

# Okanagan Lake Collaborative Monitoring Agreement 2012 Summary Report

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**BC Ministry of Environment  
Environmental Protection Division  
Penticton**

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## Executive Summary

Shared stewardship of water resources has been identified as a priority by local governments and the province of BC. To incrementally further this ambition, a Memorandum of Understanding (MOU) between BC Ministry of Environment, the City of Kelowna, Regional District of Central Okanagan and the District of Summerland, established a framework in 2010, for implementing a cost-shared monitoring program of Okanagan Lake. 2011 was the inaugural year for the Collaborative Monitoring Program for Okanagan Lake. A subsequent MOU was signed for 3 years of monitoring (2012-2014). Sampling of Okanagan Lake in 2012 was carried out on 7 dates, 5 through a contract, and 2 as part of the regular BC Ministry of Environment spring-fall sampling program on all mainstem Okanagan basin lakes. The data demonstrates that the main body of Okanagan Lake in 2012 met most water quality objectives set for the lake in 2005, with the exception of spring total nitrogen in the three main lake basins. The data provide important information to a long-term database necessary for guiding Liquid Waste Management Planning within the Okanagan Basin. Contracted sample collection services and laboratory services for 2012, totalled \$21,545.20. It is recommended that the sampling continue for 2013, with annual review and amendment, to reflect any mutually agreed upon technical or administrative changes. One recommended change is to modify phytoplankton biomass analyses, as they were consistently below detection levels.

## Introduction

### Background and Context:

Living Water Smart, the provinces vision and commitment to ensuring that our water stays healthy and secure for future generations, closely aligns with the guiding principles of the Okanagan Basin Water Boards Okanagan Sustainable Water Strategy. In both, share stewardship is promoted as key to the sustainability of significant BC freshwater resources. Okanagan Lake is arguably the single most important freshwater body to the Okanagan economy. Sustainable long-term management of this common resource requires investment in science-based information to support and inform decisions made by local and provincial governments. In particular, timely and integrated water quality information is fundamental to liquid waste management, as well as drinking water management within the Okanagan basin. Municipal liquid waste management within the Okanagan has benefited from a long history of investment in advanced waste water treatment. Indeed, utilization of the best available control technology to manage municipal effluents places the Okanagan in a leadership position, within BC and Canada. Water science information supports and confirms the success of these investments. Nevertheless, approximately 18 Mm<sup>3</sup>/yr of tertiary effluent is discharged annually to Okanagan Lake, from which approximately 100,000 people obtain some portion of their drinking water. In 2010, the municipal effluent volume was approximately 5% of inflow to Okanagan Lake in a low flow year, and is expected to become a larger proportion as the population grows and climate change potentially provides less effective inflow to the lake. Waste management in the basin has primarily focused on phosphorus removal from municipal effluents in order to prevent eutrophication of the lakes. As the population continues to increase, phosphorus loading is again increasing in some lakes. As the volume of effluent grows, there is a responsibility for ensuring sufficient information is gathered to understand

how and why Okanagan Lake changes over time. To understand the condition of Okanagan Lake in relation to conventional and emerging contaminants, proactive, collaborative and integrated monitoring at the basin level is desirable to ensure sustainability.

Local and provincial agencies have monitored Okanagan Lake quality intermittently over many decades. While this information has been useful, this information was not well integrated and could not specifically address the Okanagan Lake water quality objectives prepared in 2005

([http://www.env.gov.bc.ca/wat/wq/objectives/oklakes\\_update\\_over/index.html](http://www.env.gov.bc.ca/wat/wq/objectives/oklakes_update_over/index.html); Nordin, 2005).

Furthermore, testing of sediments for changes near wastewater outfalls, as an early indicator of impact, has not been carried out to date. Similarly, testing for various emerging contaminants of concern is not possible with the existing resourcing. Without local government collaboration, a comprehensive water quality monitoring and reporting program cannot be accomplished by the Ministry of Environment. To address these issues, a collaborative monitoring and reporting program was established with the City of Kelowna, Regional District of Central Okanagan and the District of Summerland in late-2010.

### **Purpose of Collaborative Monitoring of Okanagan Lake**

The collaborative monitoring program on Okanagan Lake combines resources from three local governments and the province, to provide high quality, integrated, and timely water quality information to guide Liquid Waste Management Planning and manage Okanagan Lake into the future. A primary function of the monitoring is to determine attainment of Okanagan Lake water quality objectives (Appendix A). This function has been made possible through this partnership. Over time, and with the support of other local governments, this program may be expanded to address similar issues on other lakes in the basin, or address emerging issues of common concern.

### **Okanagan Lake Collaborative Monitoring Agreement**

The initial 2010 Memorandum of Understanding (MOU) provided a framework for cost shared collaborative monitoring of Okanagan Lake as developed and signed on October 26, 2010 by the BC Ministry of Environment (MOE), City of Kelowna, Regional District of Central Okanagan and the District of Summerland (Appendix B). The MOU set a 1-year term to the agreement, ending December 31, 2011. The MOU required that a Technical Advisory Group meet to review the results, determine monitoring priorities, disperse any remaining funds, and if mutually agreed, re-negotiate the MOU for a subsequent term. The MOU established an approximate flow proportionate, cost shared budget (\$22,000) for the collection of samples and lab charges associated with the monitoring program necessary to check attainment of the water quality objectives for Okanagan Lake. In early-2012, a 3-year MOU (2012-2014) was signed by all three participating municipalities and the province. This MOU outlined a multi-year monitoring program, following the same protocols as the initial 2011 agreement.

## **Collaborative Monitoring Agreement Implementation - 2012**

### **Sample Collection Contract**

An invitation to quote (ITQ) for sample collection services was issued on November 28, 2011, to the following suitably qualified local contractors:

1. Larratt Aquatic Consulting, West Kelowna.
2. Okanagan Nation Alliance, West Kelowna.

The contractors submitted comprehensive and competitively priced bids. Larratt Aquatic Consulting provided the lowest priced bid at \$8,315.00. A contract (general service agreement - GS12PNE300) was awarded to Larratt Aquatic Consulting on February 02, 2012 (Appendix C).

### **Sampling Program Implementation**

Ministry of Environment (MOE) staff collected the first (March) and last (September) samples at 4 sites on Okanagan Lake (Figure 1). Larratt Aquatic Consulting collected five monthly samples at the same four sites on Okanagan Lake, as per the contract. A MOE employee observed sample collection on the first date and at the first site, to ensure methods and quality assurance procedures were implemented as per the contract. Samples were shipped on the day of collection to Maxxam Analytics in Burnaby, and data returned to MOE staff in Penticton for collation and quality control checks. All data is stored in the BC MOE database and files, and are available upon request.

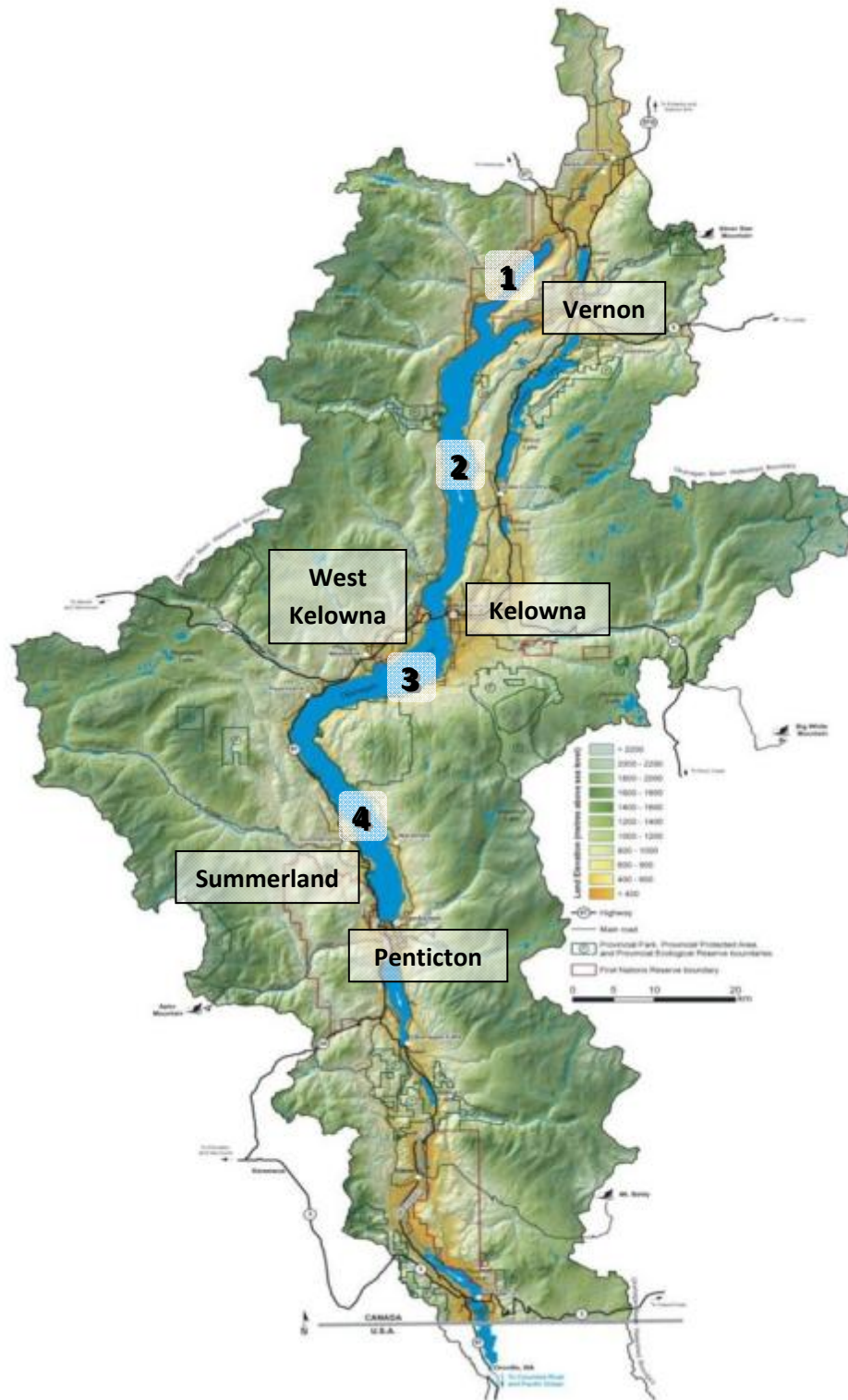


Figure 1. Map of the Okanagan basin watershed, indicating sampling sites in four Okanagan Lake basins. 1 = Armstrong Arm, 2 = Ok Centre (north basin), 3 = Kelowna (central basin), and 4 = Summerland (south basin).  
 Map modified from: Turner, RJW et al., 2006. *Okanagan Basin Waterscape*; Geological Survey of Canada, Miscellaneous report 93.

## Water Quality Objectives Attainment and Seasonal Trends

Water quality samples for nutrients and general ions, phytoplankton chlorophyll-*a*, water clarity, temperature and dissolved oxygen profiles were collected at all 4 sites. This data is summarized in Table 1, and compared against the water quality objectives for Okanagan Lake. All water chemistry data is provided in Appendix D.

Briefly, the water chemistry data demonstrated that Okanagan Lake water quality was good and most water quality objectives were met in 2012. On the basis of concentrations of nitrogen, phosphorus, phytoplankton chlorophyll-*a*, and Secchi depth, the main body of Okanagan Lake would be considered oligotrophic, while Armstrong Arm would be considered mesotrophic.

Table 1. Water quality objectives and 2012 attainment for four sites in Okanagan Lake.

<b>Water Quality Objectives</b>					
Lake Site	Seasonal (April-Sept) Secchi (m)	Seasonal (April-Sept) Chl- <i>a</i> (µg/L)	Spring TP (mg/L)	Spring TN (mg/L)	DO @ bottom (mg/L)
Summerland	≥ 7	≤ 4.0	≤ 0.007	≤ 0.230	-
Kelowna	≥ 6	≤ 4.5	≤ 0.008	≤ 0.230	-
Ok Centre	≥ 6	≤ 4.5	≤ 0.008	≤ 0.230	-
Armstrong Arm	≥ 5	≤ 5.0	≤ 0.010	≤ 0.250	≥ 5

<b>2012 Objectives Attainment</b>					
Lake Site	Seasonal (April-Sept) Secchi (m)	Seasonal (April-Sept) Chl- <i>a</i> (µg/L)	Spring TP (mg/L)	Spring TN (mg/L)	DO @ bottom (mg/L)
Summerland	7.4	1.4	0.003	0.232	-
Kelowna	6.9	1.6	0.005	0.247	-
Ok Centre	7.5	1.8	0.005	0.267	-
Armstrong Arm	3.9	2.2	0.007	0.229	3.4 (Aug) & 3.0 (Sept)

Key: Objective Not Met Objective Met

Seasonal changes in water clarity in Okanagan Lake corresponded in part to changes in algal abundance. Generally, over the growing season, as phytoplankton chlorophyll-*a* increased, Secchi depth decreased (Figure 2). Water clarity was high in the early spring and decreased as algal production increased. Following the spring algae bloom, water clarity became progressively clearer into the fall. Continued collection of chlorophyll-*a* samples and Secchi depth measurements is recommended.



