010	<0.00010	<0.0010	<0.004	0.0001	<0.00020
Dissolved Metals																																		
Aluminum	mg/L	—	—	—	0.0368	0.016	0.0115	0.0176	0.031	0.0224	0.044	0.047	0.035	0.046	0.0517	0.08	0.086	0.0904	0.035	0.046	0.122	0.149	0.107	0.133	0.0968	0.012	0.011	0.0245	0.0263	0.0218	0.06	0.0525	0.0742	0.0595
Antimony	mg/L	—	—	—	<0.00010	<0.0050	<0.0002	<0.00020	<0.00010	<0.00010	<0.0050	<0.0002	<0.00020	<0.00010	<0.00010	<0.0050	<0.0002	<0.00020	<0.00010	<0.00010	<0.00060	<0.0002	<0.00020	<0.00010	<0.00010	<0.0050	<0.0002	<0.00020	<0.00010	<0.00010	<0.00060	<0.0002	0.00013	<0.00020
Arsenic	mg/L	—	—	—	0.00036	<0.0010	0.00018	0.000149	0.0002	0.00026	<0.0010	0.00032	0.000391	0.0003	0.00135	<0.0010	0.00054	0.00068	0.00031	0.00112	<0.0010	0.00034	0.000371	0.00032	0.00036	<0.0010	0.00032	0.000273	0.00027	0.00037	<0.0010	0.00028	0.00053	0.000327
Barium	mg/L	—	—	—	0.00469	<0.010	<0.01	0.00552	0.00332	0.00722	<0.010	<0.01	0.00435	0.00423	0.00923	<0.010	<0.01	0.0049	0.00359	0.00341	<0.010	<0.01	0.00449	0.00448	0.00373	<0.010	<0.01	0.00333	0.00388	0.00412	<0.010	<0.01	0.0166	0.00534
Beryllium	mg/L	—	—	—	<0.000060	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.00001	<0.000060
Bismuth	mg/L	—	—	—	<0.00020	<0.0010	<0.001	<0.00010	<0.00020	<0.00020	<0.0010	<0.001	<0.00010	<0.00020	<0.00020	<0.0010	<0.001	<0.00010	<0.00020	<0.00020	<0.0010	<0.001	<0.00010	<0.00020	<0.00020	<0.0010	<0.001	<0.00010	<0.00020	<0.00020	<0.0010	<0.001	<0.000001	<0.00010
Boron	mg/L	—	—	—	0.0034	<0.050	<0.002	0.0013	0.0023	0.0023	<0.050	0.002	0.0028	0.0033	0.0032	<0.050	0.002	0.0035	0.0034	<0.0020	<0.050	0.004	0.003	0.0031	0.003	<0.050	0.004	0.0038	0.0034	0.0033	<0.050	<0.002	0.006	0.0019
Cadmium	mg/L	—	—	—	<0.000010	<0.00010	0.00006	<0.000030	<0.000010	0.000011	<0.00010	<0.00002	<0.000030	0.000011	0.000013	<0.00010	<0.00002	<0.000030	0.000019	<0.000010	<0.000090	<0.00002	<0.000030	<0.000010	<0.000010	<0.00010	<0.00002	<0.000030	<0.000010	0.00002	<0.000090	<0.00002	0.000035	<0.000030
Chromium	mg/L	—	—	—	<0.00050	<0.0010	0.0001	<0.00020	<0.00050	<0.00050	<0.0010	0.0001	<0.00020	<0.00050	<0.00050	<0.0010	0.0003	0.00028	<0.00050	<0.00050	<0.0010	0.0005	0.00023	<0.00050	<0.00050	<0.0010	0.0003	<0.00020	<0.00050	<0.00050	<0.0010	<0.0001	<0.00002	0.00021
Cobalt	mg/L	—	—	—	<0.000050	<0.00050	<0.00005	<0.000030	<0.000050	0.000062	<0.00050	0.0001	0.000068	<0.000050	0.00133	<0.00050	0.00015	0.000226	<0.000050	0.000098	<0.00050	0.00005	0.000202	0.00013	0.00011	<0.00050	<0.00005	<0.000030	<0.000050	<0.000050	<0.00050	<0.00005	0.00218	0.000113
Copper	mg/L	—	—	—	0.00076	<0.0010	0.0012	<0.00040	<0.00070	<0.00070	0.0011	0.00075	0.00059	0.00084	0.00081	<0.0010	0.00155	0.00114	0.00087	<0.00070	<0.0010	0.00465	0.00163	<0.00070	<0.00070	0.0015	0.00165	0.00061	0.00071	0.00088	<0.0010	0.0003	0.0004	<0.00040
Iron	mg/L	—	—	—	0.16	<0.050	0.004	0.0104	<0.010	0.082	0.369	0.36	0.169	0.164	3.15	0.674	0.482	0.494	0.117	1.18	0.176	0.226	0.132	0.193	0.161	<0.050	0.074	0.0253	0.069	<0.010	0.596	0.372	2.2	0.272
Lead	mg/L	—	—	—	<0.00010	<0.0010	0.00005	<0.00010	<0.00010	<0.00010	<0.0010	<0.00005	<0.00010	<0.00010	<0.00010	<0.0010	0.00015	0.00017	<0.00010	0.00011	<0.0010	0.00005	<0.00010	<0.00010	<0.00010	<0.0010	<0.00005	<0.00010	<0.00010	<0.00010	<0.0010	<0.00005	0.00006	<0.00010
Manganese	mg/L	—	—	—	0.00274	0.0169	0.003	0.00301	<0.00050	0.0517	0.0166	0.059	0.0166	0.00289	0.58	0.0235	0.017	0.0379	0.0155	0.02	0.0075	0.006	0.0137	0.0119	0.0126	0.0028	0.01	0.0017	0.0228	0.00501	0.0423	0.018	1.05	0.0192
Mercury	mg/L	—	—	—	<0.000010	<0.00010	<0.000020	<0.000020	<0.000010	<0.000010	<0.00010	<0.000020	<0.000020	<0.000010	<0.000010	<0.00010	<0.000020	<0.000020	<0.000010	<0.000010	<0.00010	<0.000020	<0.000020	<0.000010	<0.000010	<0.00010	<0.000020	<0.000020	<0.000010	<0.000010	<0.00010	<0.000020	<0.00001	<0.000020
Molybdenum	mg/L	—	—	—	<0.00020	<0.0010	0.0002	0.000124	0.00022	<0.00020	<0.0010	<0.0002	0.000112	0.00023	0.00037	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	<0.0010	<0.0002	0.000099	<0.00020	<0.00020	<0.0010	<0.0002	<0.000090	<0.00020	0.00021	<0.0010	<0.0002	0.000504	<0.000090
Nickel	mg/L	—	—	—	<0.0010	<0.0020	0.0003	<0.00020	<0.0010	<0.0010	<0.0020	<0.0001	<0.00020	<0.0010	<0.0010	<0.0020	0.0015	0.00077	<0.0010	<0.0010	<0.0020	0.0018	0.0008	<0.0010	<0.0010	<0.0020	0.0007	<0.00020	<0.0010	<0.0010	<0.0020	<0.0001	0.00045	0.00024
Selenium	mg/L	—	—	—	<0.00050	<0.0050	0.0003	<0.0010	<0.00050	<0.00050	<0.0050	<0.0001	<0.0010	<0.00050	<0.00050	<0.0050	<0.0001	<0.0010	<0.00050	<0.00050	<0.0020	<0.0001	<0.0010	<0.00050	<0.00050	<0.0050	<0.0001	<0.0010	<0.00050	<0.00050	<0.0020	0.0002	0.0014	<0.0010
Silicon	mg/L	—	—	—		3.37	2				3.58	2.7				5.82	3.4				1.86	2.1				1.76	2				4.99	4.4	2.5	
Silver	mg/L	—	—	—	<0.000050	<0.00010	<0.0002	<0.000010	<0.000050	<0.000050	<0.00010	<0.0002	<0.000010	<0.000050	<0.000050	<0.00010	<0.0002	<0.000010	<0.000050	<0.000050	<0.00010	<0.0002	<0.000010	<0.000050	<0.000050	<0.00010	<0.0002	<0.000010	<0.000050	<0.000050	<0.00010	<0.0002	<0.000001	<0.000010
Strontium	mg/L	—	—	—	0.0113	0.0457	0.0463	0.0442	0.0312	0.0603	0.0178	0.0135	0.0175	0.0145	0.0228	0.0123	0.0094	0.0105	0.0122	0.0239	0.0108	0.011	0.0107	0.00938	0.0109	0.0154	0.0149	0.0132	0.0135	0.0159	0.0177	0.0148	0.0311	0.0149
Thallium	mg/L	—	—	—	<0.000030	<0.00030	0.00004	<0.000010	<0.000030	<0.000030	<0.00030	<0.00002	<0.000010	<0.000030	<0.000030	<0.00030	<0.00002	<0.000010	<0.000030	<0.000030	<0.00030	<0.00002	<0.000010	<0.000030	<0.000030	<0.00030	<0.00002	<0.000010	<0.000030	<0.000030	<0.00030	<0.00002	0.000002	<0.000010
Tin	mg/L	—	—	—	<0.00010	<0.0010	<0.001	<0.00010	<0.00010	<0.00010	<0.0010	<0.001	<0.00010	<0.00010	<0.00010	<0.0010	<0.001	<0.00010	<0.00010	<0.00010	<0.0010	<0.001	<0.00010	<0.00010	<0.00010	<0.0010	<0.001	<0.00010	<0.00010	<0.00010	<0.0010	<0.001	<0.000002	<0.00010
Titanium	mg/L	—	—	—	<0.00050	<0.0020	<0.002	<0.00050	<0.00050	<0.00050	<0.0020	<0.002	<0.00050	0.00053	0.00068	<0.0020	<0.002	0.00114	<0.00050	0.00087	<0.0020	<0.002	0.001	0.00111	0.00091	<0.0020	<0.002	<0.00050	<0.00050	<0.00050	<0.0020	<0.002	0.0011	<0.00050
Tungsten	mg/L	—	—	—	<0.00010	<0.010	<0.01	<0.000010	<0.00010	<0.00010	<0.010	<0.01	<0.000010	<0.00010	<0.00010	<0.010	<0.01	<0.000010	<0.00010	<0.00010	<0.010	<0.01	0.000011	<0.00010	<0.00010	<0.010	<0.01	<0.000010	<0.00010	<0.00010	<0.010	<0.01	<0.000002	<0.000010
Uranium	mg/L	—	—	—	0.000026	<0.0050	<0.005	0.0000337	0.000042	0.000042	<0.0050	<0.005	0.0000313	0.000036	0.000027	<0.0050	<0.005	<0.0000030	0.000014	<0.000010	<0.0050	<0.005	0.0000262	0.000027	0.000028	<0.0050	<0.005	0.0000163	0.000018	0.000018	<0.0050	<0.005	0.0000195	0.0000086
Vanadium	mg/L	—	—	—	0.00039	<0.0010	0.0001	<0.00010	<0.00020	0.00021	<0.0010	0.00055	0.00024	<0.00020	0.00057	<0.0010	0.00035	0.00024	<0.00020	0.0003	<0.0010	0.0004	0.00031	0.00024	0.00031	<0.0010	0.0003	0.00011	<0.00020	<0.00020	<0.0010	0.00015	0.00075	<0.00010
Zinc	mg/L	—	—	—	<0.0020	0.0075	0.0052	<0.0020	<0.0020	0.0077	0.0038	0.002	<0.0020	0.0072	0.0182	0.0061	0.022	0.0058	0.009	0.0076	0.0042	0.0072	0.0051	0.0031	0.0045	0.0097	0.0044	<0.0020	0.0052	0.0055	0.0042	0.001	0.017	0.0057
Zirconium	mg/L	—	—	—	<0.00010	<0.0040	<0.004	0.000037	<0.00010	<0.00010	<0.0040	<0.004	0.000065	0.0004	<0.00010	<0.0040	<0.004	0.000059	<0.00010	0.00013	<0.0010	<0.004	0.000119	0.00013	0.00011	<0.0040	<0.004	0.000046	<0.00010	<0.00010	<0.0010	<0.004	0.00011	0.000085

Notes:

(a) See Appendix 1.I for detailed notes for water quality guidelines.
(b) CCME and PWQO receiving water quality guidelines for aluminum have been calculated based on pH. See Appendix 1.I for details.
(c) CCME and/or PWQO receiving water quality guidelines for these parameters have been calculated based on hardness. See Appendix 1.I for details.
1.0 Values highlighted in yellow greater than the Ontario Drinking Water Standards (ODWS), Ontario Regulation (O.Reg.) 169/03: Ontario Drinking Water Standards (ODWS) (Revised June 2006).
1.0 Values greater than the Canadian Council of Ministers of the Environment (CCME), Canadian Water Quality Guidelines for the Protection of Aquatic Life, Update 7.1 (December 2007).
1.0 Values greater than the Provincial Water Quality Objectives (PWQO), Ministry of Environment and Energy
Where cells are blank, data has been removed, or was not recorded due to field instrument error.
Where cells are blank, analysis was not performed during this time period. Some parameters were added to the sampling program later in the campaign, while others were removed from the sampling campaign due to non detection.
— = A dash indicates that guideline criteria are not available for this parameter.
"D" = A "D" next to the station name indicates that this is a duplicate sample.

TABLE 1
Surface Water Quality Results

Parameter	Unit	ODWS	CCME	PWQO	HRWQ-11D	HRWQ-11	HRWQ-11	HRWQ-11B	HRWQ-11BD	HRWQ-12	HRWQ-12	HRWQ-12	HRWQ-12	HRWQ-13	HRWQ-13	HRWQ-13	HRWQ-13	HRWQ-13	HRWQ-14	HRWQ-14	HRWQ-14	HRWQ-14	HRWQ-14	HRWQ-15	HRWQ-15D	HRWQ-15	HRWQ-15	HRWQ-15	HRWQ-15D	HRWQ-15	HRWQ-16	HRWQ-16	HRWQ-16	HRWQ-16
			Receiving WQ Guidelines[a]		Jun-11	Apr-12	Aug-12	Sep-10	Sep-10	Sep-10	Nov-10	Mar-11	Jun-11	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Sep-10	Nov-10	Jun-11	Apr-12	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Apr-12
Field Parameters																																		
Temperature	°C	—	—	±10	16.17	7.43	20.94	8.71	8.71	13.8	6.34	0.6	15.86	15.07	6.51	18.6	4.54	20.14	10.48	1.86	17.02	5.26	13.45	15.02	15.02	7.04	19.54	4.79	4.79	20.88	14.87	6.78	19.66	5.49
pH	—	6.5–8.5	6.5-9	6.5-8.5	6.88	***6.36***	***6.34***	***6.27***	***6.27***	6.94	7.3	7.19	7.6	***6.07***	7.27	6.96	6.79	7.22	***6.3***	7.19	7.14	6.79	***6.31***	6.63	6.63	7.26	6.98	6.82	6.82	7.06	6.63	7.29	6.88	6.89
Conductivity	µS/cm	—	—	—	36	29		50	50	40		45	39	46		53	47		65		87	51		47	47		51	42	42		47		51	41
Dissolved Oxygen	mg/L	—	5.5-9.5	4-8	5.78		***1.9***	5.99	5.99	8.94	11.33	11.01	7.3	8.87	11.4	10.53		8.26	9.74	13.45	8		5.85	9.13	9.13	11.48	9.41			7.69	8.84	11.45	9.48	
ORP	mV	—	—	—	115.6	108.1	26				140.4		124.9		128		100.6	51.4		108.7		199	158.1			112.6		169.9	169.9	87.7		108.3		153.3
Physical-Chemical																																		
pH	—	6.5–8.5	6.5-9	6.5-8.5	6.65	6.78	***6.34***	6.87	6.77	7.06	6.87	6.97	7.17	7.28	6.99	7.13	6.98	7.22	7.29	7.15	7.02	7.36	***6.31***	7.2	7.21	6.96	7.02	7.13	7.12	7.06	7.2	6.94	7.18	7.13
DOC	% wt	5	—	—	11.3	9.7	18.7	14	13.6	9.8	8.8	10.1	8.7	8.2	8.1	10.2	8.6	7.7	11.8	8	8.4	9.9	5.1	8.3	8.2	8.9	10.3	8.8	8.8	6.9	8.5	8.9	9.3	8.8
TOC	% wt	—	—	—	11.8	10.3	19.2	14.7	14.6	9.9	8.9	11.2	9.1	11.4	8	11.3	8.7	8.4	12.7	7.9	8.8	9.4	6.2	8.2	8.3	9.1	10.7	8.6	9.4	8.3	9	9.3	11.1	10
Acidity	mg/L	—	—	—	3.2	3.6	10.4					2.2	2.4			2.6	2.2	2			2.2	2.4	2.6				2.8	3.4	3.2	2			2.8	3.4
Alkalinity	mg(CaCO3)/L	30–500	—	-25%	15.9	10.9	47.9	22	21.1	16.7	18.2	17.6	15.3	18.9	17.6	15	18.4	16.3	29.8	28	28.5	20.9	39.7	18	17.7	19	14.2	15.4	16.3	17.4	17.8	19	14.5	15.9
Conductivity	µS/cm	—	—	—	37.9	34.2	98.1	50.7	50.1	41.7	43	44.4	39.6	48.1	49	42.7	53.8	45	67	66.5	71.2	59	83.5	49.1	48.5	50.8	41.2	50.1	50.1	46.2	48.9	50.1	41	50.1
Total Suspended Solids	mg/L	—	+5-25	—	2.9	<2.0	2.6	5.4	2.1	2.1	<2.0	60	2.1	3.1	2.6	2.2	<2.0	2.1	2.4	<2.0	<2.0	<2.0	<2.0	2.3	<2.0	<2.0	<2.0	<2.0	<2.0	2.4	2.5	<2.0	<2.0	3.5
Total Dissolved Solids	mg/L	500	—	—	52	41	148	74	72	63	50	<2.0	55	55	37	64	39	45	77	64	62	39	107	57	52	54	58	36	38	70	59	55	65	53
Major Ions																																		
Calcium	mg/L	—	—	—	5.75	5.16	18.7	9.27	9.2	7	7.44	5.77	4.6	6.18	5.79	5.32	5.96	6.25	12.5	11.2	10.3	9.93	15.1	5.97	5.96	6.8	5.63	5.5	5.31	5.76	6.12	6.73	4.35	4.84
Chloride	mg/L	250	120	—	0.3	<0.10	0.1	0.39	0.37	0.39	0.3	0.1	<0.10	1.17	1.52	1.3	1.46	1.18	0.38	0.33	<0.10	0.19	0.14	1.4	1.41	1.44	1.31	1.63	1.63	1.13	1.41	1.67	1.09	1.62
Fluoride	mg/L	1.5	—	—	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.03	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.037	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Magnesium	mg/L	—	—	—	0.645	0.635	1.73	1.05	1.04	0.78	0.79	0.769	0.6	1.5	1.43	1.3	1.53	1.65	1.11	1.02	1.04	0.842	1.18	1.49	1.49	1.53	1.41	1.37	1.29	1.4	1.54	1.49	1.07	1.19
Potassium	mg/L	—	—	—	0.035	0.134	0.456	<1.0	<1.0	<1.0	<1.0	0.294	0.213	<1.0	<1.0	0.442	0.514	0.361	<1.0	<1.0	0.246	0.247	0.052	<1.0	<1.0	<1.0	0.501	0.516	0.509	0.465	<1.0	<1.0	0.359	0.466
Sodium	mg/L	200	—	—	0.538	0.583	0.733	0.72	0.72	0.72	0.76	0.697	0.467	1.45	1.54	1.38	1.59	1.53	0.81	0.81	0.806	0.735	0.837	1.55	1.54	1.69	1.68	1.63	1.54	1.37	1.59	1.63	1.16	1.39
Sulphate	mg/L	500	—	—	1.11	1.7	<0.30	0.48	0.5	2.13	1.96	2.31	2.42	1.57	1.76	1.85	1.53	1.42	1.14	2.25	2.38	3.24	0.84	1.52	1.51	0.98	2.03	1.42	1.41	1.33	1.51	1.43	1.71	1.45
Carbonate (CO_3^{2-})	mg/L	—	—	—		<5.0	<5.0										<5.0	<5.0				<5.0	<5.0					<5.0	<5.0	<5.0				<5.0
Bicarbonate ($H(CO_3)^-$)	mg/L	—	—	—		13.3	47.9										22.5	16.3				25.5	39.7					18.8	19.9	17.4				19.4
Hardness	mg(CaCO3)/L	80–100	—	—		15.5	56.5	26.9		21.1	22	21.3	15.9	22	23	17.1	21.3	18.9	36	36	38	26	41.8	21	21	23	19.6	18.5	19	20.2	22	23	17.9	18.7
Cyanide (free)	mg/L	0.2	0.005	0.005	<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050	<0.0050				<0.0050	<0.0050	<0.0050	
Cyanide (total)	mg/L	—	—	—	<0.0020			<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020	<0.0020				<0.0020	<0.0020	<0.0020	
Nutrients																																		
Nitrate-N	mg/L	10	13	—	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.03	<0.030	<0.030	0.06	0.176	0.099	0.052	<0.030	0.037	0.148	<0.030	<0.030	<0.030	<0.030	<0.030	0.115	0.126	0.125	0.052	<0.030	<0.030	0.063	0.128
Nitrite-N	mg/L	1	0.06	—	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Ammonia-N	mg/L	—	—	—	<0.020	<0.020	0.04	<0.020	<0.020	<0.020	0.027	0.021	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.029	0.02	<0.020	<0.020	0.066	<0.020	0.033	<0.020	<0.020
Un-ionized ammonia	mg/L	—	0.019	0.02	4.51E-05	6.94E-06	3.71E-05	6.25E-06	6.25E-06	4.33E-05	7.46E-05	2.82E-05	2.29E-04	6.45E-06	5.23E-05	6.50E-05	1.48E-05	1.32E-04	7.69E-06	2.98E-05	8.74E-05	1.57E-05	9.90E-06	2.33E-05	2.33E-05	7.73E-05	7.29E-05	1.62E-05	1.62E-05	3.18E-04	2.30E-05	9.23E-05	5.84E-05	2.01E-05
ortho-Phosphate	mg/L	—	—	—		<0.0050	0.0082										<0.0050	<0.0050				<0.0050	<0.0050					<0.0050	<0.0050	<0.0050				<0.0050
Phosphorus	mg/L	—	—	0.02	0.0094	0.0071	0.0558	0.0179	0.0148	0.007	0.0069	0.0058	0.0116	0.0092	0.0103	0.0164	0.0089	0.0105	0.0077	0.0069	0.0119	0.0058	<0.0050	0.0105	0.0213	0.0098	0.0204	0.0122	0.0124	0.011	0.008	0.0106	0.0143	0.0109
Organics																																		
Oil and Greases	mg/L	—	—	physically non detect	<2.0	<6.0		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<2.0	<2.0	<4.0	<4.0		<2.0	<2.0		<4.0
Phenols	mg/L	—	0.004	0.005	0.0017	<0.0010	0.0033	0.0037	0.0022	<0.0010	0.0012	***0.0112***	0.0021	0.0011	***0.007***	0.004	<0.0010	0.0029	<0.0010	0.002	0.002	<0.0010	<0.0010	<0.0010	<0.0010	0.0016	***0.007***	<0.0010	<0.0010	0.0011	<0.0010	0.0016	0.0037	<0.0010
Micro-organisms																																		
Escherichia coli	per 100mL	—	—	100	0			8	9	0	0	0	8	0	0	3			5	0	3			0	0	0	2				0	0	3	
Total coliforms	per 100mL	—	—	—	2000			1700	2400	310	100	0	140	66	23	2400			650	140	460			330	210	52	96				140	19	34	
Total Metals																																		
Aluminum[b]	mg/L	0.1	0.005-0.1	0.015-0.075	0.0649	***0.0619***	***0.0642***	***0.106***	***0.135***	0.037	0.0485	0.0236	0.0301	***0.033***	0.035	0.0575	0.0378	0.0413	***0.084***	0.054	0.0328	0.0778	***0.047***	0.039	0.042	0.0435	0.0473	0.0531	0.0552	0.0554	0.043	0.0455	0.0471	0.0455
Antimony	mg/L	0.006	—	0.02	<0.000030	<0.00010	<0.00010	<0.0050	<0.0050	<0.00060	<0.0002	0.00002	<0.000030	<0.0050	<0.0002	0.000039	<0.00010	<0.00010	<0.0050	<0.0002	0.000036	<0.00010	<0.00010	<0.0050	<0.0050	<0.0002	<0.000030	<0.00010	<0.00010	<0.00010	<0.0050	<0.0002	<0.000030	<0.00010
Arsenic	mg/L	0.025	0.005	0.1	0.000261	0.00029	0.00117	<0.0010	<0.0010	<0.0010	0.00034	0.000282	0.000239	<0.0010	0.0003	0.000287	0.00032	0.00032	<0.0010	0.00032	0.000339	0.00037	0.00038	<0.0010	<0.0010	0.0004	0.000254	0.0003	0.0003	0.00048	<0.0010	0.0004	0.000243	0.00026
Barium	mg/L	1	—	—	0.00582	0.00391	0.0158	<0.010	<0.010	<0.010	<0.01	0.00265	0.00189	<0.010	<0.01	0.00474	0.00453	0.00429	<0.010	<0.01	0.00562	0.00419	0.00917	<0.010	<0.010	<0.01	0.00526	0.00473	0.00472	0.00583	<0.010	<0.01	0.00412	0.0043
Beryllium	mg/L	—	—	0.011-1.1	<0.000040	<0.000060	<0.000060	<0.0010	<0.0010	<0.0010	<0.0001	<0.00001	<0.000040	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060	<0.0010	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.000040	<0.000060
Bismuth	mg/L	—	—	—	<0.000020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.001	<0.000005	<0.000020	<0.0010	<0.001	<0.000020	<0.00020	<0.00020	<0.0010	<0.001	<0.000020	<0.00020	<0.00020	<0.0010	<0.0010	<0.001	<0.000020	<0.00020	<0.00020	<0.00020	<0.0010	<0.001	<0.000020	<0.00020
Boron	mg/L	5	1.5	0.2	0.00253	<0.0020	0.0028	<0.050	<0.050	<0.050	0.004	0.003	0.00221	<0.050	0.008	0.0032	0.0044	0.0028	<0.050	0.006	0.00318	0.004	0.0034	<0.050	<0.050	0.004	0.00273	0.0044	0.0037	0.0042	<0.050	0.004	0.00267	0.0036
Cadmium[c]	mg/L	0.005	0.0000041-0.000042	0.0001-0.0005	<0.0000090	***0.000021***	<0.000010	<0.000090	<0.000090	<0.000090	<0.00002	<0.000002	<0.0000090	<0.000090	<0.00002	<0.0000090	<0.000010	<0.000010	<0.000090	<0.00002	<0.0000090	***0.000021***	<0.000010	<0.000090	<0.000090	<0.00002	<0.0000090	<0.000010	<0.000010	<0.000010	<0.000090	<0.00002	<0.0000090	***0.000017***
Chromium (total)	mg/L	0.05	0.009	0.009	<0.00090	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	<0.0001	<0.0002	<0.00090	<0.0010	0.0002	<0.00090	<0.00050	<0.00050	<0.0010	0.0001	<0.00090	<0.00050	<0.00050	<0.0010	<0.0010	0.0002	<0.00090	<0.00050	<0.00050	<0.00050	<0.0010	0.0002	<0.00090	<0.00050
Cobalt	mg/L	—	—	0.0009	0.000111	<0.000050	0.00166	<0.00050	<0.00050	<0.00050	<0.00005	0.000012	<0.000020	<0.00050	<0.00005	0.000038	<0.000050	<0.000050	<0.00050	<0.00005	0.000027	<0.000050	0.000141	<0.00050	<0.00050	<0.00005	0.000027	0.00007	0.000075	0.000061	<0.00050	<0.00005	0.000031	0.000066
Copper[c]	mg/L	1	0.002-0.004	0.001-0.005	<0.00070	0.00074	<0.00070	<0.0010	<0.0010	<0.0010	0.0007	0.0006	<0.00070	<0.0010	0.0007	0.00107	0.00077	0.00075	<0.0010	0.0003	0.00096	<0.00070	<0.00070	<0.0010	<0.0010	0.00075	<0.00070	0.00074	0.00077	0.00098	<0.0010	0.0008	<0.00070	<0.00070
Iron (total)	mg/L	0.3	0.3	0.3	***0.363***	0.215	***8.02***	***0.965***	***1.11***	0.103	0.244	0.104	0.0679	0.26	***0.44***	0.283	***0.42***	0.288	0.224	0.108	0.0272	0.052	0.121	***0.436***	***0.447***	***0.65***	0.234	***0.545***	***0.524***	***0.566***	***0.477***	***0.634***	0.223	***0.455***
Lead[c]	mg/L	0.01	0.001-0.007	0.001-0.005	<0.000060	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	0.00005	0.00002	<0.000060	<0.0010	0.00005	0.000095	<0.00010	<0.00010	<0.0010	<0.00005	0.000064	<0.00010	<0.00010	<0.0010	<0.0010	0.0001	<0.000060	0.00018	<0.00010	<0.00010	<0.0010	0.0001	0.000069	<0.00010
Manganese	mg/L	0.05	—	—	0.0203	0.00534	0.695	0.0657	0.0799	0.0484	0.119	0.00538	0.0197	0.0138	0.021	0.0108	0.0241	0.0297	0.0208	0.012	0.00537	<0.00050	0.0924	0.0192	0.0187	0.017	0.00573	0.0247	0.0234	0.175	0.0203	0.015	0.00576	0.0208
Mercury	mg/L	0.001	0.000026	0.0002	<0.000010	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.000010	<0.00001	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010
Molybdenum	mg/L	—	0.073	0.04	<0.000090	<0.00020	0.00033	<0.0010	<0.0010	<0.0010	0.0004	0.00042	0.000216	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	<0.0010	0.0002	0.000203	0.00025	0.00026	<0.0010	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	<0.00020	<0.0010	<0.0002	<0.000090	<0.00020
Nickel[c]	mg/L	—	0.025-0.15	0.025	0.002	<0.0010	<0.0010	<0.0020	<0.0020	<0.0020	<0.0001	0.0002	<0.0010	<0.0020	0.0002	<0.0010	<0.0010	<0.0010	<0.0020	<0.0001	<0.0010	<0.0010	<0.0010	<0.0020	<0.0020	0.0002	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020	0.0005	<0.0010	<0.0010
Selenium	mg/L	0.01	0.001	0.1	<0.0020	<0.00050	<0.00050	<0.00040	<0.00040	<0.0050	<0.0001	<0.0002	<0.0020	<0.00040	0.0003	<0.0020	<0.00050	<0.00050	<0.00040	0.0003	<0.0020	<0.00050	<0.00050	0.00045	<0.00040	0.0002	<0.0020	<0.00050	<0.00050	<0.00050	0.00045	0.0002	<0.0020	<0.00050
Silicon	mg/L	—	—	—				5.5	5.6	3.22	3.3	3.2		3.3	2.7				4	2.8				3.5	3.5	3.1					3.6	3.3		
Silver	mg/L	—	0.0001	0.0001	<0.0000070	<0.000050	<0.000050	<0.00010	<0.00010	<0.00010	<0.0002	<0.000002	<0.0000070	<0.00010	<0.0002	<0.0000070	<0.000050	<0.000050	<0.00010	<0.0002	<0.0000070	<0.000050	<0.000050	<0.00010	<0.00010	<0.0002	<0.0000070	<0.000050	<0.000050	<0.000050	<0.00010	<0.0002	<0.0000070	<0.000050
Strontium	mg/L	—	—	—	0.0125	0.0128	0.0436	0.0214	0.0216	0.013	0.0162	0.0127	0.0106	0.0139	0.0146	0.0107	0.0113	0.0129	0.031	0.0278	0.0259	0.0212	0.034	0.0137	0.0135	0.0148	0.00922	0.0103	0.0101	0.0121	0.014	0.0146	0.00856	0.0092
Thallium	mg/L	—	0.0008	0.0003	<0.0000040	<0.000030	<0.000030	<0.00030	<0.00030	<0.00030	<0.00002	<0.000001	<0.0000040	<0.00030	<0.00002	<0.0000040	<0.000030	<0.000030	<0.00030	<0.00002	<0.0000040	<0.000030	<0.000030	<0.00030	<0.00030	<0.00002	<0.0000040	<0.000030	<0.000030	<0.000030	<0.00030	<0.00002	<0.0000040	<0.000030
Tin	mg/L	—	—	—	<0.000040	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.001	<0.000005	<0.000040	<0.0010	<0.001	<0.000040	<0.00010	<0.00010	<0.0010	<0.001	<0.000040	<0.00010	<0.00010	<0.0010	<0.0010	<0.001	0.000157	<0.00010	<0.00010	<0.00010	<0.0010	<0.001	<0.000040	<0.00010
Titanium	mg/L	—	—	—	0.00092	0.00061	0.00138	<0.0020	0.0027	<0.0020	<0.002	0.0002	<0.00060	<0.0020	<0.002	0.00104	0.00089	0.00068	<0.0020	<0.002	<0.00060	0.00057	<0.00050	<0.0020	<0.0020	<0.002	0.00075	0.00104	0.00098	0.00111	<0.0020	<0.002	0.00067	0.00098
Tungsten	mg/L	—	—	0.03	<0.000040	<0.00010	<0.00010	<0.010	<0.010	<0.010	<0.01	<0.000002	<0.000040	<0.010	<0.01	<0.000040	<0.00010	<0.00010	<0.010	<0.01	<0.000040	<0.00010	<0.00010	<0.010	<0.010	<0.01	<0.000040	<0.00010	<0.00010	<0.00010	<0.010	<0.01	<0.000040	<0.00010
Uranium	mg/L	0.02	0.015	0.005	0.0000076	0.000011	0.000017	<0.0050	<0.0050	<0.0050	<0.002	0.0000375	0.0000436	<0.0050	<0.002	0.0000269	0.000022	0.00002	<0.0050	<0.002	0.000014	0.00002	0.000015	<0.0050	<0.0050	<0.002	0.0000236	0.000023	0.000022	0.00003	<0.0050	<0.002	0.0000203	0.000021
Vanadium	mg/L	—	—	0.006	0.00014	<0.00020	0.00082	<0.0010	<0.0010	<0.0010	0.00015	0.000085	0.000081	<0.0010	0.0005	0.000381	0.00045	0.00046	<0.0010	0.00015	0.000062	<0.00020	0.00035	<0.0010	<0.0010	0.0007	0.000327	0.00058	0.00055	0.00078	<0.0010	0.0007	0.000334	0.00048
Zinc	mg/L	5	0.03	0.02	<0.0030	0.0039	0.0051	<0.0030	0.0038	<0.0030	0.0016	<0.0005	<0.0030	<0.0030	0.0028	0.0128	0.007	<0.0020	<0.0030	0.0018	0.0061	<0.0020	<0.0020	<0.0030	<0.0030	0.0012	0.0054	<0.0020	<0.0020	0.0024	<0.0030	0.002	<0.0030	<0.0020
Zirconium	mg/L	—	—	0.004	<0.00020	<0.00010	0.00013	<0.0040	<0.0040	<0.0010	<0.004	0.0001	<0.00020	<0.0040	<0.004	<0.00020	<0.00010	<0.00010	<0.0040	<0.004	<0.00020	0.00014	0.00011	<0.0040	<0.0040	<0.004	<0.00020	<0.00010	<0.00010	0.00011	<0.0040	<0.004	<0.00020	<0.00010
Dissolved Metals																																		
Aluminum	mg/L	—	—	—	0.0606	0.0545	0.0472	0.062	0.063	0.026	0.035	0.0298	0.0247	0.025	0.0215	0.0333	0.0217	0.0394	0.075	0.055	0.0354	0.0714	0.0428	0.026	0.024	0.031	0.0459	0.0365	0.0382	0.0481	0.025	0.031	0.0412	0.0374
Antimony	mg/L	—	—	—	<0.00020	<0.00010	<0.00010	<0.0050	<0.0050	<0.00060	<0.0002	<0.000005	<0.00020	<0.0050	<0.0002	<0.00020	<0.00010	<0.00010	<0.0050	<0.0002	<0.00020	<0.00010	<0.00010	<0.0050	<0.0050	<0.0002	<0.00020	<0.00010	<0.00010	<0.00010	<0.0050	<0.0002	<0.00020	<0.00010
Arsenic	mg/L	—	—	—	0.000304	0.00025	0.00096	<0.0010	<0.0010	<0.0010	0.00034	0.000305	0.00029	<0.0010	0.00036	0.000303	0.00029	0.00038	<0.0010	0.00034	0.000331	0.00038	0.00036	<0.0010	<0.0010	0.00034	0.000304	0.00029	0.00029	0.00045	<0.0010	0.00034	0.000289	0.00028
Barium	mg/L	—	—	—	0.00545	0.0035	0.015	<0.010	<0.010	<0.010	<0.01	0.00382	0.00211	<0.010	<0.01	0.0044	0.00452	0.00516	<0.010	<0.01	0.00596	0.0045	0.00944	<0.010	<0.010	<0.01	0.00509	0.00478	0.0051	0.00526	<0.010	<0.01	0.00428	0.00489
Beryllium	mg/L	—	—	—	<0.000060	<0.000060	<0.000060	<0.0010	<0.0010	<0.0010	<0.0001	<0.00001	<0.000060	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	<0.0010	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.000060	<0.000060
Bismuth	mg/L	—	—	—	<0.00010	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.001	<0.000001	<0.00010	<0.0010	<0.001	<0.00010	<0.00020	<0.00020	<0.0010	<0.001	<0.00010	<0.00020	<0.00020	<0.0010	<0.0010	<0.001	<0.00010	<0.00020	<0.00020	<0.00020	<0.0010	<0.001	<0.00010	<0.00020
Boron	mg/L	—	—	—	0.0021	0.0022	0.003	<0.050	<0.050	<0.050	0.004	0.0038	0.0024	<0.050	0.004	0.0027	0.0039	0.0035	<0.050	0.004	0.005	0.0025	0.0033	<0.050	<0.050	0.004	0.0037	0.0029	0.0027	0.0036	<0.050	0.004	0.0028	0.003
Cadmium	mg/L	—	—	—	<0.000030	0.000019	0.000011	<0.00010	<0.00010	<0.000090	<0.00002	0.000025	<0.000030	<0.00010	<0.00002	<0.000030	<0.000010	<0.000010	<0.00010	<0.00002	<0.000030	0.000011	0.000017	<0.00010	<0.00010	<0.00002	<0.000030	<0.000010	0.000018	<0.000010	<0.00010	<0.00002	<0.000030	<0.000010
Chromium	mg/L	—	—	—	<0.00020	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	0.0001	<0.00002	0.00027	<0.0010	0.0003	<0.00020	<0.00050	<0.00050	<0.0010	0.0003	0.00027	<0.00050	<0.00050	<0.0010	<0.0010	0.0002	<0.00020	<0.00050	<0.00050	0.00051	<0.0010	0.0002	<0.00020	<0.00050
Cobalt	mg/L	—	—	—	0.000115	<0.000050	0.00144	<0.00050	<0.00050	<0.00050	<0.00005	0.000072	<0.000030	<0.00050	<0.00005	0.000081	<0.000050	<0.000050	<0.00050	<0.00005	0.000037	<0.000050	0.000153	<0.00050	<0.00050	<0.00005	0.00008	0.000055	0.000056	<0.000050	<0.00050	<0.00005	<0.000030	0.000054
Copper	mg/L	—	—	—	<0.00040	<0.00070	<0.00070	0.0011	<0.0010	<0.0010	0.00145	0.0015	0.00055	0.0015	0.00165	0.00298	0.00102	0.00088	0.0015	0.00155	0.00097	0.00074	<0.00070	0.0013	<0.0010	0.0007	0.0014	<0.00070	<0.00070	0.00105	0.0014	0.00305	0.00057	<0.00070
Iron	mg/L	—	—	—	0.29	0.142	5.73	0.59	0.65	<0.050	0.134	0.052	0.0158	0.156	0.266	0.0802	0.168	0.145	0.153	0.068	<0.0050	0.021	0.084	0.299	0.292	0.436	0.128	0.266	0.294	0.394	0.309	0.42	0.127	0.249
Lead	mg/L	—	—	—	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	0.00005	0.00003	<0.00010	<0.0010	0.00005	<0.00010	<0.00010	<0.00010	<0.0010	<0.00005	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	0.00005	<0.00010	<0.00010	0.00012	<0.00010	<0.0010	0.0001	<0.00010	<0.00010
Manganese	mg/L	—	—	—	0.0192	0.00472	0.589	0.0593	0.065	0.0141	0.063	0.00254	0.00385	0.0038	0.004	0.00275	0.0147	0.0229	0.0175	0.008	0.00767	<0.00050	0.0912	0.0066	0.0065	0.005	0.00285	0.0168	0.0169	0.132	0.0069	0.004	0.00256	0.017
Mercury	mg/L	—	—	—	<0.000020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.000020	<0.00001	<0.000020	<0.00010	<0.000020	<0.000020	<0.000010	<0.000010	<0.00010	<0.000020	<0.000020	<0.000010	<0.000010	<0.00010	<0.00010	<0.000020	<0.000020	<0.000010	<0.000010	<0.000010	<0.00010	<0.000020	<0.000020	<0.000010
Molybdenum	mg/L	—	—	—	0.000093	<0.00020	0.00021	<0.0010	<0.0010	<0.0010	0.0004	0.000364	0.000292	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	<0.0010	0.0002	0.000152	0.0002	0.00027	<0.0010	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	<0.00020	<0.0010	<0.0002	<0.000090	<0.00020
Nickel	mg/L	—	—	—	0.00021	<0.0010	<0.0010	<0.0020	<0.0020	<0.0020	0.0007	0.00057	0.00025	<0.0020	0.0007	0.00061	<0.0010	<0.0010	<0.0020	0.0006	<0.00020	<0.0010	<0.0010	<0.0020	<0.0020	0.0002	0.00092	<0.0010	<0.0010	<0.0010	<0.0020	0.0009	0.00031	<0.0010
Selenium	mg/L	—	—	—	<0.0010	<0.00050	<0.00050	<0.0050	<0.0050	<0.0020	0.0002	0.0002	<0.0010	<0.0050	<0.0001	<0.0010	<0.00050	<0.00050	<0.0050	<0.0001	<0.0010	<0.00050	<0.00050	<0.0050	<0.0050	0.0003	<0.0010	<0.00050	<0.00050	<0.00050	<0.0050	0.0003	<0.0010	<0.00050
Silicon	mg/L	—	—	—				5.1	5.22	3.05	3.2	3.2		2.94	2.7				3.65	2.9				3.27	3.13	3					3.18	3.1		
Silver	mg/L	—	—	—	<0.000010	<0.000050	<0.000050	<0.00010	<0.00010	<0.00010	<0.0002	<0.000001	0.000018	<0.00010	<0.0002	<0.000010	<0.000050	<0.000050	<0.00010	<0.0002	<0.000010	<0.000050	<0.000050	<0.00010	<0.00010	<0.0002	<0.000010	<0.000050	<0.000050	<0.000050	<0.00010	<0.0002	<0.000010	<0.000050
Strontium	mg/L	—	—	—	0.0147	0.0108	0.0495	0.0205	0.0208	0.0134	0.0158	0.0152	0.0121	0.0127	0.0136	0.0104	0.0112	0.0117	0.0289	0.0266	0.0286	0.0205	0.0348	0.0136	0.0131	0.0146	0.00979	0.0103	0.0105	0.0124	0.0131	0.0147	0.00985	0.0105
Thallium	mg/L	—	—	—	<0.000010	<0.000030	<0.000030	<0.00030	<0.00030	<0.00030	<0.00002	<0.000001	<0.000010	<0.00030	<0.00002	<0.000010	<0.000030	<0.000030	<0.00030	<0.00002	<0.000010	<0.000030	<0.000030	<0.00030	<0.00030	<0.00002	<0.000010	<0.000030	<0.000030	<0.000030	<0.00030	<0.00002	<0.000010	<0.000030
Tin	mg/L	—	—	—	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.001	<0.000002	<0.00010	<0.0010	<0.001	<0.00010	<0.00010	<0.00010	<0.0010	<0.001	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.001	<0.00010	<0.00010
Titanium	mg/L	—	—	—	<0.00050	<0.00050	0.00077	<0.0020	<0.0020	<0.0020	<0.002	<0.0001	<0.00050	<0.0020	<0.002	<0.00050	<0.00050	<0.00050	<0.0020	<0.002	<0.00050	0.00058	<0.00050	<0.0020	<0.0020	<0.002	0.00064	0.00057	0.00064	0.00089	<0.0020	<0.002	0.00061	<0.00050
Tungsten	mg/L	—	—	—	<0.000010	<0.00010	<0.00010	<0.010	<0.010	<0.010	<0.01	<0.000002	0.000017	<0.010	<0.01	<0.000010	<0.00010	<0.00010	<0.010	<0.01	0.000265	<0.00010	<0.00010	<0.010	<0.010	<0.01	<0.000010	<0.00010	<0.00010	<0.00010	<0.010	<0.01	<0.000010	<0.00010
Uranium	mg/L	—	—	—	0.0000096	<0.000010	0.000012	<0.0050	<0.0050	<0.0050	<0.005	0.0000445	0.0000402	<0.0050	<0.005	0.000022	0.000021	0.000026	<0.0050	<0.005	0.0000144	0.000017	0.000012	<0.0050	<0.0050	<0.005	0.000022	0.00002	0.00002	0.000029	<0.0050	<0.005	0.000022	0.000018
Vanadium	mg/L	—	—	—	<0.00010	<0.00020	0.00063	<0.0010	<0.0010	<0.0010	0.00015	0.00007	0.00011	<0.0010	0.00065	0.00028	0.00024	0.00048	<0.0010	0.0004	0.00024	<0.00020	0.00032	<0.0010	<0.0010	0.0005	0.00041	0.00029	0.00033	0.00071	<0.0010	0.0005	0.00041	0.00028
Zinc	mg/L	—	—	—	0.0078	0.004	0.0074	0.0069	<0.0030	0.0071	0.008	0.0038	<0.0020	0.0043	0.0066	0.0087	0.0067	0.0023	0.0091	0.0054	0.0025	0.0059	0.0023	0.0053	<0.0030	0.001	0.0061	<0.0020	0.0029	0.0073	0.0058	0.0048	0.0038	<0.0020
Zirconium	mg/L	—	—	—	0.000083	<0.00010	<0.00010	<0.0040	<0.0040	<0.0010	<0.004	0.000088	0.00009	<0.0040	<0.004	0.000151	<0.00010	<0.00010	<0.0040	<0.004	0.000091	0.00013	<0.00010	<0.0040	<0.0040	<0.004	0.000105	<0.00010	<0.00010	0.00011	<0.0040	<0.004	0.000095	<0.00010

Notes:

(a) See Appendix 1.I for detailed notes for water quality guidelines.
(b) CCME and PWQO receiving water quality guidelines for aluminum have been calculated based on pH. See Appendix 1.I for details.
(c) CCME and/or PWQO receiving water quality guidelines for these parameters have been calculated based on hardness. See Appendix 1.I for details.
1.0 (highlighted) Values highlighted in yellow greater than the Ontario Drinking Water Standards (ODWS), Ontario Regulation (O.Reg.) 169/03: Ontario Drinking Water Standards (ODWS) (Revised June 2006).
1.0 Values greater than the Canadian Council of Ministers of the Environment (CCME), Canadian Water Quality Guidelines for the Protection of Aquatic Life, Update 7.1 (December 2007).
1.0 (underlined) Values greater than the Provincial Water Quality Objectives (PWQO), Ministry of Environment and Energy
Where cells are blank, data has been removed, or was not recorded due to field instrument error.
Where cells are blank, analysis was not performed during this time period. Some parameters were added to the sampling program later in the campaign, while others were removed from the sampling campaign due to non detection.
— = A dash indicates that guideline criteria are not available for this parameter.
"D" = A "D" next to the station name indicates that this is a duplicate sample.

