P.O. Box 1749
Halifax, Nova Scotia
B3J 3A5 Canada

Information Item No. 2
Regional Watersheds Advisory Board
August 12, 2015

TO: Chair and Members of Regional Watersheds Advisory Board

Original Signed

SUBMITTED BY:

Bob Bjerke, Chief Planner and Director, Planning and Development

DATE: June 9, 2015

SUBJECT: **Bedford West Water Quality**

INFORMATION REPORT

ORIGIN

Bedford Municipal Planning Strategy, Bedford West Secondary Planning Strategy, Policies BW-3, BW-4, and BW-5.
Development Agreements between Halifax Regional Municipality and West Bedford Holdings Ltd.

LEGISLATIVE AUTHORITY

The Halifax Regional Municipality Charter, Part VIII, Planning and Development, Section 240, Development Agreements.

BACKGROUND

The Bedford West Secondary Planning Strategy, Policy BW-3, requires that a water quality monitoring program be undertaken for the Paper Mill Lake watershed to track to the eutrophication process. The terms of the program are specified within Development Agreements that have been negotiated in consultation with the Bedford Watershed Advisory Board, until its dissolution in 2013, and the Regional Watersheds Advisory Board (RWAB) since 2013. All such agreements require that the municipality designates a member of staff to submit test results to the Developer, the Community Council, and the (Bedford Waters Advisory Board[1]) within three (3) months of being received from the consultant.

Policy BW-5 of the same Strategy requires the designated staff member is to immediately report results to the Developer, and to the Waters Advisory Board and the Community Council at the next meeting, if any total phosphorus measurement exceeds ten (10) micrograms per liter or if the geometric mean of any fecal coliform measurement within a given calendar year exceeds two hundred (200) counts (MPN) per 100ml at any location, or if any fecal coliform measurement exceeds four hundred (400) counts (MPN) per 100ml. Policies BW-3 through BW-5 are provided verbatim in Attachment A.

[1] In a single motion dated November 27, 2012, Regional Council moved to dissolve the Bedford Waters Advisory Board and create the Regional Watersheds Advisory Board (RWAB). RWAB assumed the functions previously performed by BWAB once it began conducting meetings in July 2013.

DISCUSSION

Water quality monitoring activities have been conducted three times annually at specified locations within the Paper Mill Lake watershed continuously since spring 2009. The last time that staff reported results to the North West Community Council (NWCC), however, was August 2013, at which time the results of the May 2013 sampling event were provided as an information report.

Five sampling events have been completed and reported by the consultant to municipal staff since the May 2013 event. Event-based reports were submitted by staff to the developers. These five reports are provided as Attachments B-F, respectively.

Staff has begun compiling and reviewing reports to present to the NWCC and RWAB, with a focus on both bacteria[2] and Total Phosphorus measurements. While *E. coli* results are within the guidelines (measurements below 400, geometric means below 200), staff quickly realized that Total Phosphorus (TP) measurements reported over the period Summer 2013 – Fall 2014 exceeded the threshold most of the time at most stations, and in some cases by substantial amounts. A more thorough review of TP measurements back through spring 2012 revealed that these observations have been generally consistent at least since that time.

A summary of E. coli and Total Phosphorus measurements obtained since spring 2012 is provided in Attachment G.

In response to the observation that TP results met and exceeded the 10µg/100mL threshold, staff has initiated an assessment in accordance with the requirements of policy BW-5 in the Bedford MPS. The assessment consists of the following steps:

Phase 1:

- Report and discuss findings with the developer (complete May 29)
- Conduct, through contractor, a detailed assessment of existing water quality data from the Paper Mill Lake watershed to identify trends in Total Phosphorus measurements, considering CCME guidelines (Initiated June 3)

Phase 2: In response to the data and its analysis, staff will investigate the cause(s) of high Total Phosphorus measurements, considering all significant land uses that have occurred in the Paper Mill Lake watershed since the inception of the monitoring program.

Phase 3: Pursuant to the results of Phase 2, staff will determine a course of action respecting watershed management and future land use development in the area

Unofficial reports of the May 2015 water quality sampling event indicate that only one of eleven stations had a TP result that exceeded the threshold value. In the event that TP threshold levels are exceeded in either of the August or October sampling events, staff intends to direct its consultants to undertake further testing to verify results and investigate possible nutrient sources upstream of locations where exceedances are recorded.

Staff proposes to provide updates to the RWAB and the NWCC in accordance with the draft timeline presented below.

Event	Time
Complete Phase 1 (Receive final consultant's report, analysis of historical data)	Mid-August

[2] Although the Secondary Planning Strategy specified fecal coliform monitoring, municipal staff and contracted parties began monitoring Escherichia coli (E. coli) instead of fecal coliforms in 2010, in response to revisions of Health Canada's Canadian Recreational Water Quality Guidelines, which were published in 2009 and formally adopted in 2012.

Develop Phase 2 of Assessment Process	Mid-August through mid-September
Update NWCC & RWAB	September
Execute Phase 2	Mid-September – end October
Update NWCC & RWAB	November
Develop Phase 3	November – Undetermined.
Update NWCC & RWAB	January 2016

FINANCIAL IMPLICATIONS

There are no financial implications associated with this report.

COMMUNITY ENGAGEMENT

None.