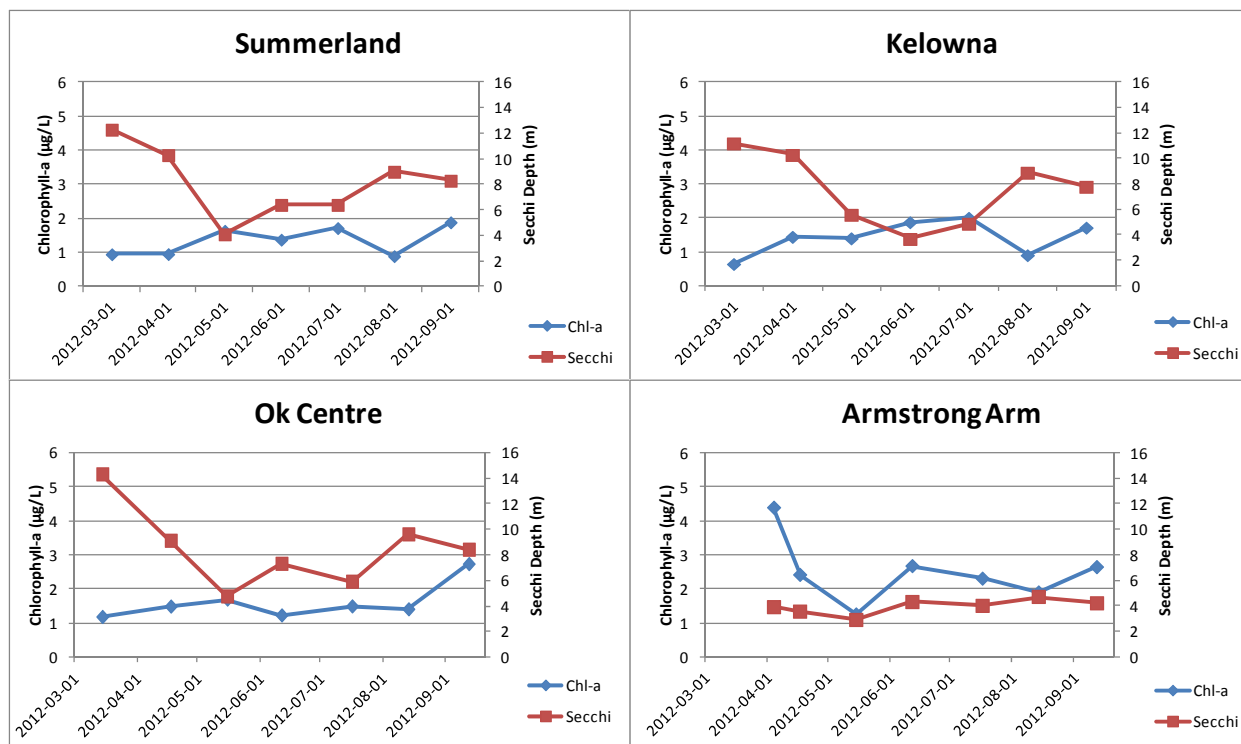


Figure 2. 2012 Secchi Depth and chlorophyll-a concentrations at four sites in Okanagan Lake.

Silica concentrations did not vary widely between sites (mean range = 6.4 – 7.3 mg/L), but exhibited seasonal patterns that were most likely related to diatom algae production. Following algal blooms, concentrations of silica were highest in the early spring, then decreased throughout the summer and increased slightly again in September. (Appendix E). Continued collection of silica samples is of lower priority, however, financial savings would be minimal.

Phosphorus concentrations were generally quite low in Okanagan Lake. The three main lake basins exhibited some seasonal variation, with low phosphorus concentrations in March and September, and generally higher levels in April-June. These three basins were similarly low, whereas Armstrong Arm phosphorus concentrations were higher, especially in late-summer/early-fall hypolimnetic waters (Appendix F). Total dissolved phosphorus concentrations and variation were similar to total phosphorus. Ortho phosphorus was generally quite low, with the exception of July to September samples in Armstrong Arm. Continued collection of total phosphorus and total dissolved phosphorus is recommended.

Like phosphorus, nitrogen levels in Okanagan Lake were relatively low. Ammonia and  $\text{NO}_2 + \text{NO}_3$  were low throughout the year, but decreased in the epilimnion following thermal stratification (Appendix G). In the three main basins, total nitrogen was generally higher than in 2011. However, there was less variation throughout the year, and no discernible trends. Continued collection of all nitrogen species is recommended.

Temperature profiles were similar at all four sites and the seasonal progression exhibited is typical of north temperate lakes. In the spring, the lake was cold and well mixed, and temperatures did not vary much with depth. As the season progressed and air temperatures rose, the lake became thermally stratified with warm water in the epilimnion (upper ~10 m) and relatively cold water in the hypolimnion (below ~20m). Armstrong arm was typically warmer than the main lake basins, due to the shallower nature of this part of the lake.

Dissolved oxygen (DO) profiles followed similar seasonal patterns in the south, central and north basins. These basins exhibited orthograde profiles, with high DO concentrations in the spring and decreasing concentrations in the epilimnion as temperatures gradually increased throughout the summer (Figure 2). Conversely, Armstrong Arm is more eutrophic than the other basins and exhibited a clinograde profile. During spring turnover, Armstrong Arm had high DO concentrations and a subsequent depletion of oxygen in the hypolimnion occurred in the summer with increased biological oxidation of organic matter (Figure 2). Continued collection of temperature and dissolved oxygen profiles is recommended.

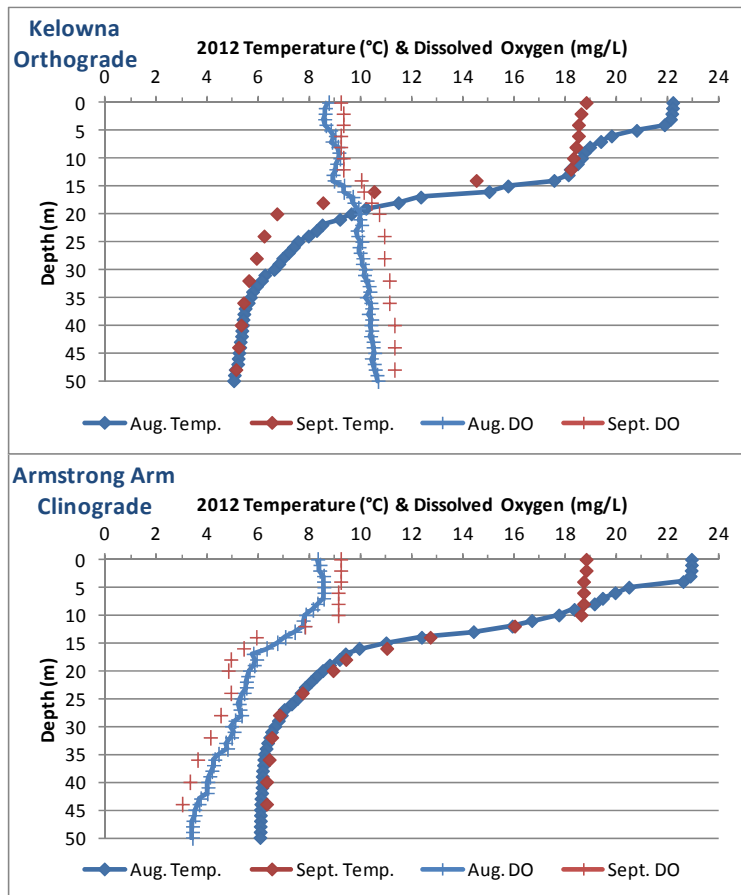


Figure 3. 2012 water column temperature and dissolved oxygen in two Okanagan Lake basins exhibiting orthograde (Kelowna) and clinograde (Armstrong Arm) profiles.

Samples for phytoplankton and zooplankton abundance and taxonomic composition were collected at the central and southern sites (Appendix H). Phytoplankton communities were very diverse with many species present, however, there were only a few species that were most dominant. These communities were quite similar at both sites, with minor seasonal differences in various species abundances. Generally, a successional pattern began with a spring peak of diatoms and flagellates followed by a summer assemblage dominated by cyanophytes which persisted into the fall when diatoms and flagellates typically regained dominance. Phytoplankton objectives for Okanagan Lake indicate that less than 5% of the phytoplankton biomass (growing season [April to September] mean should be composed of nitrogen-fixing cyanobacteria species (i.e., species with heterocysts). In 2011, the central and south sites were slightly above this (6.4% and 6.6%, respectively), however in 2012 the percentages were much lower at 1.5% and 1.4%, respectively

Zooplankton diversity was much lower than phytoplankton, but is comparable to other large lakes in BC. Similar zooplankton species were found at both the central and south sites, and were dominated by copepods throughout the year, with cladocerans emerging in late summer and fall. There were differences in abundances throughout the year, as the central site had higher zooplankton abundances in the spring, while the south site had higher populations in the late-summer and fall. Another difference between sites is that on average, there were more cladocerans in the south site compared to the central site. Zooplankton objectives for Okanagan Lake indicate that there should be a minimum of 5% by numbers of cladocerans (averaged over the growing season) in the zooplankton community. Both sites achieved this with the central site having a value of 7.3%, and the south site with a value of 12% (both up from 2011 values of 4.2% and 8.7%). The objectives also note that there should be no significant change in dominant species. The dominant species that were present in Okanagan Lake (and have been over the past 30 years) are used as indicators of biological change; these include the calanoid copepod *Leptodiapomus ashlandi*, the cyclopoid copepod *Diacyclops bicuspidatus thomasi* and the cladocerans *Daphnia galeata mendotae*, *Diaphanasoma* and *Bosmina*. These dominant species were found at both sampling sites in 2011 and 2012, and there appears to be no significant changes.

Along with taxonomy, phytoplankton and zooplankton biomass measurements were also examined in 2012 (Table 2). Phytoplankton biomass was consistently below detection values, except for one value in the central basin (Kelowna) in June. This indicates that an insufficient volume of water was collected for this analysis and needs to be increased for subsequent sampling seasons. Average zooplankton biomass was similar in both basins, with the central basin being slightly higher.

Table 2. Ash-free dry-mass (g) of 2012 seasonal zooplankton and phytoplankton samples.

AFDM (g)							
Zooplankton	April	May	June	July	August	September	Avg.
<b>Kelowna</b>	0.0208	0.0184	0.0371	0.0181	0.0194	0.0122	0.0210
<b>Summerland</b>	0.0507	0.0164	0.0080	0.0163	0.0150	0.0119	0.0197
Phytoplankton	April	May	June	July	August	September	Avg.
<b>Kelowna</b>	<0.002	<0.002	0.0028	<0.002	<0.002	<0.002	-
<b>Summerland</b>	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-

## Summary of Program Costs

### Sample Collection Contract

Larratt Aquatic Consulting Ltd. sample collection charges were delivered on budget at: \$9,312.80. Refer to Appendix I for copies of individual invoices.

### Laboratory Analysis Costs

- Maxxam analytical costs for water chemistry and chlorophyll-*a* analyses totalled: \$3,933.44. A final Year End statement is attached in Appendix J.
- Fraser Environmental costs for phytoplankton and zooplankton analytical costs totalled: \$8,299.16. Refer to Appendix K for copies of individual invoices.

### Summary of Program Costs 2012

A balance of \$454.60 remains from the 2012 budget, and will be carried over into next year's budget. This ~2% surplus may be needed as a contingency fund for any potentially minor laboratory fee increases for the 2013 sampling year. Refer to Table 3 for the Statement of Accounts summary.

Table 3. Statement of accounts summary for Okanagan collaborative monitoring agreement, 2012.

Parameter	Supplier	March	April	May	June	July	August	September	Totals
Sample Collection	Larratt Aquatic Consulting	MOE	\$1,862.56	\$1,862.56	\$1,862.56	\$1,862.56	\$1,862.56	MOE	\$9,312.80
Water Chemistry	Maxxam Analytics	MOE	\$716.80	\$891.52	\$716.80	\$891.52	\$716.80	MOE	\$3,933.44
Plankton Analyses	Fraser Environmental	-	\$1,325.62	\$1,325.62	\$1,411.98	\$1,411.98	\$1,411.98	\$1,411.98	\$8,299.16
								<b>Grand Total</b>	\$21,545.40
								<b>Budget</b>	\$22,000.00
								<b>Balance</b>	\$454.60

### MOE In-kind and direct costs

In 2012, the MOE contributed approximately 105 hours for development of the MOU, contract tendering, contract and data management, report writing, and sample collection in spring and fall. Approximately \$1300 was spent on laboratory costs.