TABLE 1
Surface Water Quality Results

Parameter	Unit	Receiving WQ Guidelines[a]																															
		ODWS	CCME	PWQO	HRWQ-16	HRWQ-17	HRWQ-17	HRWQ-17	HRWQ-17	HRWQ-17	HRWQ-18	HRWQ-18	HRWQ-18	HRWQ-19	HRWQ-19	HRWQ-19 DUP	HRWQ-19	HRWQ-20	HRWQ-20	HRWQ-20	HRWQ-20	HRWQ-20	HRWQ-21	HRWQ-21	HRWQ-21	HRWQ-21	HRWQ-21	HRWQ-22	HRWQ-22	HRWQ-22D	HRWQ-22	HRWQ-22	HRWQ-22
					Aug-12	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Sep-10	Nov-10	Nov-10	Jun-11	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Nov-10	Jun-11	Apr-12	Aug-12
Field Parameters																																	
Temperature	°C	—	—	±10	20.55	9.06	3.5	22.28	4.92	17.2	8.11	2.48	22.32	8.44	2.46	2.46	21.14	8.47	4.02	21.32	4.28	18.24	13.98	4.05	21.96	9.09	20.93	14.82	5.98	5.98	18.46	4.62	21
pH	—	6.5–8.5	6.5-9	6.5-8.5	***6.43***	***6.37***	***6.11***	6.86	7.44	7.39	***6.31***	***6.23***	6.64	***6.24***	6.84	6.84	6.55	***6.23***	6.93	6.6	6.57	7.63	6.61	6.7	6.91	6.92	7.37	6.6	7.32	7.32	7.12	6.8	7.28
Conductivity	µS/cm	—	—	—		33		59	55		27		62	39			60	40		71	33		49		56	49		56			55	48	
Dissolved Oxygen	mg/L	—	5.5-9.5	4-8	7.48	6.56	10.6	9.08		***5.39***	9.42	10.11	7.74	6.76	10.7	10.7	7.94	7.24	12.51	9.16		10.29	9.22	12.02	9.39		8.89	6.6	11.22	11.22	10.18		7.88
ORP	mV	—	—	—	108.1		175.6		103.4	141.2		180.4			170.2	170.2			159.7		127.2	78.2		210.4		160.8	73.6		117.9	117.9		91.4	37.6
Physical-Chemical																																	
pH	—	6.5–8.5	6.5-9	6.5-8.5	***6.43***	***6.15***	***6.23***	7.37	7.5	7.39	***5.63***	***5.79***	7.25	***6.16***	6.89	6.91	7	***6.49***	6.5	7.39	6.76	7.63	7.19	6.92	7.31	7.17	7.37	7.08	7.07	7.03	7.13	6.98	7.28
DOC	% wt	5	—	—	12.5	25.8	17	11.5	8.4	13.5	25.8	21	10.4	29.5	12.4	12.7	18.1	20.4	14.4	9.8	12.7	7.4	9.3	7.5	10.5	7.7	7.9	7.7	7.1	7.3	10.5	7.1	6.2
TOC	% wt	—	—	—	9.9	26.1	17	13.8	8.5	14.3	28.6	21.9	15.3	29.8	12.4	12.7	18.1	19.1	14.5	9.7	12.9	8.4	9.7	7.5	11	7.8	8.6	7.7	8.1	8.1	10.5	7.9	6.9
Acidity	mg/L	—	—	—	2			2.6	2.6	2.8			2.4				4.2			2.4	4.8	2			2.2	2.6	2				2.2	2.4	2
Alkalinity	mg(CaCO3)/L	30–500	—	-25%	17.4	10.8	9.4	19.5	25.3	20	6	6.2	19.6	11.9	20.3	20.2	18.7	15.8	13.9	24.2	12.1	27.3	19.1	18.8	16.7	20	17.2	20.2	19.4	19	15.7	19.2	17.2
Conductivity	µS/cm	—	—	—	46.2	35.2	28.6	46.8	63.7	46.6	28	26.3	50.1	39.9	51.7	50.9	45.7	41.6	41.4	57.3	40.6	61.7	51	49.5	44.9	58	45.9	53.8	52.6	51.5	45	54.5	46.3
Total Suspended Solids	mg/L	—	+5-25	—	2.7	11.5	<2.0	3.2	2.8	<2.0	3.8	4.4	4.3	<2.0	2.5	2.2	3.8	5.4	<2.0	3.2	3.2	<2.0	4.7	<2.0	2.7	<2.0	5.5	2.5	2.6	2.1	<2.0	<2.0	<2.0
Total Dissolved Solids	mg/L	500	—	—	93	102	64	68	37	85	108	72	73	118	124	119	83	89	45	67	31	76	50	39	53	35	69	52	39	49	64	75	52
Major Ions																																	
Calcium	mg/L	—	—	—	5.74	5.91	4.54	0	10.1	7.35	4.4	3.68	8.03	6.73	7.76	8.86	7.13	7.28	5.98	7.36	5.35	10.5	6.57	6.48	4.82	6.32	5.82	6.87	6.45	6.3	5.66	6.38	5.18
Chloride	mg/L	250	120	—	1.1	0.3	0.2	0.15	0.19	0.26	0.38	0.24	0.27	0.4	0.3	0.23	<0.10	0.33	0.15	0.14	1.22	0.2	1.34	1.45	1.34	1.97	1.26	1.4	1.41	1.41	1.63	1.47	1.28
Fluoride	mg/L	1.5	—	—	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.039	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Magnesium	mg/L	—	—	—	1.38	1.42	0.98		0.93	1.42	1.15	1.02	1.03	1.67	0.99	1.2	1.11	1.34	1.01	0.766	0.907	1.04	1.48	1.4	1.31	1.15	1.37	1.51	1.49	1.45	1.36	1.57	1.16
Potassium	mg/L	—	—	—	0.441	<1.0	<1.0		0.355	0.163	<1.0	<1.0	0.367	<1.0	<1.0	<1.0	0.195	<1.0	<1.0	0.235	0.195	0.152	<1.0	<1.0	0.359	0.359	0.456	<1.0	<1.0	<1.0	0.468	0.536	0.407
Sodium	mg/L	200	—	—	1.37	1.11	0.83		0.704	0.853	0.9	0.92	0.882	1.1	0.71	0.91	0.734	0.97	0.94	0.563	1.1	0.782	1.45	1.42	1.38	1.3	1.43	1.51	1.52	1.45	1.44	1.6	1.2
Sulphate	mg/L	500	—	—	1.32	<0.30	0.82	1.39	1.75	<0.30	0.42	0.72	2.03	0.65	1.81	1.75	1.02	<0.30	0.91	2.51	1.81	1.41	1.61	2.03	1.77	1.71	1.27	1.78	1.73	1.73	1.89	1.56	2.52
Carbonate (CO_3^{2-})	mg/L	—	—	—	<5.0				<5.0	<5.0											<5.0	<5.0				<5.0	<5.0					<5.0	<5.0
Bicarbonate ($H(CO_3)^-$)	mg/L	—	—	—	17.4				30.9	20											14.7	27.3				24.4	17.2					23.4	17.2
Hardness	mg($CaCO_3$)/L	80–100	—	—	18.9	21	16	22.9	28.3	24.2	16	15	24.9	24	28	29	24.1	24	20	26.2	17.3	32	23	23	20.2	22.5	20.2	23	24	23	18.4	21.9	19.6
Cyanide (free)	mg/L	0.2	0.005	0.005		<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050	<0.0050		
Cyanide (total)	mg/L	—	—	—		0.002	<0.0020	<0.0020			0.002	<0.0020	<0.0020	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020	<0.0020		
Nutrients																																	
Nitrate-N	mg/L	10	13	—	0.049	<0.030	<0.030	<0.030	0.031	<0.030	<0.030	<0.030	0.095	<0.030	<0.030	<0.030	<0.030	<0.030	0.039	<0.030	<0.030	<0.030	<0.030	0.033	<0.030	0.044	<0.030	<0.030	0.059	0.053	0.129	0.098	0.054
Nitrite-N	mg/L	1	0.06	—	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Ammonia-N	mg/L	—	—	—	0.024	0.029	0.021	<0.020	<0.020	<0.020	0.03	0.027	<0.020	0.032	0.024	<0.020	<0.020	0.025	0.021	<0.020	<0.020	<0.020	<0.020	0.026	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Un-ionized ammonia	mg/L	—	0.019	0.02	2.66E-05	1.17E-05	2.98E-06	6.75E-05	6.80E-05	1.57E-04	9.80E-06	4.65E-06	4.08E-05	9.13E-06	1.68E-05	1.40E-05	3.05E-05	6.99E-06	2.05E-05	3.47E-05	8.73E-06	2.93E-04	2.06E-05	1.50E-05	7.40E-05	2.87E-05	1.97E-04	2.14E-05	5.62E-05	5.62E-05	9.28E-05	1.52E-05	1.61E-04
ortho-Phosphate	mg/L	—	—	—	<0.0050				<0.0050	<0.0050											<0.0050	<0.0050				<0.0050	<0.0050					<0.0050	<0.0050
Phosphorus	mg/L	—	—	0.02	0.0101	0.0257	0.0086	0.0126	0.0098	0.021	0.0361	0.0139	0.0192	0.0205	0.0102	0.0175	0.0166	0.0234	0.0379	0.0239	0.0077	0.0129	0.0179	0.0143	0.0162	0.0094	0.0107	0.0074	0.013	0.0129	0.0157	0.0107	0.0092
Organics																																	
Oil and Greases	mg/L	—	—	physically non detect		<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<2.0	67.5	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<2.0	<2.0	<4.0	
Phenols	mg/L	—	0.004	0.005	0.0012	<0.0010	0.0016	***0.0043***	<0.0010	0.0027	<0.0010	0.0025	***0.0054***	0.0012	0.0026	0.003	***0.0072***	0.0015	***0.005***	0.0038	<0.0010	0.0019	<0.0010	***0.0161***	0.0034	<0.0010	0.0012	<0.0010	***0.0059***	***0.0062***	***0.0055***	<0.0010	0.002
Micro-organisms																																	
Escherichia coli	per 100mL	—	—	100		12	3	1			15	1	0	9	6	4	2	6	1	2			1	0	0			1	0	0	1		
Total coliforms	per 100mL	—	—	—		> 2420	610	2000			2400	920	> 2420	1200	580	610	> 2420	2400	550	> 2420			150	26	490			390	68	91	28		
Total Metals																																	
Aluminum[b]	mg/L	0.1	0.005-0.1	0.015-0.075	***0.0535***	***0.353***	***0.182***		0.0469	***0.162***	***0.468***	***0.374***	0.0479	***0.331***	***0.13***	***0.125***	***0.12***	***0.23***	***0.169***	0.0459	***0.157***	0.0357	0.042	0.0325	0.0362	0.0428	0.0579	0.026	0.032	0.031	0.0451	0.0375	0.0444
Antimony	mg/L	0.006	—	0.02	0.00011	<0.0050	0.0006		<0.00010	<0.00010	<0.0050	<0.0002	<0.000030	<0.0050	<0.0002	<0.0002	<0.000030	<0.0050	<0.0002	<0.000030	<0.00010	<0.00010	<0.0050	<0.0002	0.000037	<0.00010	<0.00010	<0.0050	<0.0002	<0.0002	0.000036	<0.00010	<0.00010
Arsenic	mg/L	0.025	0.005	0.1	0.00046	<0.0010	0.00072		0.00029	0.00071	<0.0010	0.0007	0.00036	<0.0010	0.00044	0.00048	0.00048	<0.0010	0.00052	0.000274	0.0004	0.00041	<0.0010	0.00034	0.000239	0.00025	0.00046	<0.0010	0.00032	0.0003	0.000294	0.00032	0.00036
Barium	mg/L	1	—	—	0.00585	<0.010	<0.01		0.00376	0.00638	<0.010	<0.01	0.00337	<0.010	<0.01	<0.01	0.00369	<0.010	<0.01	0.00299	0.00346	0.00366	<0.010	<0.01	0.00391	0.00401	0.00552	<0.010	<0.01	<0.01	0.00467	0.00444	0.00563
Beryllium	mg/L	—	—	0.011-1.1	<0.000060	<0.0010	<0.0001		<0.000060	<0.000060	<0.0010	<0.0001	<0.000040	<0.0010	<0.0001	<0.0001	0.000049	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060	<0.0010	<0.0001	<0.0001	0.00006	<0.000060	<0.000060
Bismuth	mg/L	—	—	—	<0.00020	<0.0010	<0.001		<0.00020	<0.00020	<0.0010	<0.001	0.000026	<0.0010	<0.001	<0.001	<0.000020	<0.0010	<0.001	<0.000020	<0.00020	<0.00020	<0.0010	<0.001	<0.000020	<0.00020	<0.00020	<0.0010	<0.001	<0.001	<0.000020	<0.00020	<0.00020
Boron	mg/L	5	1.5	0.2	0.0035	<0.050	<0.002		0.0038	0.0037	<0.050	<0.002	0.00303	<0.050	0.006	0.002	0.00279	<0.050	<0.002	0.00241	0.003	0.0035	<0.050	0.002	0.00262	0.0035	0.0036	<0.050	0.01	0.008	0.00375	0.0049	0.0033
Cadmium[c]	mg/L	0.005	0.0000041-0.000042	0.0001-0.0005	<0.000010	<0.000090	<0.00002		<0.000010	<0.000010	<0.000090	<0.00002	<0.0000090	<0.000090	<0.00002	<0.00002	<0.0000090	<0.000090	<0.00002	<0.0000090	<0.000010	<0.000010	<0.000090	<0.00002	<0.0000090	<0.000010	<0.000010	<0.000090	<0.00002	<0.00002	<0.0000090	<0.000010	<0.000010
Chromium (total)	mg/L	0.05	0.009	0.009	<0.00050	<0.0010	0.0002		<0.00050	<0.00050	<0.0010	0.0005	<0.00090	<0.0010	<0.0001	0.0003	<0.00090	<0.0010	0.0003	<0.00090	<0.00050	<0.00050	<0.0010	0.0002	<0.00090	<0.00050	<0.00050	<0.0010	0.0002	0.0001	<0.00090	<0.00050	<0.00050
Cobalt	mg/L	—	—	0.0009	0.000055	<0.00050	<0.00005		<0.000050	0.000453	<0.00050	0.0002	0.000043	<0.00050	<0.00005	<0.00005	0.000123	<0.00050	0.00005	0.00006	0.000085	0.000065	<0.00050	<0.00005	0.000028	0.00005	0.000051	<0.00050	<0.00005	<0.00005	0.000034	<0.000050	<0.000050
Copper[c]	mg/L	1	0.002-0.004	0.001-0.005	0.00099	<0.0010	0.00055		<0.00070	<0.00070	<0.0010	0.00065	<0.00070	0.001	0.001	0.00065	<0.00070	<0.0010	0.00045	<0.00070	0.00071	0.00071	<0.0010	0.00065	<0.00070	0.00076	0.00098	0.001	0.00085	***0.0021***	0.00115	0.00115	0.00131
Iron (total)	mg/L	0.3	0.3	0.3	***0.579***	***0.581***	0.2		0.182	***0.404***	***0.767***	***0.522***	0.107	***0.716***	0.206	0.24	0.217	***0.507***	0.292	0.0949	0.175	0.088	***0.638***	***0.32***	0.21	***0.322***	***0.421***	0.281	***0.35***	***0.316***	0.269	***0.414***	***0.357***
Lead[c]	mg/L	0.01	0.001-0.007	0.001-0.005	<0.00010	<0.0010	0.0001		<0.00010	<0.00010	<0.0010	0.00035	0.000117	<0.0010	0.00005	0.00005	<0.000060	<0.0010	0.00005	<0.000060	<0.00010	<0.00010	<0.0010	0.0001	<0.000060	0.0001	<0.00010	<0.0010	0.00005	0.0001	0.000107	<0.00010	<0.00010
Manganese	mg/L	0.05	—	—	0.176	0.0108	0.003		0.0248	0.058	0.0247	0.021	0.00314	0.0164	0.008	0.008	0.00933	0.0211	0.009	0.00738	0.00411	0.0117	0.0583	0.01	0.00624	0.0325	0.0278	0.0346	0.015	0.012	0.00961	0.0132	0.0389
Mercury	mg/L	0.001	0.000026	0.0002	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum	mg/L	—	0.073	0.04	<0.00020	<0.0010	<0.0002		<0.00020	<0.00020	<0.0010	<0.0002	<0.000090	<0.0010	<0.0002	<0.0002	<0.000090	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	<0.0010	<0.0002	<0.0002	<0.000090	<0.00020	<0.00020
Nickel[c]	mg/L	—	0.025-0.15	0.025	<0.0010	<0.0020	0.0004		<0.0010	<0.0010	<0.0020	0.0005	<0.0010	<0.0020	0.0002	0.0004	<0.0010	<0.0020	0.0003	<0.0010	<0.0010	<0.0010	<0.0020	0.0002	<0.0010	<0.0010	<0.0010	<0.0020	0.0002	0.0002	<0.0010	<0.0010	<0.0010
Selenium	mg/L	0.01	0.001	0.1	<0.00050	0.00043	0.0005		<0.00050	<0.00050	0.00044	0.0002	<0.0020	<0.00040	0.0005	<0.0001	<0.0020	<0.00040	<0.0001	<0.0020	<0.00050	<0.00050	<0.00040	0.0005	<0.0020	<0.00050	<0.00050	<0.00040	0.0006	0.0002	<0.0020	<0.00050	<0.00050
Silicon	mg/L	—	—	—		5.8	3				5.6	4		6.5	3.4	3.3		6	4.2				3.3	2.4				3.2	2.5	2.4			
Silver	mg/L	—	0.0001	0.0001	<0.000050	<0.00010	<0.0002		<0.000050	<0.000050	<0.00010	<0.0002	0.0000375	<0.00010	<0.0002	<0.0002	0.0000098	<0.00010	<0.0002	<0.0000070	<0.000050	<0.000050	<0.00010	<0.0002	<0.0000070	<0.000050	<0.000050	<0.00010	<0.0002	<0.0002	<0.0000070	<0.000050	<0.000050
Strontium	mg/L	—	—	—	0.0121	0.0158	0.0098		0.0133	0.0164	0.0139	0.0112	0.0103	0.0179	0.0149	0.0155	0.0134	0.0167	0.013	0.0111	0.01	0.0155	0.0153	0.0139	0.0102	0.0125	0.0123	0.0149	0.0144	0.0139	0.0122	0.0114	0.0113
Thallium	mg/L	—	0.0008	0.0003	<0.000030	<0.00030	<0.00002		<0.000030	<0.000030	<0.00030	<0.00002	<0.0000040	<0.00030	<0.00002	<0.00002	<0.0000040	<0.00030	<0.00002	<0.0000040	<0.000030	<0.000030	<0.00030	<0.00002	<0.0000040	<0.000030	<0.000030	<0.00030	<0.00002	<0.00002	<0.0000040	<0.000030	<0.000030
Tin	mg/L	—	—	—	<0.00010	<0.0010	<0.001		<0.00010	<0.00010	<0.0010	<0.001	<0.000040	<0.0010	<0.001	0.004	<0.000040	<0.0010	<0.001	<0.000040	<0.00010	<0.00010	<0.0010	<0.001	0.000128	<0.00010	<0.00010	<0.0010	<0.001	<0.001	<0.000040	<0.00010	<0.00010
Titanium	mg/L	—	—	—	0.00117	0.0054	<0.002		0.00081	0.00345	0.0087	0.006	0.0008	0.005	0.002	0.002	0.00207	0.0041	0.002	0.00078	0.00213	0.00067	<0.0020	<0.002	<0.00060	0.00091	0.00145	<0.0020	<0.002	<0.002	0.00075	0.00101	0.00082
Tungsten	mg/L	—	—	0.03	<0.00010	<0.010	<0.01		<0.00010	<0.00010	<0.010	<0.01	<0.000040	<0.010	<0.01	<0.01	<0.000040	<0.010	<0.01	<0.000040	<0.00010	<0.00010	<0.010	<0.01	<0.000040	<0.00010	<0.00010	<0.010	<0.01	<0.01	<0.000040	<0.00010	<0.00010
Uranium	mg/L	0.02	0.015	0.005	0.000031	<0.0050	<0.002		0.000027	0.000089	<0.0050	<0.002	0.0000253	<0.0050	<0.002	<0.002	0.0000504	<0.0050	<0.002	0.0000254	0.000042	0.000039	<0.0050	<0.002	0.0000256	0.000028	0.000033	<0.0050	<0.002	<0.002	0.000027	0.000024	0.000022
Vanadium	mg/L	—	—	0.006	0.00081	<0.0010	0.00015		<0.00020	0.00051	<0.0010	0.00055	0.000208	<0.0010	0.00025	0.0004	0.000478	<0.0010	0.0004	0.000128	0.00037	0.00037	<0.0010	0.0004	0.000246	0.00028	0.00059	<0.0010	0.00055	0.00045	0.000336	0.00045	0.00051
Zinc	mg/L	5	0.03	0.02	<0.0020	0.0043	0.0024		<0.0020	0.0026	0.0074	0.005	0.0074	<0.0030	0.003	0.0026	<0.0030	<0.0030	0.0044	<0.0030	<0.0020	0.0022	<0.0030	0.0016	<0.0030	<0.0020	<0.0020	<0.0030	0.0012	0.0026	<0.0030	<0.0020	<0.0020
Zirconium	mg/L	—	—	0.004	0.00011	<0.0040	<0.004		<0.00010	0.00011	<0.0040	<0.004	<0.00020	<0.0040	<0.004	<0.004	<0.00020	<0.0040	<0.004	<0.00020	0.00016	<0.00010	<0.0040	<0.004	<0.00020	<0.00010	0.00012	<0.0040	<0.004	<0.004	<0.00020	<0.00010	<0.00010
Dissolved Metals																																	
Aluminum	mg/L	—	—	—	0.041	0.222	0.184	0.068	0.0346	0.0607	0.352	0.35	0.0458	0.271	0.106	0.104	0.118	0.154	0.165	0.0279	0.123	0.0265	0.034	0.02	0.0297	0.0296	0.0349	0.015	0.0195	0.019	0.0338	0.0287	0.0345
Antimony	mg/L	—	—	—	<0.00010	<0.0050	<0.0002	<0.00020	<0.00010	<0.00010	<0.0050	<0.0002	<0.00020	<0.0050	<0.0002	<0.0002	<0.00020	<0.0050	<0.0002	<0.00020	<0.00010	<0.00010	<0.0050	<0.0002	<0.00020	<0.00010	<0.00010	<0.0050	<0.0002	<0.0002	<0.00020	<0.00010	<0.00010
Arsenic	mg/L	—	—	—	0.00042	<0.0010	0.00058	0.000459	0.00031	0.00068	<0.0010	0.0006	0.000368	<0.0010	0.00046	0.00046	0.00058	<0.0010	0.00052	0.000334	0.00042	0.00042	<0.0010	0.00036	0.000292	0.00027	0.00042	<0.0010	0.00034	0.00034	0.000301	0.00028	0.00039
Barium	mg/L	—	—	—	0.00544	<0.010	<0.01	0.00329	0.004	0.00571	<0.010	<0.01	0.00399	<0.010	<0.01	<0.01	0.00341	<0.010	<0.01	0.00286	0.00376	0.00378	<0.010	<0.01	0.00457	0.00413	0.005	<0.010	<0.01	<0.01	0.00483	0.00421	0.00531
Beryllium	mg/L	—	—	—	<0.000060	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.000060	<0.0010	<0.0001	<0.0001	<0.000060	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.0001	<0.000060	<0.000060	<0.000060
Bismuth	mg/L	—	—	—	<0.00020	<0.0010	<0.001	<0.00010	<0.00020	<0.00020	<0.0010	<0.001	<0.00010	<0.0010	<0.001	<0.001	<0.00010	<0.0010	<0.001	<0.00010	<0.00020	<0.00020	<0.0010	<0.001	<0.00010	<0.00020	<0.00020	<0.0010	<0.001	<0.001	0.00012	<0.00020	<0.00020
Boron	mg/L	—	—	—	0.0033	<0.050	0.002	0.003	0.0031	0.0038	<0.050	0.002	0.0034	<0.050	0.002	0.004	0.003	<0.050	<0.002	0.0025	0.0024	0.0038	<0.050	0.004	0.0032	0.0028	0.0032	<0.050	0.004	0.004	0.0031	0.0039	0.0042
Cadmium	mg/L	—	—	—	<0.000010	<0.00010	<0.00002	<0.000030	0.000014	0.00001	<0.00010	0.00002	<0.000030	<0.00010	<0.00002	<0.00002	<0.000030	<0.00010	<0.00002	<0.000030	0.000027	<0.000010	<0.00010	<0.00002	<0.000030	<0.000010	<0.000010	<0.00010	<0.00002	0.00004	<0.000030	<0.000010	<0.000010
Chromium	mg/L	—	—	—	<0.00050	<0.0010	0.0004	<0.00020	<0.00050	<0.00050	<0.0010	0.0006	<0.00020	<0.0010	0.0003	0.0005	0.00033	<0.0010	0.0004	<0.00020	<0.00050	<0.00050	<0.0010	0.0002	<0.00020	<0.00050	0.00087	<0.0010	0.0003	0.0003	<0.00020	<0.00050	<0.00050
Cobalt	mg/L	—	—	—	<0.000050	<0.00050	<0.00005	0.000041	<0.000050	0.000365	<0.00050	0.00025	0.000098	<0.00050	<0.00005	<0.00005	0.000158	<0.00050	0.00005	<0.000030	0.000087	0.000057	<0.00050	<0.00005	0.000066	<0.000050	<0.000050	<0.00050	<0.00005	<0.00005	0.000097	<0.000050	<0.000050
Copper	mg/L	—	—	—	0.00079	0.0016	0.0005	<0.00040	<0.00070	0.00075	0.0018	0.0019	0.00167	0.0016	0.002	0.00075	0.00048	0.0014	0.00205	0.00045	0.00113	0.00074	0.0011	0.00075	0.00155	0.00083	0.00094	0.0016	0.00205	0.001	0.00128	0.00096	0.00101
Iron	mg/L	—	—	—	0.395	0.355	0.246	0.0691	0.09	0.119	0.619	0.534	0.0564	0.572	0.172	0.172	0.141	0.347	0.278	0.0219	0.113	<0.010	0.294	0.196	0.0877	0.135	0.142	0.154	0.226	0.238	0.126	0.179	0.149
Lead	mg/L	—	—	—	<0.00010	<0.0010	0.00005	<0.00010	<0.00010	<0.00010	<0.0010	0.0003	<0.00010	<0.0010	0.00005	<0.00005	<0.00010	<0.0010	0.00005	<0.00010	0.0001	<0.00010	<0.0010	0.00005	<0.00010	<0.00010	<0.00010	<0.0010	0.00005	0.0001	<0.00010	<0.00010	<0.00010
Manganese	mg/L	—	—	—	0.122	0.0058	0.003	0.00184	0.0199	0.0482	0.0217	0.022	0.00315	0.0146	0.005	0.005	0.011	0.0168	0.01	0.00405	0.00331	0.00616	0.0043	0.003	0.00193	0.0173	0.00479	0.0175	0.003	0.003	0.00181	0.00623	0.0267
Mercury	mg/L	—	—	—	<0.000010	<0.00010	<0.000020	<0.000020	<0.000010	<0.000010	<0.00010	<0.000020	<0.000020	<0.00010	<0.000020	<0.000020	<0.000020	<0.00010	<0.000020	<0.000020	<0.000010	<0.000010	<0.00010	<0.000020	<0.000020	<0.000010	<0.000010	<0.00010	<0.000020	<0.000020	<0.000020	<0.000010	<0.000010
Molybdenum	mg/L	—	—	—	<0.00020	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	<0.0010	<0.0002	0.00009	<0.0010	<0.0002	<0.0002	<0.000090	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	<0.0010	<0.0002	<0.0002	<0.000090	<0.00020	<0.00020
Nickel	mg/L	—	—	—	<0.0010	<0.0020	0.0004	0.00022	<0.0010	<0.0010	<0.0020	0.0012	0.00059	<0.0020	0.0009	0.0003	0.00052	<0.0020	0.0005	<0.00020	<0.0010	<0.0010	<0.0020	0.0001	0.0008	<0.0010	<0.0010	<0.0020	0.0007	0.0002	0.00051	<0.0010	<0.0010
Selenium	mg/L	—	—	—	<0.00050	<0.0050	<0.0001	<0.0010	<0.00050	<0.00050	<0.0050	<0.0001	<0.0010	<0.0050	<0.0001	<0.0001	<0.0010	<0.0050	<0.0001	<0.0010	<0.00050	<0.00050	<0.0050	0.0002	<0.0010	<0.00050	<0.00050	<0.0050	<0.0001	<0.0001	<0.0010	<0.00050	<0.00050
Silicon	mg/L	—	—	—		4.79	3				5.14	4		6.05	3.1	3.1		5.6	4.4				2.93	2.4				2.8	2.4	2.5			
Silver	mg/L	—	—	—	<0.000050	<0.00010	<0.0002	<0.000010	<0.000050	<0.000050	<0.00010	<0.0002	0.000016	<0.00010	<0.0002	<0.0002	<0.000010	<0.00010	<0.0002	<0.000010	<0.000050	<0.000050	<0.00010	<0.0002	<0.000010	<0.000050	<0.000050	<0.00010	<0.0002	<0.0002	0.000022	<0.000050	<0.000050
Strontium	mg/L	—	—	—	0.0119	0.0153	0.0106	0.0128	0.0141	0.0165	0.0133	0.012	0.0121	0.0172	0.0149	0.0148	0.0135	0.0161	0.0125	0.0129	0.0103	0.0163	0.0148	0.0142	0.0117	0.0141	0.0128	0.0146	0.0142	0.0147	0.0112	0.0115	0.0122
Thallium	mg/L	—	—	—	<0.000030	<0.00030	<0.00002	<0.000010	<0.000030	<0.000030	<0.00030	<0.00002	<0.000010	<0.00030	<0.00002	<0.00002	<0.000010	<0.00030	<0.00002	<0.000010	<0.000030	<0.000030	<0.00030	<0.00002	<0.000010	<0.000030	<0.000030	<0.00030	<0.00002	<0.00002	<0.000010	<0.000030	<0.000030
Tin	mg/L	—	—	—	<0.00010	<0.0010	<0.001	<0.00010	<0.00010	<0.00010	<0.0010	<0.001	<0.00010	<0.0010	<0.001	<0.001	<0.00010	<0.0010	<0.001	0.00013	<0.00010	<0.00010	<0.0010	<0.001	0.00031	<0.00010	<0.00010	<0.0010	<0.001	<0.001	<0.00010	<0.00010	<0.00010
Titanium	mg/L	—	—	—	0.00061	<0.0020	<0.002	0.00057	<0.00050	0.00068	0.0047	0.004	0.00075	0.0031	<0.002	<0.002	0.00164	<0.0020	<0.002	<0.00050	0.00114	<0.00050	<0.0020	<0.002	<0.00050	<0.00050	<0.00050	<0.0020	<0.002	<0.002	<0.00050	<0.00050	<0.00050
Tungsten	mg/L	—	—	—	<0.00010	<0.010	<0.01	<0.000010	<0.00010	<0.00010	<0.010	<0.01	0.000045	<0.010	<0.01	<0.01	<0.000010	<0.010	<0.01	<0.000010	<0.00010	<0.00010	<0.010	<0.01	0.000013	<0.00010	<0.00010	<0.010	<0.01	<0.01	0.00004	<0.00010	<0.00010
Uranium	mg/L	—	—	—	0.000027	<0.0050	<0.005	0.0000261	0.000022	0.000055	<0.0050	<0.005	0.0000283	<0.0050	<0.005	<0.005	0.000055	<0.0050	<0.005	0.0000233	0.000036	0.000033	<0.0050	<0.005	0.0000246	0.00003	0.000028	<0.0050	<0.005	<0.005	0.0000253	0.000022	0.000026
Vanadium	mg/L	—	—	—	0.00066	<0.0010	0.0004	0.00051	<0.00020	0.00036	<0.0010	0.0007	0.00028	<0.0010	0.00045	0.0005	0.00048	<0.0010	0.0005	0.00027	0.00031	0.0003	<0.0010	0.0007	0.00032	<0.00020	0.00043	<0.0010	0.0007	0.00065	0.00039	0.00026	0.00042
Zinc	mg/L	—	—	—	0.0021	0.0089	0.003	<0.0020	<0.0020	0.0096	0.0118	0.008	0.0139	0.0075	0.0084	0.003	0.0046	0.0079	0.0024	0.0346	0.0086	0.0067	0.0052	0.0012	0.014	0.0066	0.0047	0.0057	0.0046	0.0014	0.0075	0.0021	<0.0020
Zirconium	mg/L	—	—	—	0.0001	<0.0040	<0.004	0.000073	<0.00010	<0.00010	<0.0040	<0.004	0.000092	<0.0040	<0.004	<0.004	0.000157	<0.0040	<0.004	0.000107	0.00016	<0.00010	<0.0040	<0.004	0.000092	<0.00010	<0.00010	<0.0040	<0.004	<0.004	0.000101	<0.00010	<0.00010

Notes:

(a) See Appendix 1.I for detailed notes for water quality guidelines.
(b) CCME and PWQO receiving water quality guidelines for aluminum have been calculated based on pH. See Appendix 1.I for details.
(c) CCME and/or PWQO receiving water quality guidelines for these parameters have been calculated based on hardness. See Appendix 1.I for details.
1.0 (yellow) Values highlighted in yellow greater than the Ontario Drinking Water Standards (ODWS), Ontario Regulation (O.Reg.) 169/03: Ontario Drinking Water Standards (ODWS) (Revised June 2006).
1.0 Values greater than the Canadian Council of Ministers of the Environment (CCME), Canadian Water Quality Guidelines for the Protection of Aquatic Life, Update 7.1 (December 2007).
1.0 (underlined) Values greater than the Provincial Water Quality Objectives (PWQO), Ministry of Environment and Energy
(light shading) Where cells are blank, data has been removed, or was not recorded due to field instrument error.
(dark shading) Where cells are blank, analysis was not performed during this time period. Some parameters were added to the sampling program later in the campaign, while others were removed from the sampling campaign due to non detection.
— = A dash indicates that guideline criteria are not available for this parameter.
"D" = A "D" next to the station name indicates that this is a duplicate sample.

TABLE 1
Surface Water Quality Results

Parameter	Unit	ODWS	CCME	PWQO	HRWQ-22D	HRWQ-23	HRWQ-23	HRWQ-23	HRWQ-24	HRWQ-24
			Receiving WQ Guidelines[a]		Aug-12	Sep-10	Nov-10	Jun-11	Sep-10	Nov-10
Field Parameters										
Temperature	°C	—	—	±10	21	11.39	4.31	18.25	12.94	4.59
pH	—	6.5–8.5	6.5-9	6.5-8.5	7.28	6.86	7.5	***6.35***	7.01	7.35
Conductivity	µS/cm	—	—	—		30		39	40	
Dissolved Oxygen	mg/L	—	5.5-9.5	4-8	7.88	10.44	12.86	8.6	9.81	12.76
ORP	mV	—	—	—	37.6		142.3			133.9
Physical-Chemical										
pH	—	6.5–8.5	6.5-9	6.5-8.5	7.28	7.09	6.77	6.7	7.28	6.84
DOC	% wt	5	—	—	7.5	8	6.6	9.9	10.6	7.9
TOC	% wt	—	—	—	7.1	7.7	8	10.9	9.5	8.6
Acidity	mg/L	—	—	—	2			2		
Alkalinity	mg(CaCO3)/L	30–500	—	-25%	17.1	12.1	15.3	9.9	16.6	16.9
Conductivity	µS/cm	—	—	—	46.7	31.7	32.4	33.1	42.2	37.2
Total Suspended Solids	mg/L	—	+5-25	—	<2.0	2.7	2	<2.0	<2.0	2.2
Total Dissolved Solids	mg/L	500	—	—	55	49	36	35	51	44
Major Ions										
Calcium	mg/L	—	—	—	4.77	4.82	4.78	4.42	6.17	5.5
Chloride	mg/L	250	120	—	1.24	0.3	0.25	0.3	0.63	0.42
Fluoride	mg/L	1.5	—	—	<0.030	<0.030	<0.030	0.056	<0.030	<0.030
Magnesium	mg/L	—	—	—	1.68	0.77	0.75	0.801	1.06	0.88
Potassium	mg/L	—	—	—	0.381	<1.0	<1.0	0.456	<1.0	<1.0
Sodium	mg/L	200	—	—	1.54	0.69	0.8	0.818	1.04	0.97
Sulphate	mg/L	500	—	—	1.4	1.73	1.8	3.36	1.91	1.77
Carbonate (CO_3^{2-})	mg/L	—	—	—	<5.0					
Bicarbonate ($H(CO_3)^-$)	mg/L	—	—	—	17.1					
Hardness	mg(CaCO3)/L	80–100	—	—	19.7	13.1	15	15.6	18.5	17
Cyanide (free)	mg/L	0.2	0.005	0.005		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cyanide (total)	mg/L	—	—	—		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Nutrients										
Nitrate-N	mg/L	10	13	—	0.052	<0.030	<0.030	0.107	<0.030	<0.030
Nitrite-N	mg/L	1	0.06	—	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Ammonia-N	mg/L	—	—	—	<0.020	<0.020	0.035	<0.020	<0.020	0.021
Un-ionized ammonia	mg/L	—	0.019	0.02	1.61E-04	2.99E-05	1.30E-04	1.56E-05	4.76E-05	5.65E-05
ortho-Phosphate	mg/L	—	—	—	<0.0050					
Phosphorus	mg/L	—	—	0.02	0.0102	0.0087	0.0095	0.0064	0.0109	0.0082
Organics										
Oil and Greases	mg/L	—	—	physically non detect		<2.0	<2.0	<2.0	<2.0	<2.0
Phenols	mg/L	—	0.004	0.005	0.002	<0.0010	<0.0010	0.0036	<0.0010	<0.0010
Micro-organisms										
Escherichia coli	per 100mL	—	—	100		1	1	26	1	1
Total coliforms	per 100mL	—	—	—		1000	330	> 2420	> 2420	120
Total Metals										
Aluminum[b]	mg/L	0.1	0.005-0.1	0.015-0.075	0.0413	0.022	0.0325	***0.0474***	0.057	0.0435
Antimony	mg/L	0.006	—	0.02	<0.00010	<0.00060	<0.0002	0.000155	<0.00060	<0.0002
Arsenic	mg/L	0.025	0.005	0.1	0.00035	<0.0010	0.0003	0.000319	<0.0010	0.0003
Barium	mg/L	1	—	—	0.00537	<0.010	<0.01	0.00527	<0.010	<0.01
Beryllium	mg/L	—	—	0.011-1.1	<0.000060	<0.0010	<0.0001	<0.000040	<0.0010	<0.0001
Bismuth	mg/L	—	—	—	<0.00020	<0.0010	<0.001	<0.000020	<0.0010	<0.001
Boron	mg/L	5	1.5	0.2	0.0031	<0.050	0.004	0.00326	<0.050	0.004
Cadmium[c]	mg/L	0.005	0.0000041-0.000042	0.0001-0.0005	<0.000010	<0.000090	<0.00002	***0.0000225***	<0.000090	<0.00002
Chromium (total)	mg/L	0.05	0.009	0.009	<0.00050	<0.0010	<0.0001	<0.00090	<0.0010	0.0001
Cobalt	mg/L	—	—	0.0009	<0.000050	<0.00050	<0.00005	0.000058	<0.00050	<0.00005
Copper[c]	mg/L	1	0.002-0.004	0.001-0.005	0.00117	<0.0010	0.00055	0.00128	<0.0010	0.0006
Iron (total)	mg/L	0.3	0.3	0.3	***0.321***	0.143	0.18	0.16	***0.326***	0.186
Lead[c]	mg/L	0.01	0.001-0.007	0.001-0.005	0.00025	<0.0010	0.00005	0.000117	<0.0010	0.00005
Manganese	mg/L	0.05	—	—	0.0358	0.0149	0.015	0.0356	0.0328	0.01
Mercury	mg/L	0.001	0.000026	0.0002	<0.000010	<0.00010	<0.000010	<0.000010	<0.00010	<0.000010
Molybdenum	mg/L	—	0.073	0.04	<0.00020	<0.0010	<0.0002	0.000798	<0.0010	<0.0002
Nickel[c]	mg/L	—	0.025-0.15	0.025	<0.0010	<0.0020	0.0001	<0.0010	<0.0020	<0.0001
Selenium	mg/L	0.01	0.001	0.1	<0.00050	<0.0050	0.0003	<0.0020	<0.0050	0.0002
Silicon	mg/L	—	—	—		1.72	1.8		2.29	1.8
Silver	mg/L	—	0.0001	0.0001	<0.000050	<0.00010	<0.0002	<0.0000070	<0.00010	<0.0002
Strontium	mg/L	—	—	—	0.0101	0.011	0.0133	0.0118	0.0129	0.0139
Thallium	mg/L	—	0.0008	0.0003	<0.000030	<0.00030	<0.00002	<0.0000040	<0.00030	<0.00002
Tin	mg/L	—	—	—	<0.00010	<0.0010	<0.001	0.000142	<0.0010	<0.001
Titanium	mg/L	—	—	—	0.00074	<0.0020	<0.002	0.00079	0.0024	<0.002
Tungsten	mg/L	—	—	0.03	<0.00010	<0.010	<0.01	<0.000040	<0.010	<0.01
Uranium	mg/L	0.02	0.015	0.005	0.000022	<0.0050	<0.002	0.0000259	<0.0050	<0.002
Vanadium	mg/L	—	—	0.006	0.00062	<0.0010	0.0001	0.000164	<0.0010	0.0002
Zinc	mg/L	5	0.03	0.02	<0.0020	<0.0030	0.0018	0.0098	<0.0030	0.0014
Zirconium	mg/L	—	—	0.004	<0.00010	<0.0010	<0.004	<0.00020	<0.0010	<0.004
Dissolved Metals										
Aluminum	mg/L	—	—	—	0.04	0.016	0.0215	0.0304	0.017	0.0235
Antimony	mg/L	—	—	—	<0.00010	<0.00060	<0.0002	<0.00020	<0.00060	<0.0002
Arsenic	mg/L	—	—	—	0.00039	<0.0010	0.0003	0.000276	<0.0010	0.00032
Barium	mg/L	—	—	—	0.0052	<0.010	<0.01	0.0052	<0.010	<0.01
Beryllium	mg/L	—	—	—	<0.000060	<0.0010	<0.0001	<0.000060	<0.0010	<0.0001
Bismuth	mg/L	—	—	—	<0.00020	<0.0010	<0.001	<0.00010	<0.0010	<0.001
Boron	mg/L	—	—	—	0.0038	<0.050	0.004	0.0036	<0.050	0.004
Cadmium	mg/L	—	—	—	<0.000010	<0.000090	<0.00002	<0.000030	<0.000090	0.00004
Chromium	mg/L	—	—	—	<0.00050	<0.0010	0.0001	<0.00020	<0.0010	0.0001
Cobalt	mg/L	—	—	—	<0.000050	<0.00050	<0.00005	0.000102	<0.00050	<0.00005
Copper	mg/L	—	—	—	0.00096	<0.0010	0.001	0.00162	<0.0010	0.00055
Iron	mg/L	—	—	—	0.167	<0.050	0.1	0.0573	0.127	0.076
Lead	mg/L	—	—	—	<0.00010	<0.0010	<0.00005	<0.00010	<0.0010	0.00005
Manganese	mg/L	—	—	—	0.027	0.0063	0.005	0.0213	0.0146	0.003
Mercury	mg/L	—	—	—	<0.000010	<0.00010	<0.000020	<0.000020	<0.00010	<0.000020
Molybdenum	mg/L	—	—	—	<0.00020	<0.0010	<0.0002	<0.000090	<0.0010	<0.0002
Nickel	mg/L	—	—	—	<0.0010	<0.0020	0.0006	0.00047	<0.0020	0.0002
Selenium	mg/L	—	—	—	<0.00050	<0.0020	0.0001	<0.0010	<0.0020	0.0003
Silicon	mg/L	—	—	—		1.68	1.8		1.96	1.7
Silver	mg/L	—	—	—	<0.000050	<0.00010	<0.0002	<0.000010	<0.00010	<0.0002
Strontium	mg/L	—	—	—	0.0122	0.0111	0.013	0.0135	0.0128	0.0136
Thallium	mg/L	—	—	—	<0.000030	<0.00030	<0.00002	<0.000010	<0.00030	0.00002
Tin	mg/L	—	—	—	<0.00010	<0.0010	<0.001	<0.00010	<0.0010	<0.001
Titanium	mg/L	—	—	—	0.00051	<0.0020	<0.002	<0.00050	<0.0020	<0.002
Tungsten	mg/L	—	—	—	<0.00010	<0.010	<0.01	<0.000010	<0.010	<0.01
Uranium	mg/L	—	—	—	0.000026	<0.0050	<0.005	0.0000192	<0.0050	<0.005
Vanadium	mg/L	—	—	—	0.00044	<0.0010	0.0001	0.00016	<0.0010	0.00015
Zinc	mg/L	—	—	—	<0.0020	0.0032	0.0032	0.0092	<0.0030	0.0006
Zirconium	mg/L	—	—	—	<0.00010	<0.0010	<0.004	0.000057	<0.0010	<0.004

Parameter	HRWQ-24	HRWQ-25	HRWQ-25	HRWQ-25	HRWQ-25	HRWQ-25	HRWQ-26	HRWQ-26	HRWQ-26	HRWQ-26	HRWQ-27	HRWQ-27	HRWQ-27
	Jun-11	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Mar-11	Jun-11	Sep-10	Nov-10	Mar-11
Field Parameters													
Temperature	17.81	9.23	4.51	10.51	6.94	16.24	12.35	5.48	-0.07	16.62	10.02	5.9	-0.01
pH	7.05	6.77	7.36	6.54	7.02	6.6	6.65	7.02	7.88	***6.21***	***6.09***	6.97	7.3
Conductivity	44	46		59	46		53		64	61	37		38
Dissolved Oxygen	9.03	9.97	12.49	9.53		8.27	7.44	11.66	11.18	9.74	***3.2***	11.01	8.98
ORP			129.7	287	104.9	71.2		120.9				126.3	
Physical-Chemical													
pH	7.12	7.07	6.99	7.08	7.13	6.6	6.88	7.19	7.04	7.17	***5.92***	6.67	6.68
DOC	11.3	13.7	8.6	9.4	10.4	7.6	8	8	8	8.3	20.5	7.6	10.2
TOC	11.4	14.1	9.1	11.5	10.2	7.7	9.3	8.7	8.4	11.2	20.6	7.9	11
Acidity	2.6			3	2.2	2			2.4	2.2			2.6
Alkalinity	13.9	21.7	23.2	24.7	20.4	31.5	20.9	20.6	26.2	19.5	11.6	12.7	12.7
Conductivity	33.8	49	46.4	52.5	53.7	69.4	56.3	53.1	63.3	49.1	34.7	35	37.3
Total Suspended Solids	2	<2.0	3.8	<2.0	<2.0	<2.0	23.8	21.2	60	4.7	13.6	<2.0	50
Total Dissolved Solids	31	51	63	60	45	59	56	51	2.7	65	68	46	4
Major Ions													
Calcium	5.02	8.2	7.68	8.71	7.33	9.95	9.46	8.12	9.28	8.45	5.26	4.42	4.3
Chloride	0.33	<0.10	0.31	0.54	0.48	0.25	0.31	0.24	0.4	<0.10	0.39	0.29	0.4
Fluoride	<0.030	<0.030	<0.030	0.043	<0.030	<0.030	<0.030	<0.030	0.031	<0.030	<0.030	<0.030	<0.030
Magnesium	0.818	1.52	1.35	1.42	1.34	1.82	1.06	0.95	0.974	0.856	1.23	0.83	0.779
Potassium	0.377	<1.0	<1.0	0.359	0.513	0.48	<1.0	<1.0	0.584	0.44	<1.0	<1.0	0.314
Sodium	0.766	0.7	0.72	0.762	0.909	0.942	0.91	0.83	0.969	0.771	1.43	0.81	0.723
Sulphate	2.03	<0.30	0.82	0.56	1.35	<0.30	2.6	2.56	3.06	2.9	0.84	2.48	2.45
Carbonate (CO_3^{2-})					<5.0	<5.0							
Bicarbonate ($H(CO_3)^-$)					24.9	31.5							
Hardness	15.9	24	25	26.6	22.6	33.2	25	24	29.3	25	15	15	15.8
Cyanide (free)	<0.0050	<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cyanide (total)	<0.0020	<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Nutrients													
Nitrate-N	<0.030	<0.030	<0.030	0.084	<0.030	0.108	<0.030	<0.030	0.09	0.046	<0.030	0.034	0.121
Nitrite-N	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Ammonia-N	<0.020	0.02	0.027	<0.020	<0.020	0.039	0.021	0.024	<0.020	<0.020	0.028	0.048	0.067
Un-ionized ammonia	7.53E-05	2.06E-05	7.39E-05	1.34E-05	3.05E-05	4.65E-05	2.09E-05	3.25E-05	1.24E-04	1.00E-05	6.41E-06	6.00E-05	1.10E-04
ortho-Phosphate					<0.0050	<0.0050							
Phosphorus	0.0109	0.0062	0.0074	0.0259	0.0078	0.0104	0.0106	0.0123	0.0108	0.0109	0.0654	0.0108	0.0132
Organics													
Oil and Greases	<2.0	<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Phenols	0.0035	0.0022	0.0012	***0.0043***	<0.0010	0.0023	0.0021	0.0018	***0.0138***	0.0033	0.0032	0.0022	***0.008***
Micro-organisms													
Escherichia coli	0	2	0	0			4	3	2	7	2	2	1
Total coliforms	2400	290	520	820			980	690	50	2400	> 2420	1200	99
Total Metals													
Aluminum[b]	0.0601	***0.119***	***0.107***	0.0681	0.0955	0.0488	0.037	0.0905	0.0174	***0.0466***	***0.203***	0.0935	***0.106***
Antimony	0.00006	<0.0050	<0.0002	<0.000030	<0.00010	<0.00010	<0.0050	<0.0002	0.00006	<0.000030	<0.0050	<0.0002	0.000135
Arsenic	0.000298	<0.0010	0.00048	0.000504	0.00048	0.00099	<0.0010	0.0004	0.000234	0.000272	<0.0010	0.00038	0.000286
Barium	0.0048	<0.010	<0.01	0.00532	0.00418	0.0068	<0.010	<0.01	0.0049	0.00455	0.013	<0.01	0.00475
Beryllium	<0.000040	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060	<0.0010	<0.0001	<0.00001	<0.000040	<0.0010	<0.0001	0.00001
Bismuth	<0.000020	<0.0010	<0.001	<0.000020	<0.00020	<0.00020	<0.0010	<0.001	<0.000005	<0.000020	<0.0010	<0.001	<0.000005
Boron	0.00305	<0.050	0.004	0.00368	0.0038	0.0036	<0.050	0.004	0.0036	0.00427	<0.050	0.004	0.0026
Cadmium[c]	<0.0000090	<0.000090	<0.00002	<0.0000090	<0.000010	<0.000010	<0.000090	<0.00002	***0.000016***	<0.0000090	<0.000090	<0.00002	***0.00002***
Chromium (total)	<0.00090	<0.0010	<0.0001	<0.00090	<0.00050	<0.00050	<0.0010	0.0002	<0.0002	<0.00090	<0.0010	0.0005	0.0004
Cobalt	0.000035	<0.00050	<0.00005	0.000046	0.00009	0.000284	<0.00050	<0.00005	0.000026	0.000035	0.00073	<0.00005	0.000064
Copper[c]	0.00076	<0.0010	0.00035	<0.00070	<0.00070	<0.00070	<0.0010	0.0009	0.001	0.00105	***0.0021***	0.0008	0.0014
Iron (total)		***0.311***	0.26	0.132	0.197	***0.475***	0.242	0.218	0.139	0.154	***1.1***	***0.328***	***0.356***
Lead[c]	0.00007	<0.0010	0.00005	<0.000060	0.00012	<0.00010	<0.0010	0.0001	0.00009	0.000078	<0.0010	0.0001	0.00016
Manganese	0.00811	0.0364	0.032	0.00821	0.0213	0.129	0.0171	0.018	0.0151	0.0284	0.169	0.02	0.0249
Mercury	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	<0.00001	<0.000010	<0.00010	<0.000010	<0.00001
Molybdenum	<0.000090	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	<0.0010	0.0002	0.00016	0.000092	<0.0010	0.0002	0.00018
Nickel[c]	<0.0010	<0.0020	<0.0001	<0.0010	<0.0010	<0.0010	<0.0020	0.0003	0.0004	<0.0010	<0.0020	0.0006	0.0004
Selenium	<0.0020	<0.00040	0.0002	<0.0020	<0.00050	<0.00050	<0.00040	0.0008	<0.0002	<0.0020	<0.00040	0.0005	<0.0002
Silicon		1.6	1.3				1.8	2.3	2.6		3.3	1.6	2
Silver	<0.0000070	<0.00010	<0.0002	0.0000104	<0.000050	<0.000050	<0.00010	<0.0002	<0.000002	<0.0000070	<0.00010	<0.0002	<0.000002
Strontium	0.0119	0.0251	0.0223	0.0266	0.0199	0.0312	0.0174	0.0146	0.0152	0.0142	0.018	0.0121	0.0101
Thallium	<0.0000040	<0.00030	<0.00002	<0.0000040	<0.000030	<0.000030	<0.00030	<0.00002	<0.000001	<0.0000040	<0.00030	<0.00002	<0.000001
Tin	0.000067	<0.0010	<0.001	<0.000040	<0.00010	<0.00010	<0.0010	<0.001	0.000035	0.000065	<0.0010	<0.001	0.00002
Titanium	0.00126	<0.0020	<0.002	<0.00060	0.00103	<0.00050	<0.0020	0.002	0.0003	0.00086	0.0036	<0.002	0.0016
Tungsten	<0.000040	<0.010	<0.01	<0.000040	<0.00010	<0.00010	<0.010	<0.01	<0.000002	<0.000040	<0.010	<0.01	<0.000002
Uranium	0.000021	<0.0050	<0.002	0.0000558	0.000052	0.000026	<0.0050	<0.002	0.0000155	0.0000213	<0.0050	<0.002	0.000057
Vanadium	0.000214	<0.0010	0.00015	0.000134	0.00026	0.00021	<0.0010	0.00135	0.00012	0.000184	<0.0010	0.00095	0.000345
Zinc	0.0035	<0.0030	0.0026	<0.0030	<0.0020	0.0033	<0.0030	0.0014	0.0025	<0.0030	0.0098	0.0024	0.002
Zirconium	<0.00020	<0.0040	<0.004	<0.00020	0.0001	<0.00010	<0.0040	<0.004	0.00006	<0.00020	<0.0040	<0.004	0.00008
Dissolved Metals													
Aluminum	0.0276	0.1	0.077	0.0629	0.0558	0.0428	0.015	0.018	0.0154	0.0222	0.158	0.0515	0.079
Antimony	<0.00020	<0.0050	<0.0002	<0.00020	<0.00010	<0.00010	<0.0050	<0.0002	<0.000005	<0.00020	<0.0050	<0.0002	0.00001
Arsenic	0.000274	<0.0010	0.0004	0.000462	0.00039	0.00099	<0.0010	0.00026	0.000225	0.000259	<0.0010	0.0003	0.000305
Barium	0.00436	<0.010	<0.01	0.00501	0.00388	0.00684	<0.010	<0.01	0.00593	0.00379	<0.010	<0.01	0.00548
Beryllium	<0.000060	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.00001	<0.000060	<0.0010	<0.0001	<0.00001
Bismuth	<0.00010	<0.0010	<0.001	<0.00010	<0.00020	<0.00020	<0.0010	<0.001	<0.000001	<0.00010	<0.0010	<0.001	<0.000001
Boron	0.0034	<0.050	0.002	0.0018	0.003	0.0046	<0.050	0.004	0.0042	0.0035	<0.050	0.004	0.0036
Cadmium	<0.000030	<0.00010	<0.00002	<0.000030	<0.000010	<0.000010	<0.00010	<0.00002	0.000025	<0.000030	<0.00010	<0.00002	0.00002
Chromium	<0.00020	<0.0010	0.0001	<0.00020	<0.00050	<0.00050	<0.0010	<0.0001	<0.00002	<0.00020	<0.0010	<0.0001	0.00008
Cobalt	0.000073	<0.00050	<0.00005	0.000037	<0.000050	0.000276	<0.00050	<0.00005	0.000096	<0.000030	<0.00050	<0.00005	0.000094
Copper	0.00211	0.001	0.00135	<0.00040	<0.00070	<0.00070	0.001	0.0013	0.0016	0.00055	0.0012	0.0013	0.0013
Iron	0.0272	0.237	0.122	0.0748	0.049	0.308	0.112	0.062	0.077	0.0356	0.615	0.188	0.253
Lead	<0.00010	<0.0010	0.00005	<0.00010	<0.00010	<0.00010	<0.0010	<0.00005	0.00003	<0.00010	<0.0010	<0.00005	0.00009
Manganese	0.003	0.0321	0.008	0.00479	0.00217	0.124	0.006	0.01	0.00694	0.0146	0.0957	0.017	0.0261
Mercury	<0.000020	<0.00010	<0.000020	<0.000020	<0.000010	<0.000010	<0.00010	<0.000020	<0.00001	<0.000020	<0.00010	<0.000020	<0.00001
Molybdenum	<0.000090	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	<0.0010	<0.0002	0.000096	<0.000090	<0.0010	0.0002	0.000174
Nickel	0.00042	<0.0020	0.0009	<0.00020	<0.0010	<0.0010	<0.0020	0.0006	0.00064	<0.00020	<0.0020	0.0008	0.00039
Selenium	<0.0010	<0.0050	0.0002	<0.0010	<0.00050	<0.00050	<0.0050	0.0003	<0.0002	<0.0010	<0.0050	0.0003	<0.0002
Silicon		1.85	1.4				2.06	1.9	2.6		4.02	1.5	2
Silver	<0.000010	<0.00010	<0.0002	<0.000010	<0.000050	<0.000050	<0.00010	<0.0002	<0.000001	<0.000010	<0.00010	<0.0002	<0.000001
Strontium	0.0107	0.0218	0.0219	0.0239	0.0193	0.0322	0.0154	0.0147	0.017	0.0131	0.0151	0.0114	0.0116
Thallium	<0.000010	<0.00030	<0.00002	<0.000010	<0.000030	<0.000030	<0.00030	<0.00002	<0.000001	<0.000010	<0.00030	<0.00002	<0.000001
Tin	<0.00010	<0.0010	<0.001	<0.00010	<0.00010	<0.00010	<0.0010	<0.001	<0.000002	<0.00010	0.001	<0.001	<0.000002
Titanium	<0.00050	<0.0020	<0.002	<0.00050	<0.00050	<0.00050	<0.0020	<0.002	<0.0001	<0.00050	<0.0020	<0.002	0.0005
Tungsten	0.00005	<0.010	<0.01	<0.000010	<0.00010	<0.00010	<0.010	<0.01	0.00003	<0.000010	<0.010	<0.01	<0.000002
Uranium	0.0000192	<0.0050	<0.005	0.000044	0.000034	0.000028	<0.0050	<0.005	0.000016	0.0000176	<0.0050	<0.005	0.0000535
Vanadium	0.00018	<0.0010	0.0001	<0.00010	<0.00020	0.00024	<0.0010	0.00015	0.00009	0.00013	<0.0010	0.0002	0.00027
Zinc	0.0063	0.0052	0.0086	<0.0020	0.0072	0.0027	0.0061	0.0034	0.0048	<0.0020	0.0091	0.0042	0.0042
Zirconium	0.000059	<0.0040	<0.004	0.000084	0.0001	<0.00010	<0.0040	<0.004	0.000032	0.000055	<0.0040	<0.004	0.000132

Parameter	HRWQ-27	HRWQ-28	HRWQ-28	HRWQ-28	HRWQ-28	HRWQ28	HRWQ28-D	HRWQ-28	HRWQ-29	HRWQ-29	HRWQ-29	HRWQ-29
	Jun-11	Sep-10	Nov-10	Mar-11	Jun-11	Apr-12	Apr-12	Aug-12	Sep-10	Nov-10	Mar-11	Jun-11
Field Parameters												
Temperature	17.45	12.6	3.57	0.53	20.12	9.33	9.33	23.24	12.25	3.34	-0.06	16.19
pH	***6.3***	6.96	7.1	7.5	8.34	7.39	7.39	***6.35***	7.09	6.91	7.98	7.58
Conductivity	24	74		84	61	60	60		57		71	54
Dissolved Oxygen	8.55	10.62	13.66	9.51	7.36			8.7	9.71	13.53	12.53	6.88
ORP			101.2		75.2	103.8	103.8	187.2		107.7		170.5
Physical-Chemical												
pH	6.67	7.61	7.28	7.17	7.58	7.49	7.52	***6.35***	7.31	7.08	7.17	7.16
DOC	9.3	11.5	8.9	7.7	7.9	7	6.8	12.1	8.9	7.8	7.1	7.1
TOC	12.9	11.5	9.6	7.8	8.4	7.2	7	10.1	9.7	8.1	7	7.7
Acidity	2.8			3.8	2.8	2.4	2.4	2			2.6	2.6
Alkalinity	11.2	33.1	33.1	35	26.8	26.2	25.7	33.7	24	24.4	17.1	21.8
Conductivity	32.1	75.8	72.2	81.5	63.2	66.8	67.1	74.5	58.6	58.4	70.3	55.8
Total Suspended Solids	3.1	2	2.2	67	4.5	6.4	3.3	9.9	<2.0	2.9	70	<2.0
Total Dissolved Solids	53	71	86	<2.0	50	49	35	58	54	27	<2.0	50
Major Ions												
Calcium	4.64	14.8	12.8	13.1	8.49	10.5	10.8	11.6	10.2	9.7	9.28	7.48
Chloride	0.28	0.25	0.31	0.41	0.34	0.14	0.15	0.14	0.24	0.35	0.43	<0.10
Fluoride	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.032	<0.030	<0.030	0.03	<0.030
Magnesium	0.824	0.95	0.85	0.869	0.592	0.688	0.712	0.69	1.02	0.92	0.875	0.716
Potassium	0.32	<1.0	<1.0	0.42	0.234	0.31	0.325	0.234	<1.0	<1.0	0.472	0.354
Sodium	1.02	0.86	0.75	0.691	0.516	0.63	0.649	0.547	0.86	0.78	0.701	0.6
Sulphate	2.56	2.39	2.43	2.45	3.09	2.45	2.45	1.85	2.63	2.94	3.62	3.37
Carbonate (CO_3^{2-})						<5.0	<5.0	<5.0				
Bicarbonate ($H(CO_3)^-$)						32	31.3	33.7				
Hardness	15.8	35	36	39.8	26.6	30.4	30.6	35.6	26	27	32.1	24.4
Cyanide (free)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050				<0.0050	<0.0050	<0.0050	<0.0050
Cyanide (total)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020				<0.0020	<0.0020	<0.0020	<0.0020
Nutrients												
Nitrate-N	0.033	0.056	<0.030	0.053	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.099	0.225
Nitrite-N	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Ammonia-N	<0.020	0.022	<0.020	0.054	<0.020	<0.020	<0.020	0.217	<0.020	0.024	<0.020	<0.020
Un-ionized ammonia	1.31E-05	4.55E-05	2.79E-05	1.47E-04	1.61E-03	8.61E-05	8.61E-05	2.43E-04	5.43E-05	2.12E-05	1.55E-04	2.25E-04
ortho-Phosphate						<0.0050	<0.0050	<0.0050				
Phosphorus	0.0109	0.0113	0.0128	0.0073	0.0183	0.0131	0.0149	0.0112	<0.0050	0.0142	0.0069	0.0145
Organics												
Oil and Greases	<2.0	<2.0	<2.0	<2.0	<2.0	<4.0	<4.0		<2.0	<2.0	<2.0	<2.0
Phenols	0.0036	0.0016	<0.0010	***0.0185***	0.0011	<0.0010	<0.0010	0.0017	0.0018	***0.0211***	***0.0071***	0.0016
Micro-organisms												
Escherichia coli	12	3	1	0	12				11	0	0	2
Total coliforms	1700	> 2420	42	29	200				980	370	160	1200
Total Metals												
Aluminum[b]	***0.0944***	0.06	0.015	0.0048	0.0152	0.0351	0.0363	***0.0242***	0.03	0.023	0.008	0.0272
Antimony	<0.000030	<0.0050	<0.0002	0.00001	<0.000030	<0.00010	<0.00010	<0.00010	<0.0050	<0.0002	0.00008	<0.000030
Arsenic	0.000377	<0.0010	0.00026	0.00025	0.000299	0.00026	0.00025	0.00031	<0.0010	0.00028	0.000204	0.000199
Barium	0.00464	<0.010	<0.01	0.00515	0.00288	0.00388	0.00387	0.00471	<0.010	<0.01	0.0044	0.00393
Beryllium	<0.000040	<0.0010	<0.0001	<0.00001	<0.000040	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	0.00001	<0.000040
Bismuth	<0.000020	<0.0010	<0.001	<0.000005	<0.000020	<0.00020	<0.00020	<0.00020	<0.0010	<0.001	<0.000005	<0.000020
Boron	0.00356	<0.050	0.004	0.0038	0.0028	0.0029	0.0031	0.005	<0.050	0.004	0.0032	0.00324
Cadmium[c]	***0.0000135***	<0.000090	<0.00002	0.000004	<0.0000090	<0.000010	<0.000010	<0.000010	<0.000090	<0.00002	***0.000014***	<0.0000090
Chromium (total)	<0.00090	<0.0010	0.0001	<0.0002	<0.00090	<0.00050	<0.00050	<0.00050	<0.0010	0.0002	<0.0002	<0.00090
Cobalt	0.000048	<0.00050	<0.00005	0.000028	<0.000020	<0.000050	<0.000050	<0.000050	<0.00050	<0.00005	0.000018	0.000038
Copper[c]	0.00096	<0.0010	0.0008	0.0006	<0.00070	0.00078	0.00085	0.00072	<0.0010	0.00055	0.0008	<0.00070
Iron (total)	0.195	0.081	0.056	0.259	0.0634	0.124	0.126	0.063	0.111	0.142	0.075	0.0988
Lead[c]	0.000217	<0.0010	<0.00005	0.00003	0.000122	<0.00010	<0.00010	<0.00010	<0.0010	<0.00005	0.0001	0.000083
Manganese	0.0136	0.0133	0.004	0.0352	0.00963	0.00817	0.00847	0.022	0.0104	0.012	0.0049	0.0261
Mercury	<0.000010	<0.00010	<0.000010	<0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	<0.00001	<0.000010
Molybdenum	0.000164	<0.0010	0.0002	0.00072	0.000164	0.00021	0.00021	0.00031	<0.0010	<0.0002	0.00006	<0.000090
Nickel[c]	<0.0010	<0.0020	<0.0001	<0.0002	<0.0010	<0.0010	<0.0010	0.0017	<0.0020	0.0002	0.0002	<0.0010
Selenium	<0.0020	0.00045	0.0003	<0.0002	<0.0020	<0.00050	<0.00050	<0.00050	<0.00040	0.0007	<0.0002	<0.0020
Silicon		3.3	2.4	3.3					2.2	2.5	2.7	
Silver	<0.0000070	<0.00010	<0.0002	<0.000002	<0.0000070	<0.000050	<0.000050	<0.000050	<0.00010	<0.0002	<0.000002	<0.0000070
Strontium	0.0109	0.0182	0.0161	0.0152	0.0104	0.0137	0.0137	0.0139	0.0169	0.0158	0.0151	0.0119
Thallium	<0.0000040	<0.00030	<0.00002	<0.000001	<0.0000040	<0.000030	<0.000030	<0.000030	<0.00030	<0.00002	<0.000001	<0.0000040
Tin	0.000102	<0.0010	<0.001	<0.000005	<0.000040	<0.00010	<0.00010	<0.00010	<0.0010	<0.001	0.00002	<0.000040
Titanium	0.00087	<0.0020	<0.002	0.0002	<0.00060	0.00081	0.00102	<0.00050	<0.0020	<0.002	0.0002	<0.00060
Tungsten	<0.000040	<0.010	<0.01	<0.000002	<0.000040	<0.00010	<0.00010	<0.00010	<0.010	<0.01	<0.000002	<0.000040
Uranium	0.0000437	<0.0050	<0.002	0.00001	0.0000238	0.000017	0.000018	0.000012	<0.0050	<0.002	0.0000125	0.0000127
Vanadium	0.000291	<0.0010	0.00025	0.000105	0.000101	<0.00020	<0.00020	0.00039	<0.0010	0.00025	0.000065	0.000096
Zinc	0.0039	<0.0030	0.0016	<0.0005	<0.0030	<0.0020	<0.0020	<0.0020	<0.0030	0.0004	0.0015	<0.0030
Zirconium	<0.00020	<0.0040	<0.004	0.00002	<0.00020	<0.00010	<0.00010	<0.00010	<0.0040	<0.004	0.00002	<0.00020
Dissolved Metals												
Aluminum	0.0693	<0.010	0.0065	0.0052	0.0088	0.0195	0.0202	0.0235	0.017	0.0125	0.0068	0.0107
Antimony	<0.00020	<0.0050	<0.0002	<0.000005	<0.00020	<0.00010	<0.00010	<0.00010	<0.0050	<0.0002	<0.000005	<0.00020
Arsenic	0.00035	<0.0010	0.00026	0.00028	0.000269	0.00023	0.00023	0.00033	<0.0010	0.00024	0.000225	0.000227
Barium	0.00438	<0.010	<0.01	0.0068	0.00316	0.00339	0.00367	0.00531	<0.010	<0.01	0.00534	0.0043
Beryllium	<0.000060	<0.0010	<0.0001	<0.00001	<0.000060	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.00001	<0.000060
Bismuth	<0.00010	<0.0010	<0.001	<0.000001	<0.00010	<0.00020	<0.00020	<0.00020	<0.0010	<0.001	<0.000001	<0.00010
Boron	0.0033	<0.050	0.004	0.0044	0.0024	0.0035	0.0034	0.004	<0.050	0.004	0.0044	0.0028
Cadmium	<0.000030	<0.00010	<0.00002	0.00004	<0.000030	<0.000010	0.000013	<0.000010	<0.00010	<0.00002	<0.000005	<0.000030
Chromium	<0.00020	<0.0010	0.0003	<0.00002	<0.00020	<0.00050	<0.00050	0.00118	<0.0010	0.0002	<0.00002	<0.00020
Cobalt	0.00007	<0.00050	<0.00005	0.000138	<0.000030	<0.000050	<0.000050	<0.000050	<0.00050	<0.00005	0.000008	0.000051
Copper	0.00141	0.0014	0.00085	0.0022	0.00077	0.00082	0.00125	0.00074	<0.0010	0.00165	0.0004	0.00134
Iron	0.079	<0.050	0.01	0.184	<0.0050	0.052	0.053	<0.010	0.054	0.058	0.021	<0.0050
Lead	<0.00010	<0.0010	<0.00005	0.00004	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	0.00005	<0.00001	<0.00010
Manganese	0.011	0.0056	0.002	0.0359	0.00371	0.0052	0.00538	0.0104	0.0052	0.005	0.00361	0.00484
Mercury	<0.000020	<0.00010	<0.000020	<0.00001	<0.000020	<0.000010	<0.000010	<0.000010	<0.00010	<0.000020	<0.00001	<0.000020
Molybdenum	0.000105	<0.0010	0.0002	0.00035	0.000186	0.00024	0.00025	0.00035	<0.0010	<0.0002	0.000022	<0.000090
Nickel	0.00062	<0.0020	<0.0001	0.00071	<0.00020	<0.0010	<0.0010	<0.0010	<0.0020	0.0007	0.0003	0.00074
Selenium	<0.0010	<0.0050	<0.0001	<0.0002	<0.0010	<0.00050	<0.00050	<0.00050	<0.0050	<0.0001	0.0002	<0.0010
Silicon		3.78	2	3.3					2.59	2	2.7	
Silver	<0.000010	<0.00010	<0.0002	<0.000001	<0.000010	<0.000050	<0.000050	<0.000050	<0.00010	<0.0002	<0.000001	<0.000010
Strontium	0.0102	0.0162	0.0158	0.0177	0.0126	0.0123	0.0122	0.0163	0.0153	0.0155	0.0182	0.0133
Thallium	<0.000010	<0.00030	<0.00002	<0.000001	<0.000010	<0.000030	<0.000030	<0.000030	<0.00030	<0.00002	<0.000001	<0.000010
Tin	<0.00010	<0.0010	<0.001	<0.000002	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.001	<0.000002	<0.00010
Titanium	0.00054	<0.0020	<0.002	<0.0001	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.002	<0.0001	<0.00050
Tungsten	<0.000010	<0.010	<0.01	0.00003	<0.000010	<0.00010	<0.00010	<0.00010	<0.010	<0.01	<0.000002	0.000031
Uranium	0.0000386	<0.0050	<0.005	0.000033	0.0000178	0.000013	0.000015	0.000018	<0.0050	<0.005	0.000013	0.0000116
Vanadium	0.00025	<0.0010	0.0002	0.000075	0.00011	<0.00020	<0.00020	0.00037	<0.0010	0.00015	0.000025	<0.00010
Zinc	0.0093	0.004	0.0008	0.0054	0.011	<0.0020	0.0067	0.0024	<0.0030	0.0052	0.0016	0.0076
Zirconium	0.000111	<0.0040	<0.004	0.000018	0.000031	<0.00010	<0.00010	<0.00010	<0.0040	<0.004	0.000018	0.000022

Notes:

(a) See Appendix 1.I for detailed notes for water quality guidelines.
(b) CCME and PWQO receiving water quality guidelines for aluminum have been calculated based on pH. See Appendix 1.I for details.
(c) CCME and/or PWQO receiving water quality guidelines for these parameters have been calculated based on hardness. See Appendix 1.I for details.
1.0 Values highlighted in yellow greater than the Ontario Drinking Water Standards (ODWS), Ontario Regulation (O.Reg.) 169/03: Ontario Drinking Water Standards (ODWS) (Revised June 2006).
1.0 Values greater than the Canadian Council of Ministers of the Environment (CCME), Canadian Water Quality Guidelines for the Protection of Aquatic Life, Update 7.1 (December 2007).
1.0 Values greater than the Provincial Water Quality Objectives (PWQO), Ministry of Environment and Energy
Where cells are blank, data has been removed, or was not recorded due to field instrument error.
Where cells are blank, analysis was not performed during this time period. Some parameters were added to the sampling program later in the campaign, while others were removed from the sampling campaign due to non detection.
— = A dash indicates that guideline criteria are not available for this parameter.
"D" = A "D" next to the station name indicates that this is a duplicate sample.