ATTACHMENTS

Attachment A: Bedford West Secondary Planning Strategy, Water Quality Monitoring Policies
Attachment B: August 2013 Water Monitoring Report
Attachment C: October 2013 Water Monitoring Report
Attachment D: May 2014 Water Monitoring Report
Attachment E: August 2014 Water Monitoring Report
Attachment F: October 2014 Water Monitoring Report
Attachment G: Summary, E. Coli and Total Phosphorus Measurements, 2013-2014

A copy of this report can be obtained online at http://www.halifax.ca/commcoun/index.php then choose the appropriate Community Council and meeting date, or by contacting the Office of the Municipal Clerk at 902.490.4210, or Fax 902.490.4208.

Report Prepared by: Cameron Deacoff, Environmental Performance Officer, 902.490.1926

Original Signed

Report Approved by: _____

Richard MacLellan, Manager, Energy & Environment, 902.490.6056

Attachment A: Bedford West Secondary Planning Strategy, Water Quality Monitoring Policies

Policy BW-3:

A water quality monitoring program shall be undertaken for the Paper Mill Lake watershed, illustrated on Schedule BW-2 to track the eutrophication process. The program is to be designed in accordance with national guidelines established by the Canadian Council for Ministers of the Environment (the CCME guidelines)and undertaken by a qualified persons retained by the Municipality and financed in whole or in part by developers within the watershed area. Specifics of the program are to be negotiated under the terms of a development agreement in consultation with the Bedford Watershed Advisory Board. The monitoring program shall:

a) specify the duration of monitoring for the pre-construction, construction and post-construction phases of development. Pre-construction phase means a period of time before construction activity starts. Post-construction phase means a period of time that commences at full build out of the area permitted by a development agreement. Construction phase means the full time period between the pre-construction and post-construction phase);
b) specify the physical and chemical water quality indicators to be measured, the location and frequency of testing and the format of submissions to the Municipality in each phase referenced under clause (a);
c) establish physical and chemical water quality indicator threshold levels for the recreational uses of the lakes which would be used as a basis for reevaluating watershed management controls and future development potential within the area. The threshold indicators are to be established prior to any development approvals being granted;
d) conform with all water quality policies, specifications, protocols and review and approval procedures approved by Regional Council.

Policy BW-4:

Where the Community Council is satisfied that a development agreement application has been made for a development proposal which could not be reasonably expected to impact the quality of water within the Paper Mill Lake watershed, the requirements of policy BW-3 may be waived.

The Community Council shall seek the advice of the Bedford Watershed Advisory Board before granting any waiver.

Policy BW-5:

In the event that water quality threshold levels, as specified under clause (c) of policy BW-3, for Paper Mill Lake or Kearney Lake are reached, the Municipality shall undertake an assessment and determine an appropriate course of action respecting watershed management and future land use development in the area. An assessment shall consider the CCME guidelines. Water quality thresholds and any assessment reports shall be made available to the public.

SNC-LAVALIN INC.
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Park Lane Terraces
5657 Spring Garden Road
Halifax, Nova Scotia
Canada, B3J 3R4

Telephone: 902-492-4544
Fax: 902-492-4540

12 September 2013

Halifax Regional Municipality
Energy and Environment
PO Box 1749
Halifax, Nova Scotia
B3J 3A5

Attention: Mr. Cameron Deacoff

Dear Mr. Deacoff:

RE: Draft Report: Water Quality Monitoring within Bedford West, Bedford, Nova Scotia – August 2013 Sampling Event

1.0 Introduction

SNC-Lavalin Inc., Environment Division (SLE) was retained by the Halifax Regional Municipality (HRM) to conduct water quality monitoring within Bedford West. The Paper Mill Lake watershed is the primary watershed within the area. The water sampling program consisted of collecting surface water samples from eleven (11) specified locations as part of the August 2013 sampling event. The purpose of the program is to determine water quality for watersheds impacted by the development in the Bedford West area. The overall purpose of the monitoring program is to conduct water quality testing prior to construction activities (establish baseline conditions) in order to detect any impacts on and/or changes to water quality during and after construction of the development project.

This report presents water quality data from Kearney Lake, Kearney Lake Run, Highway 102, Lakeshore Drive, Larry Uteck Boulevard and Paper Mill Lake, collected on August 15 and August 16, 2013. The water quality test locations are presented on Figure 1.

2.0 Methodology

The August 2013 monitoring event methodology consisted of the sampling and analyses of general chemistry (RCAp), total metals, total phosphorous, total suspended solids, E. coli bacteria, TKN and chlorophyll-a from eleven (11) specified surface water sampling locations. Standard field measurements (pH, water temperature, dissolved oxygen, conductivity, secchi depth, air temperature, cloud cover, and wildlife sightings) were to be measured at the eleven (11) specified sampling locations for the May 2013 monitoring event. The field measurements were collected using an AM100 Aqua Meter and AP800 Aqua Probe. For 2009 SLE sampling events, Oakton Portable Waterproof Meters were used for collecting field measurements (Dissolved Oxygen Meter – 35601-Series; pH and Conductivity – 35630-00 and 35630-02, respectively), and for 2010-2011 SLE sampling events, Hach intelliCAL probes for pH, conductivity and dissolved oxygen (Product Numbers pHC30101, CDC40101 and LDO10101, respectively) were used. The water samples and field parameter readings were collected from a 1.0 metre depth whenever possible.