## Recommendations

- Partners to the MOU are encouraged to post the final version of this report on their web sites and refer to the web site address in their respective annual reports required under appropriate Environmental Management Act authorizations.
- Data from the phytoplankton biomass analyses in 2012 indicate that most results were below detection values. This likely means that the 1 L sample is not enough water volume to accurately assess biomass in Okanagan Lake. It is recommended that either a larger volume of water be sampled, or a vertical haul using a fine-mesh plankton net.

- Renewal of the original agreement for a 3-year term was agreed upon in early 2012. This addressed the Ministry's need to ensure continuity and effective program management, and accommodated local governments budgetary time lines. Sampling in 2013 will be the second year of this agreement, and is recommended to remain the same with the above noted change for phytoplankton biomass.

## Appendix A: Okanagan Lake Water Quality Objectives (Nordin, 2005)

	North Basin	Central Basin	South Basin	Armstrong Arm
Secchi disc Transparency (m) (growing season average)	6	6	7	5
Dissolved Oxygen	-	-	-	5 mg/L min in bottom waters
Total Phosphorus (µg/L) (at spring overturn)	8	8	7	10
Chlorophyll-a (µg/L) (growing season average)	4.5	4.5	4	5
Total Nitrogen (µg/L) (maximum)	230	230	230	250
N:P ratio (spring .weight ratio)	>25:1	>25:1	>25:1	>25:1
Phytoplankton Structure (heterocystous cyanobacteria by numbers)	<5%	<5%	<5%	<5%
Phytoplankton growing season average biomass	<0.75 g/m <sup>3</sup>	<0.75 g/ m <sup>3</sup>	<0.75 g/ m <sup>3</sup>	<0.75 g/ m <sup>3</sup>
Zooplankton designated species mix minimum biomass	50 ug/ m <sup>3</sup>	50 ug/ m <sup>3</sup>	50 ug/ m <sup>3</sup>	50 ug/ m <sup>3</sup>
Zooplankton Structure (minimum of cladoceran by numbers)	5%	5%	5%	5%
Contaminants in fish tissue and <i>Mysis</i> tissue	Below human consumption and wildlife protection guidelines	Below human consumption and wildlife protection guidelines	Below human consumption and wildlife protection guidelines	Below human consumption and wildlife protection guidelines

Nordin, R.N. 2005. Water quality objectives for Okanagan Lake, a first update. Prepared for the BC Ministry of Water Land and Air Protection, Penticton, BC. 44p.

## **Appendix B: Memorandum of Understanding 2012-2014**

### **MEMORANDUM OF UNDERSTANDING**

**BETWEEN**

**MINISTRY OF ENVIRONMENT  
GOVERNMENT OF THE PROVINCE OF  
BRITISH COLUMBIA**

**AND**

**THE CITY OF KELOWNA**

**AND**

**THE REGIONAL DISTRICT OF CENTRAL OKANAGAN**

**AND**

**THE DISTRICT OF SUMMERLAND**

***RESPECTING***

***THE Okanagan Lake Collaborative Monitoring Agreement for  
2012-2014***

**MEMORANDUM OF UNDERSTANDING**

***RESPECTING***

*Okanagan Lake Collaborative Monitoring Agreement*  
for years **2012 to 2014**

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**BETWEEN:**

Government of the Province of British Columbia  
As Represented by  
Michael Sokal, Impact Assessment Biologist of the  
Environmental Protection Division  
Ministry of Environment

(hereinafter referred to as the “MOE”)

**AND**

City of Kelowna  
As Represented by  
Mike Gosselin, Supervisor Wastewater Treatment Operations

Regional District of Central Okanagan  
As Represented by  
Angela Lambrecht, Water and Wastewater Process Technologist

District of Summerland  
As Represented by  
Kevin McLuskey, Supervisor Wastewater Treatment Operation

(hereinafter referred to as the “local governments”)

**WHEREAS:**

- A. This Memorandum of Understanding (MOU) serves to enable collaboration of the MOE and the local governments to provide high quality, integrated and timely water quality information to enable sustainable environmental management of Okanagan Lake, and inform Liquid Waste Management Planning at the basin level.
- B. The local governments will reimburse the Ministry for costs incurred as described in Section 3 and Appendix 1.

THE PARTIES AGREE AS FOLLOWS:

**SECTION 1.0 INTERPRETATION**

- 1.1 In this Memorandum of Understanding (MOU) each of the following terms will, unless the context otherwise requires, have the meaning set beside it:
- (a) “**Costs,**” means all costs incurred by the Ministry of Environment to deliver the Collaborative Monitoring and Reporting Program set out in Appendix 1.
  - (b) “**Memorandum of Understanding,**” or “**MOU,**” means this agreement describing the delivery of a collaborative monitoring program on Okanagan Lake.
  - (c) “**MOE**” means Ministry of Environment, for the Province of British Columbia.
  - (d) “**local government**” means the City of Kelowna, Regional District of Central Okanagan, and District of Summerland and designates who are signatories to this MOU.
  - (e) “**Participants**” means representatives of each organization, either MOE or local governments, who are signatories to this MOU.

**SECTION 2.0 AGREEMENT AUTHORITY**

- 2.1 This MOU is entered into by the Ministry of Environment under the authority of the *Environment Management Act, Part 2 Section 14 Permits (1)(c)* allowing MOE to require the permittee (here the local governments) to monitor the effects of the introduction of waste into the environment. Where authorizations, permits or operational certificates under the *Environmental Management Act* enable a discharge to surface water, there is an expectation the discharger will provide monitoring information to demonstrate environmental condition.

## SECTION 3.0

## SUBJECT MATTER

### 3.1 Three Year Collaborative Monitoring and Reporting Program

- 3.1.1 A collaborative monitoring and reporting program is to replace receiving environment monitoring and environmental impact assessment programs required under existing Municipal Sewage Regulation Operational Certificates.
- 3.1.2 Monthly sample and associated field measurement collection from March through September, and analysis of water chemistry for 4 sites and plankton taxonomy for 2 sites on Okanagan Lake as per Appendix 1.
- 3.1.3 Annual reporting of Okanagan Lake trophic status, trends, and attainment of water quality objectives through the MOE or other suitable web sites.

### 3.2 Operational Certificates and Lake Monitoring

- 3.2.1 Lake monitoring requirements under the Operational Certificates ME 12211, PE 11652 and ME 13627 for the City of Kelowna, Regional District of Central Okanagan, and District of Summerland respectively, are waived while the named local governments participate in this Collaborative Monitoring MOU. The MOE will provide written confirmation following MOU sign-off. Other local governments with effluent discharges to Okanagan Lake may become participants under the terms of this MOU.
- 3.2.2 Effluent monitoring requirements and compliance with all other terms and conditions of the Operational Certificates will remain in effect.

### 3.3 Cost Estimates of Program:

- 3.3.1 Costs of this program include laboratory and sample collection costs.
- 3.3.2 Laboratory expenses are as per Appendix 1: \$11,000 (full program 2 sites + 2 sites chemistry only: Okanagan Centre, Armstrong Arm)
- 3.3.3 Sample collection contract: \$11,000
- 3.3.4 Total projected annual costs: \$22,000 (costs based on 18M m3 effluent discharged per year = \$0.0013/m3).

### 3.4 Roles and Responsibilities

- 3.4.1 The Ministry will contribute in-kind costs of program coordination and contract management for sample collection and reporting of results. For 2011, these costs included staff time of approximately 70 hours

(sampling 30, contract prep/monitoring 15, MOU prep 20, meetings 5), and \$500 for laboratory costs.

- 3.4.2 The local governments agree to provide the Ministry with funds sufficient to cover costs as described in Section 5.0 and detailed in Appendix 1.
- 3.4.3 Representatives of MOE and local governments will form a Technical Advisory Group and will meet annually to review actions carried out under this MOU, and adjust the program from year to year as agreed.
- 3.4.4 The Technical Advisory Group may invite input from other agencies or institutions to further the intent of this MOU.

#### **SECTION 4.0 SECURITY AND CONFIDENTIALITY**

- 4.1 All information and documentation provided to, collected by, delivered to or compiled by ministry employees, in the performance of their duties and responsibilities will be dealt with subject to and in accordance with all applicable provisions of Federal, Provincial and Municipal Statutes, particularly the *Privacy Act*, R.S.C. 1985, c, P-21, and the *Access to Information Act*, R.S.C. 1985, c. A-1, and the *Freedom of Information and Protection of Privacy Act*, R.S.B.C. 2004, c.165.

#### **SECTION 5.0 BASIS OF PAYMENT**

- 5.1 The local governments will provide the MOE start-up costs for contract services and laboratory services.
- 5.2 Local government share of costs and maximum estimated annual costs are as follows:
  - City of Kelowna 50% or \$11,000
  - Regional District of Central Okanagan 32% or \$7000
  - District of Summerland 18% or \$4000
- 5.3 When another municipal effluent discharge routinely occurs to Okanagan Lake, the monitoring requirements and costs will be re-evaluated and re-apportioned.

#### **SECTION 6.0 METHOD OF PAYMENT**

- 6.1 The local governments are responsible for providing funding in full, as per Section 5, before January 31 of years 2012 to 2014, by way of cheque to the **Minister of Finance for British Columbia** *c/o Senior Financial Officer of Corporate Services Division, Ministry of Environment, 102 Industrial Place, Penticton, BC, V2A 7C8.*
- 6.2 The MOE agrees to provide the local governments with a financial statement and an Annual Report.
- 6.3 Surplus funds at the end of the sampling season will be reviewed by the Technical Advisory Group and will be returned to local governments or reallocated through renewal of this MOU for the following year.

**SECTION 7.0 LIABILITY**

- 7.1 Each participant and personnel by association, waives all claims against the other participants in respect of damage caused to its personnel and/or its property by personnel or agents (excluding contractors) of that other participant arising out of, or in connection with the implementation of this MOU.
- 7.2 The provisions of sections 7.1 will survive the termination of this MOU for any reason whatsoever.

**SECTION 8.0 DISPUTE RESOLUTION**

- 8.1 Any new issue, matter of general concern or dispute arising from this MOU will be dealt with by Technical Advisory Group or their delegates.
- 8.2 The dispute or disagreement will not be submitted to a third party for resolution.

**SECTION 9.0 TERM OF AGREEMENT**

- 9.1 This MOU will begin January 31, 2012 and end December 31, 2014.
- 9.2 This MOU may be reviewed annually and amended by mutual written agreement by the Participants to this MOU.
- 9.3 Prior to the termination of this MOU, it may be renewed for an additional period on terms agreed to by participants to this MOU.

- 9.4 Any of the participants to this MOU may terminate participation in this agreement upon provision of sixty (60) days written notice to the other participants of their intention to terminate participation in this MOU.
- 9.5 On the date of termination of this MOU or termination of participation in this agreement, the lake monitoring requirements under local government operational certificates or permits as noted above, are reinstated. Regardless of the reason for termination or the participant who gives notice of termination, the MOE will not have any obligation to the local governments beyond the reimbursement of funds surplus to costs incurred by MOE to the effective date of termination.

## **SECTION 10.0**

## **NOTICE**

- 10.1 All official notices and communications pertinent to implementation of this MOU will be in writing and will be mailed or delivered. For the purposes of delivery of Notice, the addresses for delivery are:

**For MOE**

Ministry of Environment  
Attention: Manager, Environmental Protection Division  
Suite 401, 333 Victoria Street, Nelson B.C. V1L 4K3

**For local governments**

City of Kelowna  
Attention: Mike Gosselin, Supervisor Wastewater Treatment Operations  
951 Raymer Avenue, Kelowna, BC V1Y 4Z7

Regional District of Central Okanagan  
Attention: Angela Lambrecht, Water and Wastewater Technologist  
1450 K.L.O. Road, Kelowna, BC, V1W 3Z4

District of Summerland  
Attention: Kevin McLuskey, Supervisor Wastewater Treatment Operation  
13211 Henry Avenue Box 159 Summerland, BC, V0H 1Z0

- 9 -

**SECTION 11.0**

**SAVING PROVISION**

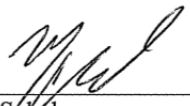
11.1 Nothing in this Memorandum of Understanding is in any way intended to replace or amend any obligation that participants are bound to, or required to perform by operation of law, unless otherwise noted in this MOU.

**SECTION 12.0**

**GENERAL**


13.1 This MOU reflects the good faith and spirit of cooperation of the participants but is not legally binding on any of the participants.