TABLE 1
Surface Water Quality Results

Parameter	Unit		Receiving WQ Guidelines[a]																																	
		ODWS	CCME	PWQO	HRWQ-30	HRWQ-30	HRWQ-30	HRWQ-31	HRWQ-31	HRWQ32	HRWQ-32	HRWQ-33	HRWQ-33	HRWQ-34	HRWQ-34	HRWQ-35	HRWQ-35	HRWQ-36	HRWQ-36	HRWQ-37	HRWQ37D	HRWQ-37	HRWQ-38	HRWQ-38	HRWQ-39	HRWQ-39	HRWQ-39D	Count	ODWS	CCME	PWQO	Min	Max	Average	Median	95th %ile
					Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Apr-12	Aug-12	Apr-12	Aug-12	Apr-12	Aug-12	Apr-12	Aug-12	Apr-12	Aug-12	Apr-12	Apr-12	Aug-12	Apr-12	Aug-12	Apr-12	Aug-12	Aug-12									
Field Parameters																																				
Temperature	°C	—	—	±10		5.05	15.79	4.47	28.75	6.63	19.46	6.56	21.63	7.45	22.63	7.51	21.56	9.04	21.75	7.44	7.44	19.4	7.96	20.01	8.53	22.28	22.28	172	—	—	—	-0.11	29	11	10	22
pH	—	6.5–8.5	6.5-9	6.5-8.5		7.19	7.29	6.88	6.99	7.11	7.21	6.87	7.06	6.89	7.12	***6.47***	***5.6***	7.12	6.51	7.18	7.18	7.12	7.41	6.7	7.58	7.66	7.66	172	32	32	32	5.6	8.3	6.7	6.9	7.7
Conductivity	µS/cm	—	—	—			34	77		45		44		46		36		62		85	85		20		79			107	—	—	—	20	706	61	48	94
Dissolved Oxygen	mg/L	—	5.5-9.5	4-8		12.37	7.53		6.48		8.65		8.18		8.38		***3.21***		***5.31***			7.91		7.13		9.11	9.11	138	—	9	5	1.3	14	8.9	8.9	13
ORP	mV	—	—	—		128.2	114.2	124.5	42	115.9	45.3	144.6	93.1	114.4	90.3	126.6	88.3	129	88.7	114.6	114.6	77.4	110	91.9	118.3	83.2	83.2	113	—	—	—	-1.5	287	112	109	183
Physical-Chemical																																				
pH	—	6.5–8.5	6.5-9	6.5-8.5	7.08	6.97	7.12	7.12	6.99	7.1	7.21	7.24	7.06	6.97	7.12	7.19	***5.6***	7.48	6.51	7.54	7.52	7.12	6.74	6.7	7.64	7.66	7.66	173	19	19	19	5.6	7.8	6.7	7.1	7.5
DOC	% wt	5	—	—	7.2	8.2	8.1	6.7	11	7.7	8	9.3	8.9	8.9	8.1	7.9	8.8	5.7	6	5.1	4.9	5	6	8.2	5.5	4.6	5.6	173	167	—	—	3.8	30	9.6	8.6	19
TOC	% wt	—	—	—	9	8.2	7.9	6.8	11.4	7.6	7.9	9.6	9.3	10.8	8.2	8.1	8.2	5.4	6.7	4.8	4.9	5.1	6	6.8	5.3	5.3	5.4	173	—	—	—	4	30	10	9.1	19
Acidity	mg/L	—	—	—			4.6	2.8	3.6	2.8	2	2.6	2.2	2.6	2.4	2.6	2	3.4	2	2.6	21.6	2	2.2	2	2.4	2	2	108	—	—	—	2.0	22	3.3	2.6	6.6
Alkalinity	mg(CaCO3)/L	30–500	—	-25%	13.7	13.3	13.5	33.6	33.1	18	16.4	17.2	17.2	17.7	17.4	15.9	17.3	28.5	28.6	37	36.9	42.5	7.6	8.8	36	38.8	38.9	173	144	—	—	6.0	123	23	19	48
Conductivity	µS/cm	—	—	—	35.4	35.5	33.9	85	79.7	52	44.9	52.8	48	52.4	49.5	44.3	44.9	68.5	61.9	93.4	94	91.6	24.6	26	85.7	84.3	84.1	173	—	—	—	23	289	57	50	100
Total Suspended Solids	mg/L	—	+5-25	—	2.6	<2.0	<2.0	2.1	6.9	<2.0	<2.0	2.8	2	<2.0	<2.0	<2.0	4	2.6	2	3.5	<2.0	4	<2.0	<2.0	3.7	<2.0	<2.0	173	—	—	—	<2	142	6.5	2.2	25
Total Dissolved Solids	mg/L	500	—	—	39	44	29	52	96	39	58	38	72	35	54	36	37	32	40	49	46	62	31	23	43	68	67	173	0	—	—	<2	375	61	54	115
Major Ions																																				
Calcium	mg/L	—	—	—	5.05	4.86	5.16	14.2	12	6.26	5.47	5.89	5.8	5.75	5.64	6.55	6.01	10.9	9.33	14.8	15.5	16.1	2.49	2.67	11.7	11.8	12.2	173	—	—	—	0	42	8.5	6.8	18
Chloride	mg/L	250	120	—	0.47	0.2	0.24	0.17	1.08	1.17	1.17	1.58	1.11	1.65	1.14	0.14	0.31	0.12	0.18	1.84	1.84	0.68	0.21	0.23	0.23	0.25	0.26	173	0	0	—	<0.1	15	0.72	0.34	1.6
Fluoride	mg/L	1.5	—	—	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	173	0	—	—	<0.03	0.056	0.031	0.03	0.035
Magnesium	mg/L	—	—	—	0.8	0.73	0.797	1.22	1.49	1.38	1.26	1.46	1.4	1.48	1.36	0.805	0.745	0.697	0.628	0.859	0.912	0.862	0.541	0.519	2.36	2.4	2.45	172	—	—	—	0.519	7.9	1.3	1.1	2.3
Potassium	mg/L	—	—	—	<1.0	<1.0	0.407	0.218	0.486	0.513	0.44	0.504	0.456	0.553	0.45	0.3	0.291	0.204	0.207	0.133	0.144	0.127	0.388	0.343	0.351	0.347	0.353	172	—	—	—	0.033	1.7	0.6	0.47	1.0
Sodium	mg/L	200	—	—	0.75	0.71	0.707	0.885	1.41	1.38	1.35	1.6	1.37	1.61	1.37	0.642	0.627	0.543	0.473	0.679	0.733	0.559	0.579	0.523	0.697	0.701	0.735	172	0	—	—	0.467	5.4	1.0	0.84	1.6
Sulphate	mg/L	500	—	—	2.25	1.92	2.18	3.9	0.75	1.68	1.41	1.48	1.31	1.45	1.33	1.67	1.77	1.09	1.19	1.37	1.39	0.97	1.6	1.65	1.94	1.72	1.72	173	0	—	—	<0.3	6.0	1.6	1.6	3.1
Carbonate (CO_3^{2-})	mg/L	—	—	—				<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	68	—	—	—	<5	5.0	5.0	5.0	5.0
Bicarbonate ($H(CO_3)^-$)	mg/L	—	—	—				41	33.1	22	16.4	21	17.2	21.6	17.4	19.4	17.3	34.8	28.6	45.2	45	42.5	9.2	8.8	43.9	38.8	38.9	68	—	—	—	8.8	123	28	23	55
Hardness	mg($CaCO_3$)/L	80–100	—	—	15	16	14.4	39.9	33.5	20.7	17.9	19.7	18.6	20.2	19.4	19.1	18.1	30.7	28.7	43.4	43.2	46.2	8.79	9.91	40.3	40	39.3	170	169	—	—	8.8	132	27	23	54
Cyanide (free)	mg/L	0.2	0.005	0.005	<0.0050	<0.0050	<0.0050																					105	0	0	0	<0.005	0.005	0.005	0.005	0.005
Cyanide (total)	mg/L	—	—	—	<0.0020	<0.0020	<0.0020																					105	—	—	—	<0.002	0.002	0.002	0.002	0.002
Nutrients																																				
Nitrate-N	mg/L	10	13	—	<0.030	<0.030	<0.030	0.066	0.033	0.079	0.043	0.108	0.053	0.114	0.052	0.032	<0.030	0.083	<0.030	0.136	0.136	<0.030	0.051	0.048	0.037	<0.030	<0.030	173	0	0	—	<0.03	1.7	0.06	0.03	0.13
Nitrite-N	mg/L	1	0.06	—	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	173	0	0	—	<0.02	0.02	0.02	0.02	0.02
Ammonia-N	mg/L	—	—	—	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.051	0.026	0.028	0.03	<0.020	<0.020	<0.020	<0.020	0.031	<0.020	173	—	—	—	<0.02	0.26	0.027	0.02	0.049
Un-ionized ammonia	mg/L	—	0.019	0.02	1.65E-12	3.87E-05	1.12E-04	1.81E-05	1.43E-04	3.66E-05	1.23E-04	2.09E-05	1.02E-04	2.35E-05	1.26E-04	9.00E-06	3.53E-06	1.16E-04	3.78E-05	6.41E-05	6.87E-05	9.94E-05	8.10E-05	3.97E-05	1.25E-04	6.48E-04	4.18E-04	173	—	0	0	1.6E-12	0.0016	0.00008	0.00004	0.00024
ortho-Phosphate	mg/L	—	—	—				<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	68	—	—	—	<0.005	0.0082	0.005	0.005	0.005
Phosphorus	mg/L	—	—	0.02	0.0096	0.0071	0.0092	<0.0050	0.0185	0.0072	0.0093	0.01	0.0114	0.01	0.0096	0.009	0.0076	0.0075	0.0093	0.0065	0.007	0.0067	0.0077	0.0072	0.0076	0.0058	0.0062	173	—	—	15	<0.005	0.31	0.014	0.01	0.025
Organics																																				
Oil and Greases	mg/L	—	—	physically non detect	<2.0	<2.0	<2.0	<4.0		5.1		<4.0		<4.0		<4.0		<4.0		<4.0	<6.0		<4.0		<4.0			138	—	—	—	<2	68	3.0	2.0	4.0
Phenols	mg/L	—	0.004	0.005	0.002	0.0036	***0.0044***	<0.0010	0.003	<0.0010	0.001	<0.0010	0.0019	<0.0010	0.002	<0.0010	0.0021	<0.0010	0.0027	<0.0010	<0.0010	0.0029	<0.0010	0.0033	<0.0010	0.0033	0.0029	173	—	24	17	<0.001	0.024	0.0027	0.0017	0.0071
Micro-organisms																																				
Escherichia coli	per 100mL	—	—	100	0	0	3																					105	—	—	0	0	83	4.7	1.0	19
Total coliforms	per 100mL	—	—	—	110	45	310																					93	—	—	—	0	2400	677	410	2400
Total Metals																																				
Aluminum[b]	mg/L	0.1	0.005-0.1	0.015-0.075	0.04	0.04	0.0408	0.0485	0.0447	0.0289	0.0622	0.0469	0.0558	0.0479	0.0545	***0.0677***	***0.0313***	0.0134	0.0269	0.014	0.0143	0.021	0.0774	0.0435	0.0077	0.0159	0.0184	172	28	48	58	0.0048	3.0	0.083	0.047	0.19
Antimony	mg/L	0.006	—	0.02	<0.0050	<0.0002	<0.000030	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	172	0	—	0	0.00001	0.005	0.00092	0.0001	0.005
Arsenic	mg/L	0.025	0.005	0.1	<0.0010	0.0003	0.000274	0.00027	***0.00553***	0.00028	0.00039	0.0003	0.00048	0.00031	0.00045	0.0003	0.00038	0.00024	0.00032	0.00025	0.00026	0.00029	0.00041	0.0004	0.00043	0.00062	0.00062	172	0	1	0	0.0002	0.0055	0.00053	0.00036	0.001
Barium	mg/L	1	—	—	<0.010	<0.01	0.00323	0.00474	0.00692	0.00421	0.00515	0.00466	0.00567	0.00477	0.00532	0.00457	0.00395	0.00524	0.00383	0.00558	0.00589	0.00599	0.0046	0.00639	0.00458	0.00396	0.00409	172	0	—	—	0.0019	0.072	0.0076	0.0059	0.011
Beryllium	mg/L	—	—	0.011-1.1	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	172	—	—	0	<0.00001	0.001	0.00024	0.00006	0.001
Bismuth	mg/L	—	—	—	<0.0010	<0.001	<0.000020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	172	—	—	—	<0.000005	0.002	0.00047	0.0002	0.001
Boron	mg/L	5	1.5	0.2	<0.050	0.004	0.00308	0.0025	0.004	0.0043	0.0039	0.0041	0.0037	0.0041	0.0037	0.0029	0.0042	0.0024	0.0035	0.0022	0.0026	0.003	0.0034	0.004	0.0035	0.0041	0.0041	172	0	0	0	<0.002	0.05	0.012	0.0037	0.05
Cadmium[c]	mg/L	0.005	0.0000041-0.000042	0.0001-0.0005	<0.000090	<0.00002	<0.0000090	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	***0.000017***	***0.000029***	<0.000010	***0.000033***	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	***0.000047***	***0.000055***	172	0	18	1	<0.000002	0.00022	0.00003	0.00001	0.00009
Chromium (total)	mg/L	0.05	0.009	0.009	<0.0010	<0.0001	<0.00090	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00102	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	172	0	0	0	<0.0001	0.0046	0.00062	0.0005	0.001
Cobalt	mg/L	—	—	0.0009	<0.00050	<0.00005	0.000021	0.000066	0.000656	<0.000050	<0.000050	0.00007	0.00005	0.000065	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	172	—	—	5	0.000012	0.0063	0.00022	0.00005	0.0005
Copper[c]	mg/L	1	0.002-0.004	0.001-0.005	<0.0010	0.0005	<0.00070	***0.00527***	***0.00293***	0.00105	0.00096	0.00075	0.00103	0.00081	0.00095	<0.00070	<0.00070	<0.00070	<0.00070	<0.00070	<0.00070	<0.00070	<0.00070	<0.00070	<0.00070	<0.00070	0.00093	172	0	5	11	0.00015	0.006	0.00088	0.00073	0.0012
Iron (total)	mg/L	0.3	0.3	0.3	0.138	0.108	0.0521	0.051	***3.11***	0.207	0.247	***0.492***	***0.524***	***0.507***	***0.47***	0.152	0.062	0.061	0.045	0.058	0.059	0.127	0.3	0.12	0.076	0.056	0.059	171	62	62	62	0.02000	18	0.49	0.23	1.0
Lead[c]	mg/L	0.01	0.001-0.007	0.001-0.005	<0.0010	<0.00005	<0.000060	0.00013	0.00064	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	172	0	1	0	0.00002	0.0032	0.00029	0.0001	0.001
Manganese	mg/L	0.05	—	—	0.0186	0.009	0.00353	0.00599	0.176	0.00986	0.0115	0.0217	0.123	0.0233	0.1	0.0661	0.0132	0.024	0.0209	0.0299	0.0299	0.095	0.014	0.0261	0.0384	0.0518	0.0535	172	31	—	—	<0.00050	2.1	0.06	0.019	0.16
Mercury	mg/L	0.001	0.000026	0.0002	<0.00010	<0.000010	<0.000010	<0.000010	0.000021	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	173	0	1	0	<0.000010	0.00010	0.000028	0.00001	0.0001
Molybdenum	mg/L	—	0.073	0.04	<0.0010	<0.0002	<0.000090	0.0006	0.00023	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00024	<0.00020	0.00023	0.00038	0.00042	0.0005	<0.00020	<0.00020	0.00054	0.0008	0.00082	172	—	0	0	<0.000020	0.0019	0.0004	0.0002	0.001
Nickel[c]	mg/L	—	0.025-0.15	0.025	<0.0020	0.0001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	172	—	0	0	<0.0001	0.01	0.001	0.001	0.002
Selenium	mg/L	0.01	0.001	0.1	<0.00040	0.0004	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	172	0	0	0	0.000100	0.005	0.00084	0.0005	0.002
Silicon	mg/L	—	—	—	2.3	1.9																						73	—	—	—	0.4	6.5	3.2	3.0	5.9
Silver	mg/L	—	0.0001	0.0001	<0.00010	<0.0002	<0.0000070	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	172	—	0	0	0.000002	0.0002	0.0001	0.00005	0.0002
Strontium	mg/L	—	—	—	0.0138	0.0131	0.00998	0.0321	0.0293	0.012	0.0113	0.0106	0.0122	0.0109	0.0119	0.0135	0.0122	0.018	0.0153	0.028	0.0294	0.0276	0.0077	0.00725	0.0252	0.0251	0.0263	172	—	—	—	0.00725	0.13	0.019	0.014	0.044
Thallium	mg/L	—	0.0008	0.0003	<0.00030	<0.00002	<0.0000040	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	172	—	0	0	0.000001	0.0003	0.000075	0.00003	0.0003
Tin	mg/L	—	—	—	<0.0010	<0.001	<0.000040	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	172	—	—	—	0.000005	0.004	0.00045	0.0001	0.001
Titanium	mg/L	—	—	—	<0.0020	<0.002	<0.00060	0.00108	0.00133	0.00068	0.00163	0.00103	0.00164	0.0011	0.00102	<0.00050	0.00073	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00077	<0.00050	<0.00050	<0.00050	<0.00050	172	—	—	—	0.0002	0.065	0.002	0.0014	0.0038
Tungsten	mg/L	—	—	0.03	<0.010	<0.01	<0.000040	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	172	—	—	0	<0.000002	0.01	0.0039	0.0001	0.01
Uranium	mg/L	0.02	0.015	0.005	<0.0050	<0.002	0.0000203	0.000033	0.000034	0.000023	0.000028	0.000024	0.000031	0.000023	0.000029	0.000081	0.000051	0.000032	0.000036	0.000018	0.000019	0.000011	0.00002	0.000013	0.000015	0.00001	0.000011	172	0	—	0	<0.000003	0.005	0.0014	0.000048	0.005
Vanadium	mg/L	—	—	0.006	<0.0010	0.0005	0.000051	<0.00020	0.00057	0.00024	0.00059	0.00052	0.00095	0.00052	0.00074	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	172	—	—	0	<0.00003	0.0052	0.00048	0.00034	0.001
Zinc	mg/L	5	0.03	0.02	<0.0030	0.0012	<0.0030	0.0034	0.0027	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0022	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0078	0.0076	172	0	0	0	0.0004	0.016	0.003	0.0026	0.0072
Zirconium	mg/L	—	—	0.004	<0.0040	<0.004	<0.00020	0.00012	0.00011	<0.00010	0.00015	<0.00010	0.00012	<0.00010	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	172	—	—	0	0.00002	0.004	0.0015	0.0002	0.004
Dissolved Metals																																				
Aluminum	mg/L	—	—	—	0.023	0.026	0.0406	0.0199	0.0262	0.0175	0.0379	0.0298	0.0399	0.0297	0.0411	0.0473		0.009	0.0216	0.0087	0.008	0.0171	0.0635	0.0369	0.004	0.0126	0.0132	172	—	—	—	0.004	0.35	0.047	0.031	0.14
Antimony	mg/L	—	—	—	<0.0050	<0.0002	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	105	—	—	—	<0.000005	0.005	0.0015	0.0002	0.005
Arsenic	mg/L	—	—	—	<0.0010	0.00026	0.000292	0.00024	0.00363	0.00027	0.00035	0.00028	0.0004	0.00029	0.00042	0.00026		0.00023	0.00032	0.00022	0.00023	0.00032	0.00039	0.00046	0.0004	0.00062	0.00063	172	—	—	—	0.00013	0.0036	0.0005	0.00035	0.001
Barium	mg/L	—	—	—	<0.010	<0.01	0.00354	0.0047	0.00624	0.00393	0.005	0.0049	0.00521	0.00452	0.00547	0.00282		0.00487	0.00409	0.0053	0.00516	0.00627	0.00404	0.00427	0.00441	0.00348	0.00361	172	—	—	—	0.0021	0.024	0.0072	0.0056	0.01
Beryllium	mg/L	—	—	—	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060		<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	105	—	—	—	<0.00001	0.001	0.00036	0.0001	0.001
Bismuth	mg/L	—	—	—	<0.0010	<0.001	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	105	—	—	—	<0.000001	0.001	0.00065	0.001	0.001
Boron	mg/L	—	—	—	<0.050	0.004	0.0041	<0.0020	0.0035	0.0039	0.0034	0.0032	0.0033	0.0032	0.0038	0.0034		0.0032	0.0039	0.0032	0.0028	0.0034	0.0041	0.0044	0.0046	0.0042	0.0042	170	—	—	—	0.0013	0.05	0.012	0.0038	0.05
Cadmium	mg/L	—	—	—	<0.00010	<0.00002	<0.000030	0.000013	0.00001	<0.000010	<0.000010	0.000032	<0.000010	<0.000010	0.00001	0.000016	0.000051	<0.000010	0.000012	<0.000010	<0.000010	<0.000010	0.000014	0.00001	0.000011	0.00005	0.000065	137	—	—	—	<0.000005	0.0001	0.000042	0.00003	0.0001
Chromium	mg/L	—	—	—	<0.0010	<0.0001	0.00052	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	108	—	—	—	<0.00002	0.0012	0.00047	0.00027	0.001
Cobalt	mg/L	—	—	—	<0.00050	<0.00005	<0.000030	<0.000050	0.000459	<0.000050	<0.000050	0.000059	<0.000050	<0.000050	0.000077	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000052	<0.000050	<0.000050	<0.000050	<0.000050	129	—	—	—	0.000008	0.0022	0.00023	0.00008	0.0005
Copper	mg/L	—	—	—	<0.0010	0.0005	0.00134	0.00529	0.00211	0.00086	0.0009	0.00127	0.00164	<0.00070	0.00089	<0.00070		<0.00070	<0.00070	0.00086	<0.00070	<0.00070	0.00085	<0.00070	<0.00070	<0.00070	0.00079	145	—	—	—	0.0003	0.0053	0.0011	0.001	0.0021
Iron	mg/L	—	—	—	<0.050	0.024	<0.0050	0.011	1.38	0.085	0.154	0.224	0.305	0.207	0.293	0.053		<0.010	0.018	<0.010	<0.010	0.032	0.134	<0.010	0.01	0.023	0.021	160	—	—	—	0.004	5.7	0.25	0.13	0.62
Lead	mg/L	—	—	—	<0.0010	<0.00005	<0.00010	<0.00010	0.00027	<0.00010	<0.00010	<0.00010	0.0002	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	110	—	—	—	<0.00001	0.001	0.00036	0.0001	0.001
Manganese	mg/L	—	—	—	0.0018	0.001	0.00111	<0.00050	0.118	0.00602	0.00402	0.0142	0.0829	0.0168	0.0744	0.0147		0.0159	0.00436	0.0157	0.0158	0.113	0.00846	0.011	0.0131	0.0129	0.0126	169	—	—	—	0.00065	1.1	0.038	0.01	0.12
Mercury	mg/L	—	—	—	<0.00010	<0.000020	<0.000020	0.000044	0.000014	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	107	—	—	—	<0.00001	0.0001	0.000044	0.00002	0.0001
Molybdenum	mg/L	—	—	—	<0.0010	<0.0002	<0.000090	0.00024	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020		<0.00020	0.00025	0.00043	0.00045	0.00047	<0.00020	<0.00020	0.00056	0.00079	0.00075	129	—	—	—	<0.000002	0.001	0.00044	0.0002	0.001
Nickel	mg/L	—	—	—	<0.0020	0.0003	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	105	—	—	—	<0.0001	0.002	0.00095	0.00064	0.002
Selenium	mg/L	—	—	—	<0.0050	<0.0001	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	105	—	—	—	<0.0001	0.005	0.0018	0.001	0.005
Silicon	mg/L	—	—	—	1.9	1.8																						73	—	—	—	0.3	6.1	3.0	2.9	5.4
Silver	mg/L	—	—	—	<0.00010	<0.0002	<0.000010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	105	—	—	—	<0.000001	0.0002	0.000096	0.0001	0.0002
Strontium	mg/L	—	—	—	0.0134	0.0133	0.012	0.0306	0.0279	0.0113	0.0111	0.0108	0.0115	0.0108	0.012	0.0116		0.0158	0.0169	0.0251	0.0258	0.0285	0.00643	0.00829	0.0227	0.0255	0.025	172	—	—	—	0.0064	0.12	0.019	0.014	0.046
Thallium	mg/L	—	—	—	<0.00030	<0.00002	<0.000010	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030		<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	105	—	—	—	<0.000001	0.0003	0.0001	0.00002	0.0003
Tin	mg/L	—	—	—	<0.0010	<0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	105	—	—	—	<0.000002	0.033	0.00096	0.001	0.001
Titanium	mg/L	—	—	—	<0.0020	<0.002	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00051	0.00064	<0.00050	0.00061	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	128	—	—	—	<0.0001	0.0047	0.0013	0.002	0.002
Tungsten	mg/L	—	—	—	<0.010	<0.01	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	107	—	—	—	<0.000002	0.01	0.0061	0.01	0.01
Uranium	mg/L	—	—	—	<0.0050	<0.005	0.0000239	0.000025	0.000023	0.000023	0.000027	0.00002	0.000027	0.000019	0.000028	0.000064		0.000028	0.000037	0.000016	0.000017	0.000015	0.000018	0.000018	0.000012	0.000015	0.000013	170	—	—	—	<0.000003	0.005	0.0019	0.000039	0.005
Vanadium	mg/L	—	—	—	<0.0010	<0.00005	0.00021	<0.00020	0.0003	<0.00020	0.00039	0.00026	0.00056	0.0003	0.00057	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	138	—	—	—	<0.000005	0.001	0.00047	0.00037	0.001
Zinc	mg/L	—	—	—	<0.0030	0.0006	<0.0020	0.0079	0.0081	0.0049	<0.0020	0.0091	0.0093	<0.0020	0.0086	0.0024		0.0072	0.0032	0.0058	<0.0020	0.0026	0.007	0.0024	0.0081	0.0057	0.0079	159	—	—	—	0.0006	0.035	0.0055	0.0052	0.0098
Zirconium	mg/L	—	—	—	<0.0040	<0.004	0.000072	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	120	—	—	—	0.000018	0.004	0.0021	0.0025	0.004

Notes:

(a) See Appendix 1.I for detailed notes for water quality guidelines.

(b) CCME and PWQO receiving water quality guidelines for aluminum have been calculated based on pH. See Appendix 1.I for details.

(c) CCME and/or PWQO receiving water quality guidelines for these parameters have been calculated based on hardness. See Appendix 1.I for details.

1.0 (yellow highlight) Values highlighted in yellow greater than the Ontario Drinking Water Standards (ODWS), Ontario Regulation (O.Reg.) 169/03: Ontario Drinking Water Standards (ODWS) (Revised June 2006).

1.0 Values greater than the Canadian Council of Ministers of the Environment (CCME), Canadian Water Quality Guidelines for the Protection of Aquatic Life, Update 7.1 (December 2007).

1.0 (underlined) Values greater than the Provincial Water Quality Objectives (PWQO), Ministry of Environment and Energy

(light shading) Where cells are blank, data has been removed, or was not recorded due to field instrument error.

(dark shading) Where cells are blank, analysis was not performed during this time period. Some parameters were added to the sampling program later in the campaign, while others were removed from the sampling campaign due to non detection.

— = A dash indicates that guideline criteria are not available for this parameter.

"D" = A "D" next to the station name indicates that this is a duplicate sample.

TABLE 1
Surface Water Quality Results

Parameter	Unit	Receiving WQ Guidelines[a]			Mitta Lake - Top							Mitta Lake - Bottom							Count	ODWS	CCME	PWQO	Min	Max	Average	Median	95th %ile
		ODWS	*CCME*	PWQO	HRWQP-1A	HRWQP-1A	HRWQP-1A	HRWQP1AD	HRWQP-1A	HRWQP-1A	HRWQP-1A	HRWQP-1B	HRWQP-1B	HRWQP-1B	HRWQP-1BD	HRWQP-1B	HRWQP-1B	HRWQP-1B									
					Sep-10	Nov-10	Mar-11	Mar-11	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Mar-11	Mar-11	Jun-11	Apr-12	Aug-12									
Field Parameters																											
Temperature	°C	—	—	±10	15.12	6.41	-0.07	-0.07	17.19	7.69	19.54	4.69	5.79	3.58	3.58	3.85	4.18	5.15	14	—	—	—	-0.07	20	6.9	4.9	18
pH	—	6.5-8.5	6.5-9	6.5-8.5	6.82	7.18	7.89	7.89	***6.25***	7.13	8	***6.49***	6.95	6.74	6.74	6.71	6.59	***6***	14	3	3	3	6.0	8.0	6.6	6.8	7.9
Conductivity	µS/cm	—	—	—	46		62	62	64	65		87		79	79	77	91		10	—	—	—	46	91	71	71	89
Dissolved Oxygen	mg/L	—	5.5-9.5	4-8	9.09	10.44	11.33	11.33	9.97		9.37	***0.55***	7.26	***1.14***	***1.14***	***2.2***		***0.48***	12	—	9	11	0.48	11	6.2	8.2	11
ORP	mV	—	—	—		100.3				152.1	64.6		35.5				30.5	-105.1	6	—	—	—	-105.1	152	46	50	139
Physical-Chemical																											
pH	—	6.5-8.5	6.5-9	6.5-8.5	7.33	6.84	7.04	7.11	7.46	7.39	8	6.65	6.82	6.96	6.89	6.61	7.04	***6***	14	—	1	1	6.0	8.0	6.8	7.0	7.6
DOC	% wt	5	—	—	7.9	6.8	10	9.5	7.3	7.4	8.6	8.3	6.8	9.1	8.9	7.9	7.1	5.9	14	14	—	—	5.9	10	8.0	7.9	9.7
TOC	% wt	—	—	—	8.3	6.9	10.2	9.8	10.7	6.9	8.1	8.8	7.6	9.3	9.8	12	7.9	6.3	14	—	—	—	6.3	12	8.8	8.6	11
Acidity	mg/L	—	—	—			2.4	2.6	2	3.6	2			8.8	11.2	2.6	6.6	3.6	10	—	—	—	2.0	11	4.5	3.1	10
Alkalinity	mg(CaCO3)/L	30–500	—	-25%	21	26.2	24.9	25.3	21.7	28.8	31.8	33.3	25.4	28.9	28.6	28.2	34.2	30.4	14	10	—	—	21	34	28	28	34
Conductivity	µS/cm	—	—	—	47.4	53	60.3	60	51.2	72.1	72.1	73.3	53.1	73.4	72.7	67.9	85	69	14	—	—	—	47	85	65	68	77
Total Suspended Solids	mg/L	—	+5-25	—	2.2	3.9	44	33	2.1	3.7	<2.0	12.5	4	67	73	6.3	17.9	10.7	14	—	—	—	<2	73	20	8.5	69
Total Dissolved Solids	mg/L	500	—	—	55	50	2	<2.0	37	42	72	65	47	5.6	6.3	40	60	68	14	0	—	—	<2	72	39	45	69
Major Ions																											
Calcium	mg/L	—	—	—	6.81	8.27	8.03	9.73	7	8.83	9.69	8.96	7.95	8.44	7.99	9.13	10.6	9.4	14	—	—	—	6.8	11	8.6	8.6	10
Chloride	mg/L	250	120	—	0.74	0.54	0.9	0.89	0.65	1.04	1.14	0.62	0.56	2.47	2.57	1.39	1.2	1.12	14	0	0	—	0.54	2.6	1.1	0.97	2.5
Fluoride	mg/L	1.5	—	—	<0.030	<0.030	0.032	0.03	<0.030	<0.030	<0.030	<0.030	<0.030	0.031	0.032	<0.030	0.03	<0.030	14	0	—	—	<0.03	0.032	0.03	0.03	0.032
Magnesium	mg/L	—	—	—	1.11	1.16	1.32	1.6	1.06	1.41	1.45	1.35	1.19	1.5	1.39	1.52	1.68	1.57	14	—	—	—	1.1	1.7	1.4	1.4	1.6
Potassium	mg/L	—	—	—	<1.0	<1.0	0.536	0.634	0.495	0.73	0.857	<1.0	<1.0	0.678	0.648	0.721	0.909	0.809	14	—	—	—	0.5	<1	0.79	0.77	1.0
Sodium	mg/L	200	—	—	0.86	1.08	0.984	1.16	0.968	1.54	1.77	1.05	1	2.03	1.89	1.63	1.77	1.66	14	0	—	—	0.86	2.0	1.4	1.4	1.9
Sulphate	mg/L	500	—	—	1.24	1.22	1.51	1.5	1.49	1.34	1.32	<0.30	1.28	1.42	1.45	1.62	1.2	1.33	14	0	—	—	<0.3	1.6	1.3	1.3	1.5
Carbonate (CO_3^{--})	mg/L	—	—	—						<5.0	<5.0						<5.0	<5.0	4	—	—	—	<5	<5	5.0	5.0	5.0
Bicarbonate (HCO_3^-)	mg/L		—	—						35.1	31.8						41.7	30.4	4	—	—	—	30	42	35	33	41
Hardness	mg($CaCO_3$)/L	80–100	—	—	21	25	24.6		21.2	28.4	31.7	28	25	26.1		33.8	32.9	30.2	12	12	—	—	21	34	27	27	33
Cyanide (free)	mg/L	0.2	0.005	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			10	0	0	0	<0.005	<0.005	0.005	0.005	0.005
Cyanide (total)	mg/L	—	—	—	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020	<0.0020	<0.0020			10	—	—	—	<0.002	<0.002	0.002	0.002	0.002
Nutrients																											
Nitrate-N	mg/L	10	13	—	<0.030	<0.030	<0.030	<0.030	0.066	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.096	<0.030	<0.030	14	0	0	—	<0.03	0.096	0.037	0.03	0.077
Nitrite-N	mg/L	1	0.06	—	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	14	0	0	—	<0.02	<0.02	0.02	0.02	0.02
Ammonia-N	mg/L	—	—	—	<0.020	0.134	0.196	0.192	0.03	0.165	<0.020	1.09	0.151	0.453	0.445	0.442	0.517	0.065	14	—	—	—	<0.02	1.1	0.28	0.18	0.72
Un-ionized ammonia	mg/L	—	0.019	0.02	3.63E-05	2.83E-04	1.24E-03	1.21E-03	1.72E-05	3.44E-04	7.38E-04	4.09E-04	1.79E-04	2.76E-04	2.71E-04	2.57E-04	2.34E-04	8.20E-06	14	—	0	0	0.0000082	0.0012	0.00039	0.00027	0.0012
ortho-Phosphate	mg/L	—	—	—						<0.0050	<0.0050						<0.0050	<0.0050	4	—	—	—	<0.005	<0.005	0.005	0.005	0.005
Phosphorus	mg/L	—	—	0.02	0.0117	0.0087	0.008	0.0082	0.008	0.0139	0.0073	0.0404	0.0127	0.0249	0.0292	0.0284	0.0628	0.0304	14	—	—	6	0.0073	0.063	0.021	0.013	0.048
Organics																											
Oil and Greases	mg/L	—	—	physically non detect	<2.0	<2.0	<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<2.0	<2.0	<2.0	<4.0		12	—	—	—	<2	<4	2.3	2.0	4.0
Phenols	mg/L	—	0.004	0.005	0.0018	<0.0010	0.0039	***0.0048***	***0.0043***	<0.0010	0.0018	0.0019	<0.0010	***0.0053***	0.0034	0.0036	<0.0010	<0.0010	14	—	3	1	<0.001	0.0053	0.0026	0.0019	0.005
Micro-organisms																											
Escherichia coli	per 100mL	—	—	100	0	0	0	0	0			0	0	0	0	1			10	—	—	0	0	1.0	0.1	0	0.55
Total coliforms	per 100mL	—	—	—	82	28	2	1	13			4	27	13	23	2			10	—	—	—	1.0	82	20	13	58
Total Metals																											
Aluminum[b]	mg/L	0.1	0.005-0.1	0.015-0.075	0.09	***0.111***	0.0314	0.0386	***0.0274***	***0.177***	0.0429	***0.085***	***0.103***	***0.161***	***0.177***	***0.184***	***1.24***	***0.0417***	14	7	10	11	0.027	1.2	0.18	0.097	0.55
Antimony	mg/L	0.006	—	0.02	<0.0050	<0.0002	0.000035	0.00004	<0.000030	<0.00010	<0.00010	<0.0050	<0.0002	0.00004	0.00003	<0.000030	<0.00010	<0.00010	14	0	—	0	<0.00003	<0.005	0.00079	0.0001	0.005
Arsenic	mg/L	0.025	0.005	0.1	<0.0010	0.0004	0.000368	0.000444	0.000341	0.0004	0.00039	<0.0010	0.00038	0.000388	0.000382	0.000459	0.00065	0.00038	14	0	0	0	0.00034	<0.001	0.0005	0.0004	0.001
Barium	mg/L	1	—	—	<0.010	0.01	0.0103	0.0127	0.00862	0.0176	0.0162	0.026	0.01	0.0135	0.0138	0.0152	0.0312	0.0211	14	0	—	—	0.0086	0.031	0.015	0.014	0.028
Beryllium	mg/L	—	—	0.011-1.1	<0.0010	<0.0001	<0.00001	<0.00001	<0.000040	<0.000060	<0.000060	<0.0010	<0.0001	<0.00001	<0.00001	<0.000040	<0.000060	<0.000060	14	—	—	0	<0.00001	<0.001	<0.00018	0.00006	0.001
Bismuth	mg/L	—	—	—	<0.0010	<0.001	<0.000005	<0.000005	<0.000020	<0.00020	<0.00020	<0.0010	<0.001	<0.000005	<0.000005	<0.000020	<0.00020	<0.00020	14	—	—	—	<0.000005	<0.001	0.00035	0.0002	0.001
Boron	mg/L	5	1.5	0.2	<0.050	0.006	0.0052	0.0064	0.00465	0.0053	0.0059	<0.050	0.006	0.0054	0.0048	0.00622	0.0056	0.0057	14	0	0	0	0.0047	<0.05	0.012	0.0058	0.05
Cadmium[c]	mg/L	0.005	0.0000041-0.000042	0.0001-0.0005	<0.000090	<0.00002	<0.000002	<0.000002	<0.0000090	<0.000010	<0.000010	<0.000090	<0.00002	0.000004	0.000004	<0.0000090	<0.000010	<0.000010	14	0	0	0	<0.000002	<0.00009	0.000021	0.00001	0.00009
Chromium (total)	mg/L	0.05	0.009	0.009	<0.0010	0.0001	<0.0002	<0.0002	<0.00090	<0.00050	<0.00050	<0.0010	0.0002	0.0002	0.0002	<0.00090	0.00157	<0.00050	14	0	0	0	0.0001	0.0016	0.00057	0.0005	0.0012
Cobalt	mg/L	—	—	0.0009	<0.00050	<0.00005	0.000018	0.00002	<0.000020	0.000062	<0.000050	<0.00050	<0.00005	0.000138	0.000172	0.000219	0.000639	0.000251	14	—	—	0	0.000018	0.00064	0.00019	0.00010	0.00055
Copper[c]	mg/L	1	0.002-0.004	0.001-0.005	<0.0010	0.00075	0.0006	0.0006	<0.00070	0.00108	0.00107	<0.0010	0.0007	0.0008	0.001	0.00084	***0.00245***	0.00104	14	0	1	0	0.0006	0.0025	0.00097	0.00092	0.0016
Iron (total)	mg/L	0.3	0.3	0.3	0.077	0.244	0.085	0.101	0.0565	0.258	0.016	***3.77***	0.28	***0.374***	***0.409***	***0.823***	***2.37***	0.082	14	5	5	5	0.016	3.8	0.64	0.25	2.9
Lead[c]	mg/L	0.01	0.001-0.007	0.001-0.005	<0.0010	0.00015	<0.00001	<0.00001	<0.000060	<0.00010	<0.00010	<0.0010	0.00005	0.00003	0.00005	0.000096	0.00057	<0.00010	14	0	0	0	<0.00001	<0.001	0.00024	0.000098	0.001
Manganese	mg/L	0.05	—	—	0.0153	0.044	0.00982	0.0118	0.0126	0.0708	0.00883	0.802	0.059	0.426	0.471	0.573	0.631	0.687	14	8	—	—	0.0088	0.8	0.27	0.065	0.73
Mercury	mg/L	0.001	0.000026	0.0002	<0.00010	<0.000010	0.00001	***0.00003***	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	0.00002	<0.00001	<0.000010	<0.000010	<0.000010	14	0	1	0	<0.000010	<0.0001	0.000025	0.00001	0.0001
Molybdenum	mg/L	—	0.073	0.04	<0.0010	0.0002	0.00022	0.00026	0.000193	0.00054	0.00068	<0.0010	0.0002	0.00056	0.0006	0.000393	0.00088	0.00077	14	—	0	0	0.00019	<0.001	0.00054	0.00055	0.001
Nickel[c]	mg/L	—	0.025-0.15	0.025	<0.0020	<0.0001	<0.0002	<0.0002	<0.0010	<0.0010	<0.0010	<0.0020	<0.0001	<0.0002	<0.0002	<0.0010	0.0012	<0.0010	14	—	0	0	<0.0001	<0.002	0.0008	0.001	0.002
Selenium	mg/L	0.01	0.001	0.1	<0.00040	<0.0001	<0.0002	<0.0002	<0.0020	<0.00050	<0.00050	0.00053	0.0002	<0.0002	<0.0002	<0.0020	<0.00050	<0.00050	14	0	0	0	<0.0001	0.002	0.00057	0.00045	0.002
Silicon	mg/L	—	—	—	<1.0	0.5	0.3	0.4				1.6	0.5	0.9	0.9				8	—	—	—	<1.0	1.6	0.76	0.7	1.4
Silver	mg/L	—	0.0001	0.0001	<0.00010	<0.0002	<0.000002	<0.000002	<0.0000070	<0.000050	<0.000050	<0.00010	<0.0002	0.000056	0.000072	<0.0000070	<0.000050	<0.000050	14	—	0	0	<0.000002	<0.0002	0.000068	0.00005	0.0002
Strontium	mg/L	—	—	—	0.0217	0.026	0.0249	0.0306	0.0237	0.0314	0.0298	0.03	0.0258	0.0278	0.0264	0.0298	0.0389	0.0302	14	—	—	—	0.022	0.039	0.028	0.029	0.034
Thallium	mg/L	—	0.0008	0.0003	<0.00030	<0.00002	<0.000001	<0.000001	<0.0000040	<0.000030	<0.000030	<0.00030	<0.00002	<0.000001	<0.000001	<0.0000040	<0.000030	<0.000030	14	—	0	0	<0.000001	<0.0003	0.000055	0.00002	0.0003
Tin	mg/L	—	—	—	<0.0010	<0.001	0.000005	<0.000005	<0.000040	<0.00010	<0.00010	<0.0010	<0.001	0.000005	<0.000005	<0.000040	<0.00010	<0.00010	14	—	—	—	<0.000005	<0.001	0.00032	0.0001	0.001
Titanium	mg/L	—	—	—	0.0022	0.004	0.0006	0.0007	0.00066	0.00699	<0.00050	<0.0020	0.004	0.0025	0.0028	0.00597	0.0507	0.00059	14	—	—	—	<0.0005	0.051	0.006	0.0024	0.022
Tungsten	mg/L	—	—	0.03	<0.010	<0.01	0.000876	0.00107	0.000547	0.00169	0.00203	<0.010	<0.01	0.00218	0.0023	0.0018	0.00652	0.00139	14	—	—	0	0.00055	<0.01	0.0043	0.0021	0.01
Uranium	mg/L	0.02	0.015	0.005	<0.00050	<0.002	0.0000345	0.0000445	0.000035	0.000069	0.000045	<0.0050	<0.002	0.0000815	0.000078	0.0000699	0.000176	0.000054	14	0	—	0	0.000035	<0.005	0.001	0.000074	0.005
Vanadium	mg/L	—	—	0.006	<0.00010	0.000015	0.00003	0.000045	<0.000030	0.00037	<0.00020	<0.00010	0.0002	0.00016	0.00015	0.000333	0.00293	<0.00020	14	—	—	0	<0.00003	0.0029	0.00049	0.0002	0.00017
Zinc	mg/L	5	0.03	0.02	0.0244	0.0042	<0.0005	0.001	<0.0030	<0.0020	<0.0020	0.003	0.0018	0.001	0.0015	<0.0030	0.0027	0.0021	14	0	0	1	<0.0005	0.024	0.0037	0.0021	0.011
Zirconium	mg/L	—	—	0.004	<0.0040	<0.004	0.00006	0.00006	<0.00020	<0.00010	<0.00010	<0.0040	<0.004	0.00006	0.00008	<0.00020	0.00021	<0.00010	14	—	—	0	0.00006	<0.004	0.0012	0.00015	0.004
Dissolved Metals																											
Aluminum	mg/L	—	—	—	0.022	0.015	0.0108	0.0102	0.0119	0.0095	0.0337	0.038	0.012	0.0528	0.05	0.0251	0.0243	0.0186	14	—	—	—	0.0095	<0.006	0.024	0.02	0.051
Antimony	mg/L	—	—	—	<0.0050	<0.0002	0.00003	0.00001	<0.00020	<0.00010	<0.00010	<0.0050	<0.0002	0.00002	0.000025	<0.00020	<0.00010	<0.00010	14	—	—	—	0.00001	<0.007	0.00081	0.0001	0.005
Arsenic	mg/L	—	—	—	<0.0010	0.00038	0.00039	0.00038	0.000353	0.00035	0.00039	<0.0010	0.00036	0.000395	0.00039	0.000388	0.00045	0.00035	14	—	—	—	0.00035	<0.008	0.00047	0.00039	0.001
Barium	mg/L	—	—	—	<0.010	0.01	0.0108	0.00998	0.00822	0.0145	0.0168	0.025	0.01	0.0126	0.0119	0.0111	0.0194	0.0159	14	—	—	—	0.0082	<0.009	0.013	0.012	0.021
Beryllium	mg/L	—	—	—	<0.0010	<0.0001	<0.00001	<0.00001	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.00001	<0.00001	<0.000060	<0.000060	<0.000060	14	—	—	—	<0.00001	<0.010	0.00019	0.00006	0.001
Bismuth	mg/L	—	—	—	<0.0010	<0.001	0.000059	<0.000001	<0.00010	<0.00020	<0.00020	<0.0010	<0.001	<0.000001	<0.000001	<0.00010	<0.00020	<0.00020	14	—	—	—	<0.000001	<0.011	0.00036	0.0002	0.001
Boron	mg/L	—	—	—	<0.050	0.006	0.006	0.0054	0.0055	0.0057	0.0056	<0.050	0.006	0.0058	0.0056	0.0064	0.0066	0.0058	14	—	—	—	0.0054	<0.012	0.012	0.0059	0.05
Cadmium	mg/L	—	—	—	<0.00010	<0.00002	0.000045	<0.000005	<0.000030	<0.000010	<0.000010	<0.00010	<0.00002	0.000035	<0.000005	<0.000030	<0.000010	<0.000010	14	—	—	—	<0.000005	<0.013	0.000031	0.00002	0.0001
Chromium	mg/L	—	—	—	<0.0010	0.0001	0.00008	0.00006	<0.00020	<0.00050	0.00053	<0.0010	0.0001	0.00006	0.00004	<0.00020	<0.00050	<0.00050	14	—	—	—	0.00004	<0.014	0.00035	0.0002	0.001
Cobalt	mg/L	—	—	—	<0.00050	<0.00005	0.000156	0.000014	<0.000030	<0.000050	<0.000050	<0.00050	<0.00005	0.000214	0.00013	0.000217	0.00028	0.0002	14	—	—	—	0.000014	<0.015	0.00017	0.00014	0.0005
Copper	mg/L	—	—	—	<0.0010	0.00185	0.0026	0.0005	0.00077	0.00149	0.00099	0.0013	0.00045	0.0023	0.0005	0.00248	<0.00070	<0.00070	14	—	—	—	0.00045	<0.016	0.0013	0.0010	0.0025
Iron	mg/L	—	—	—	<0.050	0.028	0.02	0.0125	<0.0050	<0.010	<0.010	3.56	0.032	0.09	0.0825	0.342	0.751	<0.010	14	—	—	—	<0.005	<0.017	0.36	0.03	1.7
Lead	mg/L	—	—	—	<0.0010	0.00005	0.00009	0.00003	<0.00010	<0.00010	<0.00010	<0.0010	<0.00005	0.00005	0.00002	<0.00010	<0.00010	<0.00010	14	—	—	—	0.00002	<0.018	0.00021	0.0001	0.001
Manganese	mg/L	—	—	—	<0.0010	0.003	0.00132	0.00108	0.00166	0.0411	0.00086	0.789	0.007	0.411	0.482	0.508	0.725	0.523	14	—	—	—	0.00086	<0.019	0.25	0.024	0.75
Mercury	mg/L	—	—	—	<0.00010	<0.000020	0.00001	0.00003	<0.000020	<0.000010	<0.000010	<0.00010	<0.000020	0.00002	<0.00001	<0.000020	<0.000010	<0.000010	14	—	—	—	<0.00001	<0.020	0.000028	0.00002	0.0001
Molybdenum	mg/L	—	—	—	<0.0010	0.0002	0.000284	0.000222	0.000157	0.00056	0.00078	<0.0010	<0.0002	0.000484	0.00052	0.00031	0.00076	0.00071	14	—	—	—	0.00016	<0.022	0.00051	0.0005	0.001
Nickel	mg/L	—	—	—	<0.0020	0.0007	0.00076	0.00014	<0.00020	<0.0010	<0.0010	<0.0020	<0.0001	0.00073	0.00014	<0.00020	<0.0010	<0.0010	14	—	—	—	<0.0001	<0.023	0.00078	0.00075	0.002
Selenium	mg/L	—	—	—	<0.0050	0.0002	<0.0002	<0.0002	<0.0010	<0.00050	<0.00050	<0.0050	<0.0001	<0.0002	<0.0002	<0.0010	<0.00050	<0.00050	14	—	—	—	<0.0001	<0.024	0.0011	0.0005	0.005
Silicon	mg/L	—	—	—	0.19	0.4	0.3	0.4				1.24	0.3	0.9	0.9				8	—	—	—	0.19	<0.025	0.58	0.4	1.1
Silver	mg/L	—	—	—	<0.00010	<0.0002	0.000005	<0.000001	<0.000010	<0.000050	<0.000050	<0.00010	<0.0002	<0.000001	<0.000001	<0.000010	<0.000050	<0.000050	14	—	—	—	<0.000001	<0.026	0.000059	0.00005	0.0002
Strontium	mg/L	—	—	—	0.021	0.0249	0.0242	0.0244	0.0217	0.0278	0.0316	0.0297	0.0259	0.0275	0.0274	0.0293	0.0343	0.0307	14	—	—	—	0.021	<0.027	0.027	0.027	0.033
Thallium	mg/L	—	—	—	<0.00030	<0.00002	0.000001	<0.000001	<0.000010	<0.000030	<0.000030	<0.00030	<0.00002	0.000001	<0.000001	<0.000010	<0.000030	<0.000030	14	—	—	—	<0.000001	<0.028	0.000056	0.00002	0.0003
Tin	mg/L	—	—	—	<0.0010	<0.001	0.000032	0.00004	0.00013	<0.00010	<0.00010	<0.0010	<0.001	0.00005	0.00001	<0.00010	<0.00010	<0.00010	14	—	—	—	0.00004	<0.029	0.00034	0.0001	0.001
Titanium	mg/L	—	—	—	<0.0020	<0.002	0.0002	<0.0001	<0.00050	<0.00050	<0.00050	<0.0020	<0.002	0.0007	0.0005	<0.00050	<0.00050	<0.00050	14	—	—	—	<0.0001	<0.030	0.00089	0.0005	0.002
Tungsten	mg/L	—	—	—	<0.010	<0.01	0.000918	0.0007	0.000481	0.00115	0.00204	<0.010	<0.01	0.00127	0.00128	0.00119	0.00325	0.00056	14	—	—	—	0.00048	<0.031	0.0038	0.0013	0.01
Uranium	mg/L	—	—	—	<0.0050	<0.005	0.000032	0.000032	0.0000286	0.000047	0.000041	<0.0050	<0.005	0.000063	0.000069	0.0000397	0.000066	0.000038	14	—	—	—	0.000029	<0.032	0.0015	0.000055	0.005
Vanadium	mg/L	—	—	—	<0.0010	<0.00005	<0.000005	<0.000005	<0.00010	<0.00020	<0.00020	<0.0010	<0.00005	<0.000005	<0.000005	<0.00010	0.00022	<0.00020	14	—	—	—	<0.000005	<0.033	0.00022	0.0001	0.001
Zinc	mg/L	—	—	—	0.0407	0.0086	0.0072	0.001	<0.0020	0.0054	<0.0020	0.0048	0.0044	0.0078	0.0016	0.0068	<0.0020	0.0075	14	—	—	—	0.001	<0.034	0.0073	0.0051	0.02
Zirconium	mg/L	—	—	—	<0.0040	<0.004	0.00005	0.000032	0.000031	<0.00010	<0.00010	<0.0040	<0.004	0.00005	0.000082	0.00006	<0.00010	<0.00010	14	—	—	—	0.000031	<0.035	0.0012	0.0001	0.004

Notes:

(a) See Appendix 1.I for detailed notes for water quality guidelines.