The field parameters and site conditions for each sampling location were recorded on a field report. The field reports are provided in Attachment 1. Photographs of each sampling location are attached in Attachment 2.

A new pair of latex gloves was used at each sample location. Surface water samples were collected and placed in clean laboratory-supplied jars and stored in a chilled container together with a chain of custody record for transport to the laboratory. All surface water samples collected were submitted to AGAT Laboratories, located in Dartmouth, Nova Scotia.

Secchi depth measurements were taken from the shady side of the boat at two sample locations. The secchi disk was lowered in the water until no longer visible. The depth was measured to the nearest tenth of a metre. The disk was raised until visible in the water and the depth was measured. The secchi depth is the midpoint between the two measured depths.

3.0 Assessment Standards

The Canadian Council of Ministers of the Environment (CCME) guidelines for water are broken down based on water use including Freshwater Aquatic Life, Marine Water Aquatic Life, Irrigation, Livestock Watering and Aesthetics and Drinking Water. The surface water quality results were compared to the CCME Freshwater Aquatic Life (FWAL) guidelines since the specified sampling locations are located at and/or near adjacent freshwater bodies.

Analytical data for total suspended solids (TSS) and turbidity are compared to the CCME for the Protection of Aquatic Life (CCME Narrative Total Particulate Matter – Table 1 Suspended Sediments and Turbidity, High Flow Conditions, 1999, updated 2002).

For TSS, the guideline value is equal to a maximum increase of 25 mg/L from background levels at any time when background levels are between 25 and 250 mg/L. When background is greater than 250 mg/L, the concentration should not increase more than 10% of background levels.

The Health Canada guidelines for Canadian Recreational Water Quality (2012, Third Edition) were used as reference guidelines. The Canadian Recreational Water Quality guidelines indicate that the clarity of the water should be sufficiently clear such that a Secchi disk is visible at a minimum of 1.2 metres. For turbidity, a limit of 50 Nephelometric Turbidity Units (NTU) is suggested.

4.0 Results of the Investigation

4.1 Field Measurements

Field parameters were measured at ten (10) sampling locations during the August 2013 monitoring event. One surface water sample location associated with Paper Mill Lake, PML2, was not collected as part of the August 2013 sampling program since recent draining of the lake made access to this area unsafe. Field measurements of dissolved oxygen, pH, conductivity and temperature are presented in Table 1.

Dissolved oxygen readings of 3.32 mg/L and 1.57 mg/L for sample location HWY102-1 and HWY102-2 respectively were recorded, which are outside the CCME FWAL guideline range of 5.5-9.5 mg/L. All other dissolved oxygen readings for the remaining eight sample locations were within the applied CCME FWAL guideline range.

4.2 Laboratory Analytical Results

4.2.1. General Chemistry

All analytical results reported pH levels within the acceptable range of 6.5-9.0 for all sample locations.

The analytical results for dissolved chloride indicated all samples were within the applicable CCME guideline of 120 mg/L.

All other general chemistry parameters analyzed were also within their respective applicable guidelines.

4.2.2. Metals

Analytical results reported total aluminum concentrations of above the CCME FWAL guideline of 5-100 µg/L at KL1, KL2, KL4, HWY102-1, HWY102-2, LU and PML1 (total aluminum: 120 µg/L, 270 µg/L, 106 µg/L, 145 µg/L, 138 µg/L, 447 µg/L and 103 µg/L, respectively).

The analytical results reported total cadmium concentrations of above the CCME FWAL guideline of 0.017 µg/L at LU and PML1 (total cadmium: 0.236 µg/L and 0.018 µg/L, respectively).

Total copper exceeded the CCME FWAL guideline of 2.0-4.0 µg/L at sample location LU (total copper: 6 µg/L).

Total iron exceeded the CCME FWAL guideline of 300 µg/L at sample locations KL2, HWY102-1, HWY102-2, and LU (total iron: 528 µg/L, 938 µg/L, 1720 µg/L, and 890 µg/L).

Total zinc exceeded the CCME FWAL guideline of 30 µg/L at sample location LU (total zinc:

49 µg/L).

All other metals parameters were reported to be within the applied CCME FWAL guidelines. Surface water metals results have been provided in Table 1. Laboratory certificates have been provided in Attachment 3.

4.2.3. Microbiological

The laboratory analytical results reported E. Coli concentrations were reported to be within the referenced Health Canada Recreational Water Quality guidelines of 400 MPN/100 mL for all sample locations.

Surface water microbiological results have been provided in Table 1. Laboratory certificates have been provided in Attachment 3.

5.0 Conclusions

Water quality monitoring within Bedford West was conducted on August 15 and 16, 2013, and included the collection of field parameters (pH, water temperature, dissolved oxygen, conductivity, secchi depth, air temperature, cloud cover, and wildlife sightings) and the collection of surface water samples for the analysis of RCAp, total metals, total phosphorous, total suspended solids, E. Coli, total coliforms and chlorophyll-a.

Dissolved oxygen readings outside of the CCME FWAL guideline range were recorded at two (2) sample locations: HWY102-1 and HWY102-2.

All analytical results reported pH levels within the acceptable range of 6.5-9.0 for all sample locations.

The analytical results for dissolved chloride indicated all samples were within the applicable CCME guideline of 120 mg/L.