**Signed on behalf of the MOE:**

  
\_\_\_\_\_  
Michael Sokal  
Ministry of Environment  
Province of British Columbia

Jan. 31/12  
Date

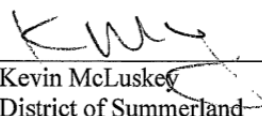
**Signed on behalf of local governments:**

  
\_\_\_\_\_  
Mike Gosselin  
City of Kelowna

JAN 31 2012  
Date

  
\_\_\_\_\_  
Angela Lambrecht  
Regional District of Central Okanagan

Feb 3, 2012  
Date

  
\_\_\_\_\_  
Kevin McLuskey  
District of Summerland

Feb 6 2012  
Date

## Appendix C: General Service Agreement (GS12PNE300) 2012-2014

### GENERAL SERVICE AGREEMENT



<i>For Administrative Purposes Only</i>	
<i>Ministry Contract No.:</i> GS12PNE300	<i>Client:</i> 048
<i>Requisition No.:</i> _____	<i>Responsibility Centre:</i> 294KD
<i>Solicitation No.(if applicable):</i> N/A	<i>Service Line:</i> 30595
<i>Commodity Code:</i>	<i>STOB:</i> 6001
	<i>Project:</i> 2930563
<b><i>Contractor Information</i></b>	
<i>Supplier Name:</i> Larratt Aquatic Consulting Ltd.	
<i>Supplier No.:</i>	
<i>Telephone No.:</i> 250-769-5444	
<i>E-mail Address:</i> heather@larratt.net	
<i>Website:</i>	



13 MISCELLANEOUS (Cont.)

Governing law

13.21 This Agreement is governed by, and is to be interpreted and construed in accordance with, the laws applicable in British Columbia.

14 INTERPRETATION

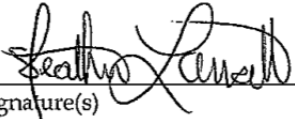

14.1 In this Agreement:

- (a) "includes" and "including" are not intended to be limiting;
- (b) unless the context otherwise requires, references to sections by number are to sections of this Agreement;
- (c) the Contractor and the Province are referred to as "the parties" and each of them as a "party";
- (d) "attached" means attached to this Agreement when used in relation to a schedule;
- (e) unless otherwise specified, a reference to a statute by name means the statute of British Columbia by that name, as amended or replaced from time to time;
- (f) the headings have been inserted for convenience of reference only and are not intended to describe, enlarge or restrict the scope or meaning of this Agreement or any provision of it;
- (g) "person" includes an individual, partnership, corporation or legal entity of any nature; and
- (h) unless the context otherwise requires, words expressed in the singular include the plural and *vice versa*.

15 EXECUTION AND DELIVERY OF AGREEMENT

15.1 This Agreement may be entered into by a separate copy of this Agreement being executed by, or on behalf of, each party and that executed copy being delivered to the other party by a method provided for in section 13.1 or any other method agreed to by the parties.

The parties have executed this Agreement as follows:

<p>SIGNED on the <u>22</u> day of <u>February</u>, 2012 by the Contractor (or, if not an individual, on its behalf by its authorized signatory or signatories):</p> <p></p> <p>Signature(s)</p> <p><u>HEATHER LARRATT</u></p> <p>Print Name(s)</p> <p><u>PRESIDENT</u></p> <p>Print Title(s)</p>	<p>SIGNED on the <u>7th</u> day of <u>February</u>, 2012 on behalf of the Province by its duly authorized representative:</p> <p></p> <p>Signature</p> <p><u>Robyn Roome, Manager</u></p> <p>Print Name(s)</p> <p><u>Environmental Protection Division</u></p> <p><u>Penticton</u></p> <p>Print Title(s)</p>
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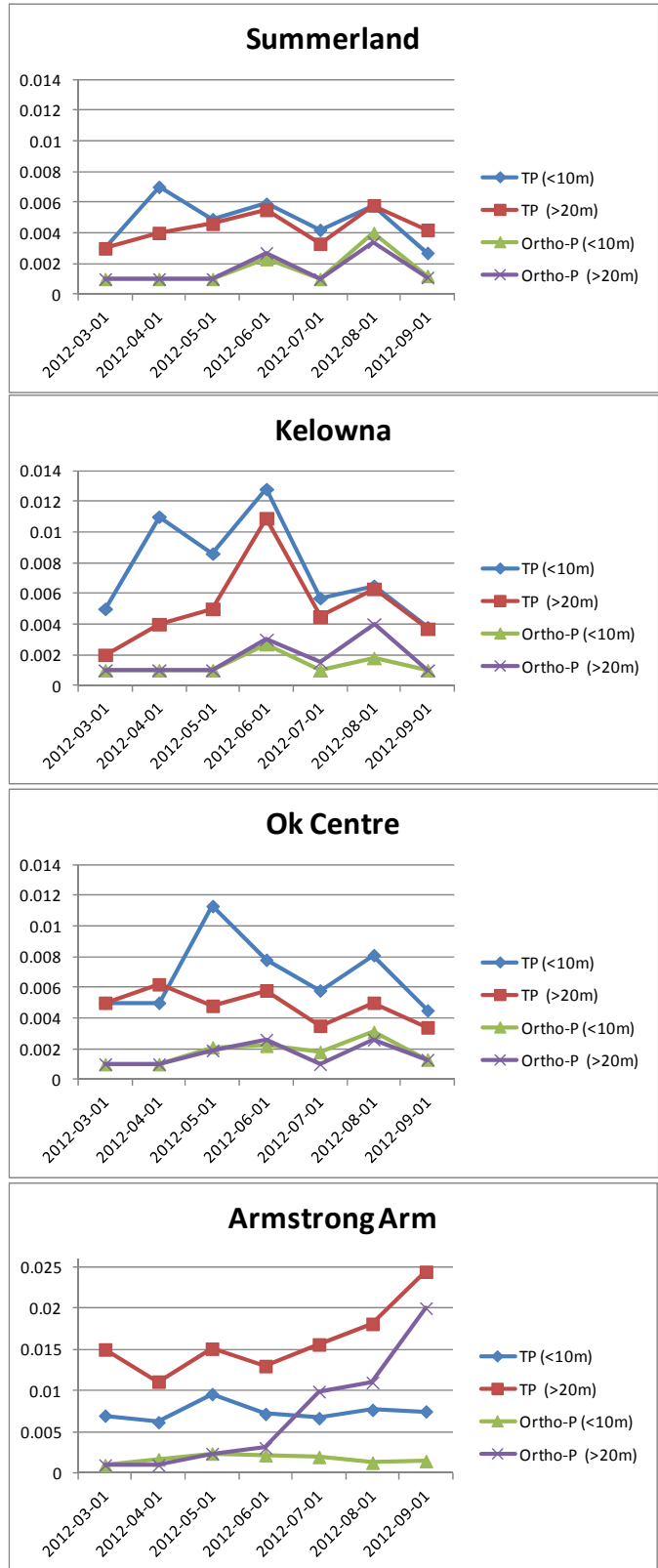
## Appendix D: Physical and chemical parameters for Okanagan Lake, 2012.

Site	EMS #	Sampling Date	µg/L	mg/L	°C	m	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
			Chl-a	DO	Temp	Secchi	Silica (<10m)	Silica (>20m)	Ortho-P (<10m)	Ortho-P (>20m)	Ammonia (<10m)	Ammonia (>20m)	TKN (<10m)	TKN (>20m)	Total Org N (<10m)	Total Org N (>20m)	DP (<10m)	DP (>20m)	NO2+NO3 (<10m)	NO2+NO3 (>20m)	TN (<10m)	TN (>20m)	TP (<10m)	TP (>20m)
Summerland	0500454	2012-03-13	0.95	13	3.46	12.3	8	8	0.001	0.001			0.157	0.153			0.002	0.002	0.0749	0.0739	0.232	0.227	0.003	0.003
Summerland	0500454	2012-04-16	0.955	12.45	5.21	10.3	7.5	7.6	0.001	0.001	0.0064	0.005	0.253	0.2	0.25	0.2	0.004	0.003	0.0598	0.0615	0.312	0.261	0.007	0.004
Summerland	0500454	2012-05-14	1.64	10.71	10.37	4.1	7.48	7.49	0.001	0.001	0.0083	0.0064	0.226	0.19	0.217	0.184	0.003	0.0027	0.0414	0.0562	0.267	0.246	0.0049	0.0046
Summerland	0500454	2012-06-11	1.38	9.65	11.61	6.4	7.22	7.45	0.0023	0.0027	0.032	0.026	0.211	0.201	0.179	0.175	0.0043	0.0035	0.0303	0.0597	0.241	0.261	0.0059	0.0055
Summerland	0500454	2012-07-16	1.72	8.23	22.7	6.4	7.11	7.35	0.001	0.001	0.0054	0.010	0.214	0.194	0.208	0.184	0.003	0.0025	0.002	0.0526	0.214	0.247	0.0042	0.0033
Summerland	0500454	2012-08-13	0.895	7.86	22.71	9	6.42	6.7	0.004	0.0034	0.018	0.006	0.23	0.173	0.212	0.167	0.0054	0.0048	0.002	0.0599	0.23	0.233	0.0058	0.0058
Summerland	0500454	2012-09-11	1.89	9.1	19.2	8.3	6.52	6.76	0.0012	0.0011			0.237	0.188			0.0029	0.0024	0.002	0.0643	0.237	0.253	0.0027	0.0042
Kelowna	0500236	2012-03-13	0.65	12.99	3.6	11.2	8	8.1	0.001	0.001			0.143	0.174			0.005	0.003	0.075	0.0731	0.218	0.247	0.005	0.002
Kelowna	0500236	2012-04-16	1.45	12.07	6.24	10.3	7.5	7.5	0.001	0.001	0.0053	0.016	0.203	0.206	0.2	0.19	0.009	0.003	0.06	0.0607	0.263	0.267	0.011	0.004
Kelowna	0500236	2012-05-14	1.405	10.29	12.86	5.6	7.36	7.42	0.001	0.001	0.0074	0.0097	0.244	0.215	0.237	0.205	0.0031	0.0035	0.0361	0.065	0.28	0.28	0.0086	0.005
Kelowna	0500236	2012-06-11	1.88	10.43	13.45	3.7	7.12	7.29	0.0027	0.0030	0.0150	0.016	0.22	0.208	0.205	0.192	0.0043	0.004	0.002	0.0394	0.22	0.247	0.0128	0.0109
Kelowna	0500236	2012-07-16	2.01	8.52	22.4	4.9	7.19	7.47	0.001	0.0015	0.0066	0.0053	0.232	0.195	0.226	0.19	0.0037	0.0041	0.002	0.0565	0.232	0.251	0.0057	0.0045
Kelowna	0500236	2012-08-13	0.91	8.63	22.17	8.9	6.36	6.69	0.0018	0.004	0.0055	0.010	0.198	0.173	0.192	0.163	0.0060	0.0057	0.002	0.0634	0.198	0.236	0.0065	0.0063
Kelowna	0500236	2012-09-11	1.72	9.2	18.8	7.8	6.41	6.8	0.001	0.001			0.212	0.176			0.0028	0.0025	0.002	0.0581	0.212	0.234	0.0038	0.0037
Ok Centre	0500730	2012-03-14	1.18	9.2	3.99	14.3	8	7.9	0.001	0.001			0.203	0.261			0.003	0.003	0.0639	0.0649	0.267	0.326	0.005	0.005
Ok Centre	0500730	2012-04-17	1.485	12.08	5.321	9.1	7.31	7.41	0.001	0.001	0.014	0.016	0.184	0.168	0.171	0.152	0.0049	0.0054	0.0403	0.0491	0.225	0.217	0.005	0.0062
Ok Centre	0500730	2012-05-15	1.69	10.55	13.86	4.75	9.96	7.25	0.0021	0.0019	0.032	0.02	0.19	0.184	0.158	0.164	0.0021	0.0022	0.0175	0.0403	0.207	0.224	0.0113	0.0048
Ok Centre	0500730	2012-06-11	1.225	9.94	16.64	7.3	6.65	7.09	0.0022	0.0026	0.023	0.018	0.225	0.200	0.202	0.182	0.0028	0.0048	0.002	0.0334	0.225	0.233	0.0078	0.0058
Ok Centre	0500730	2012-07-16	1.49	9.7	19	5.9	6.62	7.17	0.0018	0.001	0.0092	0.0062	0.218	0.189	0.209	0.183	0.0026	0.0027	0.002	0.0381	0.218	0.227	0.0058	0.0035
Ok Centre	0500730	2012-08-13	1.405	9.01	23.42	9.6	6.17	6.67	0.0031	0.0026	0.005	0.0052	0.218	0.165	0.218	0.16	0.0061	0.0049	0.002	0.0528	0.218	0.218	0.0081	0.005
Ok Centre	0500730	2012-09-12	2.73	9.2	19.2	8.4	6.05	6.03	0.0013	0.0013			0.241	0.21			0.0026	0.0026	0.002	0.0358	0.241	0.245	0.0045	0.0034
Armstrong Arm	0500239	2012-04-04	4.39	13.6	4.66	3.9	5.8	6.5	0.001	0.001			0.229	0.074			0.002	0.002	0.002	0.211	0.229	0.284	0.007	0.015
Armstrong Arm	0500239	2012-04-17	2.41	11.25	8.98	3.55	5.86	6.56	0.0017	0.001	0.016	0.022	0.203	0.218	0.187	0.196	0.0063	0.0109	0.002	0.0103	0.203	0.228	0.0062	0.0111
Armstrong Arm	0500239	2012-05-15	1.25	9.42	17.94	2.9	6.48	6.78	0.0024	0.0024	0.025	0.056	0.247	0.237	0.223	0.18	0.0027	0.003	0.0039	0.0169	0.251	0.254	0.0096	0.0151
Armstrong Arm	0500239	2012-06-12	2.67	9.11	16.8	4.3	6.77	7.26	0.0022	0.0031	0.016	0.017	0.281	0.232	0.266	0.215	0.0029	0.0052	0.002	0.0341	0.281	0.266	0.0072	0.013
Armstrong Arm	0500239	2012-07-17	2.3	9.16	20.6	4	7.03	8.03	0.002	0.0099	0.025	0.021	0.231	0.218	0.207	0.197	0.0041	0.0115	0.002	0.0802	0.231	0.298	0.0067	0.0156
Armstrong Arm	0500239	2012-08-14	1.895	8.19	22.9	4.7	6.48	7.74	0.0013	0.011	0.005	0.005	0.214	0.205	0.214	0.205	0.0034	0.0155	0.0064	0.0961	0.22	0.301	0.0077	0.0181
Armstrong Arm	0500239	2012-09-12	2.64	9.2	18.8	4.2	6.27	8.09	0.0015	0.020			0.32	0.25			0.0031	0.0215	0.002	0.115	0.32	0.25	0.0075	0.0244