(b) CCME and PWQO receiving water quality guidelines for aluminum have been calculated based on pH. See Appendix 1.I for details.

(c) CCME and/or PWQO receiving water quality guidelines for these parameters have been calculated based on hardness. See Appendix 1.I for details.

1.0 Values highlighted in yellow greater than the Ontario Drinking Water Standards (ODWS), Ontario Regulation (O.Reg.) 169/03: Ontario Drinking Water Standards (ODWS) (Revised June 2006).

1.0 Values greater than the Canadian Council of Ministers of the Environment (CCME), Canadian Water Quality Guidelines for the Protection of Aquatic Life, Update 7.1 (December 2007).

1.0 Values greater than the Provincial Water Quality Objectives (PWQO), Ministry of Environment and Energy

Where cells are blank, data has been removed, or was not recorded due to field instrument error.

Where cells are blank, analysis was not performed during this time period. Some parameters were added to the sampling program later in the campaign, while others were removed from the sampling campaign due to non detection.

— = A dash indicates that guideline criteria are not available for this parameter.

"D" = A "D" next to the station name indicates that this is a duplicate sample.

TABLE 1
Surface Water Quality Results

Parameter	Unit	Receiving WQ Guidelines[a]			Sawbill Bay - Top					Sawbill Bay - Bottom					Count	ODWS	CCME	PWQO	Min	Max	Average	Median	95th %ile
		ODWS	*CCME*	PWQO	HRWQP-2A	HRWQP-2A	HRWQP-2A	HRWQP-2A	HRWQP-2A	HRWQP-2B	HRWQP-2B	HRWQP-2B	HRWQP-2B	HRWQP-2B									
					Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12									
Field Parameters																							
Temperature	°C	—	—	±10	15.19	7.77	14.47	3.89	20.24	8.37	7.14	7.94	3.85	5.43	10	—	—	—	3.9	20	9.4	7.9	18
pH	—	6.5–8.5	6.5-9	6.5-8.5	7.39	7.59	***6.24***	6.94	7.34	6.91	7.42	***5.65***	6.71	***6.14***	10	3	3	3	5.7	7.6	6.8	6.9	7.5
Conductivity	µS/cm	—	—	—	46			46		46			54		4	—	—	—	46	54	48	46	53
Dissolved Oxygen	mg/L	—	5.5-9.5	4-8	9.04	11	10.21		9.11	***4.04***	11.05	9.01		6.3	8	—	1	0	4.0	11	8.7	9.1	11
ORP	mV	—	—	—		132.2	286	90.2	56.9		136.5	291.1	36.3	40.3	8	—	—	—	36	291	134	111	289
Physical-Chemical																							
pH	—	6.5–8.5	6.5-9	6.5-8.5	7.25	6.95	7.29	7.11	7.34	6.95	6.95	7.01	7.15	***6.14***	10	—	1	1	6.1	7.3	7.0	7.1	7.3
DOC	% wt	5	—	—	8	7.3	10	6.6	8.3	8.6	7.4	9.2	7.3	5.2	10	10	—	—	5.2	10	7.8	7.7	9.6
TOC	% wt	—	—	—	8.6	7.2	9.7	6.6	8.6	8.7	7.6	9.3	6.8	5.5	10	—	—	—	5.5	9.7	7.9	8.1	9.5
Acidity	mg/L	—	—	—			2.6	3.8	2			2.4	2.2	2	6	—	—	—	2.0	3.8	2.5	2.3	3.5
Alkalinity	mg(CaCO3)/L	30–500	—	-25%	18.7	21.7	17.1	18	16	17.9	20.8	17.7	17.6	17.8	10	10	—	—	16	22	18	18	21
Conductivity	µS/cm	—	—	—	47.7	48.6	45	60.2	43.8	48.3	48.3	46.8	54.4	48.4	10	—	—	—	44	60	49	48	58
Total Suspended Solids	mg/L	—	+5-25	—	<2.0	2	<2.0	<2.0	3.7	<2.0	2.7	<2.0	<2.0	<2.0	10	—	—	—	<2.0	3.7	2.2	2.0	3.3
Total Dissolved Solids	mg/L	500	—	—	43	61	65	38	38	44	58	54	31	36	10	0	—	—	31	65	47	44	63
Major Ions																							
Calcium	mg/L	—	—	—	6.06	6.7	5.82	5.97	5.16	5.98	6.52	5.76	5.85	5.3	10	—	—	—	5.2	6.7	5.9	5.9	6.6
Chloride	mg/L	250	120	—	1.31	1.09	1.35	1.23	1.14	1.34	1.28	1.28	1.24	1.21	10	0	0	—	1.1	1.4	1.2	1.3	1.3
Fluoride	mg/L	1.5	—	—	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	10	0	—	—	<0.030	<0.030	0.03	0.03	0.03
Magnesium	mg/L	—	—	—	1.45	1.45	1.33	1.43	1.2	1.45	1.39	1.39	1.41	1.18	10	—	—	—	1.2	1.5	1.4	1.4	1.5
Potassium	mg/L	—	—	—	<1.0	<1.0	0.464	0.449	0.43	<1.0	<1.0	0.427	0.447	0.411	10	—	—	—	0.41	<1	0.66	0.46	1.0
Sodium	mg/L	200	—	—	1.38	2.62	1.35	1.49	1.23	1.36	1.35	1.34	1.48	1.21	10	0	—	—	1.2	2.6	1.5	1.4	2.1
Sulphate	mg/L	500	—	—	1.69	1.47	1.8	1.65	1.44	1.8	1.68	1.74	1.63	1.63	10	0	—	—	1.4	1.8	1.7	1.7	1.8
Carbonate ($CO_3^{=}$)	mg/L	—	—	—				<5.0	<5.0				<5.0	<5.0	4	—	—	—	<5.0	<5.0	5.0	5.0	5.0
Bicarbonate (HCO_3^-)	mg/L	—	—	—				22	16				21.5	17.8	4	—	—	—	16	22	19	20	22
Hardness	mg(CaCO3)/L	80–100	—	—	20	23	19.5	20.9	18.1	20	22	20.8	20.4	20.5	10	10	—	—	18	23	21	20	23
Cyanide (free)	mg/L	0.2	0.005	0.005	<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050			6	0	0	0	<0.0050	<0.0050	0.005	0.005	0.005
Cyanide (total)	mg/L	—	—	—	<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020			6	—	—	—	<0.0020	<0.0020	0.002	0.002	0.002
Nutrients																							
Nitrate-N	mg/L	10	13	—	<0.030	0.046	0.045	0.097	0.044	0.127	0.042	0.175	0.098	0.155	10	0	0	—	<0.030	0.18	0.086	0.072	0.17
Nitrite-N	mg/L	1	0.06	—	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	10	0	0	—	<0.020	<0.020	0.02	0.02	0.02
Ammonia-N	mg/L	—	—	—	<0.020	0.022	<0.020	<0.020	<0.020	<0.020	0.022	<0.020	<0.020	<0.020	10	—	—	—	<0.020	0.022	0.02	0.02	0.022
Un-ionized ammonia	mg/L	—	0.019	0.02	1.35E-04	1.32E-04	9.11E-06	1.38E-05	1.75E-04	1.75E-04	1.75E-04	1.75E-04	1.16E-05	3.56E-06	10	—	0	0	0.0000036	0.00017	0.0001	0.00013	0.00017
ortho-Phosphate	mg/L	—	—	—				<0.0050	<0.0050				<0.0050	<0.0050	4	—	—	—	<0.0050	<0.0050	0.005	0.005	0.005
Phosphorus	mg/L	—	—	0.02	0.0071	0.0095	0.0099	0.007	0.0091	0.0119	0.0101	0.0096	0.0083	0.0076	10	—	—	0	0.007	0.012	0.009	0.0093	0.011
Organics																							
Oil and Greases	mg/L	—	—	physically non detect	<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<2.0	<4.0		8	—	—	—	<2	<4	2.5	2.0	4.0
Phenols	mg/L	—	0.004	0.005	0.001	<0.0010	0.0032	<0.0010	0.0017	0.001	0.0021	0.003	<0.0010	0.0025	10	—	0	0	<0.0010	0.0032	0.0018	0.0014	0.0031
Micro-organisms																							
Escherichia coli	per 100mL	—	—	100	0	0	0			26	0	0			6	—	—	0	0	26	4.3	0	20
Total coliforms	per 100mL	—	—	—	26	11	2			79	10	8			6	—	—	—	2.0	79	23	11	66
Total Metals																							
Aluminum[b]	mg/L	0.1	0.005-0.1	0.015-0.075	0.034	0.0335	***0.0424***	***0.112***	0.0493	0.068	0.035	***0.0389***	0.027	***0.0383***	10	1	4	4	0.027	0.11	0.048	0.039	0.092
Antimony	mg/L	0.006	—	0.02	<0.0050	<0.0002	<0.000030	<0.00010	<0.00010	<0.0050	<0.0002	<0.000030	<0.00010	<0.00010	10	0	—	0	<0.00003	<0.00010	0.0011	0.0001	0.005
Arsenic	mg/L	0.025	0.005	0.1	<0.0010	0.0003	0.000329	0.00031	0.00037	<0.0010	0.00032	0.000342	0.00032	0.00024	10	0	0	0	0.00024	0.001	0.00045	0.00032	0.001
Barium	mg/L	1	—	—	<0.010	<0.01	0.00491	0.00475	0.00496	<0.010	<0.01	0.00491	0.00477	0.00382	10	0	—	—	0.0038	0.01	0.0068	0.0049	0.01
Beryllium	mg/L	—	—	0.011-1.1	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060	10	—	—	—	<0.00004	<0.000060	0.00025	0.00006	0.001
Bismuth	mg/L	—	—	—	<0.0010	<0.001	<0.000020	<0.00020	<0.00020	<0.0010	<0.001	<0.000020	<0.00020	<0.00020	10	—	—	—	<0.00002	<0.00020	0.00048	0.0002	0.001
Boron	mg/L	5	1.5	0.2	<0.050	0.004	0.00358	0.0034	0.0043	<0.050	0.004	0.0031	0.0032	0.0031	10	0	0	0	0.0031	0.05	0.013	0.0038	0.05
Cadmium[b]	mg/L	0.005	0.0000041-0.000042	0.0001-0.0005	<0.000090	<0.00002	<0.0000090	<0.000010	<0.000010	<0.000090	<0.00002	<0.0000090	<0.000010	<0.000010	10	0	0	0	<0.000009	<0.000010	0.000028	0.00001	0.00009
Chromium (total)	mg/L	0.05	0.009	0.009	<0.0010	0.0001	<0.00090	<0.00050	<0.00050	<0.0010	<0.0001	<0.00090	<0.00050	<0.00050	10	0	0	0	<0.0001	0.001	0.0006	0.0005	0.001
Cobalt	mg/L	—	—	0.0009	<0.00050	<0.00005	0.000028	<0.000050	<0.000050	<0.00050	<0.00005	0.000036	<0.000050	<0.000050	10	—	—	0	0.000028	0.0005	0.00014	0.00005	0.0005
Copper[b]	mg/L	1	0.002-0.004	0.001-0.005	<0.0010	0.0008	0.00073	0.00088	0.00099	<0.0010	0.0007	0.00075	<0.00070	0.00082	10	0	0	0	<0.00070	0.001	0.00084	0.00081	0.001
Iron (total)	mg/L	0.3	0.3	0.3	0.189	0.234	0.213	0.249	0.22	***0.589***	0.216	***0.307***	0.231	0.184	10	2	2	2	0.18	0.59	0.26	0.23	0.46
Lead[b]	mg/L	0.01	0.001-0.007	0.001-0.005	<0.0010	0.00005	0.000064	<0.00010	<0.00010	<0.0010	<0.00005	0.000083	<0.00010	<0.00010	10	0	0	0	<0.00005	0.001	0.00026	0.0001	0.001
Manganese	mg/L	0.05	—	—	0.0065	0.012	0.0112	0.0172	0.00911	0.0284	0.011	0.0263	0.0179	0.00992	10	0	—	—	0.0065	0.028	0.015	0.012	0.027
Mercury	mg/L	0.001	0.000026	0.0002	<0.00010	<0.000010	<0.0000010	<0.000010	<0.0000010	<0.00010	<0.000010	<0.00010	<0.000010	<0.000010	10	0	0	0	<0.000010	<0.000010	0.000028	0.00001	0.0001
Molybdenum	mg/L	—	0.073	0.04	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	10	—	0	0	<0.00009	<0.00020	0.00034	0.0002	0.001
Nickel[b]	mg/L	—	0.025-0.15	0.025	<0.0020	0.0002	<0.0010	<0.0010	<0.0010	<0.0020	0.0001	<0.0010	<0.0010	<0.0010	10	—	0	0	0.0001	0.002	0.001	0.001	0.002
Selenium	mg/L	0.01	0.001	0.1	<0.00040	0.0003	<0.0020	<0.00050	<0.00050	<0.00040	0.0006	<0.0020	<0.00050	<0.00050	10	0	0	0	0.0003	0.002	0.00077	0.0005	0.002
Silicon	mg/L	—	—	—	3.1	2.8				4.2	2.8				4	—	—	—	2.8	4.2	3.2	3.0	4.0
Silver	mg/L	—	0.0001	0.0001	<0.00010	<0.0002	<0.0000070	<0.000050	<0.000050	<0.00010	<0.0002	<0.0000070	<0.000050	<0.000050	10	—	0	0	<0.000007	<0.000050	0.000081	0.00005	0.0002
Strontium	mg/L	—	—	—	0.0132	0.0145	0.0124	0.0135	0.0109	0.0134	0.0143	0.0128	0.0134	0.0109	10	—	—	—	0.011	0.015	0.013	0.013	0.014
Thallium	mg/L	—	0.0008	0.0003	<0.00030	<0.00002	<0.0000040	<0.000030	<0.000030	<0.00030	<0.00002	<0.0000040	<0.000030	<0.000030	10	—	0	0	<0.000004	<0.000030	0.000077	0.00003	0.0003
Tin	mg/L	—	—	—	<0.0010	<0.001	<0.000040	<0.00010	<0.00010	<0.0010	<0.001	<0.000040	<0.00010	<0.00010	10	—	—	—	<0.00004	<0.00010	0.00045	0.0001	0.001
Titanium	mg/L	—	—	—	<0.0020	<0.002	0.00082	0.00069	0.00087	<0.0020	<0.002	0.00082	0.00052	0.00059	10	—	—	—	0.00052	0.002	0.0012	0.00085	0.002
Tungsten	mg/L	—	—	0.03	<0.010	<0.01	<0.000040	<0.00010	<0.00010	<0.010	<0.01	<0.000040	<0.00010	<0.00010	10	—	—	0	<0.00004	<0.00010	0.004	0.0001	0.01
Uranium	mg/L	0.02	0.015	0.005	<0.0050	<0.002	0.0000281	0.000027	0.000027	<0.0050	<0.002	0.0000259	0.000024	0.000016	10	0	—	0	0.000016	0.005	0.0014	0.000028	0.005
Vanadium	mg/L	—	—	0.006	<0.0010	0.0003	0.000359	0.00026	0.00057	<0.0010	0.00025	0.000273	0.00023	0.00029	10	—	—	0	0.00023	0.001	0.00045	0.0003	0.001
Zinc	mg/L	5	0.03	0.02	<0.0030	0.0096	<0.0030	<0.0020	<0.0020	<0.0030	0.0024	<0.0030	<0.0020	<0.0020	10	0	0	0	<0.0020	0.0096	0.0032	0.0027	0.0066
Zirconium	mg/L	—	—	0.004	<0.0040	<0.004	<0.00020	<0.00010	<0.00010	<0.0040	<0.004	<0.00020	<0.00010	<0.00010	10	—	—	0	<0.00010	<0.00010	0.0017	0.0002	0.004
Dissolved Metals																							
Aluminum	mg/L	—	—	—	0.018	0.019	0.0236	0.0166	0.0379	0.032	0.019	0.0211	0.0158	0.0299	10	—	—	—	0.016	0.038	0.02	0.019	0.031
Antimony	mg/L	—	—	—	<0.0050	<0.0002	<0.00020	<0.00010	<0.00010	<0.0050	<0.0002	<0.00020	<0.00010	<0.00010	10	—	—	—	<0.00010	<0.00010	0.0011	0.0002	0.005
Arsenic	mg/L	—	—	—	<0.0010	0.00032	0.000285	0.00029	0.00035	<0.0010	0.0003	0.00028	0.00028	0.00025	9	—	—	—	0.00025	0.001	0.00045	0.00029	0.001
Barium	mg/L	—	—	—	<0.010	<0.01	0.00444	0.00404	0.00498	<0.010	<0.01	0.00449	0.00395	0.00419	9	—	—	—	0.004	0.01	0.0068	0.0045	0.01
Beryllium	mg/L	—	—	—	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	9	—	—	—	<0.000060	<0.000060	0.00028	0.00006	0.001
Bismuth	mg/L	—	—	—	<0.0010	<0.001	<0.00010	<0.00020	<0.00020	<0.0010	<0.001	<0.00010	<0.00020	<0.00020	9	—	—	—	<0.0001	<0.00020	0.00053	0.0002	0.001
Boron	mg/L	—	—	—	<0.050	0.004	0.003	0.004	0.0037	<0.050	0.004	0.0026	0.0039	0.0036	9	—	—	—	0.0026	0.05	0.014	0.004	0.05
Cadmium	mg/L	—	—	—	<0.00010	<0.00002	<0.0000030	<0.000010	<0.000010	<0.00010	<0.00002	<0.0000030	<0.000010	<0.000010	9	—	—	—	<0.000010	<0.000010	0.000037	0.00002	0.0001
Chromium	mg/L	—	—	—	<0.0010	0.0002	<0.00020	<0.00050	<0.00050	<0.0010	0.0002	<0.00020	<0.00050	<0.00050	9	—	—	—	<0.0002	0.001	0.00048	0.0005	0.001
Cobalt	mg/L	—	—	—	<0.00050	<0.00005	<0.0000030	<0.000050	<0.000050	<0.00050	<0.00005	<0.0000030	<0.000050	<0.000050	9	—	—	—	<0.00003	<0.000050	0.00015	0.00005	0.0005
Copper	mg/L	—	—	—	0.0016	0.00075	0.00051	0.00093	<0.00070	0.0013	0.002	0.00074	0.00096	0.00095	9	—	—	—	0.00051	0.002	0.0011	0.00095	0.0018
Iron	mg/L	—	—	—	0.113	0.152	0.0988	0.099	0.09	0.277	0.13	0.119	0.091	0.037	9	—	—	—	0.037	0.28	0.12	0.11	0.23
Lead	mg/L	—	—	—	<0.0010	<0.00005	<0.00010	<0.00010	<0.00010	<0.0010	0.00005	<0.00010	<0.00010	<0.00010	9	—	—	—	<0.00005	0.001	0.00029	0.0001	0.001
Manganese	mg/L	—	—	—	0.002	0.002	0.00137	0.0105	0.00289	0.0089	0.002	0.00305	0.0113	0.0022	9	—	—	—	0.0014	0.011	0.0048	0.0022	0.011
Mercury	mg/L	—	—	—	<0.00010	<0.000020	<0.0000020	<0.000010	0.000012	<0.00010	<0.000020	<0.0000020	<0.000010	<0.000010	9	—	—	—	<0.000010	0.0001	0.000034	0.00002	0.0001
Molybdenum	mg/L	—	—	—	<0.0010	<0.0002	<0.0000090	<0.00020	<0.00020	<0.0010	<0.0002	<0.0000090	<0.00020	<0.00020	9	—	—	—	<0.00009	<0.00020	0.00035	0.0002	0.001
Nickel	mg/L	—	—	—	<0.0020	0.0002	0.00023	<0.0010	<0.0010	<0.0020	0.0008	0.00029	<0.0010	<0.0010	9	—	—	—	0.0002	0.002	0.00095	0.001	0.002
Selenium	mg/L	—	—	—	<0.0050	0.0004	<0.0010	<0.00050	<0.00050	<0.0050	<0.0001	<0.0010	<0.00050	<0.00050	9	—	—	—	<0.0001	0.005	0.0016	0.0005	0.005
Silicon	mg/L	—	—	—	2.81	2.6				3.76	2.7				4	—	—	—	2.6	3.8	3.0	2.8	3.6
Silver	mg/L	—	—	—	<0.00010	<0.0002	<0.0000010	<0.000050	<0.000050	<0.00010	<0.0002	<0.0000010	<0.000050	<0.000050	9	—	—	—	<0.00001	<0.000030	0.000086	0.00005	0.0002
Strontium	mg/L	—	—	—	0.0127	0.0147	0.0117	0.0112	0.0112	0.0127	0.0143	0.0122	0.0113	0.0121	9	—	—	—	0.011	0.015	0.013	0.012	0.015
Thallium	mg/L	—	—	—	<0.00030	<0.00002	<0.0000010	<0.000030	<0.000030	<0.00030	<0.00002	<0.0000010	<0.000030	<0.000030	9	—	—	—	<0.00001	<0.000030	0.000083	0.00003	0.0003
Tin	mg/L	—	—	—	<0.0010	<0.001	<0.00010	<0.00010	<0.00010	<0.0010	<0.001	<0.00010	<0.00010	<0.00010	9	—	—	—	<0.00010	<0.00010	0.0005	0.0001	0.001
Titanium	mg/L	—	—	—	<0.0020	<0.002	<0.00050	<0.00050	<0.00050	<0.0020	<0.002	<0.00050	<0.00050	<0.00050	9	—	—	—	<0.00050	<0.00050	0.0012	0.0005	0.002
Tungsten	mg/L	—	—	—	<0.010	<0.01	<0.000010	<0.00010	<0.00010	<0.010	<0.01	<0.000010	<0.00010	<0.00010	9	—	—	—	<0.00010	<0.00010	0.0045	0.0001	0.01
Uranium	mg/L	—	—	—	<0.0050	<0.002	0.0000231	0.000021	0.000027	<0.0050	<0.002	0.0000232	0.000021	0.000022	9	—	—	—	0.000021	0.005	0.0022	0.000023	0.005
Vanadium	mg/L	—	—	—	<0.0010	0.00025	0.00013	<0.00020	0.00046	<0.0010	0.00025	<0.00010	<0.00020	0.00024	9	—	—	—	<0.0001	0.001	0.00037	0.00024	0.001
Zinc	mg/L	—	—	—	0.0033	0.0112	<0.0020	0.0071	<0.0020	0.0094	0.0072	<0.0020	0.0059	0.0037	9	—	—	—	<0.0020	0.011	0.0058	0.0059	0.01
Zirconium	mg/L	—	—	—	<0.0040	<0.004	0.000066	<0.00010	<0.00010	<0.0040	<0.004	0.000074	<0.00010	<0.00010	9	—	—	—	0.000066	0.004	0.0018	0.0001	0.004

Notes:

(a) See Appendix 1.I for detailed notes for water quality guidelines.

(b) CCME and PWQO receiving water quality guidelines for aluminum have been calculated based on pH. See Appendix 1.I for details.

(c) CCME and/or PWQO receiving water quality guidelines for these parameters have been calculated based on hardness. See Appendix 1.I for details.

1.0 Values highlighted in yellow greater than the Ontario Drinking Water Standards (ODWS), Ontario Regulation (O.Reg.) 169/03: Ontario Drinking Water Standards (ODWS) (R

1.0 Values greater than the Canadian Council of Ministers of the Environment (CCME), Canadian Water Quality Guidelines for the Protection of Aquatic Life, Update 7.1 (Decen

1.0 Values greater than the Provincial Water Quality Objectives (PWQO), Ministry of Environment and Energy

Where cells are blank, data has been removed, or was not recorded due to field instrument error.

Where cells are blank, analysis was not performed during this time period. Some parameters were added to the sampling program later in the campaign, while others were removed from the sampling campaign due to non detection.

— = A dash indicates that guideline criteria are not available for this parameter.

"D" = A "D" next to the station name indicates that this is a duplicate sample.

TABLE 1
Surface Water Quality Results

Parameter	Unit	Receiving WQ Guidelines[a]			Lake - Top						Lake - Bottom						Count	ODWS	CCME	PWQO	Min	Max	Average	Median	95th %ile
		ODWS	CCME	PWQO	HRWQP-3A	HRWQP-3A	HRWQP-3AD	HRWQP-3A	HRWQP-3A	HRWQP-3A	HRWQP-3B	HRWQP-3B	HRWQP-3BD	HRWQP-3B	HRWQP-3B	HRWQP-3B									
					Sep-10	Nov-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Nov-10	Jun-11	Apr-12	Aug-12									
Field Parameters																									
Temperature	°C	—	—	±10	14.92	5.13	5.13	16.81	7.83	19.8	13.52	5.17	5.17	12.02	6.82	17.05	12	—	–	–	5.1	20	11	9.9	18
pH	—	6.5–8.5	6.5-9	6.5-8.5	***6.49***	7.04	7.04	***6.45***	6.86	7.53	6.85	7.08	7.08	6.52	6.62	6.74	12	2	2	2	6.5	7.5	6.9	6.9	7.3
Conductivity	µS/cm	—	—	—	59			74	59		59			72	70		10	—	–	–	0.059	589	247	65	589
Dissolved Oxygen	mg/L	—	5.5-9.5	4-8	9.31	12.3	12.3	9.66		9.01	9.12	12.13	12.13	8.94		7.62	10	—	5	9	7.6	12	10	9.5	12
ORP	mV	—	—	—		89.5	89.5		141.3	75.6		91.5	91.5		31.3	98.9	8	—	–	–	31	141	89	91	126
Physical-Chemical																									
pH	—	6.5–8.5	6.5-9	6.5-8.5	7.54	7.19	7.24	7.4	7.33	7.53	7.58	7.24	7.23	7.4	7.31	6.74	12	—	0	0	6.7	7.6	7.3	7.3	7.6
DOC	% wt	5	—	—	9.2	7.4	8.3	9	7.8	7.9	8.8	7.6	8.7	9.1	7.7	7	12	12	–	–	7.0	9.2	8.2	8.1	9.1
TOC	% wt	—	—	—	9.3	8.8	8.8	9.1	7.4	8.1	8.8	8.8	8.9	9	7.7	7.3	12	—	–	–	7.3	9.3	8.5	8.8	9.2
Acidity	mg/L	—	—	—				3	3	2.4				3.2	3	2.8	6	—	–	–	2.4	3.2	2.9	3.0	3.2
Alkalinity	mg(CaCO3)/L	30–500	—	-25%	27.6	27.2	28.6	25.1	25.9	28.7	27.5	26.8	27.8	25.7	25.5	29.2	12	12	–	–	25	29	27	27	29
Conductivity	µS/cm	—	—	—	61.9	61.7	62.7	59.3	65.2	64.6	63.2	61.3	61.2	59.2	65.5	65	12	—	–	–	59	66	63	62	65
Total Suspended Solids	mg/L	—	+5-25	—	<2.0	<2.0	<2.0	2.4	2.4	<2.0	<2.0	<2.0	<2.0	2.3	<2.0	2.4	12	—	–	–	<2.0	2.4	2.1	2.0	2.4
Total Dissolved Solids	mg/L	500	—	—	47	44	57	49	34	73	53	82	37	58	50	72	12	0	–	–	34	82	55	52	77
Major Ions																									
Calcium	mg/L	—	—	—	10.5	10.4	10.4	9.93	10	11.5	10.9	10.3	9.63	9.56	9.38	11.3	12	—	–	–	9.4	12	10	10	11
Chloride	mg/L	250	120	—	0.44	0.22	0.24	0.32	0.16	0.12	0.41	0.22	0.24	0.39	0.16	0.12	12	0	0	–	0.12	0.44	0.25	0.23	0.42
Fluoride	mg/L	1.5	—	—	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	12	0	–	–	<0.030	<0.030	0.03	0.03	0.03
Magnesium	mg/L	—	—	—	0.96	0.91	0.93	0.864	0.87	0.93	1	0.93	0.84	0.834	0.809	0.907	12	—	–	–	0.81	1.0	0.9	0.91	0.98
Potassium	mg/L	—	—	—	<1.0	<1.0	<1.0	0.337	0.341	0.257	<1.0	<1.0	<1.0	0.337	0.316	0.257	12	—	–	–	0.26	0.34	0.65	0.67	1.0
Sodium	mg/L	200	—	—	0.7	0.7	0.7	0.638	0.65	0.691	0.7	0.7	0.67	0.608	0.611	0.681	12	0	–	–	0.61	0.7	0.67	0.69	0.7
Sulphate	mg/L	500	—	—	1.77	1.9	1.93	2.53	1.75	1.65	1.71	1.96	1.92	2.07	1.74	1.66	12	0	–	–	1.7	2.5	1.9	1.8	2.3
Carbonate (CO_3^{2-})	mg/L	—	—	—					<5.0	<5.0					<5.0	<5.0	4	—	–	–	<5.0	<5.0	5.0	5.0	5.0
Bicarbonate (HCO_3^-)	mg/L	—	—	—					31.6	28.7					31.1	29.2	4	—	–	–	29	32	30	30	32
Hardness	mg($CaCO_3$)/L	80–100	—	—	29	30	32	30	29.9	34.4	29	29	31	26.2	30.3	33.6	12	12	–	–	26	34	30	30	34
Cyanide (free)	mg/L	0.2	0.005	0.005	<0.0050	<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050	<0.0050			8	0	0	0	<0.0050	<0.0050	0.005	0.005	0.005
Cyanide (total)	mg/L	—	—	—	<0.0020	<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020	<0.0020			8	—	–	–	<0.0020	<0.0020	0.002	0.002	0.002
Nutrients																									
Nitrate-N	mg/L	10	13	—	<0.030	<0.030	<0.030	<0.030	0.053	<0.030	<0.030	<0.030	<0.030	<0.030	0.053	<0.030	12	0	0	–	<0.030	0.053	0.034	0.03	0.053
Nitrite-N	mg/L	1	0.06	—	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	12	0	0	–	<0.020	<0.020	0.02	0.02	0.02
Ammonia-N	mg/L	—	—	—	<0.020	0.026	0.026	<0.020	<0.020	<0.020	<0.020	0.024	0.024	<0.020	<0.020	<0.020	12	—	–	–	<0.020	0.026	0.022	0.02	0.026
Un-ionized ammonia	mg/L	—	0.019	0.02	1.68E-05	3.59E-05	3.59E-05	1.76E-05	2.26E-05	2.61E-04	3.45E-05	3.64E-05	3.64E-05	1.44E-05	1.20E-05	3.49E-05	12	—	0	0	0.000012	0.00026	0.000047	0.000035	0.00014
ortho-Phosphate	mg/L	—	—	—					<0.0050	<0.0050					<0.0050	<0.0050	4	—	–	–	<0.0050	<0.0050	0.005	0.005	0.005
Phosphorus	mg/L	—	—	0.02	0.0077	0.009	0.009	0.0108	0.0084	0.0078	0.0058	0.0073	0.0078	0.0101	0.0078	0.0067	12	—	–	0	0.0058	0.011	0.0082	0.0078	0.01
Organics																									
Oil and Greases	mg/L	—	—	physically non detect	<2.0	<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<2.0	<2.0	<4.0		10	—	–	–	<2	<4.0	2.4	2.0	4.0
Phenols	mg/L	—	0.004	0.005	0.0013	<0.0010	<0.0010	0.0031	<0.0010	0.0019	0.0015	<0.0010	<0.0010	0.0033	<0.0010	0.0017	12	—	0	0	<0.0010	0.0033	0.0016	0.0012	0.0032
Micro-organisms																									
Escherichia coli	per 100mL	—	—	100	0	0	0	3			0	0	1	3			8	—	–	0	0	3.0	0.88	0	3.0
Total coliforms	per 100mL	—	—	—	57	30	22	33			84	51	23	23			8	—	–	–	22	84	40	32	75
Total Metals																									
Aluminum[b]	mg/L	0.1	0.005-0.1	0.015-0.075	***0.02***	0.0225	0.021	***0.0272***	0.0342	0.0256	0.019	0.0195	0.0185	0.03	0.0323	0.0245	12	0	2	2	0.019	0.034	0.025	0.024	0.033
Antimony	mg/L	0.006	—	0.02	<0.0050	<0.0002	<0.0002	<0.000030	<0.00010	<0.00010	<0.0050	<0.0002	<0.0002	<0.000030	<0.00010	<0.00010	12	0	0	–	<0.00003	<0.00010	0.00094	0.00015	0.005
Arsenic	mg/L	0.025	0.005	0.1	<0.0010	0.00036	0.00032	0.000255	0.00027	0.00037	<0.0010	0.00032	0.00032	0.000252	0.00025	0.00039	12	0	0	0	0.00025	0.001	0.00043	0.00032	0.001
Barium	mg/L	1	—	—	<0.010	<0.01	<0.01	0.0037	0.00429	0.00415	<0.010	<0.01	<0.01	0.00364	0.004	0.0041	12	0	0	–	0.00364	0.01	0.007	0.0071	0.01
Beryllium	mg/L	—	—	0.011-1.1	<0.0010	<0.0001	<0.0001	<0.000040	<0.000060	<0.000060	<0.0010	<0.0001	<0.0001	<0.000040	<0.000060	<0.000060	12	—	–	0	<0.00004	<0.000060	0.00023	0.00008	0.001
Bismuth	mg/L	—	—	—	<0.0010	<0.001	<0.001	<0.000020	<0.00020	<0.00020	<0.0010	<0.001	<0.001	<0.000020	<0.00020	<0.00020	12	—	–	–	<0.00020	<0.00020	0.00057	0.0006	0.001
Boron	mg/L	5	1.5	0.2	<0.050	0.004	0.004	0.00308	0.0026	0.0035	<0.050	0.004	0.004	0.00333	0.0027	0.0037	12	0	0	0	0.0026	0.05	0.011	0.0039	0.05
Cadmium[c]	mg/L	0.005	0.0000041-0.000042	0.0001-0.0005	<0.000090	<0.00002	<0.00002	<0.0000090	<0.000010	<0.000010	<0.000090	<0.00002	<0.00002	<0.0000090	<0.000010	<0.000010	12	0	0	0	<0.000009	<0.000010	0.000027	0.000015	0.00009
Chromium (total)	mg/L	0.05	0.009	0.009	<0.0010	<0.0001	0.0001	<0.00090	<0.00050	<0.00050	<0.0010	<0.0001	<0.0001	<0.00090	<0.00050	<0.00050	12	0	0	0	<0.0001	0.001	0.00052	0.0005	0.001
Cobalt	mg/L	—	—	0.0009	<0.00050	<0.00005	<0.00005	<0.000020	<0.000050	<0.000050	<0.00050	<0.00005	<0.00005	<0.000020	<0.000050	<0.000050	12	—	–	0	<0.00002	<0.000050	0.00012	0.00005	0.0005
Copper[c]	mg/L	1	0.002-0.004	0.001-0.005	<0.0010	0.00045	0.00075	<0.00070	<0.00070	<0.00070	<0.0010	0.0004	0.0004	<0.00070	<0.00070	0.00073	12	0	0	0	0.0004	0.001	0.00069	0.0007	0.001
Iron (total)	mg/L	0.3	0.3	0.3	0.131	0.178	0.172	0.0887	0.177	0.099	0.149	0.174	0.162	0.0942	0.157	0.098	12	0	0	0	0.089	0.18	0.14	0.15	0.18
Lead[c]	mg/L	0.01	0.001-0.007	0.001-0.005	<0.0010	<0.00005	<0.00005	0.000112	<0.00010	<0.00010	<0.0010	<0.00005	<0.00005	0.000201	<0.00010	<0.00010	12	0	0	0	<0.00005	0.001	0.00024	0.0001	0.001
Manganese	mg/L	0.05	—	—	0.017	0.033	0.033	0.00631	0.0299	0.0393	0.0214	0.033	0.031	0.00707	0.0283	0.0386	12	0	–	–	0.0063	0.039	0.026	0.03	0.039
Mercury	mg/L	0.001	0.000026	0.0002	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	12	0	0	0	<0.000010	<0.000010	0.000025	0.00001	0.0001
Molybdenum	mg/L	—	0.073	0.04	<0.0010	<0.0002	<0.0002	<0.000090	<0.00020	0.00022	<0.0010	<0.0002	<0.0002	<0.000090	<0.00020	0.00021	12	—	0	0	<0.00009	0.001	0.00032	0.0002	0.001
Nickel[c]	mg/L	—	0.025-0.15	0.025	<0.0020	<0.0001	<0.0001	<0.0010	<0.0010	<0.0010	<0.0020	<0.0001	<0.0001	<0.0010	<0.0010	<0.0010	12	—	0	0	<0.0001	<0.0010	0.00087	0.001	0.002
Selenium	mg/L	0.01	0.001	0.1	<0.00040	0.0006	0.0004	<0.0020	<0.00050	<0.00050	<0.00040	0.0003	0.0002	<0.0020	<0.00050	<0.00050	12	0	0	0	0.0002	0.002	0.00069	0.0005	0.002
Silicon	mg/L	—	—	—	2.5	2.2	2.3				2.6	2.2	2.1				6	—	–	–	2.1	2.6	2.3	2.3	2.6
Silver	mg/L	—	0.0001	0.0001	<0.00010	<0.00002	<0.00002	<0.0000070	<0.000050	<0.000050	<0.00010	<0.00002	<0.00002	<0.0000070	<0.000050	<0.000050	12	—	0	0	<0.0000007	<0.000050	0.0001	0.000075	0.0002
Strontium	mg/L	—	—	—	0.0156	0.0161	0.016	0.0132	0.0147	0.0151	0.0159	0.0156	0.0144	0.0129	0.0136	0.0149	12	—	–	–	0.013	0.016	0.015	0.015	0.016
Thallium	mg/L	—	0.0008	0.0003	<0.00030	<0.00002	<0.00002	<0.0000040	<0.000030	<0.000030	<0.00030	<0.00002	<0.00002	<0.0000040	<0.000030	<0.000030	12	—	0	0	<0.000004	<0.000030	0.000067	0.000025	0.0003
Tin	mg/L	—	—	—	<0.0010	<0.001	<0.001	<0.000040	<0.00010	<0.00010	<0.0010	<0.001	<0.001	<0.000040	<0.00010	<0.00010	12	—	–	–	<0.00004	<0.00010	0.00054	0.00055	0.001
Titanium	mg/L	—	—	—	<0.0020	<0.002	<0.002	<0.00060	<0.00050	<0.00050	<0.0020	<0.002	<0.002	<0.00060	<0.00050	<0.00050	12	—	–	–	<0.00050	<0.00050	0.0013	0.0013	0.002
Tungsten	mg/L	—	—	0.03	<0.010	<0.01	<0.01	<0.000040	<0.00010	<0.00010	<0.010	<0.01	<0.01	<0.000040	<0.00010	<0.00010	12	—	–	0	<0.00004	<0.00010	0.005	0.0051	0.01
Uranium	mg/L	0.02	0.015	0.005	<0.0050	<0.002	<0.002	0.0000202	0.00002	0.000025	<0.0050	<0.002	<0.002	0.0000191	0.000018	0.000021	12	0	0	0	0.000018	0.005	0.0015	0.001	0.005
Vanadium	mg/L	—	—	0.006	<0.0010	0.00025	0.00015	0.000051	<0.00020	<0.00020	<0.0010	0.00015	0.00015	0.000054	<0.00020	<0.00020	12	—	–	0	0.000051	0.001	0.0003	0.0002	0.001
Zinc	mg/L	5	0.03	0.02	<0.0030	0.0022	0.0018	<0.0030	<0.0020	<0.0020	<0.0030	0.0016	0.0012	0.006	<0.0020	<0.0020	12	0	0	0	0.0012	0.006	0.0025	0.002	0.0044
Zirconium	mg/L	—	—	0.004	<0.0040	<0.004	<0.004	<0.004	<0.00020	<0.00010	<0.0040	<0.004	<0.004	<0.00020	<0.00010	<0.00010	12	—	–	–	<0.00010	<0.00010	0.0021	0.0021	0.004
Dissolved Metals																									
Aluminum	mg/L	—	—	—	0.012	0.011	0.012	0.0197	0.0261	0.0218	0.012	0.012	0.012	0.024	0.0279	0.0202	12	—	–	–	0.011	0.028	0.018	0.016	0.027
Antimony	mg/L	—	—	—	<0.0050	<0.0002	<0.0002	<0.00020	<0.00010	<0.00010	<0.0050	<0.0002	<0.0002	<0.00020	<0.00010	<0.00010	12	—	–	–	<0.00010	<0.00010	0.00097	0.0002	0.005
Arsenic	mg/L	—	—	—	<0.0010	0.00038	0.00036	0.00271	0.00027	0.00037	<0.0010	0.00032	0.00034	0.000262	0.00027	0.00037	12	—	–	–	0.000262	0.001	0.00043	0.00035	0.001
Barium	mg/L	—	—	—	<0.010	<0.01	<0.01	0.00333	0.00382	0.00403	<0.010	<0.01	<0.01	0.0033	0.00387	0.004	12	—	–	–	0.0033	0.01	0.0069	0.007	0.01
Beryllium	mg/L	—	—	—	<0.0010	<0.0001	<0.0001	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.0001	<0.000060	<0.000060	<0.000060	12	—	–	–	<0.000060	<0.000060	0.00023	0.00008	0.001
Bismuth	mg/L	—	—	—	<0.0010	<0.001	<0.001	<0.00010	<0.00020	<0.00020	<0.0010	<0.001	<0.001	<0.00010	<0.00020	<0.00020	12	—	–	–	<0.0001	<0.00020	0.00058	0.0006	0.001
Boron	mg/L	—	—	—	<0.050	0.004	0.004	0.0026	0.0031	0.0035	<0.050	0.004	0.004	0.0037	0.0032	0.0034	12	—	–	–	0.0026	0.05	0.011	0.0039	0.05
Cadmium	mg/L	—	—	—	<0.00010	0.00004	<0.00002	<0.000030	<0.000010	<0.000010	<0.00010	<0.00002	<0.00002	<0.000030	<0.000010	<0.000010	12	—	–	–	<0.0002	0.0001	0.000033	0.00002	0.0001
Chromium	mg/L	—	—	—	<0.0010	0.0003	0.0003	<0.00020	<0.00050	<0.00050	<0.0010	0.0003	0.0003	0.0005	<0.00050	<0.00050	12	—	–	–	<0.00003	0.001	0.00049	0.0005	0.001
Cobalt	mg/L	—	—	—	<0.00050	<0.00005	<0.00005	<0.000030	<0.000050	<0.000050	<0.00050	<0.00005	<0.00005	<0.000030	<0.000050	<0.000050	12	—	–	–	0.00045	<0.000050	0.00012	0.00005	0.0005
Copper	mg/L	—	—	—	0.0012	0.00145	0.00045	0.00049	0.00099	0.00075	0.0014	0.0013	0.0005	0.00053	0.00072	<0.00070	12	—	–	–	0.0091	0.0015	0.00087	0.00074	0.0014
Iron	mg/L	—	—	—	<0.050	0.074	0.084	0.0091	0.067	<0.010	0.055	0.078	0.088	0.0245	0.084	<0.010	12	—	–	–	<0.00005	0.088	0.053	0.061	0.086
Lead	mg/L	—	—	—	<0.0010	0.0001	<0.00005	<0.00010	<0.00010	<0.00010	<0.0010	<0.00005	<0.00005	<0.00010	<0.00010	<0.00010	12	—	–	–	<0.00010	0.001	0.00024	0.0001	0.001
Manganese	mg/L	—	—	—	0.0026	0.012	0.014	0.00105	0.024	0.00121	0.004	0.013	0.014	0.00131	0.025	0.00105	12	—	–	–	0.0011	0.025	0.0094	0.008	0.024
Mercury	mg/L	—	—	—	<0.00010	<0.000020	<0.000020	<0.000020	<0.000010	<0.000010	<0.00010	<0.000020	<0.000020	<0.000020	<0.000010	<0.000010	12	—	–	–	<0.000010	<0.000010	0.00003	0.00002	0.0001
Molybdenum	mg/L	—	—	—	<0.0010	<0.0002	<0.0002	<0.000090	<0.00020	0.00023	<0.0010	<0.0002	<0.0002	<0.000090	<0.00020	0.00021	12	—	–	–	<0.00009	0.001	0.00032	0.0002	0.001
Nickel	mg/L	—	—	—	<0.0020	0.0006	<0.0001	<0.00020	<0.0010	<0.0010	<0.0020	0.0004	<0.0001	0.0002	<0.0010	<0.0010	12	—	–	–	<0.0001	0.002	0.0008	0.0008	0.002
Selenium	mg/L	—	—	—	<0.0050	<0.0001	<0.0001	<0.0010	<0.00050	<0.00050	<0.0050	<0.0001	<0.0001	<0.0010	<0.00050	<0.00050	12	—	–	–	<0.0001	<0.00050	0.0012	0.0005	0.005
Silicon	mg/L	—	—	—	2.17	2	2.1				2.25	2	2.1				6	—	–	–	2.0	2.3	2.1	2.1	2.2
Silver	mg/L	—	—	—	<0.00010	<0.0002	<0.0002	<0.000010	<0.000050	<0.000050	<0.00010	<0.0002	<0.0002	<0.000010	<0.000050	<0.000050	12	—	–	–	<0.00001	<0.000050	0.0001	0.000075	0.0002
Strontium	mg/L	—	—	—	0.0151	0.0141	0.0153	0.0132	0.0132	0.016	0.0152	0.0144	0.0153	0.0133	0.0135	0.0159	12	—	–	–	0.013	0.016	0.015	0.015	0.016
Thallium	mg/L	—	—	—	<0.00030	<0.00002	<0.00002	<0.000010	<0.000030	<0.000030	<0.00030	<0.00002	<0.00002	<0.000010	<0.000030	<0.000030	12	—	–	–	<0.00001	<0.000030	0.000068	0.000025	0.0003
Tin	mg/L	—	—	—	<0.0010	<0.001	<0.001	<0.00010	<0.00010	<0.00010	<0.0010	<0.001	<0.001	<0.00010	<0.00010	<0.00010	12	—	–	–	<0.00010	<0.00010	0.00055	0.00055	0.001
Titanium	mg/L	—	—	—	<0.0020	<0.002	<0.002	<0.00050	<0.00050	<0.00050	<0.0020	<0.002	<0.002	<0.00050	<0.00050	<0.00050	12	—	–	–	<0.00050	<0.00050	0.0013	0.0013	0.002
Tungsten	mg/L	—	—	—	<0.010	<0.01	<0.01	<0.000010	<0.00010	<0.00010	<0.010	<0.01	<0.01	<0.000010	<0.00010	<0.00010	12	—	–	–	<0.00001	<0.00010	0.005	0.0051	0.01
Uranium	mg/L	—	—	—	<0.0050	<0.005	<0.005	0.0000163	0.000018	0.00002	<0.0050	<0.005	<0.005	0.0000199	0.000017	0.00002	12	—	–	–	0.0000163	0.005	0.0025	0.0025	0.005
Vanadium	mg/L	—	—	—	<0.0010	0.0004	0.00035	<0.00010	<0.00020	<0.00020	<0.0010	0.00035	0.0003	<0.00010	<0.00020	0.0002	12	—	–	–	<0.0001	0.001	0.00037	0.00025	0.001
Zinc	mg/L	—	—	—	0.0079	0.006	0.0036	0.0027	0.0086	0.0064	0.0051	0.0072	0.0014	0.0069	0.0063	0.0041	12	—	–	–	0.0014	0.0086	0.0055	0.0062	0.0082
Zirconium	mg/L	—	—	—	<0.0040	<0.004	<0.004	0.000045	<0.00010	<0.00010	<0.0040	<0.004	<0.004	0.000041	<0.00010	<0.00010	12	—	–	–	0.000041	0.004	0.002	0.0021	0.004

Notes:

(a) See Appendix 1.I for detailed notes for water quality guidelines.

(b) CCME and PWQO receiving water quality guidelines for aluminum have been calculated based on pH. See Appendix 1.I for details.

(c) CCME and/or PWQO receiving water quality guidelines for these parameters have been calculated based on hardness. See Appendix 1.I for details.

1.0 Values highlighted in yellow greater than the Ontario Drinking Water Standards (ODWS), Ontario Regulation (O.Reg.) 169/03: Ontario Drinking Water Standards (ODWS) (Revised June 2006).

1.0 Values greater than the Canadian Council of Ministers of the Environment (CCME), Canadian Water Quality Guidelines for the Protection of Aquatic Life, Update 7.1 (December 2007).

<u>1.0</u> Values greater than the Provincial Water Quality Objectives (PWQO), Ministry of Environment and Energy

Where cells are blank, data has been removed, or was not recorded due to field instrument error.

Where cells are blank, analysis was not performed during this time period. Some parameters were added to the sampling program later in the campaign, while others were removed from the sampling campaign due to non detection.

— = A dash indicates that guideline criteria are not available for this parameter.

"D" = A "D" next to the station name indicates that this is a duplicate sample.