Total aluminum concentrations above the CCME FWAL guidelines were recorded at seven (7) sample locations: KL1, KL2, KL4, HWY102-1, HWY102-2, LU, PML1. Total cadmium concentrations above the CCME FWAL guideline were recorded at two (2) sample locations: LU and PML1. Total copper concentrations above the CCME FWAL guideline were recorded

at sample location LU. Total iron exceeded the CCME FWAL guideline at four (4) sample locations KL2, HWY102-1, HWY102-2, and LU. Total zinc exceeded the CCME FWAL guideline at sample location LU. All other metals parameters were reported to be within the applied CCME FWAL guidelines.

The laboratory analytical results reported E. Coli concentrations to be within the referenced Health Canada Recreational Water Quality guidelines of 400 MPN/100 mL for all sample locations.

If you have any questions or require anything further, please contact the undersigned at (902) 492-4544.

Yours truly,

SNC♦LAVALIN INC.
Original Signed

Derek Heath, P.Geo.
Project Manager
Environment and Water

DH/ad

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N

HWY102-2

PML2

HWY102-1

PAPER MILL LAKE

PML1

KL4

LSD

KL3

KL2

LU

KEARNEY LAKE

KL5

KL1

Legend

- Water Quality Monitoring Test Locations/Sample Identification

0 200 400 800 1,200 1,600

Meters

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HALIFAX REGIONAL MUNICIPALITY