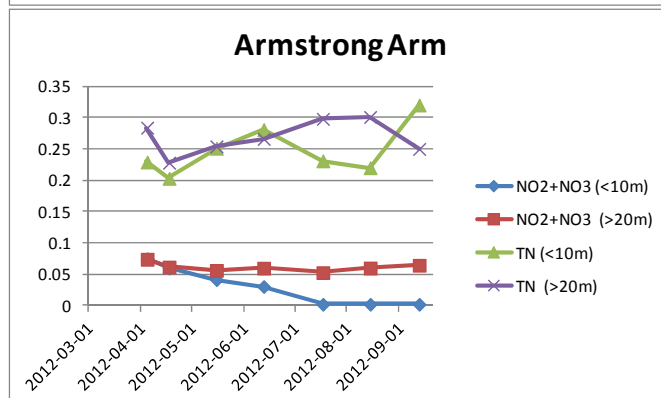
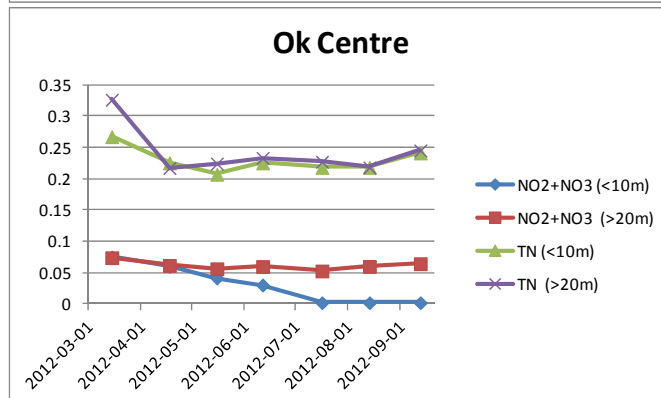
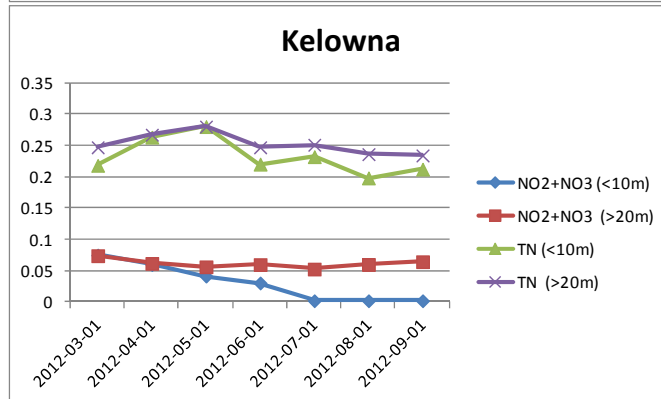
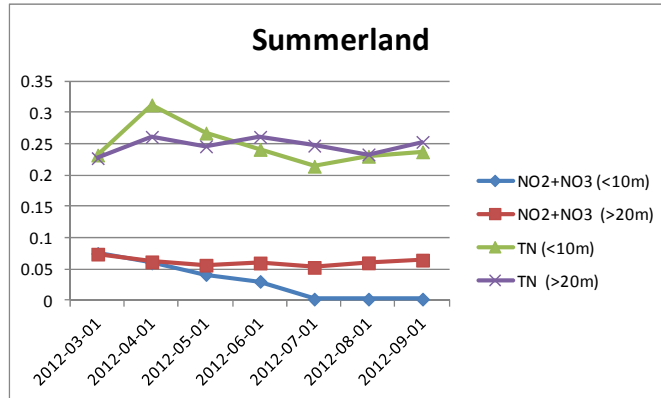
## Appendix E: Okanagan Lake seasonal data for dissolved silica data, 2012

	Summerland		Kelowna		Ok Centre		Armstrong Arm	
	Silica (<10m)	Silica (>20m)	Silica (<10m)	Silica (>20m)	Silica (<10m)	Silica (>20m)	Silica (<10m)	Silica (>20m)
March	8	8	8	8.1	8	7.9	5.8	6.5
April	7.5	7.6	7.5	7.5	7.31	7.41	5.86	6.56
May	7.48	7.49	7.36	7.42	9.96	7.25	6.48	6.78
June	7.22	7.45	7.12	7.29	6.65	7.09	6.77	7.26
July	7.11	7.35	7.19	7.47	6.62	7.17	7.03	8.03
Aug.	6.42	6.7	6.36	6.69	6.17	6.67	6.48	7.74
Sept.	6.52	6.76	6.41	6.8	6.05	6.03	6.27	8.09
Mean	7.2	7.3	7.1	7.3	7.3	7.1	6.4	7.3
Min	6.42	6.7	6.36	6.69	6.05	6.03	5.8	6.5
Max	8	8	8	8.1	9.96	7.9	7.03	8.09

## Appendix F: Okanagan Lake total phosphorus and orthophosphate seasonal data, 2012.



## Appendix G: Okanagan Lake total nitrogen and nitrite+nitrate nitrogen seasonal data, 2012.



## Appendix H: Okanagan Lake phytoplankton and zooplankton data, 2012.

PHYTOPLANKTON	Okanagan L	Okanagan L	Okanagan L	Okanagan L	Okanagan L	Okanagan L
Site Name	D/S Kelowna STP (deep)	D/S Kelowna STP (deep)	D/S Kelowna STP (deep)	D/S Kelowna STP (deep)	D/S Kelowna STP (deep)	D/S Kelowna STP (deep)
Site Number	0500236	0500236	0500236	0500236	0500236	0500236
Sampling Date(s)	2012-04-16	2012-05-14	2012-06-11	2012-07-16	2012-08-16	2012-09-11
Depth (m)	1-10	1-10	1-10	1-10	1-10	1-10
units	cells/mL	cells/mL	cells/mL	cells/mL	cells/mL	cells/mL
<b>Order : Centrales</b>						
<i>Cyclotella cf bodanica</i>	<2.8	<2.8	<17.8	17.8	7.0	2.8
<i>Cyclotella glomerata</i>	14.0	439.6	195.8	106.8	2.8	<2.8
<i>Cyclotella spp.</i>	19.6	<2.8	<17.8	71.2	2.8	14.0
<i>Melosira granulata</i>				<17.8		
<i>Melosira italica</i>	44.8	16.8	53.4	17.8	5.6	11.2
<i>Melosira varians</i>		<2.8		<17.8	<1.4	
<i>Melosira sp.</i>	<2.8	2.8	<17.8	<17.8	<1.4	<2.8
<i>Rhizosolenia eriensis / longiseta</i>		2.8	71.2	17.8		<2.8
<i>Stephanodiscus cf astrea</i>	2.8	2.8	<17.8			
<i>Stephanodiscus Niaqarae</i>	<2.8	<2.8	<17.8			<2.8
<i>Stephanodiscus sp.</i>		<2.8				<2.8
<b>Order : Chlorococcales</b>						
<i>Ankistrodesmus falcatius</i>	2.8	5.6	<17.8	<17.8	<1.4	<2.8
<i>Ankistrodesmus spp.</i>					<1.4	
<i>Botryococcus braunii</i>	<2.8	<2.8	<17.8	<17.8	<1.4	67.2
<i>Closteriopsis cf longissima</i>	<2.8	<2.8	<17.8	<17.8		
<i>Crucigenia quadrata</i>	<2.8	<2.8	<17.8	<17.8	<1.4	11.2
<i>Dictyosphaerium cf. pulchellum</i>					<1.4	
<i>Elakatothrix gelatinosa</i>	<2.8	8.4	<17.8	<17.8	2.8	8.4
<i>Lagerheimia sp. ?</i>						<2.8
<i>Nephrocytium sp. ?</i>		<2.8		<17.8		<2.8
<i>Oocystis cf lacustris</i>	<2.8		<17.8	<17.8	<1.4	<2.8
<i>Oocystis spp.</i>	11.2	<2.8	<17.8	<17.8	<1.4	<2.8
<i>Oocystis sp?</i>	<2.8		<17.8			
<i>Quadrigula closterioides</i>			<17.8		<1.4	
<i>Scenedesmus quadricauda</i>					<1.4	<2.8
<i>Selenastrum minutum</i>	8.4					5.6
<i>Sphaerocystis schroeteri</i>				<17.8	<1.4	<2.8
<i>Tetraedron sp.</i>				<17.8		<2.8
<b>Order : Chroococcales</b>						
<i>Anacystis elachista</i>	<2.8		<17.8	<17.8		246.4
<i>Anacystis limneticus</i>				<17.8	11.2	<2.8
<i>Anacystis sp.</i>					<1.4	<2.8
<i>Gomphosphaeria cf aponina</i>					<1.4	<2.8
<i>Gomphosphaeria pallidum</i>	<2.8	<2.8	<17.8	<17.8		<2.8
<b>Order: Cryptomonadales</b>						

<i>Chroomonas acuta</i>	22.4	30.8	71.2	35.6	9.8	100.8
<i>Cryptomonas ovata / erosa</i>	<2.8	2.8	<17.8	<17.8	<1.4	5.6
<i>Cryptomonas sp.</i>		<2.8	<17.8	<17.8	1.4	<2.8
<b>Order: Dinokontae</b>						
<i>Ceratium hirundinella</i>			<17.8	<17.8		
cyst of <i>Ceratium hirundinella</i>				<17.8		
<i>Gymnodinium sp. ?</i>				<17.8		<2.8
<i>Peridinium cf. inconspicuum</i>				<17.8	<1.4	<2.8
<i>Peridinium / Glenodinium</i>	<2.8	<2.8	<17.8	<17.8	<1.4	
<b>Order : Nostocales</b>						
<i>Anabaena cf affinis</i>				<17.8	30.8	<2.8
<i>Anabaena cf flos-aquae</i>			<17.8	<17.8		
<i>Anabaena spp.</i>			<17.8	<17.8	<1.4	56.0
<i>Aphanizomenon sp. ?</i>			<17.8		<1.4	<2.8
<b>Order : Ochromonadales</b>						
<i>Dinobryon cf bavaricum</i>	2.8	42.0	178.0	124.6		<2.8
<i>Dinobryon divergens</i>			<17.8	<17.8		
<i>Dinobryon cf sertularia</i>	<2.8	137.2	<17.8			
<i>Dinobryon sp</i>		11.2	35.6	2,207.2	7.0	<2.8
<i>Kephyrion/Pseudokephyrion<sup>1</sup></i>				<17.8	<1.4	
<b>Order : Oscillatoriales</b>						
<i>Lynqbya cf contorta</i>	428.4					
<i>Lynqbya cf limnetica</i>		386.4	2,136.0	2,865.8	98.0	775.6
<i>Oscillatoria cf tenuis</i>	663.6	459.2	2,670.0	<17.8	28.0	196.0
<i>Oscillatoria sp.</i>			<17.8	<17.8		
<b>Order : Pennales</b>						
<i>Achnanthes flexella</i>	<2.8					
<i>Achnanthes minutissima</i>	8.4	8.4	<17.8	<17.8	<1.4	2.8
<i>Achnanthes sp.</i>	<2.8	<2.8				<2.8
<i>Amphipleura pellucida</i>	<2.8					
<i>Amphiprora = Entomoneis sp.</i>	<2.8	<2.8	<17.8			
<i>Amphora ovalis</i>			<17.8		<1.4	<2.8
<i>Amphora spp.</i>		<2.8			<1.4	<2.8
<i>Asterionella formosa</i>	8.4	25.2	<17.8	178.0	<1.4	<2.8
<i>Ceratoneis arcus</i>	<2.8	<2.8	<17.8	<17.8		<2.8
<i>Cocconeis placentula</i>			<17.8	<17.8	<1.4	<2.8
<i>Cocconeis sp.</i>	<2.8	<2.8	<17.8			<2.8
<i>Cymatopleura cf solea</i>	<2.8	<2.8				
<i>Cymbella affinis</i>		<2.8	<17.8	<17.8	<1.4	<2.8
<i>Cymbella cf prostrata</i>					<1.4	
<i>Cymbella cf minuta</i>	2.8	<2.8	<17.8	<17.8	<1.4	<2.8
<i>Cymbella spp.</i>	2.8	<2.8	<17.8	<17.8	1.4	2.8
<i>Diatoma elongatum</i>	<2.8	<2.8	<17.8			
<i>Diatoma hiemale</i>						<2.8
<i>Diatoma spp.</i>	<2.8	<2.8	<17.8		<1.4	<2.8
<i>Diploneis sp.</i>	<2.8				<1.4	<2.8
<i>Epithemia sorex</i>				<17.8		<2.8
<i>Epithemia turgida</i>			<17.8			<2.8