TABLE 1
Surface Water Quality Results

Parameter	Unit	ODWS	Receiving WQ Guidelines[a] CCME	PWQO	Light Bay - Top			Light Bay - Bottom			Count	ODWS	CCME	PWQO	Min	Max	Average	Median	95th %ile
					HRWQP-4A	HRWQP-4A	HRWQP-4A	HRWQP-4B	HRWQP-4B	HRWQP-4B									
					Sep-10	Nov-10	Jun-11	Sep-10	Nov-10	Jun-11									
Field Parameters																			
Temperature	°C	—	—	±10	14.15	6.07	15.94	13.67	5.96	9.59	6	—	–	–	6.0	16	11	12	15
pH	—	6.5–8.5	6.5-9	6.5-8.5	6.87	7.33	6.51	6.88	7.28	***5.16***	6	1	1	1	5.2	7.3	6.7	6.9	7.3
Conductivity	µS/cm	—	—	—	42		40	42		35	6	—	–	–	0.035	654	217	0.042	653
Dissolved Oxygen	mg/L	—	5.5-9.5	4-8	9.5	12.01	9.73	9.03	11.73	7.1	6	—	3	5	7.1	12	9.9	9.6	12
ORP	mV	—	—	—		137.7	278.1		139.6	335	4	—	–	–	138	335	223	209	326
Physical-Chemical																			
pH	—	6.5–8.5	6.5-9	6.5-8.5	7.29	6.77	7.28	7.25	8.21	6.67	6	—	0	0	6.7	8.2	7.2	7.3	8.0
DOC	% wt	5	—	—	8.7	7.2	10.8	7.9	7.6	9.8	6	6	–	–	7.2	11	8.7	8.3	11
TOC	% wt	—	—	—	8.8	7.9	10.4	8.2	7.7	10.6	6	—	–	–	7.7	11	8.9	8.5	11
Acidity	mg/L	—	—	—			2.4			6.4	2	—	–	–	2.4	6.4	4.4	4.4	6.2
Alkalinity	mg(CaCO3)/L	30–500	—	-25%	17.8	17.3	16.1	17.2	23.8	15.1	6	6	–	–	15	24	18	17	22
Conductivity	µS/cm	—	—	—	45.5	45.3	39.8	44	51.7	39.4	6	—	–	–	39	52	44	45	50
Total Suspended Solids	mg/L	—	+5-25	—	2.5	<2.0	<2.0	46	<2.0	5.2	6	—	–	–	<2.0	46	10.0	2.3	36
Total Dissolved Solids	mg/L	500	—	—	49	45	69	49	49	55	6	0	–	–	45	69	53	49	66
Major Ions																			
Calcium	mg/L	—	—	—	6.3	6.74	5.57	6.33	6.65	5.47	6	—	–	–	5.5	6.7	6.2	6.3	6.7
Chloride	mg/L	250	120	—	0.65	0.52	0.42	0.72	0.5	0.43	6	0	0	–	0.42	0.72	0.54	0.51	0.7
Fluoride	mg/L	1.5	—	—	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	6	0	–	–	<0.030	<0.030	0.03	0.03	0.03
Magnesium	mg/L	—	—	—	1.06	1.08	0.94	1.12	1.03	0.95	6	—	–	–	0.94	1.1	1.0	1.0	1.1
Potassium	mg/L	—	—	—	<1.0	<1.0	0.41	<1.0	<1.0	0.415	6	—	–	–	0.41	0.42	0.8	1.0	1.0
Sodium	mg/L	200	—	—	1.02	1.06	0.834	1.07	0.97	0.85	6	0	–	–	0.83	1.1	0.97	1.0	1.1
Sulphate	mg/L	500	—	—	1.9	2.92	2.2	1.93	1.86	2.34	6	0	–	–	1.9	2.9	2.2	2.1	2.8
Carbonate (CO_3^{2-})	mg/L	—	—	—							0	—	–	–	–	–	–	–	–
Bicarbonate ($H(CO_3)^-$)	mg/L	—	—	—							0	—	–	–	–	–	–	–	–
Hardness	mg(CaCO$_3$)/L	80–100	—	—	21.3	21	17.6	20.4	21	18.6	6	6	–	–	18	21	20	21	21
Cyanide (free)	mg/L	0.2	0.005	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	6	0	0	0	<0.0050	<0.0050	0.005	0.005	0.005
Cyanide (total)	mg/L	—	—	—	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	6	—	–	–	<0.0020	<0.0020	0.002	0.002	0.002
Nutrients																			
Nitrate-N	mg/L	10	13	—	<0.030	<0.030	0.038	<0.030	<0.030	0.077	6	0	0	–	<0.030	0.077	0.039	0.03	0.067
Nitrite-N	mg/L	1	0.06	—	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	6	0	0	–	<0.020	<0.020	0.02	0.02	0.02
Ammonia-N	mg/L	—	—	—	0.022	0.028	<0.020	<0.020	0.024	<0.020	6	—	–	–	<0.020	0.028	0.022	0.021	0.027
Un-ionized ammonia	mg/L	—	0.019	0.02	4.17E-05	8.11E-05	1.90E-05	3.74E-05	6.14E-05	5.20E-07	6	—	0	0	0.00000052	0.000081	0.00004	0.00004	0.000076
ortho-Phosphate	mg/L	—	—	—							0	—	–	–	–	–	–	–	–
Phosphorus	mg/L	—	—	0.02	0.0116	0.0129	0.0153	0.0229	0.0081	0.0193	6	—	–	1	0.0081	0.023	0.015	0.014	0.022
Organics																			
Oil and Greases	mg/L	—	—	physically non detect	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	6	—	–	–	<2.0	<2.0	2.0	2.0	2.0
Phenols	mg/L	—	0.004	0.005	<0.0010	0.0013	***0.0047***	<0.0010	<0.0010	***0.0119***	6	—	2	1	<0.0010	0.012	0.0035	0.0012	0.01
Micro-organisms																			
Escherichia coli	per 100mL	—	—	100	0	0	0	0	0	0	6	—	–	0	0	0	0	0	0
Total coliforms	per 100mL	—	—	—	93	28	30	70	17	7	6	—	–	–	7.0	93	41	29	87
Total Metals																			
Aluminum[b]	mg/L	0.1	0.005-0.1	0.015-0.075	0.038	0.041	0.0489	***0.417***	0.04	***0.0881***	6	1	2	2	0.038	0.42	0.11	0.045	0.33
Antimony	mg/L	0.006	—	0.02	<0.00060	<0.0002	<0.000030	<0.00060	<0.0002	<0.000030	6	0	–	0	<0.000030	<0.000030	0.00028	0.0002	0.0006
Arsenic	mg/L	0.025	0.005	0.1	<0.0010	0.00034	0.000286	<0.0010	0.00034	0.000314	6	0	0	0	0.000286	0.001	0.00055	0.00034	0.001
Barium	mg/L	1	—	—	<0.010	<0.01	0.00462	<0.010	<0.01	0.00643	6	0	–	–	0.00462	0.01	0.0085	0.01	0.01
Beryllium	mg/L	—	—	0.011-1.1	<0.0010	<0.0001	<0.000040	<0.0010	<0.0001	<0.000040	6	—	–	0	<0.000040	<0.000040	0.00038	0.0001	0.001
Bismuth	mg/L	—	—	—	<0.0010	<0.001	<0.000020	<0.0010	<0.001	<0.000020	6	—	–	–	<0.000020	<0.000020	0.00067	0.001	0.001
Boron	mg/L	5	1.5	0.2	<0.050	0.004	0.00293	<0.050	0.004	0.00313	6	0	0	0	0.00293	0.05	0.019	0.004	0.05
Cadmium[c]	mg/L	0.005	0.0000041-0.000042	0.0001-0.0005	<0.000090	<0.00002	<0.0000090	<0.000090	<0.00002	<0.0000090	6	0	0	0	<0.0000090	<0.0000090	0.00004	0.00002	0.00009
Chromium (total)	mg/L	0.05	0.009	0.009	<0.0010	<0.0001	<0.00090	<0.0010	0.0002	<0.00090	6	0	0	0	<0.0001	0.001	0.00068	0.0009	0.001
Cobalt	mg/L	—	—	0.0009	<0.00050	<0.00005	0.000021	<0.00050	<0.00005	0.000059	6	—	–	0	0.000021	0.0005	0.0002	0.000055	0.0005
Copper[c]	mg/L	1	0.002-0.004	0.001-0.005	<0.0010	0.0008	<0.00070	<0.0010	0.00075	<0.00070	6	0	0	0	<0.00006	0.001	0.00083	0.00078	0.001
Iron (total)	mg/L	0.3	0.3	0.3	***0.356***	0.224	0.112	***0.905***	0.216	***0.32***	6	3	3	3	0.11	0.91	0.36	0.27	0.77
Lead[c]	mg/L	0.01	0.001-0.007	0.001-0.005	<0.0010	0.0001	<0.000060	<0.0010	0.0001	0.000214	6	0	0	0	<0.0010	0.001	0.00041	0.00016	0.001
Manganese	mg/L	0.05	—	—	0.051	0.012	0.00682	0.0687	0.011	0.0259	6	2	–	–	0.0068	0.069	0.029	0.019	0.064
Mercury	mg/L	0.001	0.000026	0.0002	<0.00010	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010	6	0	0	0	<0.000010	<0.000010	0.00004	0.00001	0.0001
Molybdenum	mg/L	—	0.073	0.04	<0.0010	<0.0002	<0.000090	<0.0010	<0.0002	<0.000090	6	—	0	0	<0.000090	<0.000090	0.00043	0.0002	0.001
Nickel[c]	mg/L	—	0.025-0.15	0.025	<0.0020	0.0004	<0.0010	<0.0020	0.0002	<0.0010	6	—	0	0	0.0002	0.002	0.0011	0.001	0.002
Selenium	mg/L	0.01	0.001	0.1	<0.0050	<0.0001	<0.0020	<0.0050	0.0004	<0.0020	6	0	0	0	<0.0001	0.005	0.0024	0.002	0.005
Silicon	mg/L	—	—	—	2.28	2.1		3.04	2.1		4	—	–	–	2.1	3.0	2.4	2.2	2.9
Silver	mg/L	—	0.0001	0.0001	<0.00010	<0.0002	<0.0000070	<0.00010	<0.0002	<0.0000070	6	—	0	0	<0.0000070	<0.0000070	0.0001	0.0001	0.0002
Strontium	mg/L	—	—	—	0.0127	0.0153	0.0124	0.0137	0.015	0.0127	6	—	–	–	0.012	0.015	0.014	0.013	0.015
Thallium	mg/L	—	0.0008	0.0003	<0.00030	<0.00002	<0.0000040	<0.00030	<0.00002	<0.0000040	6	—	0	0	<0.0000040	<0.0000040	0.00011	0.00002	0.0003
Tin	mg/L	—	—	—	<0.0010	<0.001	<0.000040	<0.0010	<0.001	<0.000040	6	—	–	–	<0.000040	<0.000040	0.00068	0.001	0.001
Titanium	mg/L	—	—	—	<0.0020	<0.002	0.00094	0.0143	<0.002	0.00222	6	—	–	–	0.00094	0.014	0.0039	0.002	0.011
Tungsten	mg/L	—	—	0.03	<0.010	<0.01	<0.000040	<0.010	<0.01	<0.000040	6	—	–	0	0.0000191	<0.000040	0.0067	0.01	0.01
Uranium	mg/L	0.02	0.015	0.005	<0.0050	<0.002	0.0000191	<0.0050	<0.002	0.0000212	6	0	–	0	0.000148	0.005	0.0023	0.002	0.005
Vanadium	mg/L	—	—	0.006	<0.0010	0.00025	0.000148	0.0013	0.00025	0.000448	6	—	–	0	0.002	0.0013	0.00057	0.00035	0.0012
Zinc	mg/L	5	0.03	0.02	<0.0030	0.0054	<0.0030	<0.0030	0.002	<0.0030	6	0	0	0	<0.0030	0.0054	0.0032	0.003	0.0048
Zirconium	mg/L	—	—	0.004	<0.0010	<0.004	<0.00020	<0.0010	<0.004	<0.00020	6	—	–	0	<0.00020	<0.00020	0.0017	0.001	0.004
Dissolved Metals																			
Aluminum	mg/L	—	—	—	0.016	0.016	0.0236	0.016	0.0175	0.0299	6	—	–	–	0.016	0.03	0.02	0.017	0.028
Antimony	mg/L	—	—	—	<0.00060	<0.0002	<0.00020	<0.00060	<0.0002	<0.00020	6	—	–	–	<0.00020	<0.00020	0.00033	0.0002	0.0006
Arsenic	mg/L	—	—	—	<0.0010	0.00034	0.000267	<0.0010	0.00034	0.00027	6	—	–	–	0.000267	0.001	0.00054	0.00034	0.001
Barium	mg/L	—	—	—	<0.010	<0.01	0.00493	<0.010	<0.01	0.00463	6	—	–	–	0.00463	0.01	0.0083	0.01	0.01
Beryllium	mg/L	—	—	—	<0.0010	<0.0001	<0.000060	<0.0010	<0.0001	<0.000060	6	—	–	–	<0.000060	<0.000060	0.00039	0.0001	0.001
Bismuth	mg/L	—	—	—	<0.0010	<0.001	<0.00010	<0.0010	<0.001	<0.00010	6	—	–	–	<0.00010	<0.00010	0.0007	0.001	0.001
Boron	mg/L	—	—	—	<0.050	0.004	0.0027	<0.050	0.004	0.0028	6	—	–	–	0.0027	0.05	0.019	0.004	0.05
Cadmium	mg/L	—	—	—	<0.000090	<0.00002	<0.000030	<0.000090	<0.00002	<0.000030	6	—	–	–	<0.00002	<0.000030	0.000047	0.00003	0.00009
Chromium	mg/L	—	—	—	<0.0010	<0.0001	<0.00020	<0.0010	0.0001	<0.00020	6	—	–	–	<0.0001	0.001	0.00043	0.0002	0.001
Cobalt	mg/L	—	—	—	<0.00050	<0.00005	<0.000030	<0.00050	<0.00005	<0.000030	6	—	–	–	<0.000030	<0.000030	0.00019	0.00005	0.0005
Copper	mg/L	—	—	—	<0.0010	0.0018	0.00175	<0.0010	0.00065	0.00079	6	—	–	–	0.00065	0.0018	0.0012	0.001	0.0018
Iron	mg/L	—	—	—	0.164	0.106	0.0394	0.199	0.114	0.106	6	—	–	–	0.039	0.2	0.12	0.11	0.19
Lead	mg/L	—	—	—	<0.0010	0.0001	<0.00010	<0.0010	0.00005	<0.00010	6	—	–	–	0.00005	0.001	0.00039	0.0001	0.001
Manganese	mg/L	—	—	—	0.0318	0.002	0.00143	0.0436	0.008	0.006	6	—	–	–	0.0014	0.044	0.015	0.007	0.041
Mercury	mg/L	—	—	—	<0.00010	<0.000020	<0.000020	<0.00010	<0.000020	<0.000020	6	—	–	–	<0.000020	<0.000020	0.000047	0.00002	0.0001
Molybdenum	mg/L	—	—	—	<0.0010	<0.0002	<0.000090	<0.0010	<0.0002	<0.000090	6	—	–	–	<0.000090	<0.000090	0.00043	0.0002	0.001
Nickel	mg/L	—	—	—	<0.0020	0.0007	0.00061	<0.0020	<0.0001	0.00021	6	—	–	–	<0.0001	0.002	0.00094	0.00066	0.002
Selenium	mg/L	—	—	—	<0.0020	0.0004	<0.0010	<0.0020	0.0002	<0.0010	6	—	–	–	0.0002	0.002	0.0011	0.001	0.002
Silicon	mg/L	—	—	—	2.07	2		2.09	2		4	—	–	–	2.0	2.1	2.0	2.0	2.1
Silver	mg/L	—	—	—	<0.00010	<0.0002	<0.000010	<0.00010	<0.0002	<0.000010	6	—	–	–	<0.000010	<0.000010	0.0001	0.0001	0.0002
Strontium	mg/L	—	—	—	0.0131	0.0146	0.0122	0.0132	0.0148	0.0119	6	—	–	–	0.012	0.015	0.013	0.013	0.015
Thallium	mg/L	—	—	—	<0.00030	<0.00002	<0.000010	<0.00030	<0.00002	<0.000010	6	—	–	–	<0.000010	<0.000010	0.00011	0.00002	0.0003
Tin	mg/L	—	—	—	<0.0010	<0.001	<0.00010	<0.0010	<0.001	<0.00010	6	—	–	–	<0.00010	<0.00010	0.0007	0.001	0.001
Titanium	mg/L	—	—	—	<0.0020	<0.002	<0.00050	<0.0020	<0.002	0.00056	6	—	–	–	<0.0005	0.002	0.0015	0.002	0.002
Tungsten	mg/L	—	—	—	<0.010	<0.01	0.000038	<0.010	<0.01	<0.000010	6	—	–	–	<0.000010	0.01	0.0067	0.01	0.01
Uranium	mg/L	—	—	—	<0.0050	<0.005	0.0000154	<0.0050	<0.005	0.0000176	6	—	–	–	0.0000154	0.005	0.0033	0.005	0.005
Vanadium	mg/L	—	—	—	<0.0010	0.0002	<0.00010	<0.0010	0.0002	0.00017	6	—	–	–	<0.0001	0.001	0.00045	0.0002	0.001
Zinc	mg/L	—	—	—	0.0069	0.0128	0.0049	0.0044	0.0024	<0.0020	6	—	–	–	<0.0020	0.013	0.0056	0.0047	0.011
Zirconium	mg/L	—	—	—	<0.0010	<0.004	0.000062	<0.0010	<0.004	0.000075	6	—	–	–	0.000062	0.004	0.0017	0.001	0.004

Parameter	Hawk Bay - Top					Hawk Bay - Bottom					Count	ODWS	CCME	PWQO	Min	Max	Average	Median	95th %ile
	HRWQP-5A	HRWQP-5A	HRWQP-5A	HRWQP-5A	HRWQP-5A	HRWQP-5B	HRWQP-5B	HRWQP-5B	HRWQP-5B	HRWQP-5B									
	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12									
Field Parameters																			
Temperature	14.38	6.71	17.27	4.65	20.52	8.83	6.54	7.35	4.58	13.65	10	—	-	-	4.6	21	10	8.1	19
pH	6.75	7.33	7.21	6.86	7.39	6.51	7.23	***6.44***	***6.33***	***6.02***	10	3	3	3	6.0	7.4	6.8	6.8	7.4
Conductivity	47		32	41		48		28	46		8	—	-	-	0.028	635	169	21	634
Dissolved Oxygen	9.42	12.7	9.26		8.41	***2.93***	11.43	9.32		***0.47***	8	—	4	8	0.47	13	8.0	9.3	12
ORP		101.3		149.7	75.5		111.1		94.5	49.4	6	—	-	-	49	150	97	98	140
Physical-Chemical																			
pH	7.34	6.95	7.15	7.07	7.39	6.9	6.73	6.7	7.09	***6.02***	10	—	1	1	6.0	7.4	6.9	7.0	7.4
DOC	9.7	9.1	11.2	8.3	7.6	8.4	9.3	11.7	8.8	8.7	10	10	-	-	7.6	12	9.3	9.0	11
TOC	9.9	9.8	11.7	8.7	8.3	9.3	10.2	12.8	10.8	8.4	10	—	-	-	8.3	13	10.0	9.9	12
Acidity			2.6	6.6	2			3.4	2.8	2	6	—	-	-	2.0	6.6	3.2	2.7	5.8
Alkalinity	19.2	18.8	14.6	15.1	17.5	18.1	15.5	13.8	15.2	17.7	10	10	-	-	14	19	17	17	19
Conductivity	49.6	50	40.7	50.7	46.7	48.8	51.6	40.2	48.8	46.2	10	—	-	-	40	52	47	49	51
Total Suspended Solids	3.3	<2.0	3.9	2.4	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	10	—	-	-	<2.0	3.9	2.4	2.0	3.6
Total Dissolved Solids	57	55	43	29	92	64	57	39	28	94	10	0	-	-	28	94	56	56	93
Major Ions																			
Calcium	6.14	6.75	4.82	4.98	5.7	5.94	6.45	4.71	5.02	5.76	10	—	-	-	4.7	6.8	5.6	5.7	6.6
Chloride	1.44	1.67	1.39	1.89	1.07	1.43	1.64	1.69	1.67	1.06	10	0	0	-	1.1	1.9	1.5	1.5	1.8
Fluoride	<0.030	<0.030	0.052	0.032	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	10	0	-	-	<0.030	0.052	0.032	0.03	0.043
Magnesium	1.44	1.55	1.32	1.3	1.41	1.39	1.47	1.28	1.28	1.43	10	—	-	-	1.3	1.6	1.4	1.4	1.5
Potassium	<1.0	<1.0	0.479	0.504	0.447	<1.0	<1.0	0.517	0.499	0.456	10	—	-	-	0.45	0.52	0.69	0.51	1.0
Sodium	1.51	1.8	1.48	1.56	1.34	1.45	1.65	1.51	1.55	1.37	10	0	-	-	1.3	1.8	1.5	1.5	1.7
Sulphate	1.39	1.39	1.67	1.47	1.34	1.56	1.33	1.46	1.4	1.35	10	0	-	-	1.3	1.7	1.4	1.4	1.6
Carbonate (CO_3^{2-})				<5.0	<5.0				<5.0	<5.0	4	—	-	-	<5.0	<5.0	5.0	5.0	5.0
Bicarbonate ($H(CO_3)^-$)				18.4	17.5				18.5	17.7	4	—	-	-	18	19	18	18	18
Hardness	22.3	23	17.6	18.3	19.6	18.4	22	16.3	18.1	21.2	10	10	-	-	16	23	20	19	23
Cyanide (free)	<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050			6	0	0	0	<0.0050	<0.0050	0.005	0.005	0.005
Cyanide (total)	<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020			6	—	-	-	<0.0020	<0.0020	0.002	0.002	0.002
Nutrients																			
Nitrate-N	<0.030	0.032	0.08	0.139	0.059	0.122	0.095	0.123	0.134	0.051	10	0	0	-	<0.030	0.14	0.087	0.088	0.14
Nitrite-N	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	10	0	0	-	<0.020	<0.020	0.02	0.02	0.02
Ammonia-N	<0.020	0.037	<0.020	<0.020	0.021	<0.020	0.039	0.052	<0.020	0.021	10	—	-	-	<0.020	0.052	0.027	0.021	0.046
Un-ionized ammonia	2.93E-05	1.13E-04	1.04E-04	1.75E-05	2.10E-04	1.10E-05	9.33E-05	2.16E-05	5.15E-06	5.42E-06	10	—	0	0	0.0000051	0.00021	0.000061	0.000025	0.00017
ortho-Phosphate				<0.0050	<0.0050				<0.0050	<0.0050	4	—	-	-	<0.0050	<0.0050	0.005	0.005	0.005
Phosphorus	0.0109	0.0098	0.0166	0.0141	0.0113	0.0206	0.0168	0.028	0.0137	0.01	10	—	-	2	0.0098	0.028	0.015	0.014	0.025
Organics																			
Oil and Greases	<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<2.0	<4.0		8	—	-	-	<2	<4.0	2.5	2.0	4.0
Phenols	<0.0010	<0.0010	0.004	<0.0010	0.0011	<0.0010	0.001	0.0032	<0.0010	0.0016	10	—	0	0	<0.0010	0.004	0.0016	0.001	0.0036
Micro-organisms																			
Escherichia coli	0	0	2			0	1	0			6	—	-	0	0	2.0	0.5	0	1.8
Total coliforms	46	13	22			9	4	9			6	—	-	-	4.0	46	17	11	40
Total Metals																			
Aluminum[b]	0.041	0.052	0.0625	0.0535	0.0512	0.046	0.05	***0.14***	***0.057***	***0.0526***	10	1	3	3	0.041	0.14	0.061	0.052	0.11
Antimony	<0.00060	<0.0002	<0.000030	<0.00010	<0.00010	<0.00060	<0.0002	<0.000030	<0.00010	<0.00010	10	0	-	0	<0.00010	<0.00010	0.00021	0.0001	0.0006
Arsenic	<0.0010	0.00038	0.000318	0.00029	0.00048	<0.0010	0.00038	0.000459	0.0003	0.00048	10	0	0	0	0.00029	0.001	0.00051	0.00042	0.001
Barium	<0.010	<0.01	0.0052	0.00456	0.00546	<0.010	<0.01	0.00666	0.00466	0.00542	10	0	-	-	0.00456	0.01	0.0072	0.0061	0.01
Beryllium	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060	10	—	-		<0.00004	<0.000060	0.00025	0.00006	0.001
Bismuth	<0.0010	<0.001	<0.000020	<0.00020	<0.00020	<0.0010	<0.001	<0.000020	<0.00020	<0.00020	10	—	-	-	<0.00002	<0.00020	0.00048	0.0002	0.001
Boron	<0.050	0.004	0.00308	0.0039	0.0039	<0.050	0.004	0.00279	0.0039	0.0035	10	0	0	0	0.00279	0.05	0.013	0.0039	0.05
Cadmium[c]	<0.000090	<0.00002	<0.0000090	<0.000010	<0.000010	<0.000090	<0.00002	***0.0000092***	<0.000010	<0.000010	10	0			<0.000009	0.00009	0.000028	0.00001	0.00009
Chromium (total)	<0.0010	0.0002	<0.00090	<0.00050	<0.00050	<0.0010	0.0002	<0.00090	<0.00050	<0.00050	10	0	0	0	<0.001	0.001	0.00062	0.0005	0.001
Cobalt	<0.00050	<0.00005	0.000037	0.00013	0.000061	<0.00050	<0.00005	0.000124	0.000076	0.000059	10	—	-	0	0.000037	0.0005	0.00016	0.000069	0.0005
Copper[c]	<0.0010	0.0008	0.00093	0.00075	0.00098	0.0013	0.0008	0.00085	0.00074	0.00093	10	0	0	0	0.00074	0.0013	0.00091	0.00089	0.0012
Iron (total)	***0.517***	***0.656***	0.297	***0.539***	***0.662***	***0.839***	***0.632***	***1.19***	***0.551***	***0.686***	10	9	9	9	0.3	1.2	0.66	0.64	1.0
Lead[c]	<0.0010	0.0001	<0.000060	<0.00010	<0.00010	<0.0010	0.0001	0.000244	<0.00010	<0.00010	10	0	0	0	<0.00006	0.001	0.00029	0.0001	0.001
Manganese	0.0241	0.015	0.00738	0.0232	0.114	0.0921	0.015	0.0344	0.0235	0.116	10	3	-	-	<0.000010	0.12	0.046	0.024	0.12
Mercury	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	10	0	0	0	<0.000010	<0.0001	0.00003	0.00001	0.0001
Molybdenum	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	10	—	0	0	<0.00009	<0.00020	0.00034	0.0002	0.001
Nickel[c]	<0.0020	0.0002	<0.0010	<0.0010	<0.0010	<0.0020	0.0003	<0.0010	<0.0010	<0.0010	10	—	0	0	0.0002	0.002	0.0011	0.001	0.002
Selenium	<0.0050	0.0002	<0.0020	<0.00050	<0.00050	<0.0050	0.0002	<0.0020	<0.00050	<0.00050	10	0	0	0	0.0002	0.005	0.0016	0.0005	0.005
Silicon	3.2	3.2				4.09	3.3				4	—	-	-	3.2	4.1	3.4	3.3	4.0
Silver	<0.00010	<0.0002	<0.0000070	<0.000050	<0.000050	<0.00010	<0.0002	<0.0000070	<0.000050	<0.000050	10	—	0	0	<0.000007	<0.000050	0.000081	0.00005	0.0002
Strontium	0.0125	0.0144	0.0106	0.0102	0.0123	0.011	0.014	0.0103	0.00977	0.0124	10	—	-	-	0.0098	0.014	0.012	0.012	0.014
Thallium	<0.00030	<0.00002	<0.0000040	<0.000030	<0.000030	<0.00030	<0.00002	<0.0000040	<0.000030	<0.000030	10	—	0	0	<0.000004	<0.000030	0.000077	0.00003	0.0003
Tin	<0.0010	<0.001	<0.000040	<0.00010	<0.00010	<0.0010	<0.001	<0.000040	<0.00010	<0.00010	10	—	-	-	<0.00004	<0.00010	0.00045	0.0001	0.001
Titanium	<0.0020	<0.002	<0.00020	0.00116	0.00114	<0.0020	<0.002	0.00301	0.00123	0.00115	10	—	-	-	<0.0002	0.003	0.0016	0.0016	0.0026
Tungsten	<0.010	<0.01	0.00104	<0.00010	<0.00010	<0.010	<0.01	<0.000040	<0.00010	<0.00010	10	—	-	0	<0.00004	0.01	0.0041	0.00057	0.01
Uranium	<0.0050	<0.002	<0.000040	0.000024	0.00003	<0.0050	<0.002	0.0000311	0.000023	0.000031	10	0	-	0	0.000023	0.005	0.0014	0.000036	0.005
Vanadium	<0.0010	0.0007	0.0000271	0.00059	0.00088	<0.0010	0.00065	0.00125	0.00059	0.00097	10	—	-	0	0.0000271	0.0013	0.00077	0.00079	0.0011
Zinc	<0.0030	0.0034	0.000491	<0.0020	<0.0020	<0.0030	0.002	<0.0030	<0.0020	<0.0020	10	0	0	0	0.000491	0.0034	0.0023	0.002	0.0032
Zirconium	<0.0010	<0.004	<0.0030	<0.00010	0.00012	<0.0010	<0.004	<0.00020	<0.00010	0.00011	10	—	-	0	<0.00010	0.004	0.0014	0.0006	0.004
Dissolved Metals																			
Aluminum	0.02	0.0335	0.0436	0.0413	0.0387	0.024	0.032	0.0536	0.0414	0.0408	10	—	-	-	0.02	0.054	0.037	0.04	0.049
Antimony	<0.00060	<0.0002	<0.00020	<0.00010	<0.00010	<0.00060	<0.0002	<0.00020	<0.00010	<0.00010	10	—	-	-	<0.00010	<0.00010	0.00024	0.0002	0.0006
Arsenic	<0.0010	0.00036	0.000282	0.0003	0.00042	<0.0010	0.00036	0.000306	0.00028	0.00046	10	—	-	-	0.00028	0.001	0.00048	0.00036	0.001
Barium	<0.010	<0.01	0.00557	0.005	0.00509	<0.010	<0.01	0.00573	0.00487	0.00528	10	—	-	-	0.00487	0.01	0.0072	0.0057	0.01
Beryllium	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	10	—	-	-	<0.000060	<0.000060	0.00026	0.00006	0.001
Bismuth	<0.0010	<0.001	<0.00010	<0.00020	<0.00020	<0.0010	<0.001	<0.00010	<0.00020	<0.00020	10	—	-	-	<0.00020	<0.00020	0.0005	0.0002	0.001
Boron	<0.050	0.004	0.0033	0.0037	0.0034	<0.050	0.004	0.0027	0.0037	0.0037	10	—	-	-	0.0027	0.05	0.013	0.0037	0.05
Cadmium	<0.000090	<0.00002	<0.000030	0.000014	<0.000010	<0.000090	<0.00002	<0.000030	<0.000010	0.000011	10	—	-	-	<0.000010	0.00009	0.000033	0.00002	0.00009
Chromium	<0.0010	0.0002	0.00023	<0.00050	0.00052	<0.0010	0.0002	<0.00020	<0.00050	<0.00050	10	—	-	-	<0.0002	0.001	0.00049	0.0005	0.001
Cobalt	<0.00050	<0.00005	0.000068	0.000066	<0.000050	<0.00050	<0.00005	0.000044	0.00006	<0.000050	10	—	-	-	0.000044	0.0005	0.00014	0.000055	0.0005
Copper	<0.0010	0.00185	0.00189	0.00093	0.00097	<0.0010	0.0017	0.00059	<0.00070	0.00113	10	—	-	-	0.00059	0.0019	0.0012	0.001	0.0019
Iron	0.265	0.402	0.155	0.254	0.385	0.348	0.376	0.463	0.272	0.413	10	—	-	-	0.16	0.46	0.33	0.36	0.44
Lead	<0.0010	0.0001	<0.00010	<0.00010	<0.00010	<0.0010	0.0001	<0.00010	<0.00010	<0.00010	10	—	-	-	<0.00010	0.001	0.00028	0.0001	0.001
Manganese	0.0066	0.003	0.00374	0.0155	0.0711	0.0719	0.003	0.0203	0.016	0.0747	10	—	-	-	0.003	0.075	0.029	0.016	0.073
Mercury	<0.00010	<0.000020	<0.000020	<0.000010	<0.000010	<0.00010	<0.000020	<0.000020	<0.000010	<0.000010	10	—	-	-	<0.000010	<0.000010	0.000032	0.00002	0.0001
Molybdenum	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	10	—	-	-	<0.00009	<0.00020	0.00034	0.0002	0.001
Nickel	<0.0020	0.0006	0.00095	<0.0010	<0.0010	<0.0020	0.0007	0.00027	<0.0010	<0.0010	10	—	-	-	0.00027	0.002	0.0011	0.001	0.002
Selenium	<0.0020	0.0002	<0.0010	<0.00050	<0.00050	<0.0020	<0.0001	<0.0010	<0.00050	<0.00050	10	—	-	-	<0.00050	0.002	0.00083	0.0005	0.002
Silicon	3.07	3.2				3.65	3.2				4	—	-	-	3.1	3.7	3.3	3.2	3.6
Silver	<0.00010	<0.0002	<0.000010	<0.000050	<0.000050	<0.00010	<0.0002	<0.000010	<0.000050	<0.000050	10	—	-	-	<0.00001	<0.000050	0.000082	0.00005	0.0002
Strontium	0.0127	0.014	0.00955	0.0106	0.0123	0.0102	0.0141	0.00935	0.0104	0.0131	10	—	-	-	0.0094	0.014	0.012	0.011	0.014
Thallium	<0.00030	<0.00002	<0.000010	<0.000030	<0.000030	<0.00030	<0.00002	<0.000010	<0.000030	<0.000030	10	—	-	-	<0.00001	<0.000030	0.000078	0.00003	0.0003
Tin	<0.0010	0.015	<0.00010	<0.00010	<0.00010	<0.0010	<0.001	<0.00010	<0.00010	<0.00010	10	—	-	-	<0.00010	0.015	0.0019	0.0001	0.0087
Titanium	<0.0020	<0.002	<0.00050	0.00059	0.00063	<0.0020	<0.002	0.00059	0.00062	0.00059	10	—	-	-	<0.0005	0.002	0.0012	0.00063	0.002
Tungsten	<0.010	<0.01	0.000015	<0.00010	<0.00010	<0.010	<0.01	<0.000010	<0.00010	<0.00010	10	—	-	-	<0.00001	0.01	0.004	0.0001	0.01
Uranium	<0.0050	<0.005	0.0000235	0.000021	0.000028	<0.0050	<0.005	0.0000224	0.000019	0.000027	10	—	-	-	0.000019	0.005	0.002	0.000028	0.005
Vanadium	<0.0010	0.0005	0.00039	0.0003	0.00065	<0.0010	0.00045	0.00046	0.00031	0.00066	10	—	-	-	0.0003	0.001	0.00057	0.00048	0.001
Zinc	<0.0030	0.0052	0.0074	0.0115	0.0066	0.0053	0.012	0.0022	0.002	0.0098	10	—	-	-	0.002	0.012	0.0065	0.006	0.012
Zirconium	<0.0010	<0.004	0.000063	<0.00010	<0.00010	<0.0010	<0.004	0.000076	<0.00010	0.00026	10	—	-	-	0.000063	0.004	0.0011	0.00018	0.004

Notes:

(a) See Appendix 1.I for detailed notes for water quality guidelines.
(b) CCME and PWQO receiving water quality guidelines for aluminum have been calculated based on pH. See Appendix 1.I for details.
(c) CCME and/or PWQO receiving water quality guidelines for these parameters have been calculated based on hardness. See Appendix 1.I for details.
1.0 (yellow) Values highlighted in yellow greater than the Ontario Drinking Water Standards (ODWS), Ontario Regulation (O.Reg.) 169/03: Ontario Drinking Water Standards
1.0 Values greater than the Canadian Council of Ministers of the Environment (CCME), Canadian Water Quality Guidelines for the Protection of Aquatic Life, Update
1.0 (underlined) Values greater than the Provincial Water Quality Objectives (PWQO), Ministry of Environment and Energy
(light shading) Where cells are blank, data has been removed, or was not recorded due to field instrument error.
(dark shading) Where cells are blank, analysis was not performed during this time period. Some parameters were added to the sampling program later in the campaign, while others were removed from the sampling campaign due to non detection.
— = A dash indicates that guideline criteria are not available for this parameter.
"D" = A "D" next to the station name indicates that this is a duplicate sample.

TABLE 1
Surface Water Quality Results

Parameter	Unit	Receiving WQ Guidelines[a]			Turtle Bay - Top					Turtle Bay - Bottom					Count	ODWS	CCME	PWQO	Min	Max	Average	Median	95th %ile
		ODWS	CCME	PWQO	HRWQP-6A	HRWQP-6A	HRWQP-6A	HRWQP-6A	HRWQP-6A	HRWQP-6B	HRWQP-6B	HRWQP-6B	HRWQP-6B	HRWQP-6B									
					Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12									
Field Parameters																							
Temperature	°C	—	—	±10	12.6	2.82	19.4	5.06	19.07	11.75	2.8	18.06	5.11	20.44	10	—	-	-	2.8	20.44	11.711	12.175	19.972
pH	—	6.5-8.5	6.5-9	6.5-8.5	6.65	7.05	***6.44***	7.17	7.37	6.7	7.09	***6.44***	7.11	7.65	10	2	2	2	6.44	7.65	6.967	7.07	7.524
Conductivity	µS/cm	—	—	—	52		44	55		49		41	55		8	—	-	-	0.044	503	144.143125	48	501.6
Dissolved Oxygen	mg/L	—	5.5-9.5	4-8	9.56	13.62	8.49		7.1	9.98	13.57	8.76		9.27	8	—	4	7	7.1	13.62	10.04375	9.415	13.6025
ORP	mV	—	—	—		151.2		119.4	2.6		149.7		64.8	38.9	6	—	-	-	2.6	151.2	87.7666667	92.1	150.825
Physical-Chemical																							
pH	—	6.5-8.5	6.5-9	6.5-8.5	7.44	7.36	7.39	7.49	7.37	7.42	7.09	7.25	7.5	7.65	10	—	0	0	7.09	7.65	7.396	7.405	7.5825
DOC	% wt	5	—	—	9.2	8.8	11.1	8.1	8.1	9.8	9.2	11.5	8	10	10	10	-	-	8	11.5	9.38	9.2	11.32
TOC	% wt	—	—	—	10.1	9.1	16.2	8.2	8	10.3	9.3	12.1	8.3	10.1	10	—	-	-	8	16.2	10.17	9.7	14.355
Acidity	mg/L	—	—	—			2.2	2.4	2			2.6	2.4	2	6	—	-	-	2	2.6	2.26666667	2.3	2.55
Alkalinity	mg(CaCO3)/L	30–500	—	-25%	21.9	24.2	22.3	25.4	23.8	21.8	21.7	22.1	25.6	22.9	10	10	-	-	21.7	25.6	23.17	22.6	25.51
Conductivity	µS/cm	—	—	—	53.1	58.2	52	65	57.1	53.2	54.7	51.6	64.6	56.5	10	—	-	-	51.6	65	56.6	55.6	64.82
Total Suspended Solids	mg/L	—	+5-25	—	2.9	<2.0	<2.0	<2.0	78.4	3.4	<2.0	<2.0	3.4	2.2	10	—	-	-	<2.0	78.4	10.03	2.1	44.65
Total Dissolved Solids	mg/L	500	—	—	63	49	53	34	51	60	51	51	49	52	10	0	-	-	34	63	51.3	51	61.65
Major Ions																							
Calcium	mg/L	—	—	—	7.07	8.47	8.38	10.1	9.43	6.91	8.39	8.49	10	8.53	10	—	-	-	6.91	10.1	8.577	8.48	10.055
Chloride	mg/L	250	120	—	0.74	0.56	0.5	0.18	0.47	0.75	0.44	0.66	0.19	0.54	10	0	0	-	0.18	0.75	0.503	0.52	0.7455
Fluoride	mg/L	1.5	—	—	<0.030	<0.030	0.045	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	10	0	-	-	<0.030	0.045	0.0315	0.03	0.03825
Magnesium	mg/L	—	—	—	1.09	1.1	1.01	0.904	1.29	1.03	1.08	1.11	0.884	1.15	10	—	-	-	0.884	1.29	1.0648	1.085	1.227
Potassium	mg/L	—	—	—	<1.0	<1.0	0.403	0.357	0.347	<1.0	<1.0	0.405	0.349	0.312	10	—	-	-	0.312	0.405	0.6173	0.404	1
Sodium	mg/L	200	—	—	1.07	0.98	0.887	0.679	1.03	1.09	0.93	0.94	0.657	1.03	10	0	-	-	0.657	1.09	0.9293	0.96	1.081
Sulphate	mg/L	500	—	—	1.57	1.81	1.76	1.75	1.39	1.58	1.59	1.72	1.8	1.4	10	0	-	-	1.39	1.81	1.637	1.655	1.8055
Carbonate (CO_3^{2-})	mg/L	—	—	—				<5.0	<5.0				<5.0	<5.0	4	—	-	-	<5.0	<5.0	5	5	5
Bicarbonate (HCO_3^-)	mg/L	—	—	—				31	23.8				31.2	22.9	4	—	-	-	22.9	31.2	27.225	27.4	31.17
Hardness	mg(CaCO3)/L	80–100	—	—	20.4	27	24.5	28.6	24.5	20.8	27	25.5	28.5	24.8	10	10	-	-	20.4	28.6	25.16	25.15	28.555
Cyanide (free)	mg/L	0.2	0.005	0.005	<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050			6	0	0	0	<0.0050	<0.0050	0.005	0.005	0.005
Cyanide (total)	mg/L	—	—	—	<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020			6	—	-	-	<0.0020	<0.0020	0.002	0.002	0.002
Nutrients																							
Nitrate-N	mg/L	10	13	—	<0.030	<0.030	<0.030	0.03	<0.030	<0.030	<0.030	<0.030	0.037	<0.030	10	0	0	-	<0.030	0.037	0.0307	0.03	0.03385
Nitrite-N	mg/L	1	0.06	—	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	10	0	0	-	<0.020	<0.020	0.02	0.02	0.02
Ammonia-N	mg/L	—	—	—	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	10	—	-	-	<0.020	<0.020	0.02	0.02	0.02
Un-ionized ammonia	mg/L	—	0.019	0.02	2.03E-05	2.34E-05	2.09E-05	3.70E-05	1.72E-04	2.13E-05	2.56E-05	1.89E-05	3.23E-05	3.59E-04	10	—	0	0	1.8895E-05	0.00035883	7.3041E-05	2.4472E-05	0.00027474
ortho-Phosphate	mg/L	—	—	—				<0.0050	<0.0050				<0.0050	<0.0050	4	—	-	-	<0.0050	<0.0050	0.005	0.005	0.005
Phosphorus	mg/L	—	—	0.02	0.0115	0.0121	0.0099	0.0073	0.0366	0.0102	0.0162	0.014	0.0098	0.0113	10	—	-	1	0.0073	0.0366	0.01389	0.0114	0.02742
Organics																							
Oil and Greases	mg/L	—	—	physically non detect	<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<8.0	<4.0		8	—	-	-	<2	<4.0	3.25	2	6.6
Phenols	mg/L	—	0.004	0.005	<0.0010	0.0038	0.0038	<0.0010	0.0011	<0.0010	0.002	***0.0041***	<0.0010	0.0018	10	—	1	0	<0.0010	0.0041	0.00206	0.00145	0.003965
Micro-organisms																							
Escherichia coli	per 100mL	—	—	100	1	0	0			1	0	0			6	—	-	0	0	1	0.33333333	0	1
Total coliforms	per 100mL	—	—	—	550	290	99			390	280	89			6	—	-	-	89	550	283	285	510
Total Metals																							
Aluminum[b]	mg/L	0.1	0.005-0.1	0.015-0.075	0.029	0.04	***0.0483***	0.046	***0.798***	0.028	0.0385	***0.0565***	0.0439	0.0344	10	1	3	3	0.028	0.798	0.11626	0.04195	0.464325
Antimony	mg/L	0.006	—	0.02	<0.00060	<0.0002	0.000032	<0.00010	<0.00010	<0.00060	<0.0002	<0.000030	<0.00010	<0.00010	10	0	-	0	<0.00003	0.0006	0.0002062	0.0001	0.0006
Arsenic	mg/L	0.025	0.005	0.1	<0.0010	0.00032	0.00034	0.00028	0.00052	<0.0010	0.0003	0.000315	0.00028	0.00045	10	0	0	0	0.00028	0.001	0.0004805	0.00033	0.001
Barium	mg/L	1	—	—	<0.010	<0.01	0.00503	0.00376	0.00911	<0.010	<0.01	0.00452	0.00369	0.00421	10	0	-	-	0.00369	0.01	0.007032	0.00707	0.01
Beryllium	mg/L	—	—	0.011-1.1	<0.0010	<0.0001	<0.0000040	<0.000060	<0.000060	<0.0010	<0.0001	<0.000040	<0.000060	<0.000060	10	—	-	0	<0.00004	<0.000060	0.000252	0.00006	0.001
Bismuth	mg/L	—	—	—	<0.0010	<0.001	<0.000020	<0.00020	<0.00020	<0.0010	<0.001	<0.000020	<0.00020	<0.00020	10	—	-	-	<0.00002	<0.00020	0.000484	0.0002	0.001
Boron	mg/L	5	1.5	0.2	<0.050	0.002	0.00288	0.0036	0.0045	<0.050	0.002	0.00302	0.0037	0.0046	10	0	0	0	0.002	0.05	0.01263	0.00365	0.05
Cadmium[c]	mg/L	0.005	0.0000041-0.000042	0.0001-0.0005	<0.000090	<0.00002	<0.0000090	<0.000010	***0.000021***	<0.000090	<0.00002	<0.0000090	<0.000010	<0.000010	10	0	1	0	<0.000009	0.00009	0.0000289	0.000015	0.00009
Chromium (total)	mg/L	0.05	0.009	0.009	<0.0010	0.0002	<0.00090	<0.00050	0.00138	<0.0010	0.0001	<0.00090	<0.00050	<0.00050	10	0	0	0	0.0001	0.00138	0.000698	0.0007	0.001209
Cobalt	mg/L	—	—	0.0009	<0.00050	<0.00005	0.000037	<0.000050	0.000424	<0.00050	<0.00005	0.000032	<0.000050	<0.000050	10	—	-	0	0.000032	0.0005	0.0001743	0.00005	0.0005
Copper[c]	mg/L	1	0.002-0.004	0.001-0.005	<0.0010	0.0006	<0.00070	<0.00070	0.00163	<0.0010	0.0005	<0.00070	<0.00070	0.00078	10	0	0	0	0.0005	0.00163	0.000831	0.0007	0.0013465
Iron (total)	mg/L	0.3	0.3	0.3	0.156	0.16	0.133	0.181	***0.965***	0.154	0.162	0.166	0.175	0.21	10	1	1	1	0.133	0.965	0.2462	0.164	0.62525
Lead[c]	mg/L	0.01	0.001-0.007	0.001-0.005	<0.0010	<0.00005	0.000069	<0.00010	0.00061	<0.0010	<0.00005	<0.00060	<0.00010	<0.00010	10	0	0	0	<0.00005	0.001	0.0003139	0.0001	0.001
Manganese	mg/L	0.05	—	—	0.0052	0.005	0.00628	0.0283	0.04	0.0049	0.005	0.00808	0.0264	0.0135	10	0	-	-	<0.000010	0.04	0.013639	0.00664	0.034735
Mercury	mg/L	0.001	0.000026	0.0002	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	10	0	0	0	<0.000010	<0.0001	0.000028	0.00001	0.0001
Molybdenum	mg/L	—	0.073	0.04	<0.0010	<0.0002	0.000341	<0.00020	<0.00020	<0.0010	<0.0002	0.000095	<0.00020	<0.00020	10	—	0	0	0.000095	0.001	0.0003636	0.0002	0.001
Nickel[c]	mg/L	—	0.025-0.15	0.025	<0.0020	0.0001	<0.0010	<0.0010	0.001	<0.0020	0.0001	<0.0010	<0.0010	<0.0010	10	—	0	0	0.0001	0.002	0.00102	0.001	0.002
Selenium	mg/L	0.01	0.001	0.1	<0.0050	0.0003	<0.0020	<0.00050	<0.00050	<0.0050	0.0002	<0.0020	<0.00050	<0.00050	10	0	0	0	0.0002	0.005	0.00165	0.0005	0.005
Silicon	mg/L	—	—	—	2.04	1.8				2.01	1.8				4	—	-	-	1.8	2.04	1.9125	1.905	2.0355
Silver	mg/L	—	0.0001	0.0001	<0.00010	<0.0002	<0.0000070	<0.000050	<0.000050	<0.00010	<0.0002	<0.0000070	<0.000050	<0.000050	10	—	0	0	<0.00007	<0.000050	0.0008814	0.00005	0.0002
Strontium	mg/L	—	—	—	0.0125	0.0148	0.0132	0.0131	0.0158	0.0122	0.015	0.0133	0.0128	0.0139	10	—	-	-	0.0122	0.0158	0.01366	0.01325	0.01544
Thallium	mg/L	—	0.0008	0.0003	<0.00030	<0.00002	<0.0000040	<0.000030	<0.000030	<0.00030	<0.00002	<0.0000040	<0.000030	<0.000030	10	—	0	0	<0.000004	<0.000030	0.0000768	0.00003	0.0003
Tin	mg/L	—	—	—	<0.0010	<0.001	<0.000040	<0.00010	<0.00010	<0.0010	<0.001	<0.000040	<0.00010	<0.00010	10	—	-	-	<0.00004	<0.00010	0.000448	0.0001	0.001
Titanium	mg/L	—	—	—	<0.0020	<0.002	<0.00020	0.00077	0.0279	<0.0020	<0.002	0.00107	0.00077	0.00083	10	—	-	-	<0.0002	0.0279	0.003954	0.001535	0.016245
Tungsten	mg/L	—	—	0.03	<0.010	<0.01	0.00172	<0.00010	<0.00010	<0.010	<0.01	<0.000040	<0.00010	<0.00010	10	—	-	0	<0.00004	0.01	0.004216	0.00091	0.01
Uranium	mg/L	0.02	0.015	0.005	<0.0050	<0.002	<0.000040	0.000026	<0.000090	<0.0050	<0.002	0.0000293	0.000025	0.000027	10	0	-	0	0.000025	0.005	0.00142463	0.00006955	0.005
Vanadium	mg/L	—	—	0.006	<0.0010	0.00025	0.0000282	<0.00020	0.00186	<0.0010	0.0002	0.00027	<0.00020	0.00048	10	—	-	0	0.0000282	0.00186	0.00054882	0.00026	0.001473
Zinc	mg/L	5	0.03	0.02	<0.0030	0.0026	0.000251	<0.0020	0.004	<0.0030	0.0022	<0.0030	<0.0020	<0.0020	10	0	0	0	0.000251	0.004	0.0024051	0.0024	0.00355
Zirconium	mg/L	—	—	0.004	<0.0010	<0.004	<0.0030	0.00016	0.0002	<0.0010	<0.004	<0.00020	<0.00010	<0.00010	10	—	-	0	<0.00010	0.004	0.001376	0.0006	0.004
Dissolved Metals																							
Aluminum	mg/L	—	—	—	0.014	0.0255	0.0312	0.0325	0.025	0.013	0.0265	0.0325	0.0333	0.0256	10	—	-	-	0.013	0.0333	0.02591	0.02605	0.03294
Antimony	mg/L	—	—	—	<0.00060	<0.0002	<0.00020	<0.00010	<0.00010	<0.00060	<0.0002	<0.00020	<0.00010	<0.00010	10	—	-	-	<0.00010	<0.00010	0.00024	0.0002	0.0006
Arsenic	mg/L	—	—	—	<0.0010	0.00036	0.000285	0.0003	0.00037	<0.0010	0.0003	0.000287	0.0003	0.00039	10	—	-	-	0.000285	0.001	0.0004592	0.00033	0.001
Barium	mg/L	—	—	—	<0.010	<0.01	0.00458	0.00416	0.00421	<0.010	<0.01	0.00434	0.00418	0.00423	10	—	-	-	0.00416	0.01	0.00657	0.00446	0.01
Beryllium	mg/L	—	—	—	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	10	—	-	-	<0.000060	<0.000060	0.000256	0.00006	0.001
Bismuth	mg/L	—	—	—	<0.0010	<0.001	<0.00010	<0.00020	<0.00020	<0.0010	<0.001	<0.00010	<0.00020	<0.00020	10	—	-	-	<0.0001	<0.00020	0.0005	0.0002	0.001
Boron	mg/L	—	—	—	<0.050	0.004	0.0028	0.003	0.0037	<0.050	0.004	0.0029	0.0031	0.0036	10	—	-	-	0.0028	0.05	0.01271	0.00365	0.05
Cadmium	mg/L	—	—	—	<0.000090	<0.00002	<0.000030	0.000011	<0.000010	<0.000090	<0.00002	<0.000030	0.000011	<0.000010	10	—	-	-	<0.000010	0.00009	0.0000322	0.00002	0.00009
Chromium	mg/L	—	—	—	<0.0010	0.0002	<0.00020	<0.00050	<0.00050	<0.0010	0.0001	<0.00020	<0.00050	<0.00050	10	—	-	-	0.0001	0.001	0.00047	0.0005	0.001
Cobalt	mg/L	—	—	—	<0.00050	<0.00005	0.000053	<0.000050	0.000052	<0.00050	<0.00005	<0.000030	0.000052	<0.000050	10	—	-	-	<0.00003	0.0005	0.0001387	0.000051	0.0005
Copper	mg/L	—	—	—	<0.0010	0.00145	0.00106	0.00085	0.00095	<0.0010	0.00095	0.00048	0.00081	0.00072	10	—	-	-	0.00048	0.00145	0.000927	0.00095	0.0012745
Iron	mg/L	—	—	—	0.052	0.09	0.0384	0.09	0.117	<0.050	0.084	0.0614	0.097	0.08	10	—	-	-	0.0384	0.117	0.07598	0.082	0.108
Lead	mg/L	—	—	—	<0.0010	<0.00005	<0.00010	<0.00010	<0.00010	<0.0010	<0.00005	<0.00010	<0.00010	<0.00010	10	—	-	-	<0.00005	<0.00010	0.00027	0.0001	0.001
Manganese	mg/L	—	—	—	0.0017	0.002	0.00234	0.0239	0.0102	0.0015	0.001	0.0037	0.0232	0.00197	10	—	-	-	0.001	0.0239	0.007151	0.00217	0.023585
Mercury	mg/L	—	—	—	<0.00010	<0.000020	<0.000020	<0.000010	<0.000010	<0.00010	<0.000020	<0.000020	<0.000010	<0.000010	10	—	-	-	<0.000010	<0.000010	0.000032	0.00002	0.0001
Molybdenum	mg/L	—	—	—	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	<0.0010	<0.0002	<0.000090	<0.00020	<0.00020	10	—	-	-	<0.00009	<0.00020	0.000338	0.0002	0.001
Nickel	mg/L	—	—	—	<0.0020	0.0004	0.00079	<0.0010	<0.0010	<0.0020	0.0002	<0.00020	<0.0010	<0.0010	10	—	-	-	<0.0002	0.002	0.000959	0.001	0.002
Selenium	mg/L	—	—	—	<0.0020	<0.0001	<0.0010	<0.00050	<0.00050	<0.0020	<0.0001	<0.0010	<0.00050	<0.00050	10	—	-	-	<0.0001	<0.00050	0.00082	0.0005	0.002
Silicon	mg/L	—	—	—	1.73	1.7				1.73	1.7				4	—	-	-	1.7	1.73	1.715	1.715	1.73
Silver	mg/L	—	—	—	<0.00010	<0.0002	<0.000010	<0.000050	<0.000050	<0.00010	<0.0002	<0.000010	<0.000050	<0.000050	10	—	-	-	<0.00001	<0.000050	0.000082	0.00005	0.0002
Strontium	mg/L	—	—	—	0.0119	0.0143	0.0122	0.0137	0.0133	0.012	0.0137	0.0123	0.014	0.0133	10	—	-	-	0.0119	0.0143	0.01307	0.0133	0.014165
Thallium	mg/L	—	—	—	<0.00030	<0.00002	<0.000010	<0.000030	<0.000030	<0.00030	<0.00002	<0.000010	<0.000030	<0.000030	10	—	-	-	<0.00001	<0.000030	0.0000778	0.00003	0.0003
Tin	mg/L	—	—	—	<0.0010	<0.001	<0.00010	<0.00010	<0.00010	<0.0010	<0.001	<0.00010	<0.00010	<0.00010	10	—	-	-	<0.00010	<0.00010	0.00046	0.0001	0.001
Titanium	mg/L	—	—	—	<0.0020	<0.002	<0.00050	<0.00050	<0.00050	<0.0020	<0.002	<0.00050	<0.00050	<0.00050	10	—	-	-	<0.00050	<0.00050	0.0011	0.0005	0.002
Tungsten	mg/L	—	—	—	<0.010	<0.01	0.000013	<0.00010	<0.00010	<0.010	<0.01	<0.000010	<0.00010	<0.00010	10	—	-	-	<0.00001	0.01	0.0040423	0.0001	0.01
Uranium	mg/L	—	—	—	<0.0050	<0.005	0.0000235	0.000022	0.000023	<0.0050	<0.005	0.0000235	0.000022	0.000021	10	—	-	-	0.000021	0.005	0.0020135	0.0000235	0.005
Vanadium	mg/L	—	—	—	<0.0010	0.0003	0.0002	<0.00020	0.00034	<0.0010	0.0003	0.00024	<0.00020	0.00029	10	—	-	-	<0.00020	0.001	0.000407	0.000295	0.001
Zinc	mg/L	—	—	—	<0.0030	0.006	0.0041	0.0086	0.01	<0.0030	0.0048	0.0062	0.0071	0.0055	10	—	-	-	<0.0030	0.01	0.00583	0.00575	0.00937
Zirconium	mg/L	—	—	—	<0.0010	<0.004	0.000072	<0.00010	<0.00010	<0.0010	<0.004	0.00005	<0.00010	<0.00010	10	—	-	-	0.00005	0.004	0.0010522	0.0001	0.004

Notes:

(a) See Appendix 1.I for detailed notes for water quality guidelines.

(b) CCME and PWQO receiving water quality guidelines for aluminum have been calculated based on pH. See Appendix 1.I for details.

(c) CCME and/or PWQO receiving water quality guidelines for these parameters have been calculated based on hardness. See Appendix 1.I for details.

1.0 Values highlighted in yellow greater than the Ontario Drinking Water Standards (ODWS), Ontario Regulation (O.Reg.) 169/03: Ontario Drinking Water Standards (OD'

1.0 Values greater than the Canadian Council of Ministers of the Environment (CCME), Canadian Water Quality Guidelines for the Protection of Aquatic Life, Update 7.1 (

1.0 Values greater than the Provincial Water Quality Objectives (PWQO), Ministry of Environment and Energy

Where cells are blank, data has been removed, or was not recorded due to field instrument error.

Where cells are blank, analysis was not performed during this time period. Some parameters were added to the sampling program later in the campaign, while others were removed from the sampling campaign due to non detection.

— = A dash indicates that guideline criteria are not available for this parameter.

"D" = A "D" next to the station name indicates that this is a duplicate sample.