PROJECT: WATER QUALITY MONITORING WITHIN BEDFORD WEST

TITLE: WATER QUALITY MONITORING TEST LOCATIONS

DESIGNED:	CH
DRAWN:	CH
CHECKED:	DH
SCALE:	AS SHOWN
DATE:	10-09-2012
PROJECT #:	510192-0001
DRAWING #:	1

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2013	Units (Maxxam)	Units	RDL (Maxxam)	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Kearney Lake																								
Sample Sites							KL1											KL2													
Sampling Date	yyyy-mm-dd	yyyy-mm-dd	--				2009-06-29	2009-08-13	2009-10-01	2010-05-31	2010-08-24	2010-11-01	2011-05-13	2011-08-14	2011-10-16	2012-05-01	2012-08-14	2012-10-10	2013-05-15	2013-08-16	2009-06-29	2009-08-13	2009-10-01	2010-05-31	2010-08-24	2010-11-01	2011-05-13	2011-08-14	2011-10-16	2012-05-01	2012-08-14	2012-10-10	2013-05-15	2013-08-15
Sampling Time	hh:mm	hh:mm	--				08:00	11:45	08:30	11:00	13:10	12:00	11:00	14:30	14:00	8:30	11:20	9:50	10:20	11:10	11:00	10:30	10:45	10:15	12:25	10:50	09:30	14:00	13:15	9:50	10:30	10:20	09:10	16:10
FIELD DATA																																
Secchi Depth	Meters	Meters	--	--	1.2	--	4.1	4.2	5.0	N/A	5.0	4.9	2.4	3.2	2.4	2.35	5.36	N/A	2.50	2.03	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	Celsius	0.1	0.1	--	--	14.0	22.2	16.7	12.9	23.3	8.8	11.5	25.6	15.9	8.9	23.3	15.4	13.2	22.2	16.8	18.2	15.4	13.5	20.4	8.0	9.9	19.1	14.1	7.6	21.8	12.3	10.1	22.9
Dissolved Oxygen	mg/L	mg/L	0.01	0.01	--	5.5-9.5	**10.72**	8.20	7.00	9.13	7.86	**10.48**	**10.09**	8.22	9.22	8.98	7.93	8.72	**9.75**	8.57	**10.16**	8.50	5.70	6.28	**4.56**	**9.53**	**9.66**	7.06	8.43	6.47	5.82	7.63	9.37	6.38
pH	pH	pH	N/A	N/A	--	--	6.20	6.76	6.67	7.23	7.32	6.61	6.60	6.16	6.04	8.67	6.91	6.32	6.32	8.24	6.33	6.35	6.19	6.61	6.96	6.25	6.77	5.90	5.62	7.72	6.41	6.29	5.75	7.47
Specific Conductance	uS/cm	uS/cm	1	1	--	--	263	299	261	248	242	219	288	179	146	277	279	198.1	243	216.5	46	106	89	199	104	75	80	67	54	58	96.6	61.1	77.9	65.3
INORGANICS																																
Total Alkalinity (as CaCO3)	mg/L	mg/L	5	5	--	--	6	8	8	7	8	6	<5	9	7	24	7	<5	<5	<5	<5	8	<5	5	7	<5	<5	7	<5	20	<5	8	<5	<5
Dissolved Chloride (Cl)	mg/L	mg/L	1	1	--	120	81	74	64	62	60	55	73	45	33	66	70	50	66	59	17	23	16	21	25	17	19	14	10	16	20	12	19	21
Colour	TCU	TCU	30	5	--	--	18	18	16	26	8	21	28	40	45	50	11	20	11	37	99	74	110	61	63	95	80	110	120	52	60	94	37	90
Nitrite + Nitrate	mg/L	mg/L	0.05	0.05	--	--	0.18	0.09	0.12	0.21	0.16	0.23	0.2	0.11	0.13	0.20	0.09	0.10	0.18	0.14	0.06	0.11	<0.05	0.10	0.07	0.06	0.12	0.07	<0.05	0.11	0.08	<0.05	0.12	<0.05
Nitrate (N)	mg/L	mg/L	0.05	0.05	--	13000	0.18	--	--	0.21	0.16	--	0.2	--	--	0.20	0.09	0.10	0.18	0.14	0.06	--	--	0.10	0.07	--	0.12	--	--	0.11	0.08	<0.05	0.12	<0.05
Nitrite (N)	mg/L	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	mg/L	0.05	0.03	--	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.04	0.03	<0.03	0.03	0.03	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03	<0.03	<0.03	0.04
Total Organic Carbon	mg/L	mg/L	0.5	0.5	--	--	2.4	2.9	4.7	3.3	3.2	3.1	3.4	5.9	5.5	5.4	2.9	5.2	4.4	4.1	8.2	7.2	9.9	4.8	6.6	9.7	6.5	10	12	8.1	7.1	10.9	7.5	11.1
Orthophosphate (as P)	mg/L	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.09	<0.01	<0.01	<0.01
pH (Lab)	pH	pH	N/A	N/A	5.0-9.0	6.5-9	6.94	6.65	6.68	6.91	7.00	6.79	6.52	6.51	6.52	6.7	7.2	6.9	6.78	6.93	**6.22**	6.58	6.61	6.59	6.78	**6.11**	**6.27**	**6.4**	**6.05**	6.5	6.7	6.5	**6.37**	6.62
Total Calcium (Ca)	mg/L	mg/L	0.1	0.1	--	--	9.2	8.5	7.2	7.72	8.66	8.30	7.65	4.82	5.31	6.8	8.4	6.3	7.5	6.6	2.8	4.2	2.9	3.44	4.08	3.55	2.51	2.48	2.21	2.4	3.6	2.9	2.7	2.5