<u>Epithemia sp.</u>		<2.8	<17.8		<1.4	2.8
<u>Eunotia sp.</u>				<17.8	<1.4	<2.8
<u>Fragilaria crotonensis</u>	120.4	36.4	516.2	302.6	<1.4	2.8
<u>Fragilaria spp.</u>	<2.8	5.6	<17.8	<17.8	<1.4	<2.8
<u>Frustulia sp.</u>					<1.4	
<u>Gomphonema constrictum</u>				<17.8		
<u>Gomphonema geminata</u>	<2.8	<2.8				
<u>Gomphonema olivaceum</u>	<2.8	<2.8	<17.8		<1.4	<2.8
<u>Gomphonema sp</u>		<2.8	<17.8	<17.8	<1.4	<2.8
<u>Meridion circulare</u>	<2.8		<17.8			
<u>Navicula radiosa</u>	<2.8	<2.8	<17.8		<1.4	<2.8
<u>Navicula spp.</u>	<2.8	2.8	17.8	<17.8	2.8	5.6
<u>Neidium sp. ?</u>						<2.8
<u>Nitzschia spp.</u>	5.6	<2.8	<17.8	<17.8	<1.4	<2.8
<u>Pinnularia gibba</u>	<2.8	<2.8			<1.4	<2.8
<u>Pleurosigma / Gyrosigma</u>		<2.8				<2.8
<u>Stauroneis sp.</u>	<2.8					<2.8
<u>Surirella spp.</u>		<2.8				<2.8
<u>Synedra actinastroides</u>	<2.8					<2.8
<u>Synedra acus</u>	5.6	8.4	53.4	<17.8	<1.4	<2.8
<u>Synedra capitata</u>						<2.8
<u>Synedra ulna</u>	2.8	<2.8	<17.8	<17.8	<1.4	<2.8
<u>Synedra spp.</u>	<2.8	<2.8	<17.8	<17.8	<1.4	<2.8
<u>Tabellaria fenestrata</u>	30.8	2.8	<17.8	<17.8	<1.4	33.6
<u>Tabellaria flocculosa</u>		<2.8				
UID	<2.8	5.6	<17.8		<1.4	5.6
<b>Order : Rhizochrysidales</b>						
<u>Diceras phaseolus</u>				<17.8		
<b>Order: Tetrasporales</b>						
<u>Gloeocystis ampla</u>			<17.8		19.6	
<b>Order : Ulothricales</b>						
<u>Ulothrix variabilis</u>						<2.8
<u>Ulothrix sp. ?</u>		<2.8	<17.8	<17.8	2.8	<2.8
<b>Order : Volvocales</b>						
<u>Eudorina sp. ?</u>						<2.8
<b>Order : Zygnematales</b>						
<u>Arthrodesmus sp</u>				<17.8	1.4	<2.8
<u>Closterium sp</u>			<17.8			
<u>Cosmarium spp.</u>	<2.8		<17.8	<17.8		
<u>Mougeotia sp. ?</u>	<2.8	<2.8	<17.8	<17.8	<1.4	<2.8
<u>Spondylosium planum</u>				<17.8	<1.4	<2.8
<u>Staurastrum cf. paradoxum</u>			<17.8	<17.8	<1.4	<2.8
<u>Staurastrum sp.</u>						<2.8
UID		<2.8			<1.4	
UID colonial algae		<2.8				<2.8
UID unicellular algae	<2.8					<2.8



UID flagellates observed but not counted.
UID = unidentified due to lack of size and/or missing morphological characters.
<sup>1</sup> Note: Previously included under UID flagellates observed but not counted.

PHYTOPLANKTON	Okanagan L	Okanagan L	Okanagan L	Okanagan L	Okanagan L	Okanagan L
Site Name	South Prairie Cr, Summerland	South Prairie Cr, Summerland	South Prairie Cr, Summerland	South Prairie Cr, Summerland	South Prairie Cr, Summerland	South Prairie Cr, Summerland
Site Number	0500434	0500454	0500454	0500454	0500454	0500454
Sampling Date(s)	2012-04-16	2012-05-14	2012-06-11	2012-07-16	2012-08-16	2012-09-11
Depth (m)	1-10	1-10	1-10	1-10	1-10	1-10
units	cells/mL	cells/mL	cells/mL	cells/mL	cells/mL	cells/mL
<b>Order : Centrales</b>						
<i>Cyclotella cf bodanica</i>	<2.8	<2.8	<17.8	<17.8	7.0	2.8
<i>Cyclotella glomerata</i>	5.6	238.0	178.0	676.4	12.6	11.2
<i>Cyclotella spp.</i>	33.6	<2.8	<17.8	<17.8	4.2	8.4
<i>Melosira italica</i>	53.2	<2.8	<17.8	<17.8	15.4	11.2
<i>Melosira varians</i>						<2.8
<i>Melosira sp.</i>	<2.8	<2.8	<17.8			<2.8
<i>Rhizosolenia eriensis / longiseta</i>	7.2	<2.8	89.0	17.8		<2.8
<i>Stephanodiscus cf astrea</i>	2.4	2.8			<1.4	
<i>Stephanodiscus Niagarae</i>	2.4	<2.8	<17.8			<2.8
<i>Stephanodiscus sp.</i>					<1.4	<2.8
<b>Order : Chlorococcales</b>						
<i>Ankistrodesmus falcatus</i>	11.2	<2.8	<17.8	17.8	<1.4	<2.8
<i>Ankistrodesmus spp.</i>	2.8		<17.8			
<i>Botryococcus braunii</i>	<2.8	<2.8	<17.8	<17.8	<1.4	<2.8
<i>Botryococcus sp.</i>	<2.8					
<i>Closteriopsis cf longissima</i>	<2.8	<2.8	<17.8	<17.8	<1.4	
<i>Crucigenia quadrata</i>				<17.8	<1.4	<2.8
<i>Dictyosphaerium cf. pulchellum</i>			<17.8			
<i>Elakatothrix gelatinosa</i>	<2.8	5.6	<17.8	<17.8		
<i>Kirchneriella sp.</i>	<2.8					
<i>Nephrocytium sp. ?</i>	<2.8					
<i>Oocystis cf lacustris</i>			<17.8	35.6	5.6	<2.8
<i>Oocystis spp.</i>	<2.8			35.6	<1.4	5.6
<i>Oocystis sp?</i>				<17.8		<2.8
<i>Quadrigula closterioides</i>						<2.8
<i>Scenedesmus cf denticulatus</i>		<2.8				
<i>Scenedesmus dimorphus</i>					<1.4	
<i>Scenedesmus quadricauda</i>			<17.8			<2.8
<i>Scenedesmus sp.</i>					<1.4	
<i>Selenastrum minutum</i>	<2.8			<17.8	<1.4	<2.8
<i>Selenastrum sp.</i>					<1.4	
<i>Sphaerocystis schroeteri</i>						
<i>Tetraedron minimum</i>					1.4	
<i>Tetraedron sp.</i>				<17.8		
<b>Order : Chroococcales</b>						
<i>Anacystis elachista</i>	<2.8		<17.8	<17.8	<1.4	350.0

<i>Anacystis limneticus</i>					<1.4	16.8
<i>Anacystis sp.</i>					<1.4	<2.8
<i>Gomphosphaeria pallidum</i>	<2.8		<17.8			<2.8
<b>Order: Cryptomonadales</b>						
<i>Chroomonas acuta</i>	58.8	11.2	231.4	<17.8		61.6
<i>Cryptomonas ovata / erosa</i>	<2.8	<2.8	17.8	<17.8	<1.4	2.8
<i>Cryptomonas sp.</i>	<2.8	2.8	<17.8	<17.8	4.2	<2.8
<b>Order: Dinokontae</b>						
<i>Ceratium hirundinella</i>				<17.8		
<i>Gymnodinium sp. ?</i>				<17.8	<1.4	
<i>Peridinium cf inconspicuum</i>				17.8	<1.4	2.8
<i>Peridinium / Glenodinium</i>				<17.8	<1.4	
<b>Order : Nostocales</b>						
<i>Anabaena cf affinis</i>					<1.4	<2.8
<i>Anabaena cf circinalis</i>					<1.4	
<i>Anabaena cf flos-aquae</i>						<2.8
<i>Anabaena spp.</i>				<17.8	19.6	11.2
<i>Aphanizomenon sp. ?</i>				<17.8	28.0	
<b>Order : Ochromonadales</b>						
<i>Dinobryon cf bavarium</i>		22.4	53.4	<17.8		
<i>Dinobryon divergens</i>				<17.8	17.8	
<i>Dinobryon cf sertularia</i>	14.0	39.2	<17.8			
<i>Dinobryon sp</i>	<2.8		17.8	925.6	5.6	<2.8
<i>Kephyrion/Pseudokephyrion<sup>1</sup></i>			<17.8	<17.8	4.2	
<i>Synura sp. ?</i>						2.8
<b>Order : Oscillatoriales</b>						
<i>Lynqbya cf contorta</i>	<2.8					
<i>Lynqbya cf limnetica</i>	224.0	420.0	818.8	1,869.0	161.0	364.0
<i>Oscillatoria cf tenuis</i>	999.6	627.2	4,094.0	<17.8	<1.4	280.0
<i>Oscillatoria sp.</i>				<17.8		
<b>Order : Pennales</b>						
<i>Achnanthes flexella</i>		<2.8	<17.8		<1.4	<2.8
<i>Achnanthes minutissima</i>	<2.8	2.8	<17.8	17.8	1.4	2.8
<i>Achnanthes sp.</i>	<2.8					
<i>Amphipleura pellucida</i>					<1.4	
<i>Amphiprora = Entomoneis sp.</i>	<2.8	<2.8	<17.8			
<i>Amphora ovalis</i>		<2.8			1.4	
<i>Amphora spp.</i>	<2.8	<2.8	<17.8		<1.4	<2.8
<i>Asterionella formosa</i>	39.2	19.6	35.6	106.8	7.0	
<i>Ceratoneis arcus</i>				<17.8		
<i>Cocconeis placentula</i>				<17.8		
<i>Cocconeis sp.</i>	<2.8	<2.8				
<i>Cymatopleura cf solea</i>	<2.8					
<i>Cymatopleura sp.</i>						<2.8
<i>Cymbella affinis</i>						<2.8
<i>Cymbella cf minuta</i>	<2.8	<2.8	<17.8	<17.8	<1.4	<2.8
<i>Cymbella spp.</i>	<2.8	<2.8	<17.8	<17.8	1.4	<2.8
<i>Diatoma elongatum</i>			17.8			
<i>Diatoma spp.</i>			<17.8		<1.4	2.8
<i>Diploneis sp.</i>		<2.8				