TABLE 1
Surface Water Quality Results

Parameter	Unit	Receiving WQ Guidelines[a]			Lynxhead Bay - Top							Lynxhead Bay - Bottom							Count	ODWS	CCME	PWQO	Min	Max	Average	Median	95th %ile
		ODWS	CCME	PWQO	HRWQP-7A	HRWQP-7AD	HRWQP-7A	HRWQP-7A	HRWQP-7AD	HRWQP-7A	HRWQP-7A	HRWQP-7B	HRWQP-7BD	HRWQP-7B	HRWQP-7B	HRWQP-7BD	HRWQP-7B	HRWQP-7B									
					Sep-10	Sep-10	Nov-10	Jun-11	Jun-11	Apr-12	Aug-12	Sep-10	Sep-10	Nov-10	Jun-11	Jun-11	Apr-12	Aug-12									
Field Parameters																											
Temperature	°C	—	—	±10	13.92	13.92	6.46	15.39	15.39	4.75	21.16	7	7	6.44	10.3	10.3	4.59	19.58	14	—	-	-	4.59	21.16	11.1571429	10.3	20.133
pH	—	6.5-8.5	6.5-9	6.5-8.5	7.22	7.22	7.27	***6.16***	***6.16***	6.78	7.17	6.93	6.93	7.22	***6***	***6***	6.58	***6.47***	14	5	5	5	6	7.27	6.72214286	6.855	7.2375
Conductivity	µS/cm	—	—	—	47	47				44		47	47		44	44	40		10	—	-	-	0.044	531	111.8276	0.047	518.4
Dissolved Oxygen	mg/L	—	5.5-9.5	4-8	9.34	9.34	11.73	9.21	9.21		8.06	6.52	6.52	11.42	9.51	9.51		***5.21***	12	—	5	9	5.21	11.73	8.79833333	9.275	11.5595
ORP	mV	—	—	—			144.9	297.7	297.7	121.4	75.6			147.9	272.1	272.1	96.6	53.1	10	—	-	-	53.1	297.7	177.91	146.4	297.7
Physical-Chemical																											
pH	—	6.5-8.5	6.5-9	6.5-8.5	7.32	7.28	7.02	7.12	7.1	6.93	7.17	7.07	7.17	6.96	6.96	6.97	6.94	***6.47***	14	—	1	1	6.47	7.32	7.03428571	7.045	7.294
DOC	% wt	5	—	—	10.7	11.2	8.5	10.4	10.7	12.3	12.3	11	11.4	8.8	10.8	10.5	9.9	8.7	14	14	-	-	8.5	12.3	10.5142857	10.7	12.3
TOC	% wt	—	—	—	11.3	11.5	9.1	11	11.2	10.3	11.6	11.2	11.4	9.3	11.8	11.8	9.6	9.8	14	—	-	-	9.1	11.8	10.7785714	11.2	11.8
Acidity	mg/L	—	—	—				2.8	2.8	3.2	4.4				3	2.6	2.6	2	8	—	-	-	2	4.4	2.925	2.8	3.98
Alkalinity	mg(CaCO3)/L	30-500	—	-25%	18.7	18.7	18.1	14.4	14.4	16.6	17.2	18.6	18.3	18.5	15.7	15.8	16.5	16.7	14	14	-	-	14.4	18.7	17.0142857	16.95	18.7
Conductivity	µS/cm	—	—	—	49.1	48.9	49.8	40.1	40.1	58.4	46.8	48.7	48.8	49.4	42.9	42.8	52.7	46.2	14	—	-	-	40.1	58.4	47.4785714	48.75	54.695
Total Suspended Solids	mg/L	—	+5-25	—	2.4	2.5	<2.0	<2.0	<2.0	2.4	2.5	<2.0	<2.0	2.2	<2.0	2.1	<2.0	35.5	14	—	-	-	<2.0	35.5	4.54285714	2.05	14.05
Total Dissolved Solids	mg/L	500	—	—	41	45	120	55	61	30	66	43	47	33	55	54	28	49	14	0	-	-	28	120	51.9285714	48	84.9
Major Ions																											
Calcium	mg/L	—	—	—	6.6	6.64	5.56	5.01	4.59	5.51	5.65	6.47	6.73	5.81	5	5.21	5.35	6.14	14	—	-	-	4.59	6.73	5.73357143	5.605	6.6715
Chloride	mg/L	250	120	—	1.34	1.46	1.85	1.39	1.39	1.61	1.13	1.4	1.33	1.39	1.51	1.53	1.61	1.12	14	0	0	-	1.12	1.85	1.43285714	1.395	1.694
Fluoride	mg/L	1.5	—	—	<0.030	<0.030	<0.030	<0.030	0.058	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.056	<0.030	<0.030	14	0	-	-	<0.030	0.058	0.03385714	0.03	0.0567
Magnesium	mg/L	—	—	—	1.61	1.7	1.46	1.25	1.17	1.42	1.37	1.66	1.73	1.49	1.23	1.35	1.34	1.48	14	—	-	-	1.17	1.73	1.44714286	1.44	1.7105
Potassium	mg/L	—	—	—	<1.0	<1.0	<1.0	0.455	0.425	0.525	0.452	<1.0	<1.0	<1.0	0.453	0.49	0.492	0.483	14	—	-	-	0.425	0.525	0.69821429	0.5085	1
Sodium	mg/L	200	—	—	1.66	1.82	1.58	1.41	1.33	1.59	1.37	1.67	1.72	1.55	1.44	1.55	1.51	1.39	14	0	-	-	1.33	1.82	1.54214286	1.55	1.755
Sulphate	mg/L	500	—	—	1.59	1.55	1.59	1.64	1.66	1.43	1.3	1.62	1.45	1.28	1.51	1.69	1.44	1.31	14	0	-	-	1.28	1.69	1.50428571	1.53	1.6705
Carbonate (CO_3^{--})	mg/L	—	—	—						<5.0	<5.0						<5.0	<5.0	4	—	-	-	<5.0	<5.0	5	5	5
Bicarbonate ($H(CO_3)$)	mg/L	—	—	—						20.2	17.2						20.1	16.7	4	—	-	-	16.7	20.2	18.55	18.65	20.185
Hardness	mg(CaCO3)/L	80-100	—	—	20	20	23	17.1		19.5	19.1	20			24	17.8	19.4	18.6	13	11	-	-	17.1	24	19.8636364	19.5	23.5
Cyanide (free)	mg/L	0.2	0.005	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			10	0	0	0	<0.0050	<0.0050	0.005	0.005	0.005
Cyanide (total)	mg/L	—	—	—	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020	<0.0020	<0.0020			10	—	-	-	<0.0020	<0.0020	0.002	0.002	0.002
Nutrients																											
Nitrate-N	mg/L	10	13	—	<0.030	0.031	0.055	0.075	0.094	0.121	0.053	0.057	0.037	0.034	0.116	0.112	0.119	0.068	14	0	0	-	<0.030	0.121	0.07157143	0.0625	0.1197
Nitrite-N	mg/L	1	0.06	—	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	14	0	0	-	<0.020	<0.020	0.02	0.02	0.02
Ammonia-N	mg/L	—	—	—	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.024	14	—	-	-	<0.020	0.024	0.02035714	0.02	0.02205
Un-ionized ammonia	mg/L	—	0.019	0.02	8.31E-05	8.31E-05	5.21E-05	8.13E-06	8.13E-06	1.47E-05	1.27E-04	2.49E-05	2.49E-05	4.87E-05	3.80E-06	3.80E-06	9.16E-06	2.72E-05	14	—	0	0	3.802E-06	0.00012669	3.703E-05	2.4898E-05	9.8378E-05
ortho-Phosphate	mg/L	—	—	—						<0.0050	<0.0050						<0.0050	<0.0050	4	—	-	-	<0.0050	<0.0050	0.005	0.005	0.005
Phosphorus	mg/L	—	—	0.02	0.0074	0.0088	0.0073	0.0125	0.0092	0.0128	0.0112	0.0075	0.0068	0.0101	0.0124	0.0144	0.0153	0.0716	14	—	-	1	0.0068	0.0716	0.01480714	0.01065	0.035005
Organics																											
Oil and Greases	mg/L	—	—	physically non detect	<2.0	<2.0	<2.0	<2.0	<2.0	<4.0		<2.0	<2.0	<2.0	<2.0	<2.0	<4.0		12	—	-	-	<2	<4.0	2.33333333	2	4
Phenols	mg/L	—	0.004	0.005	0.0019	0.0011	0.0029	***0.007***	0.0038	<0.0010	<0.0010	0.0016	0.0016	***0.0044***	***0.0058***	***0.0041***	<0.0010	0.0016	14	—	4	2	<0.0010	0.007	0.00277143	0.00175	0.00622
Micro-organisms																											
Escherichia coli	per 100mL	—	—	100	0	0	0	1	1			0	1	0	0	0			10	—	-	0	0	1	0.3	0	1
Total coliforms	per 100mL	—	—	—	40	33	23	24	12			47	32	17	5	5			10	—	-	-	5	47	23.8	23.5	43.85
Total Metals																											
Aluminum[b]	mg/L	0.1	0.005-0.1	0.015-0.075	0.041	0.041	0.036	***0.0614***	***0.0562***	0.0508	0.0554	0.043	0.044	0.0365	***0.0533***	***0.0612***	0.0456	***0.545***	14	1	5	3	0.036	0.545	0.0836	0.0482	0.23066
Antimony	mg/L	0.006	—	0.02	<0.0050	<0.0050	<0.0002	<0.000030	<0.000030	<0.00010	<0.00010	<0.0050	<0.0050	<0.0002	0.000033	<0.000030	<0.00010	<0.00010	14	0	-	0	<0.00003	0.005	0.0014945	0.0001	0.005
Arsenic	mg/L	0.025	0.005	0.1	<0.0010	<0.0010	0.00034	0.000328	0.000314	0.00029	0.00048	<0.0010	<0.0010	0.00034	0.000296	0.000304	0.00029	0.00103	14	0	0	0	0.00029	0.00103	0.00057229	0.00034	0.0010105
Barium	mg/L	1	—	—	<0.010	<0.010	<0.01	0.00531	0.0052	0.00476	0.00547	<0.010	<0.010	<0.01	0.00551	0.00569	0.00455	0.0223	14	0	-	-	0.00455	0.0223	0.008485	0.007845	0.014305
Beryllium	mg/L	—	0.011-1.1	—	<0.0010	<0.0010	<0.0001	<0.000040	<0.000040	<0.000060	<0.000060	<0.0010	<0.0010	<0.0001	<0.000040	<0.000040	<0.000060	<0.000060	14	—	-	-	<0.00004	<0.000060	0.00032857	0.00006	0.001
Bismuth	mg/L	—	—	—	<0.0010	<0.0010	<0.001	<0.000020	<0.000020	<0.00020	<0.00020	<0.0010	<0.0010	<0.001	<0.000020	<0.000020	<0.00020	<0.00020	14	—	-	-	<0.00002	<0.00020	0.00049143	0.0002	0.001
Boron	mg/L	5	1.5	0.2	<0.050	<0.050	0.050	0.008	0.00299	0.00274	0.0038	0.0039	<0.050	<0.050	0.006	0.00289	0.00305	0.0037	0.004	14	0	0	0	0.00274	0.05	0.01721929	0.00395	0.05
Cadmium[b,c]	mg/L	0.005	0.0000041-0.000042	0.0001-0.0005	<0.000090	<0.000090	<0.00002	<0.0000090	<0.0000090	<0.0000010	<0.000010	<0.000090	<0.000090	<0.00002	<0.0000090	<0.0000090	<0.000010	***0.00005***	14	0	1	0	<0.000010	0.00009	3.6857E-05	0.000015	0.00009
Chromium (total)	mg/L	0.05	0.009	0.009	<0.0010	<0.0010	0.0001	<0.00090	<0.00090	<0.00050	<0.00050	<0.0010	<0.0010	0.0002	<0.00090	<0.00090	<0.00050	0.00105	14	0	0	0	0.0001	0.00105	0.00074643	0.0009	0.0010175
Cobalt	mg/L	—	—	0.0009	<0.00050	<0.00050	<0.00005	0.000034	0.000029	0.000064	<0.000050	<0.00050	<0.00050	<0.00005	0.000039	0.000041	0.000066	0.00106	14	—	-	1	0.000029	0.00106	0.00024879	0.000057	0.000696
Copper[b,c]	mg/L	1	0.002-0.004	0.001-0.005	<0.0010	<0.0010	0.00065	0.00085	<0.00070	<0.00070	0.00108	<0.0010	<0.0010	0.00065	<0.00070	<0.00070	<0.00070	0.00177	14	0	0	2	0.00065	0.00177	0.00089286	0.000775	0.0013215
Iron (total)	mg/L	0.3	0.3	0.3	***0.378***	***0.408***	***0.588***	0.278	0.253	***0.508***	***0.498***	***0.341***	***0.362***	***0.574***	***0.343***	***0.413***	***0.507***	***3.97***	14	12	12	12	0.253	3.97	0.67292857	0.4105	1.7717
Lead[b,c]	mg/L	0.01	0.001-0.007	0.001-0.005	<0.0010	<0.0010	0.00005	0.000062	<0.000060	<0.00010	<0.00010	<0.0010	<0.0010	<0.00005	0.000082	0.000067	<0.00010	0.00095	14	0	0	0	0.00005	0.001	0.0004015	0.0001	0.001
Manganese	mg/L	0.05	—	—	0.0164	0.0164	0.041	0.00787	0.00723	0.0227	0.111	0.0151	0.0156	0.043	0.0138	0.015	0.0223	1.49	14	2	-	-	0.00723	1.49	0.13124286	0.0164	0.59365
Mercury	mg/L	0.001	0.000026	0.0002	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	14	0	0	0	<0.000010	<0.000010	3.5714E-05	0.00001	0.0001
Molybdenum	mg/L	—	0.073	0.04	<0.0010	<0.0010	<0.0002	<0.000090	<0.000090	<0.00020	<0.00020	<0.0010	<0.0010	<0.0002	<0.000090	<0.000090	<0.00020	<0.00020	14	—	0	0	<0.00009	<0.00020	0.00039714	0.0002	0.001
Nickel[b,c]	mg/L	—	0.025-0.15	0.025	<0.0020	<0.0020	0.0002	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020	<0.0020	0.0002	<0.0010	<0.0010	<0.0010	0.0012	14	—	0	0	0.0002	0.002	0.00118571	0.001	0.002
Selenium	mg/L	0.01	0.001	0.1	<0.00040	<0.00040	0.0002	<0.0020	<0.0020	<0.00050	<0.00050	<0.00040	<0.00040	0.0003	<0.0020	<0.0020	<0.00050	<0.00050	14	0	0	0	0.0003	0.002	0.00086429	0.0005	0.002
Silicon	mg/L	—	—	—	2.8	2.8	3					2.9	2.9	2.9					6	—	-	-	2.8	3	2.88333333	2.9	2.975
Silver	mg/L	—	0.0001	0.0001	<0.00010	<0.00010	<0.0002	<0.0000070	<0.0000070	0.000051	<0.000050	<0.00010	<0.00010	<0.0002	<0.0000070	<0.0000070	<0.000050	<0.000050	14	—	0	0	<0.000007	0.0002	0.0000735	0.0000505	0.0002
Strontium	mg/L	—	—	—	0.015	0.0156	0.0145	0.0111	0.00998	0.01	0.0122	0.014	0.0146	0.0144	0.0108	0.0112	0.00995	0.0135	14	—	-	-	0.00995	0.0156	0.01263071	0.01285	0.01521
Thallium	mg/L	—	0.0008	0.0003	<0.000030	<0.000030	<0.000002	<0.0000040	<0.0000040	<0.0000030	<0.000030	<0.000030	<0.000030	<0.00002	<0.0000040	<0.0000040	<0.000030	<0.000030	14	—	0	0	<0.000004	<0.000030	9.8286E-05	0.00003	0.0003
Tin	mg/L	—	—	—	<0.0010	<0.0010	<0.001	<0.000040	<0.000040	<0.00010	<0.00010	<0.0010	<0.0010	<0.001	<0.000040	<0.000040	<0.00010	<0.00010	14	—	-	-	<0.00004	<0.00010	0.00046857	0.0001	0.001
Titanium	mg/L	—	—	—	<0.0020	<0.0020	<0.002	0.00091	0.00087	0.00101	0.00119	<0.0020	<0.0020	<0.002	0.0008	0.00094	0.00093	0.0136	14	—	-	-	0.0008	0.0136	0.00230357	0.001595	0.00606
Tungsten	mg/L	—	—	0.03	<0.010	<0.010	<0.01	<0.000040	<0.000040	<0.00010	<0.00010	<0.010	<0.010	<0.01	<0.000040	<0.000040	<0.00010	<0.00010	14	—	-	0	<0.00004	<0.00010	0.00432571	0.0001	0.01
Uranium	mg/L	0.02	0.015	0.005	<0.0050	<0.0050	<0.002	0.0000269	0.0000256	0.000022	0.000029	<0.0050	<0.0050	<0.002	0.0000257	0.0000277	0.000022	0.000074	14	0	-	0	0.000022	0.005	0.00173235	0.0000515	0.005
Vanadium	mg/L	—	—	0.006	<0.0010	<0.0010	0.0006	0.000401	0.000376	0.00055	0.0008	<0.0010	<0.0010	0.000255	0.000399	0.000418	0.00052	0.00556	14	—	-	0	0.000376	0.00556	0.00101243	0.000575	0.002596
Zinc	mg/L	5	0.03	0.02	<0.0030	<0.0030	0.0028	<0.0030	<0.0030	<0.0020	<0.0020	<0.0030	<0.0030	0.0018	<0.0030	<0.0030	<0.0020	0.0073	14	0	0	0	0.0018	0.0073	0.00299286	0.003	0.004505
Zirconium	mg/L	—	—	0.004	<0.0040	<0.0040	<0.004	<0.00020	<0.00020	<0.00010	0.00011	<0.0040	<0.0040	<0.004	<0.00020	<0.00020	<0.00010	0.0002	14	—	-	0	<0.00010	0.004	0.00180786	0.0002	0.004
Dissolved Metals																											
Aluminum	mg/L	—	—	—	0.024	0.024	0.027	0.0413	0.041	0.0325	0.0442	0.025	0.025	0.026	0.0408	0.0395	0.0309	0.041	14	—	-	-	0.024	0.0442	0.03301429	0.0317	0.042315
Antimony	mg/L	—	—	—	<0.0050	<0.0050	<0.0002	<0.000020	<0.000020	<0.00010	<0.00010	<0.0050	<0.0050	<0.0002	<0.00020	<0.00020	<0.00010	<0.00010	14	—	-	-	<0.00010	<0.00010	0.00154286	0.0002	0.005
Arsenic	mg/L	—	—	—	<0.0010	<0.0010	0.00038	0.000293	0.000282	0.00028	0.00041	<0.0010	<0.0010	0.00036	0.000278	0.000257	0.00029	0.00042	14	—	-	-	0.000257	0.001	0.00051786	0.00037	0.001
Barium	mg/L	—	—	—	<0.010	<0.01	0.00482	0.00468	0.00452	0.00511	<0.010	<0.010	<0.010	<0.01	0.00518	0.00514	0.00458	0.00551	14	—	-	-	0.00452	0.01	0.00711	0.005345	0.01
Beryllium	mg/L	—	—	—	<0.0010	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	<0.000060	<0.0010	<0.0010	<0.0001	<0.000060	<0.000060	<0.000060	<0.000060	14	—	-	-	<0.000060	<0.000060	0.00033429	0.00006	0.001
Bismuth	mg/L	—	—	—	<0.0010	<0.0010	<0.001	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010	<0.0010	<0.001	<0.00010	<0.00010	<0.00020	<0.00020	14	—	-	-	<0.0001	<0.00020	0.00051429	0.0002	0.001
Boron	mg/L	—	—	—	<0.050	<0.050	0.004	0.0025	0.0026	0.0033	0.0034	<0.050	<0.050	0.004	0.0026	0.0023	0.0037	0.0033	14	—	-	-	0.0023	0.05	0.01655	0.00355	0.05
Cadmium	mg/L	—	—	—	<0.00010	<0.00010	<0.00002	<0.000030	<0.000030	<0.000010	<0.000010	<0.00010	<0.00010	<0.00002	<0.000030	<0.000030	0.000013	<0.000010	14	—	-	-	<0.000010	0.0001	4.3071E-05	0.00003	0.0001
Chromium	mg/L	—	—	—	<0.0010	<0.0010	0.0003	<0.00020	<0.00020	<0.00050	<0.00050	<0.0010	<0.0010	0.0003	<0.00020	<0.00020	<0.00050	<0.00050	14	—	-	-	<0.0002	0.001	0.00052857	0.0005	0.001
Cobalt	mg/L	—	—	—	<0.00050	<0.00050	<0.00005	<0.000030	<0.000030	<0.000050	<0.000050	<0.00050	<0.00050	<0.00005	0.000033	<0.000030	0.000052	<0.000050	14	—	-	-	<0.00003	0.0005	0.00017321	0.00005	0.0005
Copper	mg/L	—	—	—	0.0015	<0.0010	0.00075	0.00059	0.00076	0.00107	0.0011	0.0016	<0.0010	0.0008	0.00086	0.0005	0.00104	0.00192	14	—	-	-	0.0005	0.00192	0.001035	0.001	0.001712
Iron	mg/L	—	—	—	0.245	0.267	0.406	0.15	0.148	0.225	0.305	0.231	0.25	0.38	0.222	0.223	0.217	0.242	14	—	-	-	0.148	0.406	0.25078571	0.2365	0.3891
Lead	mg/L	—	—	—	<0.0010	<0.0010	<0.00005	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.00005	<0.00010	<0.00010	<0.00010	<0.00010	14	—	-	-	<0.00005	<0.00010	0.00035	0.0001	0.001
Manganese	mg/L	—	—	—	0.0038	0.004	0.017	0.00213	0.00213	0.0156	0.084	0.0038	0.0039	0.018	0.00937	0.0116	0.014	0.103	14	—	-	-	0.00213	0.103	0.02088071	0.010485	0.09065
Mercury	mg/L	—	—	—	<0.00010	<0.00010	<0.000020	<0.000020	<0.000020	<0.000010	<0.000010	<0.00010	<0.00010	<0.000020	<0.000020	<0.000020	<0.000010	<0.000010	14	—	-	-	<0.000010	<0.000010	0.00004	0.00002	0.0001
Molybdenum	mg/L	—	—	—	<0.0010	<0.0010	<0.0002	<0.000090	<0.000090	<0.00020	<0.00020	<0.0010	<0.0010	<0.0002	<0.000090	<0.000090	<0.00020	<0.00020	14	—	-	-	<0.00009	<0.00020	0.00039714	0.0002	0.001
Nickel	mg/L	—	—	—	<0.0020	0.0002	0.00027	<0.0010	0.0003	<0.0010	<0.0010	<0.0020	<0.0020	0.0002	0.00029	0.00022	<0.0010	<0.0010	14	—	-	-	0.0002	0.002	0.00096286	0.001	0.002
Selenium	mg/L	—	—	—	<0.0050	<0.0050	0.0001	<0.0010	<0.0010	<0.00050	<0.00050	<0.0050	<0.0050	<0.0001	<0.0010	<0.0010	<0.00050	<0.00050	14	—	-	-	<0.00050	0.005	0.00187143	0.001	0.005
Silicon	mg/L	—	—	—	3.19	3.19	2.8					3.27	3.26	2.8					6	—	-	-	2.8	3.27	3.085	3.19	3.2675
Silver	mg/L	—	—	—	<0.00010	<0.00010	<0.0002	<0.000010	<0.000010	<0.000050	<0.000050	<0.00010	<0.00010	<0.0002	<0.000010	<0.000010	<0.000050	<0.000050	14	—	-	-	<0.00001	<0.000050	7.4286E-05	0.00005	0.0002
Strontium	mg/L	—	—	—	0.013	0.0128	0.0133	0.0102	0.0102	0.0101	0.0117	0.0127	0.0128	0.0138	0.0106	0.0104	0.0103	0.0118	14	—	-	-	0.0101	0.0138	0.01169286	0.01175	0.013475
Thallium	mg/L	—	—	—	<0.00030	<0.00030	<0.00002	<0.000010	<0.000010	<0.000030	<0.000030	<0.00030	<0.00030	<0.00002	<0.000010	<0.000010	<0.000030	<0.000030	14	—	-	-	<0.00001	<0.000030	0.0001	0.00003	0.0003
Tin	mg/L	—	—	—	<0.0010	<0.0010	<0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.001	<0.00010	<0.00010	<0.00010	<0.00010	14	—	-	-	<0.00010	<0.00010	0.00048571	0.0001	0.001
Titanium	mg/L	—	—	—	<0.0020	<0.0020	<0.002	<0.00050	<0.00050	<0.00050	0.00071	<0.0020	<0.0020	<0.002	<0.00050	<0.00050	0.00053	<0.00050	14	—	-	-	<0.00050	0.002	0.00116	0.00062	0.002
Tungsten	mg/L	—	—	—	<0.010	<0.010	<0.01	<0.000010	<0.000010	<0.00010	<0.00010	<0.010	<0.010	<0.01	<0.000010	<0.000010	<0.00010	<0.00010	14	—	-	-	<0.00001	<0.00010	0.00431714	0.0001	0.01
Uranium	mg/L	—	—	—	<0.0050	<0.0050	<0.005	0.0000242	0.0000242	0.000022	0.000025	<0.0050	<0.0050	<0.005	0.0000231	0.0000231	0.000018	0.000024	14	—	-	-	<0.005	0.005	0.00215597	0.0000246	0.005
Vanadium	mg/L	—	—	—	<0.0010	<0.0010	0.00075	0.00023	0.00022	0.0003	0.0006	<0.0010	<0.0010	0.00075	0.00022	0.0002	0.00029	0.00054	14	—	-	-	0.0002	0.001	0.00057857	0.00057	0.001
Zinc	mg/L	—	—	—	0.0082	0.0058	0.0028	<0.0020	0.0041	<0.0020	0.0022	0.0079	<0.0030	0.0016	0.0035	0.0027	0.0067	0.0057	14	—	-	-	<0.002	0.0082	0.00415714	0.00325	0.008005
Zirconium	mg/L	—	—	—	<0.0040	<0.0040	<0.004	0.000082	0.000078	<0.00010	0.00012	<0.0040	<0.0040	<0.004	0.00008	0.000077	<0.00010	<0.00010	14	—	-	-	0.000077	0.004	0.00176693	0.00011	0.004

Notes:

(a) See Appendix 1.I for detailed notes for water quality guidelines.

(b) CCME and PWQO receiving water quality guidelines for aluminum have been calculated based on pH. See Appendix 1.I for details.

(c) CCME and/or PWQO receiving water quality guidelines for these parameters have been calculated based on hardness. See Appendix 1.I for details.

1.0 Values highlighted in yellow greater than the Ontario Drinking Water Standards (ODWS), Ontario Regulation (O.Reg.) 169/03: Ontario Drinking Water Standards (ODWS) (Revised June 2006).

1.0 Values greater than the Canadian Council of Ministers of the Environment (CCME), Canadian Water Quality Guidelines for the Protection of Aquatic Life, Update 7.1 (December 2007).

1.0 Values greater than the Provincial Water Quality Objectives (PWQO), Ministry of Environment and Energy

Where cells are blank, data has been removed, or was not recorded due to field instrument error.

Where cells are blank, analysis was not performed during this time period. Some parameters were added to the sampling program later in the campaign, while others were removed from the sampling campaign due to non detection.

— = A dash indicates that guideline criteria are not available for this parameter.

"D" = A "D" next to the station name indicates that this is a duplicate sample.

TABLE 1
Surface Water Quality Results

Part 1: Receiving WQ Guidelines[(a)] and sample results (Premier Lake - Top: HRWQP-8A; Premier Lake - Bottom: HRWQP-8B)

Parameter	Unit	ODWS	*CCME*	PWQO	HRWQP-8A Sep-10	HRWQP-8A Nov-10	HRWQP-8A Mar-11	HRWQP-8A Jun-11	HRWQP-8B Sep-10	HRWQP-8B Nov-10	HRWQP-8B Mar-11	HRWQP-8B Jun-11
Field Parameters												
Temperature	°C	—	—	±10	6.74	6.44	0.98	14.37	13.43	6.51	3.22	7.49
pH	—	6.5–8.5	6.5-9	6.5-8.5	6.87	7.22	7.57	7.44	***5.79***	7.58	7.24	7.45
Conductivity	µS/cm	—	—	—	47		43	39	38		41	40
Dissolved Oxygen	mg/L	—	5.5-9.5	4-8	6.64	11.42	11.1	7.85	9.39	11.37	9.44	7.05
ORP	mV	—	—	—		147.9		145.4		149.9		135.1
Physical-Chemical												
pH	—	6.5–8.5	6.5-9	6.5-8.5	7.2	6.95	6.97	7.25	7.14	6.9	6.9	6.89
DOC	% wt	5	—	—	6.8	6.3	7.1	7.5	7.4	6.5	6.2	7.6
TOC	% wt	—	—	—	7.3	7	7.8	7.8	7.7	6.8	6.6	7.4
Acidity	mg/L	—	—	—			2.2	3.4			3.8	3.8
Alkalinity	mg(CaCO3)/L	30–500	—	-25%	15.6	15	16.7	15.3	15.3	15.4	16.2	15.2
Conductivity	µS/cm	—	—	—	39.8	39.8	42.7	39	40.1	39.8	40.8	39.4
Total Suspended Solids	mg/L	—	+5-25	—	<2.0	2.1	44	2.5	2.6	<2.0	41	3
Total Dissolved Solids	mg/L	500	—	—	45	45	<2.0	30	40	45	<2.0	34
Major Ions												
Calcium	mg/L	—	—	—	5.84	5.19	5.35	5.87	5.95	5.37	5.01	5.67
Chloride	mg/L	250	120	—	0.33	0.14	0.43	0.3	0.37	0.23	0.45	0.28
Fluoride	mg/L	1.5	—	—	<0.030	<0.030	0.03	<0.030	<0.030	<0.030	0.032	<0.030
Magnesium	mg/L	—	—	—	0.82	0.75	0.775	0.8	0.83	0.6	0.732	0.763
Potassium	mg/L	—	—	—	<1.0	<1.0	0.364	0.393	<1.0	<1.0	0.358	0.383
Sodium	mg/L	200	—	—	0.76	0.76	0.685	1.03	0.78	0.59	0.654	0.71
Sulphate	mg/L	500	—	—	2.51	2.09	2.39	2.44	2.31	2.25	2.29	2.48
Carbonate (CO_3^{2-})	mg/L	—	—	—								
Bicarbonate ($H(CO_3)^-$)	mg/L	—	—	—								
Hardness	mg($CaCO_3$)/L	80–100	—	—	17	17	19.1	19.4	17	17	18.3	18.3
Cyanide (free)	mg/L	0.2	0.005	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cyanide (total)	mg/L	—	—	—	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Nutrients												
Nitrate-N	mg/L	10	13	—	<0.030	0.036	0.038	<0.030	<0.030	0.034	0.062	0.058
Nitrite-N	mg/L	1	0.06	—	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Ammonia-N	mg/L	—	—	—	<0.020	<0.020	0.021	<0.020	<0.020	<0.020	<0.020	<0.020
Un-ionized ammonia	mg/L	—	0.019	0.02	2.12E-05	4.64E-05	6.96E-05	1.42E-04	2.99E-06	1.06E-04	3.74E-05	8.55E-05
ortho-Phosphate	mg/L	—	—	—								
Phosphorus	mg/L	—	—	0.02	0.006	0.0244	0.0078	0.0101	0.0063	0.0055	0.011	0.0091
Organics												
Oil and Greases	mg/L	—	—	physically non detect	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Phenols	mg/L	—	0.004	0.005	0.0025	<0.0010	***0.0179***	0.0023	0.0031	0.0025	***0.0121***	0.0028
Micro-organisms												
Escherichia coli	per 100mL	—	—	100	0	0	0	0	0	0	0	0
Total coliforms	per 100mL	—	—	—	31	7	3	20	48	6	0	6
Total Metals												
Aluminum[(b)]	mg/L	0.1	0.005-0.1	0.015-0.075	0.024	0.0245	0.0142	0.0297	***0.025***	0.021	0.0202	0.0301
Antimony	mg/L	0.006	—	0.02	<0.0050	<0.0002	0.00002	<0.000030	<0.0050	<0.0002	<0.000005	<0.000030
Arsenic	mg/L	0.025	0.005	0.1	<0.0010	0.00024	0.000202	0.000217	<0.0010	0.00026	0.000182	0.000211
Barium	mg/L	1	—	—	<0.010	<0.01	0.00375	0.00359	<0.010	<0.01	0.0034	0.00369
Beryllium	mg/L	—	—	0.011-1.1	<0.0010	<0.0001	<0.00001	<0.000040	<0.0010	<0.0001	<0.00001	<0.000040
Bismuth	mg/L	—	—	—	<0.0010	<0.001	<0.000005	<0.000020	<0.0010	<0.001	<0.000005	<0.000020
Boron	mg/L	5	1.5	0.2	<0.050	0.004	0.003	0.00395	<0.050	0.004	0.003	0.0039
Cadmium[(c)]	mg/L	0.005	0.0000041-0.000042	0.0001-0.0005	<0.000090	<0.00002	0.000006	<0.0000090	<0.000090	<0.00002	0.000004	***0.0000104***
Chromium (total)	mg/L	0.05	0.009	0.009	<0.0010	0.0002	<0.0002	<0.00090	<0.0010	<0.0001	<0.0002	<0.00090
Cobalt	mg/L	—	—	0.0009	<0.00050	<0.00005	0.000012	<0.000020	<0.00050	<0.00005	0.000018	<0.000020
Copper[(c)]	mg/L	1	0.002-0.004	0.001-0.005	<0.0010	0.0005	0.0006	<0.00070	<0.0010	0.00045	0.0006	<0.00070
Iron (total)	mg/L	0.3	0.3	0.3	<0.050	0.036	0.023	0.0484	<0.050	0.02	0.045	0.052
Lead[(c)]	mg/L	0.01	0.001-0.007	0.001-0.005	<0.0010	<0.00005	0.00005	0.000072	<0.0010	<0.00005	0.00004	0.000312
Manganese	mg/L	0.05	—	—	0.0042	0.013	0.00174	0.00818	0.0044	0.011	0.00742	0.0108
Mercury	mg/L	0.001	0.000026	0.0002	<0.00010	<0.000010	<0.00001	<0.000010	<0.00010	<0.000010	<0.00001	<0.000010
Molybdenum	mg/L	—	0.073	0.04	<0.0010	<0.0002	0.00038	0.000102	<0.0010	<0.0002	0.00014	0.000113
Nickel[(c)]	mg/L	—	0.025-0.15	0.025	<0.0020	<0.0001	<0.0002	<0.0010	<0.0020	<0.0001	0.0002	<0.0010
Selenium	mg/L	0.01	0.001	0.1	<0.00040	0.0006	<0.0002	<0.0020	<0.00040	0.0006	<0.0002	<0.0020
Silicon	mg/L	—	—	—	3.3	2.4	2.8		3.3	2.1	2.8	
Silver	mg/L	—	0.0001	0.0001	<0.00010	<0.0002	<0.000002	<0.0000070	<0.00010	<0.0002	<0.000002	<0.0000070
Strontium	mg/L	—	—	—	0.0146	0.0142	0.0128	0.0138	0.0148	0.0131	0.0121	0.0135
Thallium	mg/L	—	0.0008	0.0003	<0.00030	<0.00002	<0.000001	<0.0000040	<0.00030	<0.00002	<0.000001	<0.0000040
Tin	mg/L	—	—	—	<0.0010	<0.001	0.000015	<0.000040	<0.0010	<0.001	<0.000005	0.000116
Titanium	mg/L	—	—	—	<0.0020	<0.002	0.0002	<0.00060	<0.0020	<0.002	0.0003	<0.00060
Tungsten	mg/L	—	—	0.03	<0.010	<0.01	<0.000002	<0.000040	<0.010	<0.01	<0.000002	<0.000040
Uranium	mg/L	0.02	0.015	0.005	<0.0050	<0.002	0.0000225	0.0000265	<0.0050	<0.002	0.0000215	0.0000244
Vanadium	mg/L	—	—	0.006	<0.0010	0.0005	0.000035	<0.000030	<0.0010	0.00035	0.000055	<0.000030
Zinc	mg/L	5	0.03	0.02	<0.0030	0.0024	0.002	<0.0030	<0.0030	0.0038	0.004	0.0035
Zirconium	mg/L	—	—	0.004	<0.0040	<0.004	0.00006	<0.00020	<0.0040	<0.004	0.00006	<0.00020
Dissolved Metals												
Aluminum	mg/L	—	—	—	0.016	0.018	0.017	0.0197	0.016	0.0175	0.0176	0.0229
Antimony	mg/L	—	—	—	<0.0050	<0.0002	<0.000005	<0.00020	<0.0050	<0.0002	<0.000005	<0.00020
Arsenic	mg/L	—	—	—	<0.0010	0.00022	0.000225	0.000221	<0.0010	0.00022	0.0002	0.000232
Barium	mg/L	—	—	—	<0.010	<0.01	0.00433	0.00359	<0.010	<0.01	0.00496	0.00444
Beryllium	mg/L	—	—	—	<0.0010	<0.0001	<0.00001	<0.000060	<0.0010	<0.0001	<0.00001	<0.000060
Bismuth	mg/L	—	—	—	<0.0010	<0.001	<0.000001	<0.00010	<0.0010	<0.001	<0.000001	<0.00010
Boron	mg/L	—	—	—	<0.050	0.004	0.004	0.0034	<0.050	0.004	0.0042	0.0035
Cadmium	mg/L	—	—	—	<0.00010	<0.00002	0.000005	<0.000030	<0.00010	<0.00002	0.000035	<0.000030
Chromium	mg/L	—	—	—	<0.0010	<0.0001	0.00002	<0.00020	<0.0010	<0.0001	<0.00002	<0.00020
Cobalt	mg/L	—	—	—	<0.00050	<0.00005	0.000006	0.000049	<0.00050	<0.00005	0.000128	0.000072
Copper	mg/L	—	—	—	0.002	0.0016	0.0005	0.00145	<0.0010	0.0007	0.0027	0.00202
Iron	mg/L	—	—	—	<0.050	<0.002	<0.0005	<0.0050	<0.050	<0.002	<0.0005	<0.0050
Lead	mg/L	—	—	—	<0.0010	<0.00005	0.00002	<0.00010	<0.0010	<0.00005	0.00006	<0.00010
Manganese	mg/L	—	—	—	0.001	0.004	0.00046	0.00077	0.0012	0.004	0.00108	0.00132
Mercury	mg/L	—	—	—	<0.00010	<0.000020	<0.00001	<0.000020	<0.00010	<0.000020	<0.00001	<0.000020
Molybdenum	mg/L	—	—	—	<0.0010	<0.0002	0.000142	<0.000090	<0.0010	<0.0002	0.0001	<0.000090
Nickel	mg/L	—	—	—	<0.0020	0.0007	0.00023	0.00072	<0.0020	0.0002	0.00089	0.00109
Selenium	mg/L	—	—	—	<0.0050	0.0002	<0.0002	<0.0010	<0.0050	0.0002	0.0004	<0.0010
Silicon	mg/L	—	—	—	2.8	2.7	2.8		2.85	2.7	2.8	
Silver	mg/L	—	—	—	<0.00010	<0.0002	<0.000001	<0.000010	<0.00010	<0.0002	<0.000001	<0.000010
Strontium	mg/L	—	—	—	0.0142	0.0142	0.015	0.0128	0.0141	0.0141	0.0146	0.0126
Thallium	mg/L	—	—	—	<0.00030	<0.00002	<0.000001	<0.000010	<0.00030	<0.00002	<0.000001	<0.000010
Tin	mg/L	—	—	—	<0.0010	<0.001	<0.000002	<0.00010	<0.0010	<0.001	<0.000002	<0.00010
Titanium	mg/L	—	—	—	<0.0020	<0.002	<0.0001	<0.00050	<0.0020	<0.002	<0.0001	0.00066
Tungsten	mg/L	—	—	—	<0.010	<0.01	<0.000002	0.00004	<0.010	<0.01	0.00002	0.000045
Uranium	mg/L	—	—	—	<0.0050	<0.005	0.000028	0.0000237	<0.0050	<0.005	0.0000255	0.0000224
Vanadium	mg/L	—	—	—	<0.0010	<0.00005	<0.000005	<0.00010	<0.0010	<0.00005	0.00002	<0.00010
Zinc	mg/L	—	—	—	0.0054	0.0074	0.005	0.0058	0.0043	0.0034	0.013	0.002
Zirconium	mg/L	—	—	—	<0.0040	<0.004	0.00006	0.000057	<0.0040	<0.004	0.000062	0.000074

Part 2: Premier Lake summary statistics

Parameter	Count	ODWS	CCME	PWQO	Min	Max	Average	Median	95th %ile
Field Parameters									
Temperature	8	—	–	–	0.98	14	7.4	6.6	14
pH	8	1	1	1	5.8	7.6	7.1	7.3	7.6
Conductivity	8	—	–	–	0	531	153	0	638
Dissolved Oxygen	8	—	3	5	6.64	11	9.3	9.4	11
ORP	4	—	–	–	135.1	150	145	147	150
Physical-Chemical									
pH	8	—	0	0	6.9	7.3	7.0	7.0	7.2
DOC	8	8	–	–	6.2	8	6.9	7.0	8
TOC	8	—	–	–	6.6	8	7.3	7.4	8
Acidity	4	—	–	–	2.2	4	3.3	3.6	3.8
Alkalinity	8	8	–	–	15	17	16	15	17
Conductivity	8	—	–	–	39	43	40	40	42
Total Suspended Solids	8	—	–	–	<2.0	44	12.4	2.6	43
Total Dissolved Solids	8	0	–	–	<2.0	45	30	37	45
Major Ions									
Calcium	8	—	–	–	5.0	6	5.5	5.5	6
Chloride	8	0	0	–	0.14	0.5	0.32	0.32	0.4
Fluoride	8	0	–	–	<0.030	0.032	0.03	0.03	0.031
Magnesium	8	—	–	–	0.6	0.8	0.8	0.8	0.8
Potassium	8	—	–	–	0.36	0.4	0.69	0.7	1.0
Sodium	8	0	–	–	0.59	1.0	0.7	0.7	0.9
Sulphate	8	0	–	–	2.09	2.5	2.3	2.4	2.5
Carbonate (CO_3^{2-})	0	—	–	–	–	–	–	–	–
Bicarbonate ($H(CO_3)^-$)	0	—	–	–	–	–	–	–	–
Hardness	8	8	–	–	17	19	18	18	19
Cyanide (free)	8	0	0	0	<0.0050	<0.0050	0.005	0.005	0.005
Cyanide (total)	8	—	–	–	<0.0020	<0.0020	0.002	0.002	0.002
Nutrients									
Nitrate-N	8	0	0	–	<0.030	0.06	0.04	0.035	0.06
Nitrite-N	8	0	0	–	<0.020	<0.020	0.02	0.02	0.02
Ammonia-N	8	—	–	–	<0.020	0.0	0.02	0.02	0.02
Un-ionized ammonia	8	—	0	0	0.00000299	0.0001	0.00006	0.000058	0.00013
ortho-Phosphate	0	—	–	–	–	–	–	–	–
Phosphorus	8	—	–	1	0.0055	0.024	0.01	0.008	0.02
Organics									
Oil and Greases	8	—	–	–	<2.0	<2.0	2.0	2.0	2.0
Phenols	8	—	2	2	<0.0010	0.018	0.0055	0.0027	0.0159
Micro-organisms									
Escherichia coli	8	—	–	0	0	0	0.0	0	0.0
Total coliforms	8	—	–	–	0	48	15	7	42
Total Metals									
Aluminum[(b)]	8	0	1	1	0.014	0.0	0.024	0.024	0.03
Antimony	8	0	–	0	<0.000005	0.005	0.00131	0.00012	0.005
Arsenic	8	0	0	0	0.000182	0.001	0.00041	0.00023	0.001
Barium	8	0	–	–	0.0034	0.01	0.0068	0.007	0.01
Beryllium	8	—	–	0	<0.00001	<0.000040	0.00029	0.00007	0.001
Bismuth	8	—	–	–	<0.000005	<0.000020	0.00051	0.00051	0.001
Boron	8	0	0	0	0.003	0.05	0.015	0.004	0.05
Cadmium[(c)]	8	0	1	0	0.000004	0.00009	0.000031	0.000015	0.00009
Chromium (total)	8	0	0	0	<0.0001	0.001	0.00056	0.00055	0.001
Cobalt	8	—	–	0	0.000012	0.0005	0.00015	0.000035	0.0005
Copper[(c)]	8	0	0	0	0.00045	0.001	0.00069	0.00065	0.001
Iron (total)	8	0	0	0	0.02	0.1	0.04	0.05	0.05
Lead[(c)]	8	0	0	0	0.00004	0.001	0.00032	0.00006	0.001
Manganese	8	0	–	–	0.00174	0.0	0.008	0.008	0.01
Mercury	8	0	0	0	<0.000010	<0.000010	0.00003	0.00001	0.0001
Molybdenum	8	—	0	0	0.000102	0.001	0.00039	0.0002	0.001
Nickel[(c)]	8	—	0	0	<0.0001	0.002	0.00083	0.0006	0.002
Selenium	8	0	0	0	<0.0020	0.002	0.0008	0.0005	0.002
Silicon	6	—	-	-	2.1	3.3	2.8	2.8	3.3
Silver	8	—	0	0	<0.0000070	<0.0000070	0.000077	0.000054	0.0002
Strontium	8	—	–	–	0.0121	0.015	0.014	0.014	0.015
Thallium	8	—	0	0	<0.000001	<0.0000040	0.000081	0.000012	0.0003
Tin	8	—	–	–	<0.000005	0.001	0.00052	0.00056	0.001
Titanium	8	—	–	–	0.0003	0.002	0.0012	0.0013	0.002
Tungsten	8	—	–	0	<0.000002	<0.000040	0.005	0.005	0.01
Uranium	8	0	–	0	0.0000215	0.005	0.0018	0.001013	0.005
Vanadium	8	—	–	0	<0.000030	0.001	0.00038	0.0002	0.001
Zinc	8	0	0	0	0.002	0.004	0.0031	0.003	0.0039
Zirconium	8	—	–	0	0.00006	0.004	0.0021	0.0021	0.004
Dissolved Metals									
Aluminum	8	—	–	–	0.016	0.023	0.018	0.018	0.022
Antimony	8	—	–	–	<0.000005	<0.00020	0.00135	0.0002	0.005
Arsenic	8	—	–	–	0.0002	0.001	0.00041	0.00022	0.001
Barium	8	—	–	–	0.00359	0.01	0.0072	0.007	0.01
Beryllium	8	—	–	–	<0.000060	<0.000060	0.00029	0.00008	0.001
Bismuth	8	—	–	–	<0.000001	<0.00010	0.00053	0.00055	0.001
Boron	8	—	–	–	0.0034	0.05	0.015	0.004	0.05
Cadmium	8	—	–	–	<0.00002	0.0001	0.000043	0.00003	0.0001
Chromium	8	—	–	–	<0.00002	0.001	0.00033	0.00015	0.001
Cobalt	8	—	–	–	0.000006	0.0005	0.00017	0.000061	0.0005
Copper	8	—	–	–	0.0005	0.0027	0.0015	0.0015	0.0025
Iron	8	—	–	–	<0.0005	<0.0050	0.01	0.004	0.05
Lead	8	—	–	–	0.00002	0.001	0.0003	0.00008	0.001
Manganese	8	—	–	–	0.00046	0.0	0.002	0.0011	0.0
Mercury	8	—	–	–	<0.00001	<0.000020	0.000038	0.00002	0.0001
Molybdenum	8	—	–	–	<0.000090	0.001	0.00035	0.00017	0.001
Nickel	8	—	–	–	0.0002	0.002	0.00098	0.0008	0.002
Selenium	8	—	–	–	<0.0002	0.005	0.0016	0.0007	0.005
Silicon	6	—	–	–	2.7	2.9	2.8	2.8	2.8
Silver	8	—	–	–	<0.000001	<0.000010	0.000078	0.000055	0.0002
Strontium	8	—	–	–	0.0126	0.015	0.014	0.014	0.015
Thallium	8	—	–	–	<0.000001	<0.000010	0.000083	0.000015	0.0003
Tin	8	—	–	–	<0.000002	<0.00010	0.00053	0.00055	0.001
Titanium	8	—	–	–	<0.0001	0.002	0.0012	0.00133	0.002
Tungsten	8	—	–	–	<0.000002	0.01	0.005	0.005	0.01
Uranium	8	—	–	–	0.0000224	0.005	0.0025	0.002514	0.005
Vanadium	8	—	–	–	<0.000005	0.001	0.00029	0.00008	0.001
Zinc	8	—	–	–	0.002	0.013	0.0058	0.0052	0.011
Zirconium	8	—	–	–	0.000057	0.004	0.002	0.00204	0.004

Part 3: Marmion Reservoir

Parameter	Count	ODWS	CCME	PWQO	Min	Max	Average	Median	95th %ile
Field Parameters									
Temperature	77	–	–	–	2.8	21	11	10	21
pH	77	16	16	16	5.2	7.7	6.5	6.9	7.4
Conductivity	44	–	–	–	28	56	46	46	55
Dissolved Oxygen	64	–	4	2	0.47	14	9.2	9.3	13
ORP	50	–	–	–	2.6	335	131	118	295
Physical-Chemical									
pH	77	4	4	4	6.0	8.2	7.0	7.1	7.5
DOC	77	77	–	–	5.2	13	9.1	8.8	12
TOC	77	–	–	–	5.5	16	9.5	9.3	12
Acidity	43	–	–	–	2.0	6.6	2.7	2.6	4.3
Alkalinity	77	77	–	–	14	26	18	18	24
Conductivity	77	–	–	–	34	65	49	49	58
Total Suspended Solids	77	–	–	–	<2.0	78	4.3	2.0	4.2
Total Dissolved Solids	77	0	–	–	28	120	52	52	78
Major Ions									
Calcium	77	–	–	–	4.4	10	6.2	6.0	8.5
Chloride	77	0	-	–	0.18	1.9	1.2	1.3	1.7
Fluoride	77	0	–	–	<0.030	0.058	0.031	0.03	0.039
Magnesium	77	–	–	–	0.82	1.7	1.3	1.4	1.7
Potassium	77	–	–	–	<1.0	0.54	0.69	0.51	1.0
Sodium	77	0	–	–	0.66	2.6	1.4	1.4	1.7
Sulphate	77	0	–	–	0.98	2.9	1.6	1.6	2.1
Carbonate (CO_3^{2-})	26	–	–	–	<5.0	<5.0	5.0	5.0	5.0
Bicarbonate ($H(CO_3)^-$)	26	–	–	–	16	31	20.1	18.7	29.2
Hardness	74	74	–	–	16	29	21	20	26
Cyanide (free)	51	0	0	0	<0.0050	<0.005	0.005	0.005	0.005
Cyanide (total)	51	–	–	–	<0.0020	<0.002	0.002	0.002	0.002
Nutrients									
Nitrate-N	77	0	0	–	<0.030	0.18	0.066	0.052	0.14
Nitrite-N	77	0	0	–	<0.020	<0.020	0.02	0.02	0.02
Ammonia-N	77	–	–	–	<0.020	0.066	0.022	0.02	0.034
Un-ionized ammonia	77	–	0	0	0.00000052	0.00036	0.000064	0.000032	0.00017
ortho-Phosphate	26	–	–	–	<0.0050	<0.005	0.005	0.005	0.005
Phosphorus	77	–	–	7	0.0068	0.072	0.013	0.011	0.022
Organics									
Oil and Greases	63	–	–	–	<4.0	<8.0	2.5	2.0	4.0
Phenols	77	–	12	8	<0.0010	0.012	0.0024	0.0013	0.0064
Micro-organisms									
Escherichia coli	51	–	–	0	0	26	0.9	0	2.5
Total coliforms	50	–	–	–	2.0	2420	178	34	478
Total Metals									
Aluminum[(b)]	77	5	8	9	0.026	0.8	0.069	0.045	0.12
Antimony	77	0	–	0	<0.00010	0.00011	0.00085	0.0001	0.005
Arsenic	77	0	0	0	<0.0010	0.001	0.0005	0.00034	0.001
Barium	77	0	–	–	<0.01	0.022	0.0074	0.0059	0.01
Beryllium	77	–	–	0	<0.000060	0.00006	0.00028	0.00006	0.001
Bismuth	77	–	–	–	<0.00020	<0.001	0.00051	0.0002	0.001
Boron	77	0	0	0	<0.050	0.01	0.015	0.004	0.05
Cadmium[(c)]	77	0	0	0	<0.000010	0.00005	0.000031	0.00001	0.00009
Chromium (total)	77	0	2	2	<0.00050	0.0014	0.00065	0.0005	0.001
Cobalt	77	–	–	1	<0.000050	0.0011	0.00017	0.00005	0.0005
Copper[(c)]	77	0	1	7	<0.00070	0.0021	0.00089	0.0008	0.0013
Iron (total)	76	45	45	45	0.11	4.0	0.44	0.35	0.86
Lead[(c)]	77	0	0	0	<0.00005	0.00095	0.00032	0.0001	0.001
Manganese	77	9	–	–	0.0049	1.5	0.047	0.017	0.11
Mercury	77	0	0	0	<0.000010	<0.00010	0.00003	0.00001	0.0001
Molybdenum	77	–	0	0	<0.00009	0.00034	0.00037	0.0002	0.001
Nickel[(c)]	77	–	0	0	<0.0010	0.0012	0.0011	0.001	0.002
Selenium	77	0	0	0	<0.00050	0.0006	0.0012	0.0005	0.005
Silicon	34	–	0	0	1.8	4.2	2.8	2.9	3.8
Silver	77	–	0	0	<0.000007	0.000051	0.00	0.00005	0.0002
Strontium	77	–	–	–	0.0086	0.016	0.013	0.013	0.015
Thallium	77	–	0	0	<0.000004	<0.00030	0.000085	0.00003	0.0003
Tin	77	–	–	–	<0.00004	0.00016	0.00049	0.0001	0.001
Titanium	77	–	–	–	<0.0002	0.028	0.0	0.0013	0.0025
Tungsten	76	–	–	0	<0.00004	0.0017	0.0046	0.0001	0.01
Uranium	77	0	–	0	<0.00004	0.000099	0.0016	0.000031	0.005
Vanadium	77	–	–	0	<0.00020	0.0056	0.00067	0.00055	0.0011
Zinc	77	0	0	0	<0.0020	0.013	0.0029	0.003	0.0057
Zirconium	76	–	–	0	<0.00010	0.0002	0.0017	0.0002	0.004
Dissolved Metals									
Aluminum	77	–	–	–	0.013	0.054	0.029	0.029	0.044
Antimony	76	–	–	–	<0.00010	<0.00010	0.0009	0.0002	0.005
Arsenic	77	–	–	–	<0.0010	0.00046	0.00048	0.00034	0.001
Barium	77	–	–	–	<0.01	0.0057	0.0071	0.0053	0.01
Beryllium	76	–	–	–	<0.000060	<0.000060	0.00029	0.00006	0.001
Bismuth	76	–	–	–	<0.00020	0.00012	0.00054	0.0002	0.001
Boron	77	–	–	–	<0.050	0.0042	0.014	0.0039	0.05
Cadmium	76	–	–	–	<0.000010	0.00004	0.000037	0.00002	0.0001
Chromium	76	–	–	–	<0.00050	0.00052	0.00049	0.0005	0.001
Cobalt	77	–	–	–	<0.000050	0.000097	0.00016	0.00005	0.0005
Copper	77	–	–	–	<0.0010	0.0031	0.0011	0.001	0.002
Iron	77	–	–	–	<0.050	0.46	0.2	0.17	0.41
Lead	76	–	–	–	<0.00010	0.00012	0.00031	0.0001	0.001
Manganese	77	–	–	–	0.001	0.13	0.017	0.0062	0.077
Mercury	76	–	–	–	<0.000010	0.000012	0.000036	0.00002	0.0001
Molybdenum	76	–	–	–	<0.00020	<0.00020	0.00037	0.0002	0.001
Nickel	77	–	–	–	<0.0010	0.00095	0.00099	0.001	0.002
Selenium	76	–	–	–	<0.00050	0.0004	0.0013	0.0005	0.005
Silicon	34	–	–	–		3.8	2.7	2.8	3.4
Silver	76	–	–	–	<0.000050	0.000022	0.000085	0.00005	0.0002
Strontium	77	–	–	–	0.0094	0.015	0.012	0.012	0.015
Thallium	76	–	–	–	<0.000030	0.00002	0.000088	0.00003	0.0003
Tin	76	–	–	–	<0.00010	0.015	0.00069	0.0001	0.001
Titanium	76	–	–	–	<0.00050	0.00089	0.0012	0.00064	0.002
Tungsten	77	–	–	–	<0.00010	0.00005	0.0045	0.0001	0.01
Uranium	77	–	–	–	<0.005	0.000029	0.0022	0.000027	0.005
Vanadium	77	–	–	–	<0.00020	0.00075	0.00051	0.00041	0.001
Zinc	77	–	–	–	<0.0030	0.013	0.0049	0.0046	0.01
Zirconium	77	–	–	–	<0.00010	0.00026	0.0015	0.00011	0.004

Notes:

(a) See Appendix 1.I for detailed notes for water quality guidelines.
(b) CCME and PWQO receiving water quality guidelines for aluminum have been calculated based on pH. See Appendix 1.I for details.
(c) CCME and/or PWQO receiving water quality guidelines for these parameters have been calculated based on hardness. See Appendix 1.I for details.
1.0 (highlighted yellow) Values highlighted in yellow greater than the Ontario Drinking Water Standards (ODWS), Ontario Regulation (O.Reg.) 169/03: Ontario Drinking Water Standards (ODWS)
1.0 Values greater than the Canadian Council of Ministers of the Environment (CCME), Canadian Water Quality Guidelines for the Protection of Aquatic Life, Update 7.1 (Dece
1.0 (underlined) Values greater than the Provincial Water Quality Objectives (PWQO), Ministry of Environment and Energy
(light shading) Where cells are blank, data has been removed, or was not recorded due to field instrument error.
(dark shading) Where cells are blank, analysis was not performed during this time period. Some parameters were added to the sampling program later in the campaign, while others were removed from the sampling campaign due to non detection.
— = A dash indicates that guideline criteria are not available for this parameter.
"D" = A "D" next to the station name indicates that this is a duplicate sample.