Total Magnesium (Mg)	mg/L	mg/L	0.1	0.1	--	--	1.5	1.4	1.2	1.42	1.36	1.30	1.29	0.86	1.06	1.1	1.5	1.5	1.1	1.2	0.7	1.1	0.7	0.92	0.98	0.84	0.63	0.64	0.36	0.7	1.0	1.0	0.7	0.5
Total Phosphorus (1M depth)	mg/L	mg/L	0.002	0.006	--	--	<0.02	<0.02	<0.002	0.009	0.007	0.005	0.008	0.012	0.009	0.037	0.043	0.007	0.007	0.011	<0.02	0.04	0.034	0.009	0.009	0.009	0.008	0.013	0.021	0.059	0.013	0.010	0.02
Total Potassium (K)	mg/L	mg/L	0.1	0.1	--	--	1.1	0.9	1.3	0.876	0.888	0.901	0.788	0.773	0.871	0.7	0.9	0.9	0.8	0.7	0.6	0.8	0.7	0.716	0.634	0.826	0.534	0.497	0.734	0.5	0.7	0.8	0.5	0.5
Total Sodium (Na)	mg/L	mg/L	0.1	0.1	--	--	51	46	37	31.8	35.2	33.8	43.7	22.8	19.8	40.1	42.0	29.8	35.8	26.2	11	15	9.9	10.7	14.7	10.6	11.1	7.8	6.9	9.8	14.2	9.5	8.9	7.0
Reactive Silica (SiO2)	mg/L	mg/L	0.5	0.5	--	--	2.6	2.2	2.3	2.9	2.7	2.9	2.8	1.9	2.3	2.4	1.3	2.2	2.5	1.8	3.3	4.5	4.4	2.0	4.2	4.7	2.7	4.3	4	2.6	4.0	4.9	2.8	4.4
Total Suspended Solids	mg/L	mg/L	2	5	--	--	1	1	<1	4	17	3	2	2	3	<5	<5	<5	<5	<5	<2	2	5	6	7	<1	<1	<2	<1	<5	<5	<5	<5	135
Dissolved Sulphate (SO4)	mg/L	mg/L	2	2	--	--	14	13	12	11	11	11	12	10	8	8	9	9	11	9	<2	<2	<2	3	<2	<2	<2	<2	<2	3	3	2	4	5
Turbidity (NTU)	NTU	NTU	0.1	0.1	50	--	0.7	0.8	1.0	1.3	0.6	1	1	1	0.9	2.4	0.8	1.3	1.6	3.3	0.3	7.6	1.0	17	1.0	1.0	0.4	0.7	0.6	0.5	1.1	1.0	1.9	2.2
Conductivity (uS/cm)	µS/cm	µS/cm	1	1	--	--	310	290	250	240	240	230	290	180	140	246	274	196	259	241	76	100	74	90	100	97	79	66	54	71	91	61	83	69
Calculated Parameters																																
Anion Sum	me/L	me/L	N/A	N/A	--	--	2.72	2.52	2.23	2.12	2.08	1.91	2.33	1.66	1.27	2.52	2.31	1.60	2.10	1.86	0.49	0.82	0.45	0.77	0.85	0.49	0.53	0.53	0.28	0.92	0.63	0.54	0.63	0.70
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	mg/L	1	5	--	--	6	8	8	7	8	6	<1	9	7	24	7	<5	<5	<5	<1	8	<1	5	7	<1	<1	7	<1	20	<5	8	<5	<5
Calculated TDS	mg/L	mg/L	1	1	--	--	166	151	131	123	125	118	143	92	77	139	137	98	124	104	36	55	35	46	55	38	37	34	25	45	44	34	37	37
Carb. Alkalinity (calc. as CaCO3)	mg/L	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	--	2.85	2.57	2.12	1.92	2.10	2.02	2.42	1.33	1.25	2.24	2.41	1.79	2.08	1.61	0.71	0.99	0.67	0.74	0.95	0.74	0.68	0.55	0.49	0.65	0.94	0.73	0.63	0.54
Hardness (CaCO3)	mg/L	mg/L	1	N/A	--	--	29	27	23	25	27	26	24	16	18	21.5	27.2	21.9	23.3	21.4	10	15	10	12	14	12	9	9	8	8.9	13.1	11.4	9.6	8.3
Ion Balance (% Difference)	%	%	N/A	N/A	--	--	2.33	0.98	2.53	4.95	0.48	2.80	1.89	11.00	0.79	5.9	2.1	5.3	0.7	7.3	18.30	9.39	19.60	1.99	5.56	20.30	12.40	1.85	27.30	17.6	19.7	15.1	0.3	12.9
Langelier Index (@ 20C)	N/A	N/A	N/A	N/A	--	--	-2.68	-2.87	-2.94	-2.72	-2.51	-2.87	NC	-3.18	-3.21	-2.69	-2.63	-3.19	-3.24	-3.14	NC	-3.20	NC	-3.44	-3.05	NC	NC	-3.66	NC	-3.37	-3.60	-3.68	-4.05	-3.83
Langelier Index (@ 4C)	N/A	N/A	N/A	N/A	--	--	-2.93	-3.12	-3.19	-2.97	-2.76	-3.12	NC	-3.43	-3.46	-3.01	-2.95	-3.51	-3.56	-3.46	NC	-3.45	NC	-3.70	-3.30	NC	NC	-3.91	NC	-3.69	-3.92	-4.00	-4.37	-4.15
Saturation pH (@ 20C)	N/A	N/A	N/A	N/A	--	--	9.62	9.52	9.62	9.63	9.51	9.66	NC	9.69	9.73	9.39	9.83	10.10	10.0	10.1	NC	9.78	NC	10.00	9.83	NC	NC	10.10	NC	9.87	10.3	10.2	10.4	10.5
Saturation pH (@ 4C)	N/A	N/A	N/A	N/A	--	--	9.87	9.77	9.87	9.88	9.76	9.91	NC	9.94	9.98	9.71	10.2	10.4	10.3	10.4	NC	10.00	NC	10.30	10.10	NC	NC	10.30	NC	10.2	10.6	10.5	10.7	10.8
Metals (ICP-MS)																																
Total Aluminum (Al)	µg/L	µg/L	5	5	--	5-100	**230**	--	--	**289**	47.8	--	**338**	--	--	**321**	43	**168**	**191**	**120**	**290**	--	--	**175**	**151**	--	**271**	--	--	**209**	**205**	**338**	**256**	**270**