<u>Epithemia turgida</u>		<2.8				
<u>Epithemia sp.</u>			<17.8	<17.8	<1.4	<2.8
<u>Eunotia cf pectinalis</u>		<2.8				
<u>Eunotia sp.</u>		<2.8			<1.4	
<u>Fragilaria crotonensis</u>	28.0	50.4	534.0	71.2	23.8	<2.8
<u>Fragilaria spp.</u>	<2.8	<2.8			<1.4	<2.8
<u>Gomphonema constrictum</u>					<1.4	<2.8
<u>Gomphonema olivaceum</u>		<2.8	<17.8	<17.8		
<u>Gomphonema sp</u>	<2.8	<2.8	<17.8	<17.8	<1.4	<2.8
<u>Meridion circulare</u>		<2.8				
<u>Navicula radiosa</u>		<2.8			<1.4	<2.8
<u>Navicula spp.</u>	<2.8	<2.8	<17.8	<17.8	<1.4	2.8
<u>Nitzschia spp.</u>	5.6	<2.8				
<u>Pinnularia gibba</u>		<2.8		<17.8	<1.4	<2.8
<u>Pleurosigma / Gyrosigma</u>		<2.8				
<u>Rhopalodia gibba</u>		<2.8				
<u>Stauroneis sp.</u>		<2.8				
<u>Surirella spp.</u>	<2.8					
<u>Synedra actinastroides</u>			<17.8		<1.4	
<u>Synedra acus</u>	11.2	5.6	17.8	<17.8	1.4	
<u>Synedra ulna</u>	<2.8	<2.8		<17.8		
<u>Synedra spp.</u>	<2.8	2.8				<2.8
<u>Tabellaria fenestrata</u>	39.2	11.2	<17.8	<17.8	<1.4	<2.8
UID	5.6	2.8	<17.8	<17.8	<1.4	11.2
<b>Order: Tetrasporales</b>						
<u>Gloeocystis ampla</u>				<17.8	<1.4	
<u>Gloeocystis sp?</u>			<17.8			
<b>Order : Ulothricales</b>						
<u>Ulothrix sp. ?</u>		<2.8	17.8		2.8	
<b>Order : Zygnematales</b>						
<u>Arthrodesmus sp.</u>		<2.8	<17.8	<17.8	<1.4	2.8
<u>Cosmarium spp.</u>	<2.8	<2.8	<17.8	<17.8		<2.8
<u>Mougeotia sp. ?</u>		<2.8	<17.8	<17.8		
<u>Spondylosium planum</u>	<2.8	<2.8	<17.8	<17.8	1.4	<2.8
<u>Staurastrum cf. paradoxum</u>			<17.8		<1.4	<2.8
<u>Staurastrum sp.</u>					<1.4	
UID colonial algae	<2.8	<2.8	<17.8		<1.4	<2.8
UID unicellular algae	<2.8		<17.8	<17.8	<1.4	<2.8
UID filamentous algae						<2.8
UID flagellates observed but not counted.						
UID = unidentified due to lack of size and/or missing morphological characters.						
<sup>1</sup> Note: Previously included under UID flagellates observed but not counted.						

ZOOPLANKTON		Okanagan L	Okanagan L	Okanagan L	Okanagan L	Okanagan L	Okanagan L
Site Name		D/S Kelowna STP (Deep)	D/S Kelowna STP (Deep)	D/S Kelowna STP (Deep)	D/S Kelowna STP (Deep)	D/S Kelowna STP (Deep)	D/S Kelowna STP (Deep)
Site Number		0500236	0500236	0500236	0500236	0500236	0500236
Sampling Date		2012-04-16	2012-05-14	2012-06-11	2012-07-16	2012-08-13	2012-09-11
Depth (m)		0-45	0-45	0-45	0-45	0-45	0-45
units = total organisms / sample	stage						
Sub-class : Copepoda							
Order : Cyclopoida							
<i>Diacyclops thomasi</i>	adult	7,500	4,600	1,728	896	1,300	200
<i>Macrocyclus sp.</i>	adult					10	
UID	copepodid		11,000	71,296	51,712	46,000	24,000
Order : Calanoida							
Family : Diaptomidae	copepodid						
<i>Leptodiaptomus ashlandi</i>	adult	9,400	39,000	13,696	4,608	900	900
<i>Leptodiaptomus ashlandi</i>	copepodid	159,000	127,000	12,160	29,952	72,000	42,900
<i>Epischura nevadensis</i>	adult	6		20	288	680	1,300
<i>Epischura nevadensis</i>	copepodid				640	2,600	2,200
UID Calanoida / Cyclopoida	nauplii	12,000	7,000	1,728	2,048	1,000	500
Order : Cladocera							
<i>Bosmina longirostris</i>	adult	200	100	1,280	1,792	20	1,400
<i>Bosmina longirostris</i>	juvenile			768	1,536		
<i>Daphnia thorata</i>	adult	1		325	2,432	13,000	2,800
<i>Daphnia thorata</i>	juvenile	200			640		
<i>Diaphanosoma cf birgei</i>	juvenile				4,096		
<i>Diaphanosoma brachyurum</i>	adult		100			5,100	250
<i>Leptodora kindtii</i>	adult						3
Order : Mysidacea							
<i>Mysis relicta</i>				11			
Phylum : Rotifera							
<i>Conochilus</i>	colony	20,000	3,000				800
<i>Kellicottia longispina</i>				5,056	4,352	13,000	4,200
<i>Keratella cochlearis</i>					768		100
<i>Keratella quadrata</i>		3,000	100			400	100
<i>Polyarthra spp.</i>						1,000	
<i>Testudinella</i>		2,000	900				100
TOTAL		213,307	192,800	108,068	105,760	157,010	81,753
UID = unidentified due to lack of size and/or missing morphological characters.							

ZOOPLANKTON		Okanagan L	Okanagan L	Okanagan L	Okanagan L	Okanagan L	Okanagan L
Site Name		S Prairie Cr Summerland	S Prairie Cr Summerland	S Prairie Cr Summerland	S Prairie Cr Summerland	S Prairie Cr Summerland	S Prairie Cr Summerland
Site Number		0500454	0500454	0500454	0500454	0500454	0500454
Sampling Date		2012-04-16	2012-05-14	2012-06-11	2012-07-16	2012-08-13	2012-09-11
Depth (m)		0-45	0-45	0-45	0-45	0-45	0-45
units = total organisms / sample	stage						
Sub-class : Copepoda							
Order : Cyclopoida							
<i>Diacyclops thomasi</i>	adult	6,000	4,600	1,344		1,000	800
UID	copepodid	200	2,100	7,232	55,168	58,000	60,000
Order : Calanoida							
Family : Diaptomidae	copepodid						
<i>Leptodiaptomus ashlandi</i>	adult	9,100	9,500	9,728	4,736	4,800	100
<i>Leptodiaptomus ashlandi</i>	copepodid	119,000	20,500	11,456	39,424	54,300	64,600
<i>Epischura nevadensis</i>	adult			46	896	440	1,100
<i>Epischura nevadensis</i>	copepodid				320	240	2,200
UID Calanoida / Cyclopoida	nauplii	5,000	1,900	1,664	8,192	1,100	1,000
Order : Cladocera							
<i>Bosmina longirostris</i>	adult	100	10	48	8,320	1,200	1,900
<i>Bosmina longirostris/longispina</i>	juvenile			32	5,888		
<i>Chydorus sphaericus</i>	adult		10				
<i>Daphnia thorata</i>	adult				768	11,000	5,800
<i>Daphnia thorata</i>	juvenile			2	640		
<i>Diaphanosoma birgei</i>	adult			9			
<i>Diaphanosoma cf birgei</i>	juvenile				1,920		
<i>Diaphanosoma brachyurum</i>	adult		20			3,900	500
<i>Leptodora kindtii</i>	adult					20	
Phylum : Rotifera							
<i>Conochilus</i>	colony						2,400
<i>Kellicottia longispina</i>		20,000	1,500	960	3,456	2,500	11,000
<i>Keratella cochlearis</i>		300					
<i>Keratella quadrata</i>						400	
<i>Platyias sp.</i>		100					
<i>Testudinella</i>							200
UID Rotifera			900		128		
TOTAL		159,800	41,040	32,521	129,856	138,900	151,600
UID = unidentified due to lack of size and/or missing morphological characters.							

# Appendix I: Larratt Aquatic Consulting Ltd. Invoices, 2012

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 DATE: 08JUN12      INVOICE: 20410  
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LARRATT AQUATIC CONSULTING LTD.  
 3025 ENSIGN LANE  
 WEST KELOWNA, BC  
 V4T 2Z4      250-769-5444

Received

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 BILL TO:

JUN 11 2012

Ministry of Environment  
 Attn: Mike Sokal  
 102 Industrial Place  
 Penticton, BC V2A 7C8

102 Industrial Place  
 Penticton, BC V2A 7C8

PRICE	DESCRIPTION
	Water Sampling of Okanagan Lake April and May 2012 as specified by Ministry Contract GS12PNE300
1,663.00	April 16, 17 H Larratt, B Larratt
1,663.00	May 14, 15 B Larratt, J Self
399.12	HST # R102372885
	Note: This is first statement issued under this contract
-----	
3,725.12	** PLEASE PAY THIS AMOUNT **

<b>Goods Services Received</b>	
Rec'd DD/MM/YY:	18 106 12012
Signature:	<i>[Signature]</i> Date: 2012 06 18
Printed name:	Danny St. Hilaire
Is this a capital Asset? Yes ___ No <input checked="" type="checkbox"/>	
(If yes - enter stob 2000 in A/P)	
048/294KD/30595 160 / 2930563	
Client/Resp/Service Line/Stob/Project	
Invoice (if not on invoice) # _____	
W/P # _____	
P.O. or Contract #: _____	
Prices, extensions checked: (initial) _____	
<b>Expense Authority</b>	
Printed Name:	Michael Sokal
If required:	<i>[Signature]</i>
Signature:	<i>[Signature]</i>

-----  
 TERMS: NET 60

P.O. #: GS12PNE300

P.S.T. #:

DATE: 18JUL12 INVOICE: 20422

LARRATT AQUATIC CONSULTING LTD.  
3025 ENSIGN LANE  
WEST KELOWNA, BC  
V4T 2Z4 250-769-5444

BILL TO:

Ministry of Environment  
Attn: Mike Sokal  
102 Industrial Place  
Penticton, BC V2A 7C8

PRICE	DESCRIPTION
	Water Sampling of Okanagan Lake June and July 2012 as specified by Ministry Contract GS12PNE300
1,663.00	June 11, 12 B Larratt, J Self
1,663.00	July 16, 17 B Larratt, J Self
399.12	HST # R102372885
	Note: \$ 3,725.12 billed June 8, 2012
	\$ 3,725.15 Payment received July 9, 2012
	\$ 0.00 Previous balance outstanding
3,725.12	** PLEASE PAY THIS AMOUNT **

<b>Goods Services Received</b>	
Rec'd DD/MM/YY:	23 107 12012
Signature: <i>[Signature]</i>	Date: 2012-07-23
Qualified Receiver	
Printed name:	Drumy St. Hilaire
Is this a capital Asset? Yes ___ No <input checked="" type="checkbox"/>	
(If yes - enter mob 2000 in A/P)	
048 1294KD/30595/60 12930563	
Client/Resp/Service Line/Stub/Project	
Invoice (if not on invoice) #	
WIP #	
P.O. or Contract #:	
Prices, extensions checked: (initial)	
<b>Expense Authority</b>	
Printed Name:	Michael Sokal
If required, Signature:	<i>[Signature]</i>

TERMS: NET 30

P.O. #: GS12PNE300

P.S.T. #:

DATE: 18SEP12 INVOICE: 20430

LARRATT AQUATIC CONSULTING LTD.  
3025 ENSIGN LANE  
WEST KELOWNA, BC  
V4T 2Z4 250-769-5444

Received

BILL TO:

SEP 19 2012

Ministry of Environment  
Attn: Mike Sokal  
102 Industrial Place  
Penticton, BC V2A 7C8

102 Industrial Place  
Penticton, BC V2A 7C8

PRICE	DESCRIPTION
1,663.00	Okanagan lake sampling for August 2012 as specified under Ministry Contract GS12PNE300 August 13, 14 B Larratt and J Self
199.56	HST # R102372885
	Note: Payment has been received for all previous invoices
1,862.56	** PLEASE PAY THIS AMOUNT **

<b>Goods Services Received</b>	
Rec'd DD/MM/YY: 20 109 1 2012	
Signature: <i>[Signature]</i> Date: 2012-09-20	
Qualified Receiver	
Printed name: Danny St. Hilaire	
Is this a capital Asset? Yes ___ No <input checked="" type="checkbox"/>	
(If yes - enter stob 2000 in A/P)	
1 see attached	
Client/Resp/Service Line/Stob/Project	
Invoice (if not on invoice) #	
W/P #	
P.O. or Contract #	
Prices, extensions checked: (initial)	
<b>Expense Authority</b>	
Printed Name: Michael Sokal	
If required, Signature: <i>[Signature]</i>	

TERMS: NET 30

P.O. #: GS12PNE300

P.S.T. #:



# Appendix J: Maxxam Analytics invoice records, 2012



Success Through Science

Maxxam  
 4606 Canada Way  
 Burnaby British Columbia  
 Canada V5G 1K5  
 Tel (604) 734 7276  
 Fax (604) 731 2386

Invoice : BC903943

Invoice Date: 31 Aug 12  
 Page 2 of 4

To: MINISTRY OF ENVIRONMENT

#401-333 Victoria Street  
 Nelson, BC  
 V1L 4K3  
 At: Alison Libby/AJ Downie

Account # : 151023

Client Code 4809 continued

Client Code	Invoice Number	Invoice Date	Job Number	Project#(Name)	Requisition Id	Invoice Amount
				Project REYV AQ SubTotal :		52.50
				Project REYV AQ HST Total :		6.30
				Project REYV AQ YTD SubTotal :		157.50
				Project REYV AQ HST YTD Total :		18.90
	635304	2012/08/10	B263705	REYV FH AQ	50192667	52.50
	639834	2012/08/30	B273261	REYV FH AQ	50193680	31.50
				Project REYV FH AQ SubTotal :		84.00
				Project REYV FH AQ HST Total :		10.08
				Project REYV FH AQ YTD SubTotal :		178.50
				Project REYV FH AQ HST YTD Total :		21.42
				Client Code 4809(cb) SubTotal :		555.50
				Client Code 4809(cb) HST Total :		66.78
				Client Code 4809(cb) YTD SubTotal :		1,018.50
				Client Code 4809(cb) HST YTD Total :		122.22
4818( tq )	636692	2012/08/20	B272493	LSSS	50190384	10.00
	636693	2012/08/20	B272491	LSSS	50190405	10.00
	636696	2012/08/20	B272489	LSSS	50190447	10.00
	636697	2012/08/20	B272490	LSSS	50190426	10.00
	636915	2012/08/21	B262391	LSSS	50190538	75.00
	637062	2012/08/22	B272480	LSSS	50190468	75.00
	637067	2012/08/22	B272482	LSSS	50190579	75.00
	637068	2012/08/22	B272483	LSSS	50190536	75.00
	637072	2012/08/22	B272484	LSSS	50190489	75.00
				Project LSSS SubTotal :		415.00
				Project LSSS HST Total :		49.80
				Project LSSS YTD SubTotal :		3,956.00
				Project LSSS HST YTD Total :		474.72
	638783	2012/08/27	B271877	OKCOLAB12	50189359	160.00
				Project OKCOLAB12 SubTotal :		160.00
				Project OKCOLAB12 HST Total :		19.20
				Project OKCOLAB12 YTD SubTotal :		480.00
				Project OKCOLAB12 HST YTD Total :		57.60
	638776	2012/08/27	B271717	OKCOLABS12	50189416	160.00

**TERMS**

Net 30 days after date of invoice  
 2% interest on overdue accounts  
 Please make cheque payable to: Maxxam Analytics  
 Please Remit to: PO Box 7156 Station Terminal Vancouver, BC V6B 4E2  
 E.&O.E.

Continued on next page



Success Through Science

Maxxam  
 4606 Canada Way  
 Burnaby British Columbia  
 Canada V5G 1K5  
 Tel (604) 734 7276  
 Fax (604) 731 2386

Invoice : BC903943

Invoice Date: 31 Aug 12  
 Page 3 of 4

To: MINISTRY OF ENVIRONMENT

#401-333 Victoria Street  
 Nelson, BC  
 V1L 4K3  
 Att: Alison Libby/AJ Downie

Account # : 151023

Client Code 4818 continued

Client Code	Invoice Number	Invoice Date	Job Number	Project#(Name)	Requisition Id	Invoice Amount
				Project OKCOLABS12 SubTotal :		160.00
				Project OKCOLABS12 HST Total :		19.20
				Project OKCOLABS12 YTD SubTotal :		160.00
				Project OKCOLABS12 HST YTD Total :		19.20
638778	2012/08/27	B271722	OKLCLAB12	50189354	160.00	
638774	2012/08/27	B271711	OKLCLAB12	50189411	160.00	
			Project OKLCLAB12 SubTotal :		320.00	
			Project OKLCLAB12 HST Total :		38.40	
			Project OKLCLAB12 YTD SubTotal :		2,872.00	
			Project OKLCLAB12 HST YTD Total :		344.64	
636529	2012/08/17	B271597	ONA 12	50190294	135.00	
			Project ONA 12 SubTotal :		135.00	
			Project ONA 12 HST Total :		16.20	
			Project ONA 12 YTD SubTotal :		298.00	
			Project ONA 12 HST YTD Total :		35.76	
638754	2012/08/27	B271587	ONA12	50190273	163.00	
638756	2012/08/27	B271592	ONA12	50190278	28.00	
638759	2012/08/27	B271593	ONA12	50190285	163.00	
638761	2012/08/27	B271595	ONA12	50190290	28.00	
			Project ONA12 SubTotal :		382.00	
			Project ONA12 HST Total :		45.84	
			Project ONA12 YTD SubTotal :		1,530.00	
			Project ONA12 HST YTD Total :		183.60	
637053	2012/08/22	B272182	S050124STR	50193087	84.00	
637058	2012/08/22	B272184	S050124STR	50193089	28.00	
637060	2012/08/22	B272233	S050124STR	50193090	153.00	
638792	2012/08/27	B272185	S050124STR	50193086	73.00	
638800	2012/08/27	B272188	S050124STR	50193088	73.00	
			Project S050124STR SubTotal :		411.00	
			Project S050124STR HST Total :		49.32	
			Project S050124STR YTD SubTotal :		1,825.00	
			Project S050124STR HST YTD Total :		219.00	
638781	2012/08/27	B271875	VERNONOUTF	50190628	160.00	

TERMS

Net 30 days after date of invoice  
 2% interest on overdue accounts  
 Please make cheque payable to: Maxxam Analytics  
 Please Remit to: PO Box 7156 Station Terminal Vancouver, BC V6B 4E2  
 E.&O.E.

Continued on next page

## Appendix K: Fraser Environmental invoice records, 2012

\*Note: Total invoice costs also include other sampling, not associated with this program.

**Attention : Robyn Roome**  
 B.C. Ministry of Environment  
 Cranbrook, Nelson and Penticton, B.C.  
 Rm. 401-333 Victoria Street  
 Nelson, B.C.  
 V1L 4K3  
 (250) 354-6333  
 Robyn.Roome@gov.bc.ca

### BILLING FOR JULY 2012

**Payee : Linde Looy**  
**FRASER ENVIRONMENTAL SERVICES**  
 9358 Cinnamon Drive  
 Surrey, B.C., V3V 1V2  
 telephone and fax (604) 588-9738

Ministry Contract GS13ESD-003-1

INVOICE # 901-TQ

Total for Client Code TQ           \$ 1,988.43

#### Outstanding Balances

Balance Payable from Previous Month           \$ 0.00

Goods Services Received	
Rec'd DD/MM/YY:	20 10 8 12 012
Signature:	<i>[Signature]</i> Date: 2012-08-20
Printed name:	Danny St. Hilaire <small>Qualified Receiver</small>
Is this a capital Asset? Yes ___ No <input checked="" type="checkbox"/>	
(If yes - enter stob 2000 in A/P)	1 See attached
Client/Resp/Service Line/Stob/Project	
Invoice (if not on invoice) #	
WIP #	
P.O. or Contract #:	
Prices, extensions checked: (initial)	
Expense Authority	
Printed Name:	Michael Sokal
If required.	<i>[Signature]</i>
Signature:	

Attention : Robyn Roome  
 B.C. Ministry of Environment  
 Cranbrook, Nelson and Penticton, B.C.  
 Rm. 401-333 Victoria Street  
 Nelson, B.C.  
 V1L 4K3  
 (250) 354-6333  
 Robyn.Roome@gov.bc.ca

**BILLING FOR AUGUST 2012**

Payee : Linde Looy  
**FRASER ENVIRONMENTAL SERVICES**  
 9358 Cinnamon Drive  
 Surrey, B.C., V3V 1V2  
 telephone and fax (604) 588-9738

Ministry Contract GS13ESD-003-1

**INVOICE # 904-TQ**

Total for Client Code TQ                      \$ 1,988.43

Outstanding Balances

Balance Payable from Previous Month                      \$ 1,988.43

Apr = \$1,988.<sup>43</sup>

May = \$1,618.<sup>83</sup>

Jul = \$ 369.<sup>66</sup>

**TOTAL**                      \$ 3,976.<sup>86</sup>

<b>Goods Services Received</b>	
Rec'd DD/MM/YY:	20 109 12012
Signature:	<i>[Signature]</i> Date: 2012-09-20
Printed name:	Danny St. Hilaire
Is this a capital Asset? Yes ___ No <u>X</u> (If yes - enter stob 2000 in A/P)	
1 see attached	
Client/Resp/Service Line/Stob/Project	
Invoice (if not on invoice) #	
WIP #	
P.O. or Contract #:	
Prices, extensions checked: (initial)	
<b>Expense Authority</b>	
Printed Name:	Michael Sokol
If required,	
Signature:	<i>[Signature]</i>

**Attention : Robyn Roome**  
B.C. Ministry of Environment  
Cranbrook, Nelson and Penticton, B.C.  
Rm. 401-333 Victoria Street  
Nelson, B.C.  
V1L 4K3  
(250) 354-6333  
Robyn.Roome@gov.bc.ca

**BILLING FOR SEPTEMBER 2012**

**Payee : Linde Looy**  
**FRASER ENVIRONMENTAL SERVICES**  
9358 Cinnamon Drive  
Surrey, B.C., V3V 1V2  
telephone and fax (604) 588-9738

**Ministry Contract GS13ESD-003-1**

**INVOICE # 905-TQ**

**Total for Client Code TQ**

**\$ 926.10**



Outstanding Balances

Balance Payable from Previous Months                      \$ 3,976.86

**Attention : Robyn Roome**  
B.C. Ministry of Environment  
Cranbrook, Nelson and Penticton, B.C.  
Rm. 401-333 Victoria Street  
Nelson, B.C.  
V1L 4K3  
(250) 354-6333  
Robyn.Roome@gov.bc.ca

**BILLING FOR NOVEMBER/DECEMBER 2012**

**Payee : Linde Looy**  
**FRASER ENVIRONMENTAL SERVICES**  
9358 Cinnamon Drive  
Surrey, B.C., V3V 1V2  
telephone and fax (604) 588-9738

**Ministry Contract GS13ESD-003-1**

**INVOICE # 910/918-TQ**

**Total for Client Code TQ**

**\$ 4,865.70**

Outstanding Balances

Balance Payable from Previous Months                      \$ 0.00

**Received**

**JAN 07 2013**

102 Industrial Place  
Penticton, BC V2A 7G8

**Attention : Robyn Roome**  
B.C. Ministry of Environment  
Cranbrook, Nelson and Penticton, B.C.  
Rm. 401-333 Victoria Street  
Nelson, B.C.  
V1L 4K3  
(250) 354-6333  
Robyn.Roome@gov.bc.ca

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**BILLING FOR JANUARY 2013**

**Payee : Linde Looy**  
**FRASER ENVIRONMENTAL SERVICES**  
9358 Cinnamon Drive  
Surrey, B.C., V3V 1V2  
telephone and fax (604) 588-9738

**Ministry Contract GS13ESD-003-1**

**INVOICE # 924-TQ**

**Total for Client Code TQ           \$ 2,680.08**

Received

FEB 18 2013

Outstanding Balances

Balance Payable from Previous Months           \$ 0.00

102 Industrial Place  
Penticton, BC V2A 7G8

## Appendix L: Cost estimates for 2013

- Costs should remain the same or similar to 2012 costs (see table below).
- Sample collection prices will remain the same in 2013, as per MOE contract with Larratt Aquatic Consulting.
- May and July water chemistry samples are higher in cost due to QA samples being collected and analyzed.
- April and May plankton analyses are lower priced than later samples, as Fraser Environmental gives a discount to early-season sample submission.

Parameter	Supplier	March	April	May	June	July	August	September	Totals
<b>Sample Collection</b>	Larratt Aquatic Consulting	MOE	\$1,862.56	\$1,862.56	\$1,862.56	\$1,862.56	\$1,862.56	MOE	\$9,312.80
<b>Water Chemistry</b>	Maxxam Analytics	MOE	\$716.80	\$891.52	\$716.80	\$891.52	\$716.80	MOE	\$3,933.44
<b>Plankton Analyses</b>	Fraser Environmental	-	\$1,325.62	\$1,325.62	\$1,411.98	\$1,411.98	\$1,411.98	\$1,411.98	\$8,299.16
<b>Grand Total</b>									\$21,545.40
<b>Budget</b>									\$22,000.00
<b>Balance</b>									\$454.60