APPENDIX 2.IV

Sediment Quality Results

TABLE 1
Sediment Quality Results

Parameter	Unit	CCME[a]		MOEE[b]		HRWQ-2	HRWQ-2	HRWQ-2	HRWQ2	HRWQ-2	HRWQ-3	HRWQ-3	HRWQ-3	HRWQ3	HRWQ-3	HRWQ-4	HRWQ-4	HRWQ-4	HRWQ-4 DUP	HRWQ4	HRWQ-4	HRWQ-5	HRWQ-5	HRWQ-5	HRWQ5	HRWQ-5	HRWQ-5 (D)	HRWQ-6	HRWQ-6	HRWQ-6	HRWQ6	HRWQ-6	HRWQ-7	HRWQ-7	HRWQ-7	HRWQ7	HRWQ-7	HRWQ-8
		Freshwater PEL[c]	Freshwater ISQG[d]	LEL[e]	SEL[f]	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Aug-12	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10
Metals																																				
Aluminum (Al)	mg/kg	—	—	—	—	7320	6500	3720	3240	5470	6980	7580	7370	13900	9270	5880	7340	4720	4790	4360	6730	9490	13700	10600	9960	11100	10800	17300	16300	18300	18200	20100	3050	1720	2150	1560	3570	6180
Antimony (Sb)	mg/kg	—	—	—	—	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic (As)	mg/kg	17	5.9	6	33	**11**	3.7	2.5	4.7	3.2	<1.0	1.6	1.5	<1.0	2.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.7	3.1	3.9	5.5	1.7	1.5	5	2.5	3.3	2.7	2.4	<1.0	<1.0	<1.0	<1.0	<1.0	1.4
Barium (Ba)	mg/kg	—	—	—	—	131	66.6	40.8	63.1	95.4	58.3	71.7	80.4	85.1	62.3	27.1	38.4	27.1	28.4	24.5	38	52.9	74	72.2	70.5	50.3	48.4	88.5	82	103	101	106	13.3	6.9	10.4	6.3	18	49.5
Beryllium (Be)	mg/kg	—	—	—	—	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bismuth (Bi)	mg/kg	—	—	—	—	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Boron (B)	mg/kg	—	—	—	—	7.6	9.6	<5.0	<5.0	<5.0	<5.0	8.3	<5.0	<5.0	<5.0	<5.0	7.8	<5.0	<5.0	<5.0	<5.0	6.6	7.9	<5.0	<5.0	<5.0	<5.0	5.6	11	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	7.7
Cadmium (Cd)	mg/kg	3.5	0.6	0.6	10	**0.75**	**0.8**	<0.50	**0.66**	**0.71**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.6	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Calcium (Ca)	mg/kg	—	—	—	—	13500	9210	2630	5740	9850	7710	11200	7680	13300	6590	2920	3620	2630	2790	2610	3690	5880	8760	6320	8230	5940	5560	17000	15600	11200	9610	10100	1650	1160	1310	1130	2490	7800
Chromium (Cr)	mg/kg	90	37.3	26	110	11.1	9.4	9.6	8.7	11.5	15.9	19.2	21.5	**27.6**	**26.3**	11.7	15.4	11.8	12	13.3	15.8	17.4	25.5	22.4	17.6	22.2	21.4	**29.9**	**27.1**	**34.3**	**33.8**	**38.5**	5.2	3.1	5.5	3	7.2	12.8
Cobalt (Co)	mg/kg	—	—	—	50	5.3	2.6	3	2.9	3.6	5.8	8.7	15.5	5.7	8.6	4.6	6	3.4	3.3	4.1	4.4	6.1	8.8	7.2	7.7	6.5	6.4	8.5	7.9	8.4	8.2	8.9	2.3	2	2.1	1.7	3	5.8
Copper (Cu)	mg/kg	197	35.7	16	110	15.6	10.9	5.3	8.4	**19.8**	**19.3**	**22**	**26.6**	14.6	**22.5**	6.4	9.5	5.5	5.6	12.5	7.5	12	**20.3**	**17.9**	**20.3**	10.4	10.5	**22.9**	**22.4**	**22.8**	**20.7**	**22.8**	2	<1.0	1.6	1.3	3.9	13.6
Iron (Fe)	mg/kg	—	—	20000	40000	19800	8790	7510	7970	8160	9370	15100	10800	12000	17800	9060	12700	8350	8320	9820	10900	12200	19300	15400	14900	12700	12300	18800	16300	17200	16400	18100	4010	2190	2850	1630	5850	10100
Lead (Pb)	mg/kg	91.3	35	31	250	28.3	29.2	5.6	21.7	21.6	10.8	12.1	7.1	4.9	11.7	1.8	2.3	4.7	2.2	2.9	2.7	12.1	18.5	18	18.8	6.9	6.9	9.7	8.9	8.5	7.1	6.1	1.5	<1.0	1.8	<1.0	2.6	5.9
Lithium (Li)	mg/kg	—	—	—	—	<5.0	<5.0	1.3	2	2.5	5.3	<5.0	6.3	9.7	7.9	5.7	5.4	3.7	3.7	4.9	4.8	<5.0	7.1	7.9	6.3	7.2	6.4	9.2	9.3	15.5	15.3	15	<5.0	<5.0	2	1.8	2	<5.0
Magnesium (Mg)	mg/kg	—	—	—	—	1610	1140	518	823	1490	1700	2050	2290	3650	3140	2150	3090	1880	1910	2170	2730	2230	3880	3330	2700	3560	3430	4240	3790	4670	4400	5340	819	541	763	461	1050	1430
Manganese (Mn)	mg/kg	—	—	460	1100	**2050**	**677**	37.2	**558**	436	288	**568**	305	208	**466**	175	222	188	189	180	174	270	376	444	**627**	197	188	**937**	372	338	348	271	57.3	30	60	37.1	136	300
Mercury (Hg)	mg/kg	0.486	0.17	0.2	2	0.114	0.085	<0.050	0.069	0.067	**1.02**	**0.641**	**1.52**	0.102	**0.69**	<0.050	<0.050	<0.050	<0.050	<0.010	0.012	0.07	0.112	0.092	0.087	0.035	0.065	0.146	0.102	0.086	0.187	0.082	<0.050	<0.050	<0.050	<0.010	0.015	0.057
Molybdenum (Mo)	mg/kg	—	—	—	—	1	<1.0	<1.0	<1.0	<1.0	2.7	3.1	4	1.6	2.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.2	<1.0	<1.0	1.4	1.4	<1.0	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	1.2
Nickel (Ni)	mg/kg	36	18	16	75	8.3	6.3	**19.4**	8.7	10.1	14.5	**17.4**	**20.9**	**16.8**	**18**	6.8	9.3	6.8	7	8.4	9	11.1	**16.7**	15	13.4	13	12.7	**17.3**	**16.1**	**20.3**	**19.4**	**22.9**	3.1	2	3.1	2	4.2	12.7
Phosphorus (P)	mg/kg	—	—	—	—	1180	858	536	439	797	606	625	462	705	568	246	274	315	267	275	340	286	516	474	501	357	380	1020	773	815	733	754	162	109	151	102	227	398
Potassium (K)	mg/kg	—	—	—	—	683	583	540	450	570	839	786	570	480	810	347	472	310	320	390	430	515	681	640	500	470	460	784	651	700	730	810	149	79	100	<100	180	492
Selenium (Se)	mg/kg	—	—	—	—	2.4	1.8	<1.0	<1.0	1.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.2	<1.0	<1.0	<1.0	<1.0	1.6	1.3	1.2	1	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Silver (Ag)	mg/kg	—	—	—	0.5	0.25	<0.20	<0.20	<0.20	0.73	0.2	0.22	0.31	<0.20	0.32	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.25	<0.20	<0.20
Sodium (Na)	mg/kg	—	—	—	—	158	397	<100	<100	130	161	298	170	280	180	267	472	200	200	180	370	228	740	280	280	540	510	283	569	240	260	310	124	86	<100	<100	120	523
Strontium (Sr)	mg/kg	—	—	—	—	41.1	27.7	6.8	20.1	36.7	24.9	29.9	30.3	51.2	26.3	12	11	10.6	10	10	14.6	17	24.2	21.7	27.2	22	20.9	47.9	44.1	43.9	38.3	40.3	7.3	5.9	6.7	4.9	8.2	16.7
Thallium (Tl)	mg/kg	—	—	—	—	2.29	0.68	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.94	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg	—	—	—	—	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg	—	—	—	—	108	88.8	9.5	93.5	169	193	206	230	421	517	576	565	498	457	555	656	531	650	468	363	585	554	496	499	501	506	620	239	273	327	219	330	221
Uranium (U)	mg/kg	—	—	—	—	<1.0	<1.0	<1.0	1	2.1	<1.0	<1.0	1.6	3	1.6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.9	1.4	1.3	<1.0	5.6	11.6	10.1	9.8	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vanadium (V)	mg/kg	—	—	—	—	12.1	6.8	3.8	6.3	11.3	10.7	13.8	14.2	22.7	28.9	19.4	23.7	19.9	19	25.9	23.8	29	40.2	37.2	33.8	29.9	28.9	27.6	28.6	33.9	30.4	33.2	6.9	4.4	6.6	4.6	11.5	12.8
Zinc (Zn)	mg/kg	315	123	120	820	53.1	32.8	13.1	56.7	74.1	36.4	40.2	43.5	60.7	42.9	14.2	21.9	13.7	13.6	15.5	25.4	35.1	56.3	51	46	29	28.3	50.4	48.7	49.4	49.5	52.2	8.8	4.4	6.7	<5.0	14.4	45.9
Zirconium	mg/kg	—	—	—	—	4.2	2.5				2.7	5.6				3.1	4.4					3.8	4.5					3.8	3.5				1.4	1.3				4.5
Polycyclic Aromatic Hydrocarbons (PAHs)[g]																																					
1-Methylnaphthalene	mg/kg	0.0889	0.00671	—	—	<0.50	<0.20	<0.050			<0.10	<0.10	<0.10			<0.050	<0.050	<0.050	<0.050			<0.25	<0.20	<0.25				<0.25	<0.20	<0.15			<0.050	<0.050	<0.050			<0.50
2-Methylnaphthalene	mg/kg	0.128	0.00587	—	—	<0.50	<0.20	<0.050			<0.10	<0.10	<0.10			<0.050	<0.050	<0.050	<0.050			<0.25	<0.20	<0.25				<0.25	<0.20	<0.15			<0.050	<0.050	<0.050			<0.50
Acenaphthene	mg/kg	—	—	—	—	<0.50	<0.20	<0.050			<0.10	<0.10	<0.10			<0.050	<0.050	<0.050	<0.050			<0.25	<0.20	<0.25				<0.25	<0.20	<0.15			<0.050	<0.050	<0.050			<0.50
Acenaphthylene	mg/kg	0.245	0.0469	—	—	<0.50	<0.20	<0.050			<0.10	<0.10	<0.10			<0.050	<0.050	<0.050	<0.050			<0.25	<0.20	<0.25				<0.25	<0.20	<0.15			<0.050	<0.050	<0.050			<0.50
Acridine	mg/kg	0.385	0.0317	0.00032	1.48	<8.0	<3.2	<0.80			<1.6	<1.6	<1.6			<0.80	<0.80	<0.80	<0.80			<4.0	<3.2	<4.0				<4.0	<3.2	<2.4			<0.80	<0.80	<0.80			<8.0
Anthracene	mg/kg	0.782	0.0319	0.00024	1.34	<0.50	<0.20	<0.050			<0.10	<0.10	<0.10			<0.050	<0.050	<0.050	<0.050			<0.25	<0.20	<0.25				<0.25	<0.20	<0.15			<0.050	<0.050	<0.050			<0.50
Benz(a)anthracene	mg/kg			0.00017	0.32			<0.050					<0.10					<0.050	<0.050					<0.25					<0.15					<0.050				
Benzo(b&j)fluoranthene	mg/kg	—	—	0.00037	1.44	<0.50	<0.20	<0.050			<0.10	<0.10	<0.10			<0.050	<0.050	<0.050	<0.050			<0.25	<0.20	<0.25				<0.25	<0.20	<0.15			<0.050	<0.050	<0.050			<0.50
Benzo(g,h,i)perylene	mg/kg	—	—	—	—	<0.50	<0.20	<0.050			<0.10	<0.10	<0.10			<0.050	<0.050	<0.050	<0.050			<0.25	<0.20	<0.25				<0.25	<0.20	<0.15			<0.050	<0.050	<0.050			<0.50
Benzo(k)fluoranthene	mg/kg	0.862	0.0571	0.00034	0.46	<0.20	<0.080	<0.020			<0.040	<0.040	<0.040			<0.020	<0.020	<0.020	<0.020			<0.10	<0.080	<0.10				<0.10	<0.080	<0.060			<0.020	<0.020	<0.020			<0.20
Benzo(a)pyrene	mg/kg	0.135	0.00622	0.00006	0.13	<0.20	<0.080	<0.020			<0.040	<0.040	<0.040			<0.020	<0.020	<0.020	<0.020			<0.10	<0.080	<0.10				<0.10	<0.080	<0.060			<0.020	<0.020	<0.020			<0.20
Chrysene	mg/kg	2.355	0.111	0.00075	1.02	<0.50	<0.20	<0.050			<0.10	<0.10	<0.10			<0.050	<0.050	<0.050	<0.050			<0.25	<0.20	<0.25				<0.25	<0.20	<0.15			<0.050	<0.050	<0.050			<0.50
Dibenzo(a,h)anthracene	mg/kg	0.144	0.0212	0.00019	0.16	<0.50	<0.20	<0.050			<0.10	<0.10	<0.10			<0.050	<0.050	<0.050	<0.050			<0.25	<0.20	<0.25				<0.25	<0.20	<0.15			<0.050	<0.050	<0.050			<0.50
Fluoranthene	mg/kg	—	—	0.0002	0.32	<0.50	<0.20	<0.050			<0.10	<0.10	<0.10			<0.050	<0.050	<0.050	<0.050			<0.25	<0.20	<0.25				<0.25	<0.20	<0.15			<0.050	<0.050	<0.050			<0.50
Fluorene	mg/kg	—	—	—	—	<0.50	<0.20	<0.050			<0.10	<0.10	<0.10			<0.050	<0.050	<0.050	<0.050			<0.25	<0.20	<0.25				<0.25	<0.20	<0.15			<0.050	<0.050	<0.050			<0.50
Indeno(1,2,3-cd)pyrene	mg/kg	0.201	0.0202	—	—	<0.50	<0.20	<0.050			<0.10	<0.10	<0.10			<0.050	<0.050	<0.050	<0.050			<0.25	<0.20	<0.25				<0.25	<0.20	<0.15			<0.050	<0.050	<0.050			<0.50
Naphthalene	mg/kg	0.391	0.0346	—	—	<0.10	<0.040	<0.010			<0.020	<0.020	<0.020			<0.010	<0.010	<0.010	<0.010			<0.050	<0.040	<0.050				<0.050	<0.040	<0.030			<0.010	<0.010	<0.010			<0.10
Phenanthrene	mg/kg	0.515	0.0419	0.00056	0.95	<0.30	<0.12	<0.030			<0.060	<0.060	<0.060			<0.030	<0.030	<0.030	<0.030			<0.15	<0.12	<0.15				<0.15	<0.12	<0.090			<0.030	<0.030	<0.030			<0.30
Pyrene	mg/kg	0.875	0.053	0.00049	0.85	<0.50	<0.20	<0.050			<0.10	<0.10	<0.10			<0.050	<0.050	<0.050	<0.050			<0.25	<0.20	<0.25				<0.25	<0.20	<0.15			<0.050	<0.050	<0.050			<0.50
Quinoline	mg/kg	—	—	—	—	<0.50	<0.20	<0.050			<0.10	<0.10	<0.10			<0.050	<0.050	<0.050	<0.050			<0.25	<0.20	<0.25				<0.25	<0.20	<0.15			<0.050	<0.050	<0.050			<0.50
Polychlorinated Biphenyls (PCBs)[g]																																					
Aroclor 1254	mg/kg	3.4	0.6	—	—	<0.50	<0.040	<0.010			<0.10	<0.020	<0.020			<0.010	<0.010	<0.010	<0.010			<0.25	<0.040	<0.050				<0.25	<0.040	<0.030			<0.050	<0.010	<0.010			<0.50
Total PCBs	mg/kg	2.77	0.341	—	—	<1.0	<0.080	<0.020			<0.20	<0.040	<0.040			<0.020	<0.020	<0.020	<0.020			<0.50	<0.080	<0.10				<0.50	<0.080	<0.060			<0.10	<0.020	<0.020			<1.0
2-Fluorobiphenyl	%	—	—	—	—	105	97	106			99	95	105			113	111	105	105			92	111	107				91	99	96			93	102	104			108
p-Terphenyl d14	%	—	—	—	—	108	100	118			105	97	108			107	103	114	115			95	104	110				91	99	104			97	100	112			109
Aroclor 1242	mg/kg	—	—	—	—	<0.50	<0.040	<0.010			<0.10	<0.020	<0.020			<0.010	<0.010	<0.010	<0.010			<0.25	<0.040	<0.050				<0.25	<0.040	<0.030			<0.050	<0.010	<0.010			<0.50
Aroclor 1248	mg/kg	—	—	—	—	<0.50	<0.040	<0.010			<0.10	<0.020	<0.020			<0.010	<0.010	<0.010	<0.010			<0.25	<0.040	<0.050				<0.25	<0.040	<0.030			<0.050	<0.010	<0.010			<0.50
Aroclor 1260	mg/kg	—	—	—	—	<0.50	<0.040	<0.010			<0.10	<0.020	<0.020			<0.010	<0.010	<0.010	<0.010			<0.25	<0.040	<0.050				<0.25	<0.040	<0.030			<0.050	<0.010	<0.010			<0.50
d14-Terphenyl	%	—	—	—	—	77		115			83	100	122			101	103	110	110			80		115				80		116			76		112			88
Silicon (Si)	mg/kg	—	—	—	—	2370	665				1380	742				1090	1110					3490	799					1860	590				1420	18				8630

Notes:

(a) Canadian Council of Environment Ministers (CCME)
(b) Ontario Ministry of Environment and Energy (MOEE)
(c) CCME Sediment quality guidelines for the protection of aquatic life: Probable Effect Level (PEL), Freshwater, 2002
(d) CCME Sediment quality guidelines for the protection of aquatic life: Interim Sediment Quality Guideline (ISQG), Freshwater, 2003
(e) MOEE Provincial Sediment Quality Guidelines (PSQG): Lowest Effect Level (LEL), 1993
(f) MOEE Provincial Sediment Quality Guidelines (PSQG): Severe Effect Level (SEL), 1994
(g) Blank cells indicate parameters that were not analyzed either due to non detection in previous campaigns, or were missing from the laboratory analytical suite.
— = A dash indicates that guideline criteria are not available for this parameter.

1.0	Value greater the Freshwater PEL (CCME) guideline
1.0	Value greater the Freshwater ISQG (CCME) guideline
1.0	Value greater than the LEL (MOEE) guideline
1.0	Value greater than the SEL (MOEE) guideline
	Where cells are blank, analysis was not performed during this time period.

TABLE 1
Sediment Quality Results

Parameter	Unit	CCME[a]		MOEE[b]		HRWQ-8	HRWQ-8	HRWQ8	HRWQ-8	HRWQ-9	HRWQ-9	HRWQ-9	HRWQ9	HRWQ-9	HRWQ-11	HRWQ-11	HRWQ-11 DUP
		Freshwater PEL[c]	Freshwater ISQG[d]	LEL[e]	SEL[f]	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Sep-10	Sep-10
Metals																	
Aluminum (Al)	mg/kg	—	—	—	—	3530	2870	4760	6940	10400	9030	8430	6930	4710	7660	7000	6970
Antimony (Sb)	mg/kg	—	—	—	—	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic (As)	mg/kg	17	5.9	6	33	<1.0	<1.0	1.6	1.7	2.2	2.1	1.1	1.4	<1.0	<1.0	1.1	<1.0
Barium (Ba)	mg/kg	—	—	—	—	27	32.6	43.5	51.6	55.7	47.6	44.4	34.4	21.8	50	54.1	45.2
Beryllium (Be)	mg/kg	—	—	—	—	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bismuth (Bi)	mg/kg	—	—	—	—	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Boron (B)	mg/kg	—	—	—	—	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cadmium (Cd)	mg/kg	3.5	0.6	0.6	10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Calcium (Ca)	mg/kg	—	—	—	—	3890	5030	5660	6740	5220	4530	3950	3450	3220	6460	6960	7220
Chromium (Cr)	mg/kg	90	37.3	26	110	6.7	6.6	10.2	14.8	16.1	15.5	17	12.2	8.8	13.5	12.4	12.6
Cobalt (Co)	mg/kg	—	—	—	50	3.1	2.6	4.7	6.4	10.2	9.2	6	6.4	4.9	4.7	4.9	4.5
Copper (Cu)	mg/kg	197	35.7	16	110	8.7	7.6	11.2	**18.3**	**16.4**	13.5	10.2	9	4.7	10.7	10.3	10.3
Iron (Fe)	mg/kg	—	—	20000	40000	4810	6120	8240	9020	11900	11600	9050	7850	6400	9310	9720	8540
Lead (Pb)	mg/kg	91.3	35	31	250	3	3.4	6.1	6.2	11.3	9.4	4.8	5.7	3.3	4.1	4.6	4
Lithium (Li)	mg/kg	—	—	—	—	<5.0	<1.0	2.4	2.7	<5.0	5	5.5	5.7	3.6	<5.0	<5.0	<5.0
Magnesium (Mg)	mg/kg	—	—	—	—	862	815	1190	1770	2320	2360	2230	1970	1880	1360	1260	1330
Manganese (Mn)	mg/kg	—	—	460	1100	101	156	299	264	293	0.061	189	239	125	279	324	341
Mercury (Hg)	mg/kg	0.486	0.17	0.2	2	<0.050	<0.050	0.055	0.045	0.077	256	<0.050	0.035	0.015	0.057	0.066	0.063
Molybdenum (Mo)	mg/kg	—	—	—	—	<1.0	<1.0	1	1.3	3	1.2	<1.0	<1.0	<1.0	2	2.2	1.8
Nickel (Ni)	mg/kg	36	18	16	75	8	6	11.5	**16.1**	11.3	10.2	9.5	8.6	6.5	6.7	6.3	6.3
Phosphorus (P)	mg/kg	—	—	—	—	209	290	372	350	682	455	375	432	385	535	554	567
Potassium (K)	mg/kg	—	—	—	—	310	200	390	490	478	432	370	350	260	296	283	319
Selenium (Se)	mg/kg	—	—	—	—	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Silver (Ag)	mg/kg	—	—	—	0.5	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Sodium (Na)	mg/kg	—	—	—	—	126	130	160	180	288	302	280	220	140	156	172	175
Strontium (Sr)	mg/kg	—	—	—	—	9.2	17	15.8	15.9	17.6	16.2	15.8	13.6	10.7	18.1	20.3	19.9
Thallium (Tl)	mg/kg	—	—	—	—	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg	—	—	—	—	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg	—	—	—	—	135	130	177	238	423	491	465	400	470	329	353	332
Uranium (U)	mg/kg	—	—	—	—	<1.0	<1.0	<1.0	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vanadium (V)	mg/kg	—	—	—	—	6.8	6.8	10.5	16	24.9	26.7	20.5	17.2	13.6	17.4	21.5	16.1
Zinc (Zn)	mg/kg	315	123	120	820	24	29.6	57.7	52.5	50.5	36.4	36.7	46.2	22.8	52.6	70.1	39.2
Zirconium	mg/kg	—	—	—	—	2.3				2.3	<1.0				2.1	3.7	2.9
Polycyclic Aromatic Hydrocarbons (PAHs)[g]																	
1-Methylnaphthalene	mg/kg	0.0889	0.00671	—	—	<0.50	<0.25			<0.25	<0.20	<0.15			<0.25	<0.25	<0.20
2-Methylnaphthalene	mg/kg	0.128	0.00587	—	—	<0.50	<0.25			<0.25	<0.20	<0.15			<0.25	<0.25	<0.20
Acenaphthene	mg/kg	—	—	—	—	<0.50	<0.25			<0.25	<0.20	<0.15			<0.25	<0.25	<0.20
Acenaphthylene	mg/kg	0.245	0.0469	—	—	<0.50	<0.25			<0.25	<0.20	<0.15			<0.25	<0.25	<0.20
Acridine	mg/kg	0.385	0.0317	0.00032	1.48	<8.0	<4.0			<4.0	<3.2	<2.4			<4.0	<4.0	<4.0
Anthracene	mg/kg	0.782	0.0319	0.00024	1.34	<0.50	<0.25			<0.25	<0.20	<0.15			<0.25	<0.25	<0.20
Benz[a]anthracene	mg/kg			0.00017	0.32		<0.25					<0.15					
Benzo(b&j)fluoranthene	mg/kg	—	—	0.00037	1.44	<0.50	<0.25			<0.25	<0.20	<0.15			<0.25	<0.25	<0.20
Benzo(g,h,i)perylene	mg/kg	—	—	—	—	<0.50	<0.25			<0.25	<0.20	<0.15			<0.25	<0.25	<0.20
Benzo(k)fluoranthene	mg/kg	0.862	0.0571	0.00034	0.46	<0.20	<0.10			<0.10	<0.080	<0.060			<0.10	<0.10	<0.080
Benzo(a)pyrene	mg/kg	0.135	0.00622	0.00006	0.13	<0.20	<0.10			<0.10	<0.080	<0.060			<0.10	<0.10	<0.080
Chrysene	mg/kg	2.355	0.111	0.00075	1.02	<0.50	<0.25			<0.25	<0.20	<0.15			<0.25	<0.25	<0.20
Dibenzo(a,h)anthracene	mg/kg	0.144	0.0212	0.00019	0.16	<0.50	<0.25			<0.25	<0.20	<0.15			<0.25	<0.25	<0.20
Fluoranthene	mg/kg	—	—	0.0002	0.32	<0.50	<0.25			<0.25	<0.20	<0.15			<0.25	<0.25	<0.20
Fluorene	mg/kg	—	—	—	—	<0.50	<0.25			<0.25	<0.20	<0.15			<0.25	<0.25	<0.20
Indeno(1,2,3-cd)pyrene	mg/kg	0.201	0.0202	—	—	<0.50	<0.25			<0.25	<0.20	<0.15			<0.25	<0.25	<0.20
Naphthalene	mg/kg	0.391	0.0346	—	—	<0.10	<0.050			<0.050	<0.040	<0.030			<0.050	<0.050	<0.040
Phenanthrene	mg/kg	0.515	0.0419	0.00056	0.95	<0.30	<0.15			<0.15	<0.12	<0.090			<0.15	<0.15	<0.12
Pyrene	mg/kg	0.875	0.053	0.00049	0.85	<0.50	<0.25			<0.25	<0.20	<0.15			<0.25	<0.25	<0.20
Quinoline	mg/kg	—	—	—	—	<0.50	<0.25			<0.25	<0.20	<0.15			<0.25	<0.25	<0.20
Polychlorinated Biphenyls (PCBs)[g]																	
Aroclor 1254	mg/kg	3.4	0.6	—	—	<0.50	<0.050			<0.25	<0.20	<0.030			<0.25	<0.25	<0.20
Total PCBs	mg/kg	2.77	0.341	—	—	<1.0	<0.10			<0.50	<0.40	<0.060			<0.50	<0.50	<0.40
2-Fluorobiphenyl	%	—	—	—	—	103	108			99	107	107			95	116	113
p-Terphenyl d14	%	—	—	—	—	100	117			102	100	114			98	118	114
Aroclor 1242	mg/kg	—	—	—	—	<0.50	<0.070			<0.25	<0.20	<0.030			<0.25	<0.25	<0.20
Aroclor 1248	mg/kg	—	—	—	—	<0.50	<0.10			<0.25	<0.20	<0.030			<0.25	<0.25	<0.20
Aroclor 1260	mg/kg	—	—	—	—	<0.50	<0.050			<0.25	<0.20	<0.030			<0.25	<0.25	<0.20
d14-Terphenyl	%	—	—	—	—		112			93		111			90	98	93
Silicon (Si)	mg/kg	—	—	—	—	591				5220	<10				2370	1160	1110

Parameter	Unit	HRWQ-11	HRWQ-11	HRWQ-11 DUP	HRWQ11	HRWQ-11	HRWQ-12	HRWQ-12	HRWQ-12	HRWQ-17	HRWQ-17	HRWQ-17	HRWQ17	HRWQ-17	HRWQ-18	HRWQ-18	HRWQ-19	HRWQ-19	HRWQ-23	HRWQ-23	HRWQ-25
		Nov-10	Jun-11	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Jun-11	Sep-10	Jun-11	Sep-10	Jun-11	Sep-10
Metals																					
Aluminum (Al)	mg/kg	7010	6980	6240	2890	5240	3120	3590	3360	18500	14800	15800	13800	18800	14500	7130	6720	9650	5030	3560	13900
Antimony (Sb)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic (As)	mg/kg	<1.0	1.5	1.3	<1.0	<1.0	<1.0	<1.0	1.2	<1.0	<1.0	1.8	2.3	1.4	<1.0	1.1	<1.0	<1.0	<1.0	<1.0	50.5
Barium (Ba)	mg/kg	10.3	11.4	12.8	81.7	58.4	88.9	76.4	81.7	48.8	45.6	33.3	50.2	21.7	18.7	188					
Beryllium (Be)	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bismuth (Bi)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.4
Boron (B)	mg/kg	7.5	<5.0	<5.0	<5.0	<5.0	<5.0	5.9	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cadmium (Cd)	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.52	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.19
Calcium (Ca)	mg/kg	8410	8630	7050	2110	5470	1730	2060	2410	9050	5130	10100	7090	9060	3660	4360	2960	4200	2700	2140	17700
Chromium (Cr)	mg/kg	12.2	14.1	12.5	5.8	10.5	10.9	11.1	11.7	**29.2**	24.7	23.9	24.7	**45.8**	19.5	11.4	15	22.5	10.4	8.8	14.1
Cobalt (Co)	mg/kg	5.4	5	4.2	2	3.3	4.4	4	3.1	9.1	6.8	5.3	6.3	13.8	4.1	3.2	6.6	6.9	4.1	2.5	31.1
Copper (Cu)	mg/kg	11.6	13.1	11.3	3.1	9	8.3	9.6	10.2	15.3	9.1	**16.6**	15.3	**22.6**	**16.1**	11.2	7.7	13.5	5.3	3.2	15.3
Iron (Fe)	mg/kg	12000	10800	9340	3610	8110	9160	8000	7650	16800	13100	12400	12000	**26500**	8060	6770	11200	14300	7220	5460	46300
Lead (Pb)	mg/kg	4.7	6	5.1	4.7	3.4	2.1	3.2	3.1	7.4	6.4	7.3	12.9	4.4	7.2	13.3	2.1	3.1	4.3	2.5	26.4
Lithium (Li)	mg/kg	<5.0	<5.0	3	2.3	2.3	<5.0	<5.0	3.8	6.8	8.9	8.2	8.1	13.2	<5.0	3.4	<5.0	7.5	6.8	4.9	5.6
Magnesium (Mg)	mg/kg	1200	1300	1230	727	1170	1560	1830	1910	4150	3420	2840	2870	8950	1420	1570	2670	4310	1690	1520	1850
Manganese (Mn)	mg/kg	358	**499**	401	114	279	82.4	99.6	94	241	164	169	228	278	69.5	129	174	194	268	297	7970
Mercury (Hg)	mg/kg	0.056	0.068	0.061	0.017	0.037	<0.050	<0.050	<0.050	0.078	<0.050	0.08	0.07	0.012	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.137
Molybdenum (Mo)	mg/kg	2.2	2.9	2.6	<1.0	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.7
Nickel (Ni)	mg/kg	6.3	7	6.4	5.3	5.6	7.8	7.8	8.5	15	11.8	12.7	13	**27.7**	9	6.7	9	13.8	6.7	6.5	10
Phosphorus (P)	mg/kg	572	661	566	222	412	201	197	196	600	235	644	753	549	386	335	262	402	292	197	1780
Potassium (K)	mg/kg	276	250	220	130	220	264	345	340	723	576	520	730	910	406	430	465	660	215	160	731
Selenium (Se)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.3
Silver (Ag)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.2
Sodium (Na)	mg/kg	302	120	110	130	110	126	399	110	310	258	170	220	1100	207	180	261	450	128	<100	114
Strontium (Sr)	mg/kg	22.2	26.8	24	9.6	17.8	7.9	11	8.9	24.7	17.3	34	20.8	31.7	12.6	16.4	11	16.8	11.5	9.5	65
Thallium (Tl)	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.75	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10.8
Tin (Sn)	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg	320	213	250	328	289	627	577	484	533	609	260	342	1360	495	268	628	712	630	534	152
Uranium (U)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3.9	1.7	<1.0	<1.0	<1.0	<1.0	<1.0	0	<1.0	<1.0
Vanadium (V)	mg/kg	21.3	18.5	16.9	9	15.4	28.1	21.3	21.5	32.5	26.9	23.6	27	76	21.9	16.9	26.7	35.5	15.6	13.6	44.5
Zinc (Zn)	mg/kg	41.6	40.2	35	51.3	24.5	11.9	13	14.4	40.2	31.4	33.3	56.4	38.4	17.5	27.5	16.7	25	20.3	14.4	113
Zirconium	mg/kg	2.2					2.7	3.8		3.7	2.9				2		4.8		3.8		9
Polycyclic Aromatic Hydrocarbons (PAHs)[g]																					
1-Methylnaphthalene	mg/kg	<0.050	<0.25	<0.20			<0.050	<0.050	<0.050	<0.20	<0.15	<0.20			<0.15	<0.20	<0.050	<0.050	<0.10	<0.050	<0.50
2-Methylnaphthalene	mg/kg	0.054	<0.25	<0.20			<0.050	<0.050	<0.050	<0.20	<0.15	<0.20			<0.15	<0.20	<0.050	<0.050	<0.10	<0.050	<0.50
Acenaphthene	mg/kg	<0.050	<0.25	<0.20			<0.050	<0.050	<0.050	<0.20	<0.15	<0.20			<0.15	<0.20	<0.050	<0.050	<0.10	<0.050	<0.50
Acenaphthylene	mg/kg	<0.050	<0.25	<0.20			<0.050	<0.050	<0.050	<0.20	<0.15	<0.20			<0.15	<0.20	<0.050	<0.050	<0.10	<0.050	<0.50
Acridine	mg/kg	<0.80	<4.0	<4.0			<0.80	<0.80	<0.80	<3.2	<2.4	<3.2			<2.4	<3.2	<0.80	<0.80	<1.6	<0.80	<8.0
Anthracene	mg/kg	<0.050	<0.25	<0.20			<0.050	<0.050	<0.050	<0.20	<0.15	<0.20			<0.15	<0.20	<0.050	<0.050	<0.10	<0.050	<0.50
Benz[a]anthracene	mg/kg		<0.25	<0.25			<0.050					<0.20				<0.20		<0.050		<0.050	<0.50
Benzo(b&j)fluoranthene	mg/kg	<0.050	<0.25	<0.25			<0.050	<0.050	<0.050	<0.20	<0.15	<0.20			<0.15	<0.20	<0.050	<0.050	<0.10	<0.050	<0.50
Benzo(g,h,i)perylene	mg/kg	<0.050	<0.25	<0.25			<0.050	<0.050	<0.050	<0.20	<0.15	<0.20			<0.15	<0.20	<0.050	<0.050	<0.10	<0.050	<0.50
Benzo(k)fluoranthene	mg/kg	**0.034**	<0.10	<0.10			<0.020	<0.020	<0.020	<0.080	<0.060	<0.080			<0.060	<0.080	<0.020	<0.020	<0.040	<0.020	<0.20
Benzo(a)pyrene	mg/kg	<0.020	<0.10	<0.10			<0.020	<0.020	<0.020	<0.080	<0.060	<0.080			<0.060	<0.080	<0.020	<0.020	<0.040	<0.020	<0.20
Chrysene	mg/kg	<0.050	<0.25	<0.25			<0.050	<0.050	<0.050	<0.20	<0.15	<0.20			<0.15	<0.20	<0.050	<0.050	<0.10	<0.050	<0.50
Dibenzo(a,h)anthracene	mg/kg	<0.050	<0.25	<0.25			<0.050	<0.050	<0.050	<0.20	<0.15	<0.20			<0.15	<0.20	<0.050	<0.050	<0.10	<0.050	<0.50
Fluoranthene	mg/kg	<0.050	<0.25	<0.25			<0.050	<0.050	<0.050	<0.20	<0.15	<0.20			<0.15	<0.20	<0.050	<0.050	<0.10	<0.050	<0.50
Fluorene	mg/kg	<0.050	<0.25	<0.25			<0.050	<0.050	<0.050	<0.20	<0.15	<0.20			<0.15	<0.20	<0.050	<0.050	<0.10	<0.050	<0.50
Indeno(1,2,3-cd)pyrene	mg/kg	<0.050	<0.25	<0.25			<0.050	<0.050	<0.050	<0.20	<0.15	<0.20			<0.15	<0.20	<0.050	<0.050	<0.10	<0.050	<0.50
Naphthalene	mg/kg	<0.010	<0.050	<0.050			<0.010	<0.010	<0.010	<0.040	<0.030	<0.040			<0.030	<0.040	<0.010	<0.010	<0.020	<0.010	<0.10
Phenanthrene	mg/kg	<0.030	<0.15	<0.15			<0.030	<0.030	<0.030	<0.12	<0.090	<0.12			<0.090	<0.12	<0.030	<0.030	<0.060	<0.030	<0.30
Pyrene	mg/kg	<0.050	<0.25	<0.25			<0.050	<0.050	<0.050	<0.20	<0.15	<0.20			<0.15	<0.20	<0.050	<0.050	<0.10	<0.050	<0.50
Quinoline	mg/kg	<0.050	<0.25	<0.25			<0.050	<0.050	<0.050	<0.20	<0.15	<0.20			<0.15	<0.20	<0.050	<0.050	<0.10	<0.050	<0.50
Polychlorinated Biphenyls (PCBs)[g]																					
Aroclor 1254	mg/kg	<0.25	<0.050	<0.050			<0.010	<0.010	<0.010	<0.040	<0.030	<0.040			<0.030	<0.040	<0.010	<0.010	<0.020	<0.010	<0.10
Total PCBs	mg/kg	<0.50	<0.10	<0.10			<0.020	<0.020	<0.020	<0.080	<0.060	<0.080			<0.060	<0.080	<0.020	<0.020	<0.040	<0.020	<0.20
2-Fluorobiphenyl	%	104	106	102			96	103	103	96	98	108			86	102	101	107	93	99	78
p-Terphenyl d14	%	107	110	109			98	105	109	99	110	110			90	106	102	117	92	103	84
Aroclor 1242	mg/kg	<0.25	<0.050	<0.050			<0.010	<0.010	<0.010	<0.040	<0.030	<0.040			<0.030	<0.040	<0.010	<0.010	<0.020	<0.010	<0.10
Aroclor 1248	mg/kg	<0.25	<0.050	<0.050			<0.010	<0.010	<0.010	<0.040	<0.030	<0.040			<0.030	<0.040	<0.010	<0.010	<0.020	<0.010	<0.10
Aroclor 1260	mg/kg	<0.25	<0.050	<0.050			<0.010	<0.010	<0.010	<0.040	<0.030	<0.040			<0.030	<0.040	<0.010	<0.010	<0.020	<0.010	<0.10
d14-Terphenyl	%	110	101	107			103	114	110	94		109			84	112	98	119	103	111	80
Silicon (Si)	mg/kg	405					1100	410		3640	437				3420		780		1080		898

Notes:

(a) Canadian Council of Environment Ministers (CCME)
(b) Ontario Ministry of Environment and Energy (MOEE)
(c) CCME Sediment quality guidelines for the protection of aquatic life: Probable Effect Level (PEL), Freshwater, 2002
(d) CCME Sediment quality guidelines for the protection of aquatic life: Interim Sediment Quality Guideline (ISQG), Freshwater, 2003
(e) MOEE Provincial Sediment Quality Guidelines (PSQG): Lowest Effect Level (LEL), 1993
(f) MOEE Provincial Sediment Quality Guidelines (PSQG): Severe Effect Level (SEL), 1994
(g) Blank cells indicate parameters that were not analyzed either due to non detection in previous campaigns, or were missing from the laboratory analytical suite.
— = A dash indicates that guideline criteria are not available for this parameter.

1.0	Value greater the Freshwater PEL (CCME) guideline
1.0	Value greater the Freshwater ISQG (CCME) guideline
1.0	Value greater than the LEL (MOEE) guideline
1.0	Value greater than the SEL (MOEE) guideline
	Where cells are blank, analysis was not performed during this time period.

TABLE 1
Sediment Quality Results

Parameter	Unit	CCME[a]		MOEE[b]		HRWQ-25	HRWQ-25	HRWQ25	HRWQ-25	HRWQ-26	HRWQ-26	HRWQ-26	HRWQ-27	HRWQ-27	HRWQ-27	HRWQ-28	HRWQ-28	HRWQ-28	HRWQ28	HRWQ-28	HRWQ-29	HRWQ-29	HRWQ-29	HRWQ31	HRWQ-31	HRWQ32	HRWQ-32	HRWQ34	HRWQ-34	HRWQ37	HRWQ-37	HRWQ38	HRWQ-38	HRWQ39	HRWQ-39
		Freshwater PEL[c]	Freshwater ISQG[d]	LEL[e]	SEL[f]	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Sep-10	Nov-10	Jun-11	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Sep-10	Nov-10	Jun-11	Apr-12	Aug-12	Apr-12	Aug-12	Apr-12	Aug-12	Apr-12	Aug-12	Apr-12	Aug-12	Apr-12	Aug-12
Metals																																			
Aluminum (Al)	mg/kg	—	—	—	—	13200	13100	9760	16300	11600	11700	8280	6790	4220	7060	4770	3260	3290	4130	3820	9160	3930	5560	2880	1090	3320	9050	8160	7510	5180	8460	14100	29300	19200	14400
Antimony (Sb)	mg/kg	—	—	—	—	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic (As)	mg/kg	17	5.9	6	33	**25.7**	60.9	**29.1**	**12.7**	1.7	1.3	3.2	<1.0	<1.0	2.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.9	**6.1**	2.5	1.4	1.9	1.5	<1.0	1.7	**8.6**	**14.3**	1.1	**6.4**
Barium (Ba)	mg/kg	—	—	—	—	75.1	106	97.3	72	53.1	52.9	58.2	57.9	22.6	47.1	21.5	15.4	16.4	14.9	14.3	56.3	15.8	20.6	20	7.7	22.8	45.3	53.9	58.7	15.2	24.5	62.8	62.1	38	138
Beryllium (Be)	mg/kg	—	—	—	—	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bismuth (Bi)	mg/kg	—	—	—	—	2.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Boron (B)	mg/kg	—	—	—	—	13.1	19.7	6	8.2	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cadmium (Cd)	mg/kg	3.5	0.6	0.6	10	<0.50	<0.50	0.55	**0.88**	<0.50	<0.50	0.53	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**0.67**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**0.79**	**1.77**	<0.50	**1.18**
Calcium (Ca)	mg/kg	—	—	—	—	20300	17700	12100	18300	8540	8900	7360	3870	1950	3900	6340	4070	2360	3080	2850	3620	2120	1620	1280	3120	1900	4710	5860	5230	2130	3690	5530	9860	5050	12000
Chromium (Cr)	mg/kg	90	37.3	26	110	14	16.5	10.5	18	22.4	23.4	16	10.3	9.9	13.8	10.1	7.2	9.6	9.4	11.2	23.7	19.5	16	4.3	4.5	7.8	20.9	17.5	17.6	15	23.2	**31.5**	216	10.6	24.2
Cobalt (Co)	mg/kg	—	—	—	50	9.2	12.4	12.1	5.7	6.1	6.5	5.6	3	3.3	3.6	4.9	3.8	2.3	3	3.2	6.9	7.2	5	2.8	2.2	2.6	5.9	4.6	4.3	3.4	5.3	9.4	25.8	18.6	17.5
Copper (Cu)	mg/kg	197	35.7	16	110	**17.5**	**17.9**	12.2	**21.1**	**17.7**	14.5	**17.8**	12.5	7.4	14.6	11.8	4.2	7.5	11.1	7.9	**21.7**	**20.5**	9.4	**18.2**	**24.8**	**26.8**	6.8	8.8	14	5.6	**26.2**	**33.6**	**52.7**	**35.4**	**67.9**
Iron (Fe)	mg/kg	—	—	20000	40000	**24700**	44800	**26000**	17400	13800	13900	9500	4620	4390	5980	6720	6060	5600	5690	5920	13400	18500	15200	4660	4860	5870	13100	10000	10600	6970	9880	19400	41500	**31300**	**20700**
Lead (Pb)	mg/kg	91.3	35	31	250	22.1	25.6	24.3	**31.6**	10.2	8.4	11.9	10.2	2.9	8.6	8.2	3.6	14.1	15.8	11.7	**42.9**	3.6	3.4	5.8	12.2	11.1	6.9	5.2	13.1	3.1	9.6	25.9	**44**	3.2	16.6
Lithium (Li)	mg/kg	—	—	—	—	<5.0	3.3	4	3.6	8.2	0	4	<5.0	0	4.4	5.4	<5.0	3.5	4.2	3.2	11.8	<5.0	4.7	2.7	<1.0	2.9	6	4.8	5.6	6.1	7.8	8.6	14.6	56.7	9.8
Magnesium (Mg)	mg/kg	—	—	—	—	1650	1930	1600	2180	2610	3450	2040	1100	1260	1490	1750	1580	1530	1490	1540	2730	2040	1810	590	749	1030	3660	2200	2260	2810	3560	3240	18000	7760	4370
Manganese (Mn)	mg/kg	—	—	460	1100	1510	2520	3180	330	308	219	**493**	166	87.2	153	139	158	124	96.6	97.6	274	140	97.6	297	67	105	243	409	**622**	146	138	369	**471**	387	1410
Mercury (Hg)	mg/kg	0.486	0.17	0.2	2	0.161	0.148	0.099	0.137	0.086	0.071	0.067	0.095	95	<0.050	0.051	<0.050	<0.050	0.011	0.01	<0.050	<0.050	<0.050	**2.1**	**3.4**	**4.48**	**0.382**	0.037	0.063	0.012	0.017	0.053	0.072	0.021	0.092
Molybdenum (Mo)	mg/kg	—	—	—	—	1.4	2.3	1.2	1.3	1.4	1	1.4	1.1	<0.050	1.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1	1.2	1.9
Nickel (Ni)	mg/kg	36	18	16	75	9	9.6	6.8	10.5	14.8	13.8	12.4	6.1	<1.0	9.6	7.1	4.7	6.2	6.7	8.3	13.2	14.5	12.1	3.4	3.1	4.9	12.3	9.5	11	7.9	13.8	**21.5**	104	**16.1**	**21.7**
Phosphorus (P)	mg/kg	—	—	—	—	2310	2410	1470	2420	660	420	596	646	6.7	417	569	436	289	320	324	328	210	172	156	192	210	200	486	276	216	360	839	1340	96	584
Potassium (K)	mg/kg	—	—	—	—	635	630	620	580	483	536	360	470	210	270	237	197	180	160	180	465	311	270	150	230	340	560	390	470	130	310	550	610	300	540
Selenium (Se)	mg/kg	—	—	—	—	2.1	2	1.2	2.2	<1.0	<1.0	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.4	2.3	<1.0	1.7
Silver (Ag)	mg/kg	—	—	—	0.5	<0.20	<0.20	<0.20	0.21	<0.20	<0.20	<0.20	<0.20	201	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.26	0.25	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.38
Sodium (Na)	mg/kg	—	—	—	—	309	1480	<100	130	417	546	310	138	942	130	143	124	100	<100	150	231	175	100	<100	<100	130	580	240	560	<100	210	120	200	<100	180
Strontium (Sr)	mg/kg	—	—	—	—	60.4	74.3	51.5	65.2	19.7	21.3	19.6	17.2	<0.20	13.4	16.3	14.1	11.3	10.1	11.7	12.3	7.3	6.3	5.5	9.4	7	19.1	21.7	18.5	14.1	19.5	13.9	13.6	21.6	40.7
Thallium (Tl)	mg/kg	—	—	—	—	1.87	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	129	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg	—	—	—	—	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	8.1	<5.0	<5.0	<5.0	5.9	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg	—	—	—	—	137	112	101	141	448	615	258	238	<0.50	252	818	852	574	559	706	989	1010	866	121	9	182	908	484	440	398	1010	355	470	3070	763
Uranium (U)	mg/kg	—	—	—	—	<1.0	5.5	3.5	6.5	<1.0	<1.0	1.1	<1.0	<5.0	1.6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	1.4	1.9	3.5	7
Vanadium (V)	mg/kg	—	—	—	—	21	45.5	28.2	28.1	31.4	32.7	26.7	11.9	359	16.9	15.3	12.6	14.4	19.6	17.1	43.7	67	68.2	5.5	<1.0	9.8	38.4	19.8	30.7	14.6	36.3	46.8	90.9	53.6	29.3
Zinc (Zn)	mg/kg	315	123	120	820	59.1	75.8	68.7	79.9	32.5	29.5	50.2	29.7	<1.0	44.2	44.6	25.3	23.7	55.1	47.1	72	19.1	17.4	26.3	23.8	31	26.3	28	44.4	16.1	27.1	72.9	**153**	60.5	114
Zirconium	mg/kg	—	—	—	—	4.3				3.8	3.8		1.4	12		3.1	2.6				3.6	1														
Polycyclic Aromatic Hydrocarbons (PAHs)[g]																																			
1-Methylnaphthalene	mg/kg	0.0889	0.00671	—	—	<0.25	<0.25			<0.25	<0.25	<0.25	<0.25	2.7	<0.25	<0.10	<0.050	<0.050			<0.050	<0.050	<0.050												
2-Methylnaphthalene	mg/kg	0.128	0.00587	—	—	<0.25	<0.25			<0.25	<0.25	<0.25	<0.25	68.5	<0.25	<0.10	<0.050	<0.050			<0.050	<0.050	<0.050												
Acenaphthene	mg/kg	—	—	—	—	<0.25	<0.25			<0.25	<0.25	<0.25	<0.25	<0.25	<0.15	<0.25	<0.10	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050												
Acenaphthylene	mg/kg	0.245	0.0469	—	—	<0.25	<0.25			<0.25	<0.25	<0.25	<0.25	<0.25	<0.15	<0.25	<0.10	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050												
Acridine	mg/kg	0.385	0.0317	0.00032	1.48	<4.0	<4.0			<4.0	<4.0	<4.0	<4.0	<0.15	<4.0	<1.6	<0.80	<0.80			<0.80	<0.80	<0.80												
Anthracene	mg/kg	0.782	0.0319	0.00024	1.34	<0.25	<0.25			<0.25	<0.25	<0.25	<0.25	<0.15	<0.25	<0.10	<0.050	<0.050			<0.050	<0.050	<0.050												
Benz(a)anthracene	mg/kg	—	—	0.00017	0.32		<0.25					<0.25			<0.25			<0.050																	
Benzo(b&j)fluoranthene	mg/kg	—	—	0.00037	1.44	<0.25	<0.25			<0.25	<0.25	<0.25	<0.25	<0.15	<0.25	<0.10	<0.050	<0.050			<0.050	<0.050	<0.050												
Benzo(g,h,i)perylene	mg/kg	—	—	—	—	<0.25	<0.25			<0.25	<0.25	<0.25	<0.25	<0.060	<0.25	<0.10	<0.050	<0.050			<0.050	<0.050	<0.050												
Benzo(k)fluoranthene	mg/kg	0.862	0.0571	0.00034	0.46	<0.10	<0.10			<0.10	<0.10	<0.10	<0.10	<0.15	<0.10	<0.040	<0.020	<0.020			<0.020	<0.020	<0.020												
Benzo(a)pyrene	mg/kg	0.135	0.00622	0.00006	0.13	<0.10	<0.10			<0.10	<0.10	<0.10	<0.10	<0.15	<0.10	<0.040	<0.020	<0.020			<0.020	<0.020	<0.020												
Chrysene	mg/kg	2.355	0.111	0.00075	1.02	<0.25	<0.25			<0.25	<0.25	<0.25	<0.25	<0.15	<0.25	<0.10	<0.050	<0.050			<0.050	<0.050	<0.050												
Dibenzo(a,h)anthracene	mg/kg	0.144	0.0212	0.00019	0.16	<0.25	<0.25			<0.25	<0.25	<0.25	<0.25	<0.060	<0.25	<0.10	<0.050	<0.050			<0.050	<0.050	<0.050												
Fluoranthene	mg/kg	—	—	0.0002	0.32	<0.25	<0.25			<0.25	<0.25	<0.25	<0.25	<0.15	<0.25	<0.10	<0.050	<0.050			<0.050	<0.050	<0.050												
Fluorene	mg/kg	—	—	—	—	<0.25	<0.25			<0.25	<0.25	<0.25	<0.25	<0.15	<0.25	<0.10	<0.050	<0.050			<0.050	<0.050	<0.050												
Indeno(1,2,3-cd)pyrene	mg/kg	0.201	0.0202	—	—	<0.25	<0.25			<0.25	<0.25	<0.25	<0.25	<0.15	<0.25	<0.10	<0.050	<0.050			<0.050	<0.050	<0.050												
Naphthalene	mg/kg	0.391	0.0346	—	—	<0.050	<0.050			<0.050	<0.050	<0.050	<0.050	<0.15	<0.050	<0.020	<0.010	<0.010			<0.010	<0.010	<0.010												
Phenanthrene	mg/kg	0.515	0.0419	0.00056	0.95	<0.15	<0.15			<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.060	<0.030	<0.030			<0.030	<0.030	<0.030												
Pyrene	mg/kg	0.875	0.053	0.00049	0.85	<0.25	<0.25			<0.25	<0.25	<0.25	<0.25	<0.030	<0.25	<0.10	<0.050	<0.050			<0.050	<0.050	<0.050												
Quinoline	mg/kg	—	—	—	—	<0.25	<0.25			<0.25	<0.25	<0.25	<0.25	<0.090	<0.25	<0.10	<0.050	<0.050			<0.050	<0.050	<0.050												
Polychlorinated Biphenyls (PCBs)[g]																																			
Aroclor 1254	mg/kg	3.4	0.6	—	—	<0.050	<0.050			<0.050	<0.050	<0.050	<0.050	<0.030	<0.050	<0.020	<0.050	<0.010			<0.010	<0.010	<0.010												
Total PCBs	mg/kg	2.77	0.341	—	—	<0.10	<0.10			<0.10	<0.10	<0.10	<0.10	<0.030	<0.10	<0.040	<0.10	<0.020			<0.020	<0.020	<0.020												
2-Fluorobiphenyl	%	—	—	—	—	99	105			97	100	105	97	<0.15	108	98	109	102			100	102	105												
p-Terphenyl d14	%	—	—	—	—	100	101			105	96	113	105	<0.15	116	107	100	111			109	100	113												
Aroclor 1242	mg/kg	—	—	—	—	<0.050	<0.050			<0.050	<0.050	<0.050	<0.050	98	<0.050	<0.020	<0.050	<0.010			<0.013	<0.010	<0.010												
Aroclor 1248	mg/kg	—	—	—	—	<0.050	<0.050			<0.050	<0.050	<0.050	<0.050	<0.030	<0.050	<0.020	<0.050	<0.010			<0.010	<0.010	<0.010												
Aroclor 1260	mg/kg	—	—	—	—	<0.050	<0.050			<0.050	<0.050	<0.050	<0.050	<0.030	<0.050	<0.020	<0.050	<0.010			<0.010	<0.010	<0.010												
d14-Terphenyl	%	—	—	—	—		111			109		109	114		115	106		111			109		108												
Silicon (Si)	mg/kg	—	—	—	—	643				1780	1790		550	<0.060		1440	<10				842	<10													

Notes:

(a) Canadian Council of Environment Ministers (CCME)
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1.0	Value greater the Freshwater PEL (CCME) guideline
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	Where cells are blank, analysis was not performed during this time period.