Total Antimony (Sb)	µg/L	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	µg/L	1	2	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	µg/L	1	5	--	--	16	--	--	18.5	15.9	--	13	--	--	12	15	9	12	7	9	--	--	11.7	14.3	--	9.5	--	--	9	11	10	8	<5
Total Beryllium (Be)	µg/L	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	µg/L	5	5	--	1500	8	--	--	11.4	9.1	--	<50	--	--	<5	11	33	6	10	8	--	--	14.7	12.7	--	<50	--	--	6	14	22	6	11
Total Cadmium (Cd)	µg/L	µg/L	0.017	0.017	--	0.017	<0.3	--	--	**0.053**	<0.017	--	**0.056**	--	--	**0.032**	**0.027**	**0.021**	**0.020**	<0.017	<0.3	--	--	**0.018**	<0.017	--	<0.017	--	--	<0.017	<0.017	<0.017	<0.017	<0.017
Total Chromium (Cr)	µg/L	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1
Total Cobalt (Co)	µg/L	µg/L	0.4	1	--	--	1	--	--	0.54	<0.40	--	0.79	--	--	<1	<1	<1	<1	<1	<1	--	--	<0.40	<0.40	--	<0.40	--	--	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	µg/L	2	2	--	2.0-4.0	<2	--	--	**5.8**	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<1	<2	--	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<1
Total Iron (Fe)	µg/L	µg/L	50	50	--	300	130	--	--	**313**	62	125	177	162	**384**	229	137	195	207	132	250	--	--	227	**403**	238	202	**418**	**358**	154	**541**	**813**	269	**528**
Total Lead (Pb)	µg/L	µg/L	0.5	0.5	--	1.0-7.0	<0.5	--	--	**10.3**	<0.50	--	<0.50	--	--	<0.5	<0.5	1.9	<0.5	<0.5	<0.5	--	--	1.01	<0.50	--	<0.50	--	--	<0.5	<0.5	1.1	<0.5	0.5
Total Manganese (Mn)	µg/L	µg/L	2	2	--	--	100	--	--	79.2	57.1	59	78.4	52.3	55.8	48	65	68	73	48	26	--	--	43.2	83.3	34.7	12.1	68.4	22.6	17	90	114	24	67
Total Molybdenum (Mo)	µg/L	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	µg/L	2	2	--	25-150	5	--	--	3.2	<2.0	--	3.2	--	--	<2	<2	2	2	<2	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2
Total Selenium (Se)	µg/L	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	1	<1	<1
Total Silver (Ag)	µg/L	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	--	--	**0.42**	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	µg/L	2	5	--	--	46	--	--	39.1	37.7	--	36	--	--	32	41	32	37	33	14	--	--	17.8	19.5	--	11.9	--	--	10	18	15	12	9
Total Thallium (Tl)	µg/L	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	3	<2	<2
Total Titanium (Ti)	µg/L	µg/L	2	2	--	--	11	--	--	6.4	<2.0	--	5.4	--	--	8	<2	3	4	2	2	--	--	<2.0	<2.0	--	2.8	--	--	<2	2	3	4	<2
Total Uranium (U)	µg/L	µg/L	0.1	0.1	--	15	0.1	--	--	0.11	<0.10	--	0.12	--	--	0.1	<0.1	0.1	0.1	0.1	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1
Total Vanadium (V)	µg/L	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	µg/L	5	5	--	30	27	--	--	14.4	7.5	11.1	12.1	13.3	9.7	5	<5	11	11	6	8	--	--	5.4	5.3	6.5	<5.0	<5.0	<5.0	<5	<5	7	<5	<5
MICROBIOLOGICAL																																
Total Coliform	CFU/100mL	MPN/100mL	1	1	--	--	200	65	--	>250	63	>250	91	>250	--	2420	>2420	1120	1200	866	1800	170	--	>250	11	>250	59	>250	--	>2420	1986	>2420	>2420	>2420
E. coli	CFU/100mL	MPN/100mL	100	1	400	--	39	24	--	9	15	37	8	>250	<100	41	11	17	48	2	**1500**	100	--	**>250**	6	6	2	>250	<100	3	7	3	12	6
Fecal Coliform	MPN/ml	MPN/ml	1	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	µg/L	N/A	0.30	--	--	0.53	0.79	1.11	1.73	1.47	0.99	0.76	1.44	1.36	0.62	2.3	1.54	1.22	1.40	0.82	6.05	1.97	0.73	0.55	0.22	0.44	0.89	0.97	0.53	2.2	0.07	0.62	1.00
Chlorophyll A - Welschmeyer method	µg/L	µg/L	N/A	0.30	--	--	0.48	0.69	1.17	1.61	1.42	0.81	0.69	1.15	1.14	0.63	2.3	2.16	1.40	1.40	0.87	5.97	1.95	0.66	0.54	0.21	0.42	0.73	0.82	0.56	2.2	0.12	0.72	1.00
Total Kjeldahl Nitrogen as N		mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	0.9	3.1	0.4	--	0.7	--	--	--	--	--	--	--	--	--	<0.4	2.2	0.7	--	1.1