TABLE 1
Sediment Quality Results

Parameter	Unit	CCME[a]		MOEE[b]		HRWQP-1B	HRWQP-1B	HRWQP-1B	HRWQP1B	HRWQP1B	HRWQP-2B	HRWQP-2B	HRWQP-2B	HRWQP2B	HRWQP2B	HRWQP-3B	HRWQP-3B	HRWQP-3B DUP	HRWQP-3B	HRWQP3B	HRWQP3B	HRWQP-4B	HRWQP-4B	HRWQP-4B
		Freshwater PEL[c]	Freshwater ISQG[d]	LEL[e]	SEL[f]	Sep-10	Nov-10	Jun-11	Aug-12	Apr-12	Sep-10	Nov-10	Jun-11	Aug-12	Apr-12	Sep-10	Nov-10	Nov-10	Jun-11	Aug-12	Apr-12	Sep-10	Nov-10	Jun-11
Metals																								
Aluminum (Al)	mg/kg	—	—	—	—	10200	12800	11100	11000	12100	18500	21100	19700	19500	13600	18000	15800	14800	15600	14400	15000	21000	23000	29200
Antimony (Sb)	mg/kg	—	—	—	—	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic (As)	mg/kg	17	5.9	6	33	**16.3**	**15.8**	**9.8**	**7.7**	**22.9**	**26.4**	**13.3**	**29.2**	**13.5**	**22.3**	3.9	3.9	3.3	3.2	4.6	4	2.7	4.8	**6.5**
Barium (Ba)	mg/kg	—	—	—	—	65.3	81.9	67.5	68.9	107	301	266	451	309	517	82.7	77.8	76.4	79.8	78.9	77.8	106	123	180
Beryllium (Be)	mg/kg	—	—	—	—	<0.50	<0.50	<0.50	<0.50	<0.50	0.55	0.59	0.67	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bismuth (Bi)	mg/kg	—	—	—	—	2.7	1.2	<1.0	<1.0	<1.0	8.7	4.7	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Boron (B)	mg/kg	—	—	—	—	7.9	14	7.6	7.5	8.3	<5.0	8.9	6	5.5	<5.0	5.3	5	5.6	<5.0	<5.0	<5.0	<5.0	8.6	<5.0
Cadmium (Cd)	mg/kg	3.5	0.6	0.6	10	**1.48**	**1.47**	**1.2**	**0.94**	**1.36**	0.57	**0.78**	**0.69**	**0.87**	**0.64**	0.57	**0.8**	**0.81**	0.53	**0.84**	**0.79**	<0.50	0.58	**0.78**
Calcium (Ca)	mg/kg	—	—	—	—	6070	6800	7190	6720	5490	6700	6910	7020	6640	5180	10500	9590	9640	8060	8650	8220	6730	6850	8000
Chromium (Cr)	mg/kg	90	37.3	26	110	15.3	20.6	19.9	17.9	18.8	**36**	**38.9**	**41.5**	**40.5**	**27.8**	**27.1**	24.6	23.6	**26.3**	23.9	24.7	**34.2**	**37.4**	**53.1**
Cobalt (Co)	mg/kg	—	—	—	50	6.4	7.8	7.1	6.6	6.1	18	19.7	20.5	17.3	14.2	10.9	9.2	8.2	8.1	8.2	7.8	12.8	14.4	17.3
Copper (Cu)	mg/kg	197	35.7	16	110	**29.4**	**31.7**	**23.9**	**27.1**	**44**	**24.6**	**28.5**	**32.3**	**31.6**	**22.2**	**28.5**	**27.3**	**26.7**	**30**	**28.4**	**26.5**	**20.2**	**23**	**31.8**
Iron (Fe)	mg/kg	—	—	20000	40000	15500	18600	12000	12900	**20100**	**74300**	**62600**	**137000**	**102000**	**107000**	**21700**	18500	17300	17900	17400	17200	**24500**	**31200**	**37300**
Lead (Pb)	mg/kg	91.3	35	31	250	**68.1**	**60.8**	**34**	**33.5**	**60.2**	26.4	**36.2**	24	28.9	18.7	15.4	22.2	26.1	7	18.6	18.1	17.7	30.9	26.2
Lithium (Li)	mg/kg	—	—	—	—	<5.0	<5.0	5.2	3.7	4.8	5.1	8.6	11.3	7.8	7.5	<5.0	5.9	5.5	6.7	5.6	7.5	16.3	11.3	19
Magnesium (Mg)	mg/kg	—	—	—	—	1610	2210	2280	2240	2020	4870	5570	5520	5510	3730	3320	3090	2900	2920	2920	2870	5290	5860	7510
Manganese (Mn)	mg/kg	—	—	460	1100	**537**	**515**	422	**477**	**646**	**4970**	**5880**	**5500**	**3240**	**12200**	**484**	402	394	378	417	455	**497**	**533**	**764**
Mercury (Hg)	mg/kg	0.486	0.17	0.2	2	0.128	0.149	0.111	0.092	0.157	0.118	0.13	0.087	0.086	0.068	0.144	0.148	0.161	0.083	0.092	0.107	0.105	0.118	0.09
Molybdenum (Mo)	mg/kg	—	—	—	—	3.2	2.7	1.8	2.6	4.6	3.9	2.2	3	1.7	3.8	1.1	1.1	1	1	1.2	1.1	<1.0	<1.0	<1.0
Nickel (Ni)	mg/kg	36	18	16	75	13.2	15.5	14.5	15.3	**16.3**	**23.4**	**24.4**	**27.3**	**26.9**	**20.6**	**18.5**	**17.6**	**16.2**	**18.6**	**18**	**18.3**	**21**	**22.6**	**34.7**
Phosphorus (P)	mg/kg	—	—	—	—	1250	1330	1290	1380	1610	2960	2170	3510	2620	2780	1040	828	803	1020	905	929	910	983	1440
Potassium (K)	mg/kg	—	—	—	—	680	1050	980	840	1150	967	1190	1280	1240	950	850	793	772	720	830	830	1160	1040	1560
Selenium (Se)	mg/kg	—	—	—	—	1.8	2.6	2.2	2.2	2.6	1.1	1.5	1.5	1.5	1.1	1.5	1.7	1.3	1.2	1.4	1.3	<1.0	1.1	1
Silver (Ag)	mg/kg	—	—	—	0.5	<0.20	1.46	<0.20	0.29	2.11	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Sodium (Na)	mg/kg	—	—	—	—	234	494	220	270	280	569	770	620	720	450	363	419	381	260	280	320	685	734	750
Strontium (Sr)	mg/kg	—	—	—	—	20.7	23	28.6	26.3	24.8	22.2	24.1	25.8	25.1	21.4	19.6	19.2	18.4	20.3	21.2	20.3	22.4	22	29.2
Thallium (Tl)	mg/kg	—	—	—	—	<0.50	<0.50	<0.50	<0.50	<0.50	6.8	9.53	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn)	mg/kg	—	—	—	—	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti)	mg/kg	—	—	—	—	157	226	206	204	153	656	786	639	664	466	466	400	399	332	354	373	797	862	1010
Uranium (U)	mg/kg	—	—	—	—	<1.0	<1.0	3.8	3.5	3	<1.0	<1.0	2.4	2.3	1.6	<1.0	<1.0	<1.0	1.8	1.8	1.6	0	<1.0	1.3
Vanadium (V)	mg/kg	—	—	—	—	24.1	27.4	21.1	25.7	30.3	115	125	141	123	93.7	37.2	33.9	31.9	34.8	32.6	30.4	55.2	63.1	84.2
Zinc (Zn)	mg/kg	315	123	120	820	93.5	105	82.6	81	103	98.8	118	94.2	100	79	90.1	92.6	91.3	84.4	91	**123**	79.9	99.6	119
Zirconium	mg/kg	—	—	—	—	4.1	3.4	0			12.5	8.5				4	<1.0	<1.0				5.6	4.7	
Polycyclic Aromatic Hydrocarbons (PAHs)[g]																								
1-Methylnaphthalene	mg/kg	0.0889	0.00671	—	—	<0.50	<0.50	<0.50			<0.25	<0.25	<0.25			<0.50	<0.50	<0.25	<0.25			<0.20	<0.050	<0.25
2-Methylnaphthalene	mg/kg	0.128	0.00587	—	—	<0.50	<0.50	<0.50			<0.25	<0.25	<0.25			<0.50	<0.50	<0.25	<0.25			<0.20	<0.050	<0.25
Acenaphthene	mg/kg	—	—	—	—	<0.50	<0.50	<0.50			<0.25	<0.25	<0.25			<0.50	<0.50	<0.25	<0.25			<0.20	<0.050	<0.25
Acenaphthylene	mg/kg	0.245	0.0469	—	—	<0.50	<0.50	<0.50			<0.25	<0.25	<0.25			<0.50	<0.50	<0.25	<0.25			<0.20	<0.050	<0.25
Acridine	mg/kg	0.385	0.0317	0.00032	1.48	<8.0	<8.0	<8.0			<4.0	<4.0	<4.0			<8.0	<8.0	<4.0	<4.0			<3.2	<0.80	<4.0
Anthracene	mg/kg	0.782	0.0319	0.00024	1.34	<0.50	<0.50	<0.50			<0.25	<0.25	<0.25			<0.50	<0.50	<0.25	<0.25			<0.20	<0.050	<0.25
Benz(a)anthracene	mg/kg	—	—	0.00017	0.32			<0.50			<0.25		<0.25						<0.25					<0.25
Benzo(b&j)fluoranthene	mg/kg	—	—	0.00037	1.44	<0.50	<0.50	<0.50			<0.25	<0.25	<0.25			<0.50	<0.50	<0.25	<0.25			<0.20	<0.050	<0.25
Benzo(g,h,i)perylene	mg/kg	—	—	—	—	<0.50	<0.50	<0.50			<0.25	<0.25	<0.25			<0.50	<0.50	<0.25	<0.25			<0.20	<0.050	<0.25
Benzo(k)fluoranthene	mg/kg	0.862	0.0571	0.00034	0.46	<0.20	<0.20	<0.20			<0.10	<0.10	**0.18**			<0.20	<0.20	<0.10	<0.10			<0.080	**0.028**	<0.10
Benzo(a)pyrene	mg/kg	0.135	0.00622	0.00006	0.13	<0.20	<0.20	<0.20			<0.10	<0.10	**0.15**			<0.20	<0.20	<0.10	<0.10			<0.080	**0.02**	<0.10
Chrysene	mg/kg	2.355	0.111	0.00075	1.02	<0.50	<0.50	<0.50			<0.25	<0.25	<0.25			<0.50	<0.50	<0.25	<0.25			<0.20	<0.050	<0.25
Dibenzo(a,h)anthracene	mg/kg	0.144	0.0212	0.00019	0.16	<0.50	<0.50	<0.50			<0.25	<0.25	<0.25			<0.50	<0.50	<0.25	<0.25			<0.20	<0.050	<0.25
Fluoranthene	mg/kg	—	—	0.0002	0.32	<0.50	<0.50	<0.50			<0.25	<0.25	<0.25			<0.50	<0.50	<0.25	<0.25			<0.20	<0.050	<0.25
Fluorene	mg/kg	—	—	—	—	<0.50	<0.50	<0.50			<0.25	<0.25	<0.25			<0.50	<0.50	<0.25	<0.25			<0.20	<0.050	<0.25
Indeno(1,2,3-cd)pyrene	mg/kg	0.201	0.0202	—	—	<0.50	<0.50	<0.50			<0.25	<0.25	<0.25			<0.50	<0.50	<0.25	<0.25			<0.20	<0.050	<0.25
Naphthalene	mg/kg	0.391	0.0346	—	—	<0.10	<0.10	<0.10			<0.050	<0.050	<0.050			<0.10	<0.10	<0.050	<0.050			<0.040	<0.010	<0.050
Phenanthrene	mg/kg	0.515	0.0419	0.00056	0.95	<0.30	<0.30	<0.30			<0.15	<0.15	<0.15			<0.30	<0.30	<0.15	<0.15			<0.12	<0.030	<0.15
Pyrene	mg/kg	0.875	0.053	0.00049	0.85	<0.50	<0.50	<0.50			<0.25	<0.25	<0.25			<0.50	<0.50	<0.25	<0.25			<0.20	<0.050	<0.25
Quinoline	mg/kg	—	—	—	—	<0.50	<0.50	<0.50			<0.25	<0.25	<0.25			<0.50	<0.50	<0.25	<0.25			<0.20	<0.050	<0.25
Polychlorinated Biphenyls (PCBs)[g]																								
Aroclor 1254	mg/kg	3.4	0.6	—	—	<0.50	<0.10	<0.10			<0.25	<0.050	<0.050			<0.50	<0.50	<0.25	<0.050			<0.060	<0.20	<0.050
Total PCBs	mg/kg	2.77	0.341	—	—	<1.0	<0.20	<0.20			<0.50	<0.10	<0.10			<1.0	<1.0	<0.50	<0.10			<0.12	<0.40	<0.10
2-Fluorobiphenyl	%	—	—	—	—	93	98	101			103	105	99			96	105	104	104			88	110	98
p-Terphenyl d14	%	—	—	—	—	95	100	105			110	106	101			100	101	103	113			101	110	95
Aroclor 1242	mg/kg	—	—	—	—	<0.50	<0.16	<0.10			<0.25	<0.050	<0.053			<0.50	<0.50	<0.25	<0.050			<0.060	<0.20	<0.050
Aroclor 1248	mg/kg	—	—	—	—	<0.50	<0.10	<0.10			<0.25	<0.050	<0.050			<0.50	<0.50	<0.25	<0.050			<0.060	<0.20	<0.050
Aroclor 1260	mg/kg	—	—	—	—	<0.50	<0.10	<0.10			<0.25	<0.050	<0.050			<0.50	<0.50	<0.25	<0.050			<0.060	<0.20	<0.050
d14-Terphenyl	%	—	—	—	—	70		114			87		116			81			111			113	112	108
Silicon (Si)	mg/kg	—	—	—	—	2600	2190				3230	538				6550	201	252				1990	957	

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		Freshwater PEL[c]	Freshwater ISQG[d]	LEL[e]	SEL[f]	Sep-10	Nov-10	Jun-11	Aug-12	Apr-12	Sep-10	Nov-10	Jun-11	Aug-12	Apr-12	Sep-10	Sep-10	Nov-10	Jun-11	Jun-11	Aug-12	Apr-12	Sep-10	Nov-10						
Metals																									G					
Aluminum (Al)	mg/kg	—	—	—	—	19500	25400	27100	19700	23400	14300	3760	16100	11700	13900	14300	16400	7790	16500	19200	14700	16600	17300	21200	134	1090	29300	10871.87	9570	21135
Antimony (Sb)	mg/kg	—	—	—	—	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	134	<1	1	1	1	1
Arsenic (As)	mg/kg	17	5.9	6	33	**10.2**	**6.2**	**12**	**11.8**	**6.1**	<1.0	1.2	2.6	1.9	3.2	**15.5**	**19.7**	**9.2**	**6.1**	**8.3**	**9.1**	**20.4**	3.1	**8.1**	134	<1	60.9	5.519403	1.9	22.51
Barium (Ba)	mg/kg	—	—	—	—	142	168	208	152	179	51.9	35.7	78.6	58.9	64.9	3970	2140	190	134	172	167	309	109	389	134	6.3	3970	125.0739	58.55	303.8
Beryllium (Be)	mg/kg	—	—	—	—	<0.50	0.5	0.63	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.52	0.56	<0.50	<0.50	<0.50	<0.50	<0.50	0.73	0.7	134	<0.5	0.73	0.50709	0.5	0.5305
Bismuth (Bi)	mg/kg	—	—	—	—	2.5	6.9	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	11	8.7	6.7	<1.0	<1.0	<1.0	<1.0	1.7	4.3	134	<1	11	1.385821	1	3.26
Boron (B)	mg/kg	—	—	—	—	<5.0	7.1	5.9	<5.0	<5.0	<5.0	8.6	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	134	<5	19.7	5.703731	5	8.6
Cadmium (Cd)	mg/kg	3.5	0.6	0.6	10	**0.7**	0.58	**1.08**	**0.85**	**0.78**	<0.50	<0.50	<0.50	<0.50	<0.50	**5.4**	**5.31**	<0.50	**0.65**	**0.83**	**0.88**	**1.03**	**1.69**	**1.93**	134	<0.5	5.4	0.697836	0.5	1.3985
Calcium (Ca)	mg/kg	—	—	—	—	5070	5740	6460	4960	6810	6040	6010	8680	6370	10400	5800	5520	1970	4070	4280	4290	4820	5270	6980	134	1130	20300	6358.955	5870	13370
Chromium (Cr)	mg/kg	90	37.3	26	110	**33.8**	**43**	**54.5**	**39**	**44.7**	25.9	5.8	**32.5**	24.1	22	**31.7**	**30.3**	15.3	**38.3**	**42.1**	**32.2**	**32.6**	25.4	**34.1**	134	3	216	21.66866	17.6	41.71
Cobalt (Co)	mg/kg	—	—	—	50	24.2	27.2	28.9	23.9	22.7	7.9	2.6	8.5	7.2	5.5	69.9	57.7	16.6	25.1	29.7	22.8	26	11.1	21.2	134	1.7	69.9	9.452239	6.4	25.87
Copper (Cu)	mg/kg	197	35.7	16	110	**24.5**	**25.8**	**34.9**	**27.3**	**28.2**	**17**	7.8	**21.1**	14.3	**24.4**	**24.8**	**27.4**	7.8	13.7	**17.9**	**16.4**	**21.3**	**29.6**	**43.9**	134	<1	67.9	17.56567	16.25	32.755
Iron (Fe)	mg/kg	—	—	20000	40000	**68200**	**70000**	**105000**	**88300**	**75700**	13000	5380	17800	13800	12100	**102000**	**104000**	**58200**	**75100**	**90400**	**69400**	**98300**	**28000**	**48300**	134	1630	137000	22987.46	12700	93165
Lead (Pb)	mg/kg	91.3	35	31	250	**42.4**	27.9	**34**	**36.7**	22.4	4.1	6.9	11.1	9.6	10.4	**34.8**	**35.3**	15.6	10.5	15.1	19.9	**33.9**	8.5	13.5	134	<1	68.1	14.12836	9.65	36.375
Lithium (Li)	mg/kg	—	—	—	—	9.9	9	13	7.5	11.4	11.3	<5.0	12.1	7.7	6.8	6.9	7.2	<5.0	7.2	8.7	5.9	7.5	<5.0	0	134	0	56.7	6.584328	5.05	14.67
Magnesium (Mg)	mg/kg	—	—	—	—	3110	4560	5060	3690	4570	3920	881	4920	4080	3180	2000	2190	1160	2550	3090	2620	3020	1150	1630	134	461	18000	2737.007	2220	5537.5
Manganese (Mn)	mg/kg	—	—	460	1100	**1350**	**1150**	**1590**	**1300**	**950**	184	225	318	274	272	**80900**	**36500**	**4210**	**2350**	**3040**	**3890**	**8100**	**2710**	**11400**	134	0.061	80900	1800.583	302.5	5633
Mercury (Hg)	mg/kg	0.486	0.17	0.2	2	0.163	0.159	0.127	0.12	0.117	<0.050	0.069	<0.050	0.046	0.068	0.119	0.131	0.073	0.075	0.089	0.079	0.11	0.05	0.083	134	0.01	256	2.794851	0.0695	0.8055
Molybdenum (Mo)	mg/kg	—	—	—	—	1.4	<1.0	1.3	1.3	<1.0	<1.0	<1.0	<1.0	<1.0	1.3	5.9	4.8	1.2	<1.0	<1.0	<1.0	2	12.7	22.9	134	<0.05	22.9	1.666045	1	3.835
Nickel (Ni)	mg/kg	36	18	16	75	**18.6**	**23.3**	**31.1**	**22.5**	**24.3**	13.5	4.5	**19.4**	14.6	13.7	**52.4**	**41.8**	11.4	**19.7**	**23.1**	**18.6**	**20.6**	**17.6**	**28.7**	134	<1	104	14.30149	12.7	27.44
Phosphorus (P)	mg/kg	—	—	—	—	2690	1540	3110	2190	1700	396	238	623	446	1020	2750	2970	1150	1490	1850	1400	2340	2150	2140	134	6.7	3510	838.0425	560	2644.5
Potassium (K)	mg/kg	—	—	—	—	1010	966	1190	980	1120	499	227	810	660	580	1070	840	353	580	690	600	900	478	681	134	79	1560	560.5224	507.5	1153.5
Selenium (Se)	mg/kg	—	—	—	—	1.1	<1.0	1.6	1.4	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	1.1	1	<1.0	<1.0	<1.0	<1.0	1.1	1.9	2.6	134	<1	2.6	1.185821	1	2.2
Silver (Ag)	mg/kg	—	—	—	0.5	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	4.42	1.18	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	134	<0.2	201	1.770448	0.2	0.341
Sodium (Na)	mg/kg	—	—	—	—	350	660	560	400	520	663	690	550	470	320	234	237	100	390	430	330	380	205	141	134	86	1480	308.6119	240	724.9
Strontium (Sr)	mg/kg	—	—	—	—	16.2	18.7	22.7	18.4	21.7	19.6	11.8	24.6	19.2	24.7	138	44.9	8.8	14.9	17	15.8	19.8	15.9	21.3	134	<0.2	138	21.95821	19.35	49.055
Thallium (Tl)	mg/kg	—	—	—	—	<0.50	0.78	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	89.1	38.5	9.67	<0.50	<0.50	<0.50	<0.50	3.23	18.7	134	<0.5	129	2.851791	0.5	7.7555
Tin (Sn)	mg/kg	—	—	—	—	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	134	<5	8.1	5.029851	5	5
Titanium (Ti)	mg/kg	—	—	—	—	548	793	785	589	707	915	149	825	668	330	391	431	302	641	666	538	529	415	395	134	<0.5	3070	476.2037	461	910.45
Uranium (U)	mg/kg	—	—	—	—	0	<1.0	1.6	1.2	1.2	0	<1.0	1.8	1.1	3.1	<1.0	<1.0	<1.0	1	1.2	1	1.2	<1.0	<1.0	134	0	11.6	1.629104	1	5.175
Vanadium (V)	mg/kg	—	—	—	—	170	166	226	179	173	35.5	9	40.6	30.6	29.7	171	186	74.6	115	140	115	145	78	67.9	134	<1	359	44.31642	27.5	167.4
Zinc (Zn)	mg/kg	315	123	120	820	104	119	**132**	108	117	32.7	78	53.6	45.8	45.9	**213**	**180**	66.2	94.4	111	93	116	**145**	**169**	134	<1	213	57.02015	46.65	120.4
Zirconium	mg/kg	—	—	—	—	16.8	11.4				5.1	2.5				19.3	25.4	10.3					7.7	34.5	56	0	34.5	5.498214	3.8	17.425
Polycyclic Aromatic Hydrocarbons (PAHs)[g]																														
1-Methylnaphthalene	mg/kg	0.0889	0.00671	—	—	<0.25	<0.050	<0.25			<0.10	<0.25	<0.15			<0.25	<0.25	<0.10	<0.15	<0.15			<0.25	<0.25	84	<0.05	2.7	0.227381	0.2	0.5
2-Methylnaphthalene	mg/kg	0.128	0.00587	—	—	<0.25	<0.050	<0.25			<0.10	<0.25	<0.15			<0.25	<0.25	<0.10	<0.15	<0.15			<0.25	<0.25	84	<0.05	68.5	1.010762	0.2	0.5
Acenaphthene	mg/kg	—	—	—	—	<0.25	<0.050	<0.25			<0.10	<0.25	<0.15			<0.25	<0.25	<0.10	<0.15	<0.15			<0.25	<0.25	84	<0.05	0.5	0.197024	0.2	0.5
Acenaphthylene	mg/kg	0.245	0.0469	—	—	<0.25	<0.050	<0.25			<0.10	<0.25	<0.15			<0.25	<0.25	<0.10	<0.15	<0.15			<0.25	<0.25	84	<0.05	0.5	0.197024	0.2	0.5
Acridine	mg/kg	0.385	0.0317	0.00032	1.48	<4.0	<0.80	<4.0			<1.6	<4.0	<2.4			<4.0	<4.0	<1.6	<2.4	<2.4			<4.0	<4.0	84	<0.15	8	3.125595	3.2	8
Anthracene	mg/kg	0.782	0.0319	0.00024	1.34	<0.25	<0.050	<0.25			<0.10	<0.25	<0.15			<0.25	<0.25	<0.10	<0.15	<0.15			<0.25	<0.25	84	<0.05	0.5	0.197024	0.2	0.5
Benz(a)anthracene	mg/kg	—	—	0.00017	0.32			<0.25					<0.15						<0.15	<0.15					29	<0.05	0.5	0.17069	0.15	0.25
Benzo(b&j)fluoranthene	mg/kg	—	—	0.00037	1.44	<0.25	**0.064**	<0.25			<0.10	<0.25	<0.15			<0.25	<0.25	<0.10	<0.15	<0.15			<0.25	<0.25	84	<0.05	0.5	0.19719	0.2	0.5
Benzo(g,h,i)perylene	mg/kg	—	—	—	—	<0.25	0.065	<0.25			<0.10	<0.25	<0.15			<0.25	<0.25	<0.10	<0.15	<0.15			<0.25	<0.25	84	<0.05	0.5	0.196131	0.2	0.5
Benzo(k)fluoranthene	mg/kg	0.862	0.0571	0.00034	0.46	<0.10	**0.041**	<0.10			<0.040	<0.10	<0.060			<0.10	<0.10	<0.040	<0.060	<0.060			<0.10	<0.10	84	<0.02	0.2	0.081345	0.08	0.2
Benzo(a)pyrene	mg/kg	0.135	0.00622	0.00006	0.13	<0.10	**0.038**	<0.10			<0.040	<0.10	<0.060			<0.10	<0.10	<0.040	<0.060	<0.060			<0.10	<0.10	84	<0.02	0.2	0.08069	0.08	0.2
Chrysene	mg/kg	2.355	0.111	0.00075	1.02	<0.25	<0.050	<0.25			<0.10	<0.25	<0.15			<0.25	<0.25	<0.10	<0.15	<0.15			<0.25	<0.25	84	<0.05	0.5	0.197024	0.2	0.5
Dibenzo(a,h)anthracene	mg/kg	0.144	0.0212	0.00019	0.16	<0.25	<0.050	<0.25			<0.10	<0.25	<0.15			<0.25	<0.25	<0.10	<0.15	<0.15			<0.25	<0.25	84	<0.05	0.5	0.195952	0.2	0.5
Fluoranthene	mg/kg	—	—	0.0002	0.32	<0.25	**0.067**	<0.25			<0.10	<0.25	<0.15			<0.25	<0.25	<0.10	<0.15	<0.15			<0.25	<0.25	84	<0.05	0.5	0.197226	0.2	0.5
Fluorene	mg/kg	—	—	—	—	<0.25	<0.050	<0.25			<0.10	<0.25	<0.15			<0.25	<0.25	<0.10	<0.15	<0.15			<0.25	<0.25	84	<0.05	0.5	0.197024	0.2	0.5
Indeno(1,2,3-cd)pyrene	mg/kg	0.201	0.0202	—	—	<0.25	0.073	<0.25			<0.10	<0.25	<0.15			<0.25	<0.25	<0.10	<0.15	<0.15			<0.25	<0.25	84	<0.05	0.5	0.197298	0.2	0.5
Naphthalene	mg/kg	0.391	0.0346	—	—	<0.050	<0.010	<0.050			<0.020	<0.050	<0.030			<0.050	<0.050	<0.020	<0.030	<0.030			<0.050	<0.050	84	<0.01	0.15	0.040833	0.04	0.1
Phenanthrene	mg/kg	0.515	0.0419	0.00056	0.95	<0.15	<0.030	<0.15			<0.060	<0.15	<0.090			<0.15	<0.15	<0.060	<0.090	<0.090			<0.15	<0.15	84	<0.03	0.3	0.118929	0.12	0.3
Pyrene	mg/kg	0.875	0.053	0.00049	0.85	<0.25	**0.061**	<0.25			<0.10	<0.25	<0.15			<0.25	<0.25	<0.10	<0.15	<0.15			<0.25	<0.25	84	<0.03	0.5	0.195726	0.2	0.5
Quinoline	mg/kg	—	—	—	—	<0.25	<0.050	<0.25			<0.10	<0.25	<0.15			<0.25	<0.25	<0.10	<0.15	<0.15			<0.25	<0.25	84	<0.05	0.5	0.19631	0.2	0.5
Polychlorinated Biphenyls (PCBs)[g]																														
Aroclor 1254	mg/kg	3.4	0.6	—	—	<0.075	<0.25	<0.050			<0.030	<0.050	<0.030			<0.25	<0.050	<0.020	<0.030	<0.030			<0.25	<0.050	84	<0.01	0.5	0.10375	0.05	0.5
Total PCBs	mg/kg	2.77	0.341	—	—	<0.15	<0.50	<0.10			<0.060	<0.10	<0.060			<0.50	<0.10	<0.040	<0.060	<0.060			<0.50	<0.10	84	<0.02	1	0.207143	0.1	1
2-Fluorobiphenyl	%	—	—	—	—	76	104	101			119	98	104			90	82	97	100	100			103	97	84	<0.15	119	99.71607	102	111
p-Terphenyl d14	%	—	—	—	—	84	108	96			116	106	108			93	84	110	101	95			110	98	84	<0.15	118	102.7994	104.5	116
Aroclor 1242	mg/kg	—	—	—	—	<0.075	<0.25	<0.065			<0.030	<0.050	<0.030			<0.25	<0.050	<0.020	<0.030	<0.030			<0.25	<0.050	84	<0.01	98	1.271262	0.05	0.5
Aroclor 1248	mg/kg	—	—	—	—	<0.075	<0.25	<0.050			<0.030	<0.050	<0.030			<0.25	<0.050	<0.020	<0.030	<0.030			<0.25	<0.050	84	<0.01	0.5	0.104345	0.05	0.5
Aroclor 1260	mg/kg	—	—	—	—	<0.075	<0.25	<0.050			<0.030	<0.050	<0.030			<0.25	<0.050	<0.020	<0.030	<0.030			<0.25	<0.050	84	<0.01	0.5	0.10375	0.05	0.5
d14-Terphenyl	%	—	—	—	—	132	118	112			128		113			93	84		119	109			97		65	70	132	103.8308	109	119
Silicon (Si)	mg/kg	—	—	—	—	1680	947				855	677				941	822	746					1400	2130	55	<0.06	8630	1501.201	957	4114

Notes:

(a) Canadian Council of Environment Ministers (CCME)
(b) Ontario Ministry of Environment and Energy (MOEE)
(c) CCME Sediment quality guidelines for the protection of aquatic life: Probable Effect Level (PEL), Freshwater, 2002
(d) CCME Sediment quality guidelines for the protection of aquatic life: Interim Sediment Quality Guideline (ISQG), Freshwater, 2003
(e) MOEE Provincial Sediment Quality Guidelines (PSQG): Lowest Effect Level (LEL), 1993
(f) MOEE Provincial Sediment Quality Guidelines (PSQG): Severe Effect Level (SEL), 1994
(g) Blank cells indicate parameters that were not analyzed either due to non detection in previous campaigns, or were missing from the laboratory analytical suite.
— = A dash indicates that guideline criteria are not available for this parameter.

1.0	Value greater the Freshwater PEL (CCME) guideline
1.0	Value greater the Freshwater ISQG (CCME) guideline
1.0	Value greater than the LEL (MOEE) guideline
1.0	Value greater than the SEL (MOEE) guideline
	Where cells are blank, analysis was not performed during this time period.

APPENDIX 3.I

Field Parameters Results for Water Column Profiles

FIGURE 1
Field Parameter Results for Mitta Lake Water Column Profile

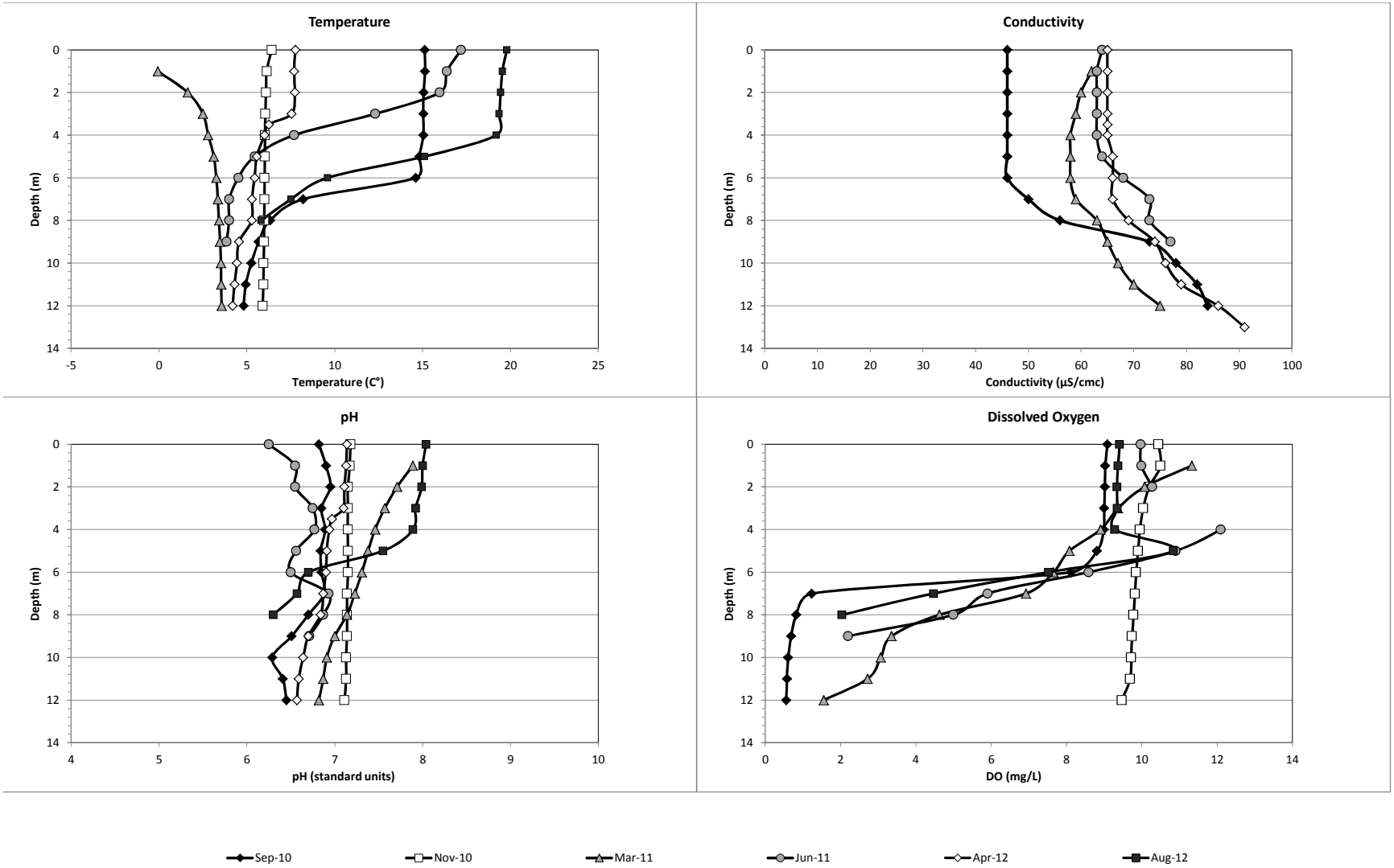

FIGURE 2
Field Parameter Results for Lizard Lake Water Column Profile

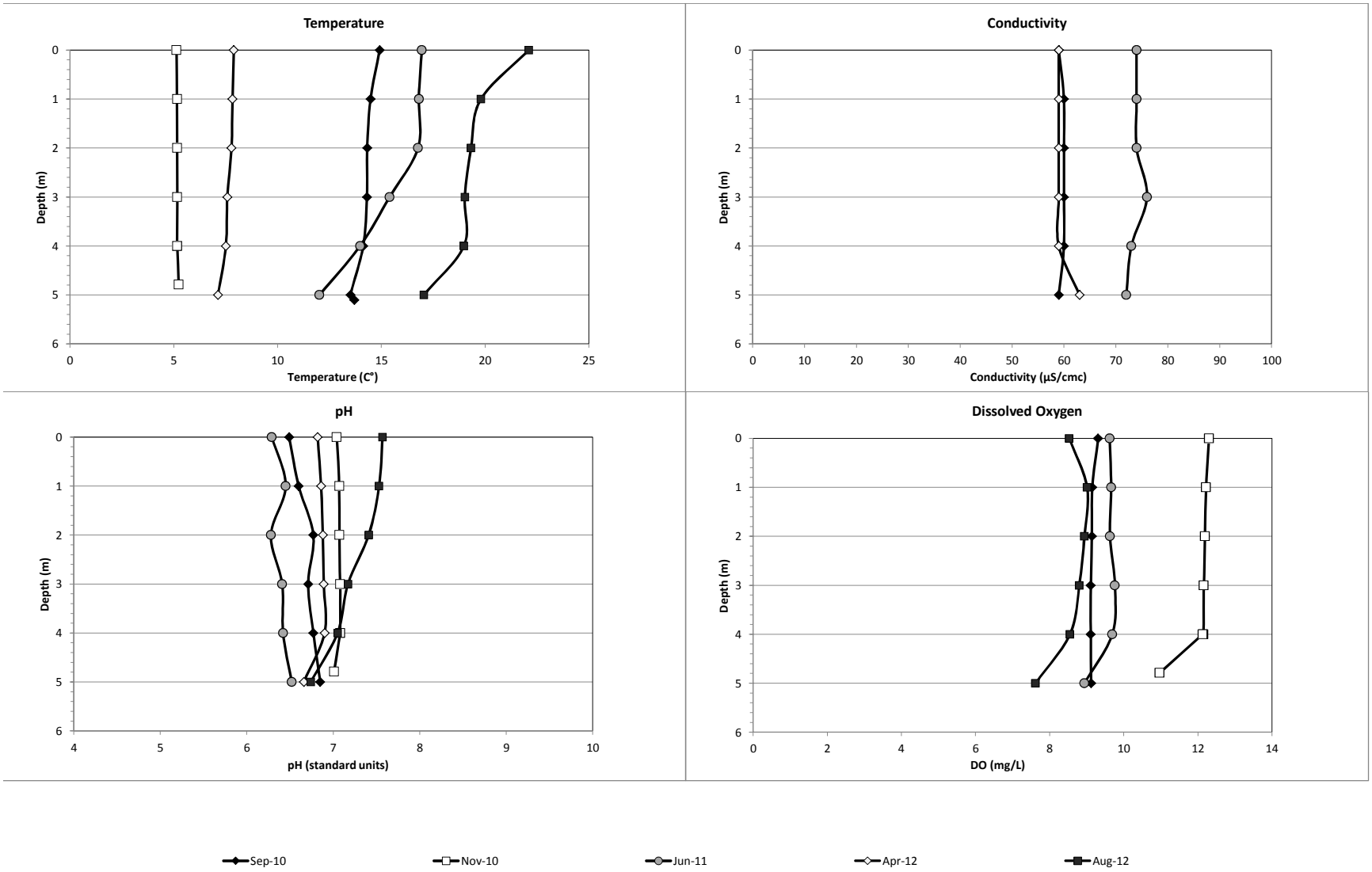

FIGURE 3
Field Parameter Results for Sawbill Bay Water Column Profile

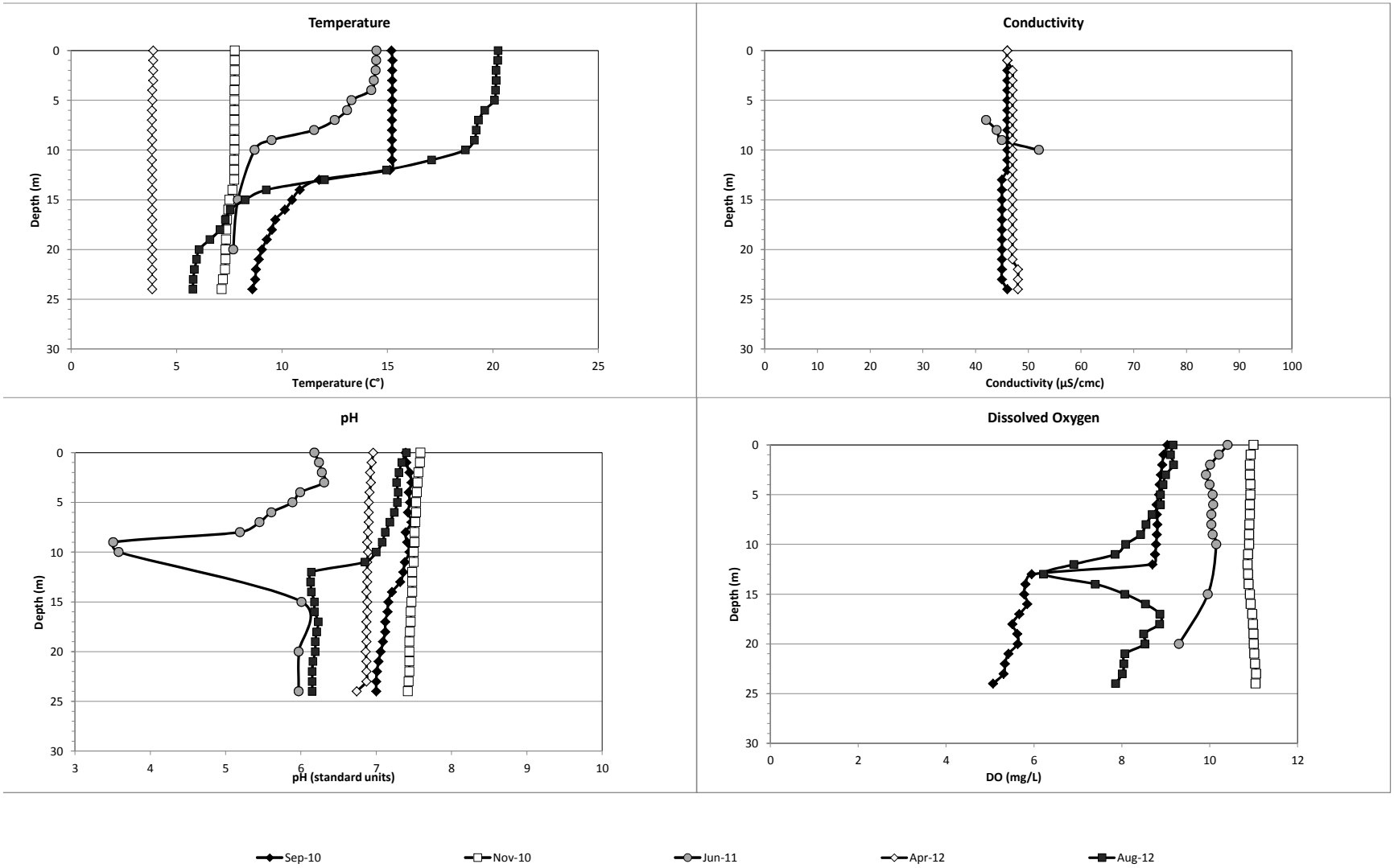

FIGURE 4
Field Parameter Results for Light Bay Water Column Profile

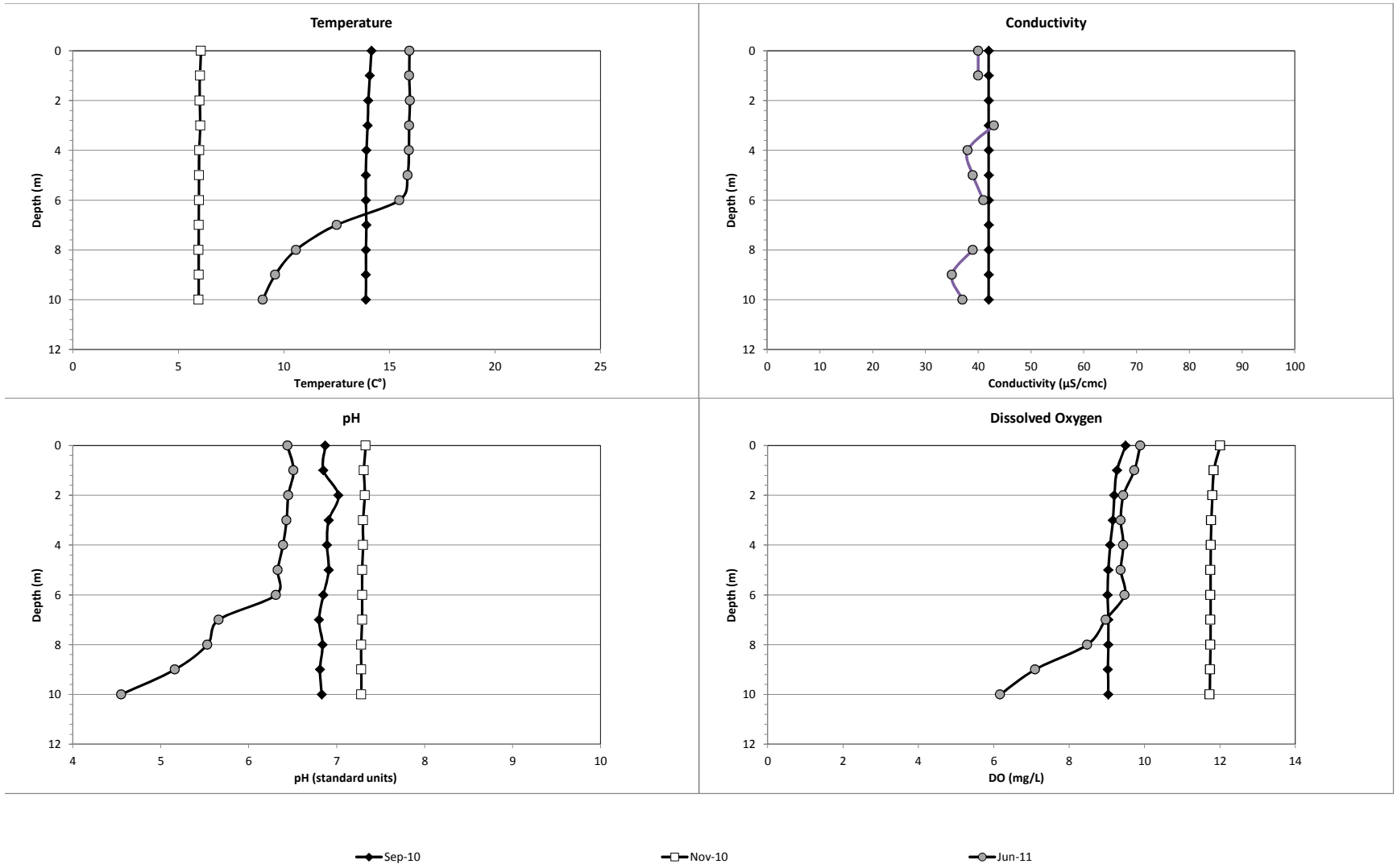

FIGURE 5
Field Parameter Results for Hawk Bay Water Column Profile

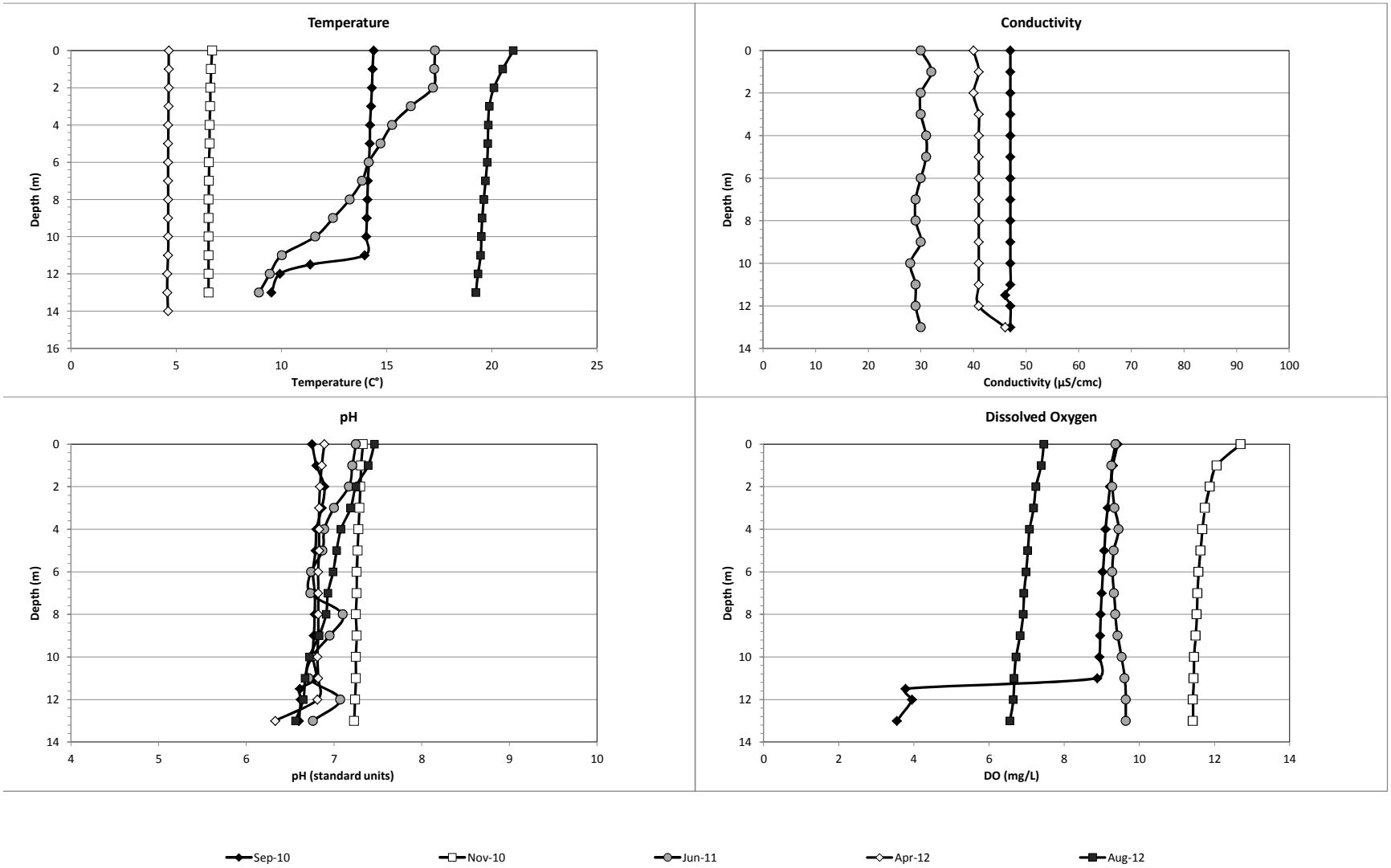

FIGURE 6
Field Parameter Results for Turtle Bay Water Column Profile

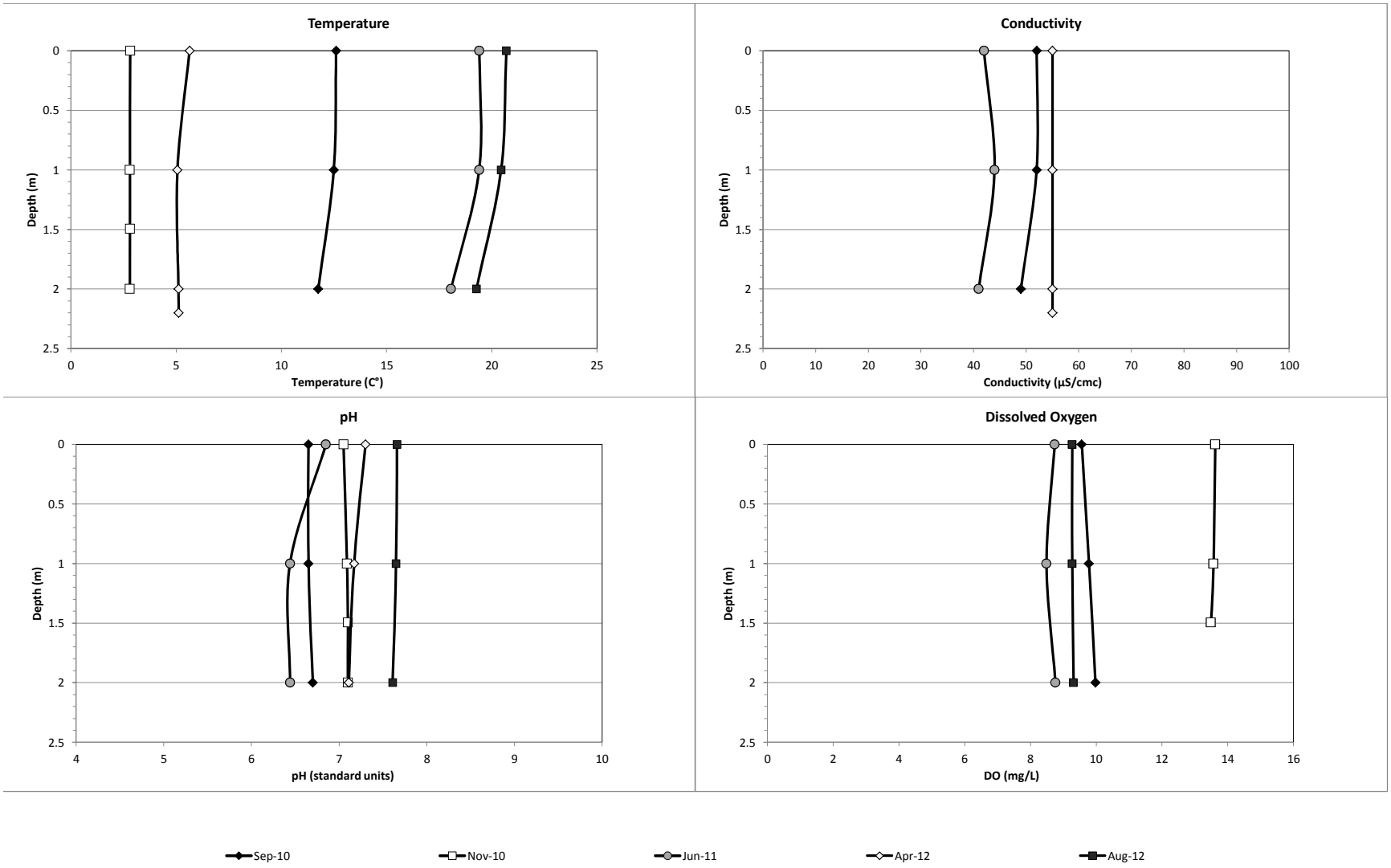

FIGURE 7
Field Parameter Results for Lynxhead Bay Water Column Profile

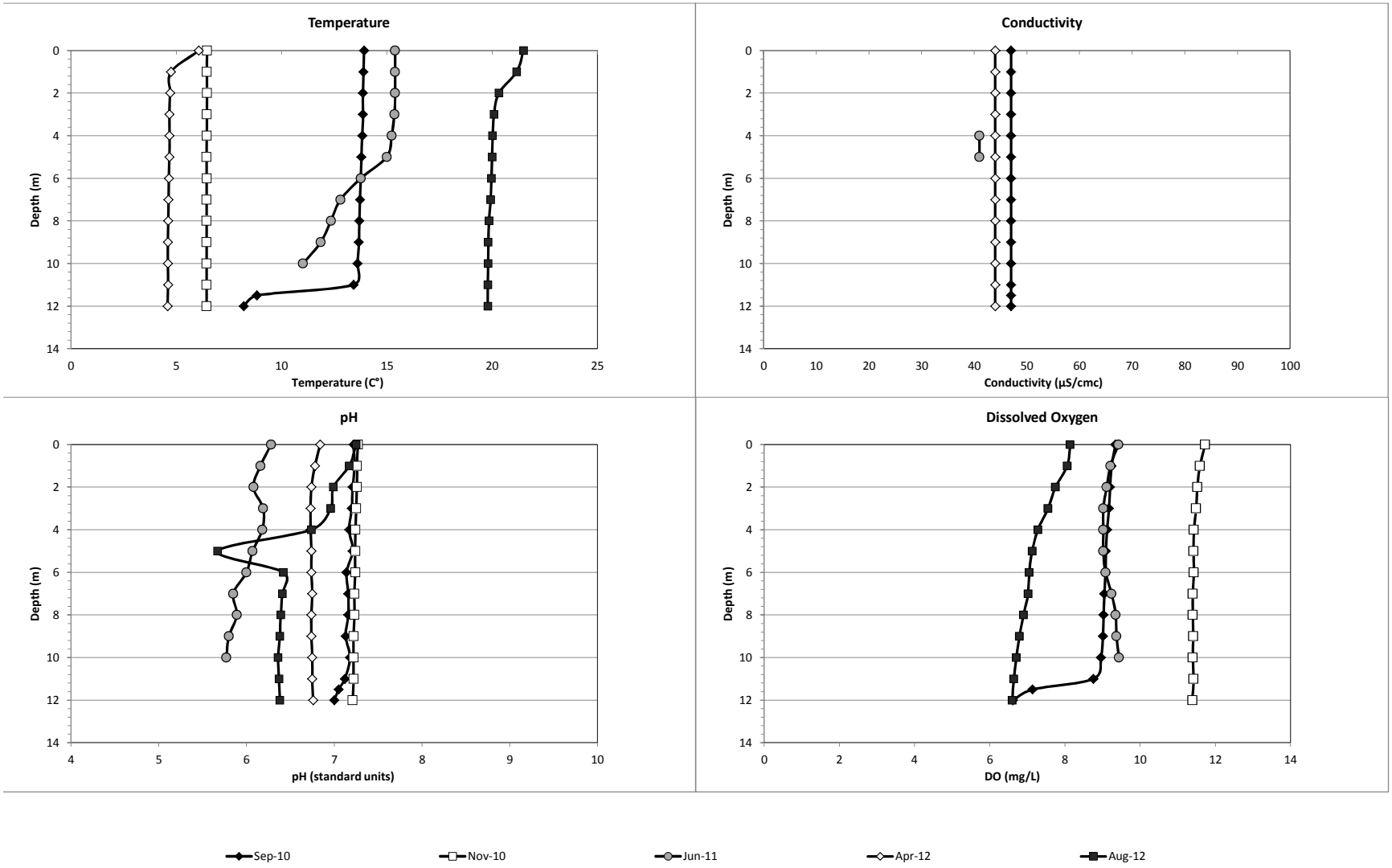

FIGURE 8
Field Parameter Results for Premier Lake Water Column Profile