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2013	Units (Maxxam)	Units	RDL (Maxxam)	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Kearney Lake Run																													
Sample Sites							KL3												KL4														KL5					
Sampling Date	yyyy-mm-dd	yyyy-mm-dd	--				2009-06-29	2009-08-13	2009-10-01	2010-05-31	2010-08-24	2010-11-01	2011-05-13	2011-08-14	2011-10-16	2012-05-01	2012-08-14	2012-10-10	2013-05-15	2013-08-16	2009-06-29	2009-08-13	2009-10-01	2010-05-31	2010-08-24	2010-11-01	2011-05-13	2011-08-14	2011-10-16	2012-05-01	2012-08-14	2012-10-10	2013-05-15	2013-08-16	2011-10-17	2012-05-01	2012-08-14	2012-10-10	2013-05-15	2013-08-16
Sampling Time	hh:mm	hh:mm	--				09:00	11:00	09:30	11:30	14:12	11:40	10:30	12:20	12:00	10:26	12:20	11:20	9:50	10:00	10:00	11:30	10:00	11:20	13:50	11:15	10:10	11:40	11:40	10:16	12:00	11:40	9:41	10:30	9:40	10:52	13:10	12:10	10:03	10:50
FIELD DATA																																						
Secchi Depth	Meters	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	Celsius	0.1	0.1	--	--	14.0	21.6	17.3	14.7	23.1	9.9	10.3	21.1	15.5	9	24.5	15.6	11.7	21.5	13.4	21.9	17.3	14.5	21.9	9.8	10.1	21.2	15.3	9.0	24.4	15.7	21.7	20.4	14.7	10.5	26.1	16.6	13.3	22.7
Dissolved Oxygen	mg/L	mg/L	0.01	0.01	--	5.5-9.5	10.79	8.89	8.00	9.26	7.83	10.35	11.06	8.42	9.60	8.89	8.17	7.72	10.20	9.20	10.57	8.10	8.30	9.01	6.27	10.89	10.59	8.55	9.65	8.70	7.32	8.87	10.09	8.89	9.38	7.88	7.90	8.16	9.67	8.89
pH	pH	pH	N/A	N/A	--	--	7.27	6.74	6.97	7.27	7.33	6.76	6.83	6.96	6.30	7.68	6.85	6.51	5.86	7.25	8.00	6.71	6.94	7.19	6.98	6.07	6.49	6.43	6.02	9.0	6.71	6.77	5.72	7.08	6.52	7.76	6.69	6.72	6.20	8.57
Specific Conductance	uS/cm	uS/cm	1	1	--	--	95	282	246	220	228	199	220	175	161	204	225	177.2	207.3	194.4	771	262	247	224	226	215	218	172	126	206	225	185.9	207.1	196.2	112	230	229	189.0	219.5	202.1
INORGANICS																																						
Total Alkalinity (as CaCO3)	mg/L	mg/L	5	5	--	--	<5	7	7	6	7	7	6	7	7	23	6	5	<5	5	5	7	7	6	8	7	5	8	7	22	8	<5	<5	<5	9	21	8	<5	<5	6
Dissolved Chloride (Cl)	mg/L	mg/L	1	1	--	120	66	63	60	55	55	53	56	43	37	50	57	46	54	40	67	65	60	56	56	53	56	44	37	51	57	46	54	41	37	55	57	48	58	44
Colour	TCU	TCU	30	5	--	--	22	20	20	28	12	20	31	38	40	57	15	31	19	23	22	18	20	27	11	20	32	38	43	48	11	20	17	21	35	43	10	27	10	22
Nitrite + Nitrate	mg/L	mg/L	0.05	0.05	--	--	0.14	0.12	0.14	0.24	0.15	0.22	0.24	0.15	0.16	0.19	0.09	0.09	0.21	0.11	0.15	0.12	0.14	0.23	0.19	0.21	0.23	0.15	0.17	0.19	0.11	0.09	0.20	0.11	0.17	0.19	0.15	0.83	0.21	0.21
Nitrate (N)	mg/L	mg/L	0.05	0.05	--	13000	0.14	--	--	0.24	0.15	--	0.24	--	--	0.19	0.09	0.09	0.21	0.11	0.15	--	--	0.23	0.19	--	0.23	--	--	0.19	0.11	0.09	0.20	0.11	--	0.19	0.15	0.83	0.21	0.21
Nitrite (N)	mg/L	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	mg/L	0.05	0.03	--	19	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	0.04	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	0.05	<0.03	<0.03	<0.03	<0.03	<0.05	<0.03	0.03	<0.03	<0.03	<0.03
Total Organic Carbon	mg/L	mg/L	0.5	0.5	--	--	2.6	3.9	4.3	3.6	3.1	3.3	3.8	5.1	5	5.9	3.4	4.9	4.3	4.4	2.5	2.6	4.0	3.3	2.6	3.1	3.7	6	5.4	7.5	3.2	4.8	4.2	4.5	4.8	5.8	3.4	4.7	4.0	4.6
Orthophosphate (as P)	mg/L	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (Lab)	pH	pH	N/A	N/A	5.0-9.0	6.5-9	6.38	6.67	6.82	6.82	6.99	6.87	6.52	6.5	6.38	6.7	7.1	6.9	6.68	6.96	6.61	6.75	6.83	6.83	6.93	6.83	6.57	6.57	6.46	6.7	7.0	6.9	6.69	6.96	6.57	6.7	7.1	6.5	6.71	6.93
Total Calcium (Ca)	mg/L	mg/L	0.1	0.1	--	--	6.7	7.1	6.8	6.81	7.98	8.29	7.09	4.73	5.63	5.7	6.9	6.0	7.0	5.3	6.8	7.7	7.0	6.81	8.00	8.45	6.84	4.93	5.24	5.7	6.8	5.8	6.8	5.1	5.79	6.1	6.6	5.9	7.1	5.7
Total Magnesium (Mg)	mg/L	mg/L	0.1	0.1	--	--	1.2	1.2	1.11	1.22	1.28	1.27	1.21	0.83	1.01	1.0	1.2	1.3	1.0	0.9	1.2	1.3	1.2	1.22	1.24	1.31	1.19	0.86	0.99	1.0	1.2	1.2	1.0	0.8	1.05	1.0	1.1	1.2	1.0	1.0
Total Phosphorus (1M depth)	mg/L	mg/L	0.002	0.006	--	--	<0.02	<0.02	0.005	0.005	<0.002	0.003	0.008	0.003	0.012	0.019	0.045	0.007	0.006	0.006	<0.02	<0.02	<0.002	0.004	<0.002	<0.002	0.007	0.003	0.026	0.022	0.043	0.007	0.006	2.39	0.009	0.018	0.040	0.006	0.005	0.013
Total Potassium (K)	mg/L	mg/L	0.1	0.1	--	--	0.9	1.1	0.9	0.791	0.837	0.990	0.879	0.681	0.921	0.7	0.9	0.9	0.8	0.6	1	1	1	0.807	0.905	0.968	0.826	0.733	1.130	0.7	1.0	0.9	0.8	0.6	0.858	0.7	0.9	0.8	0.8	0.7
Total Sodium (Na)	mg/L	mg/L	0.1	0.1	--	--	38	38	35	28.3	33.1	33.0	33.0	20.8	21.3	31.2	34.5	26.37	35.1	20.1	39	41	37	28.5	34.3	33.9	32.1	21.5	21.1	31.5	34.5	25.2	31.6	20.1	22.0	34.6	32.0	27.7	33.6	19.2
Reactive Silica (SiO2)	mg/L	mg/L	0.5	0.5	--	--	2.7	2.6	2.6	3.2	2.9	3.2	2.9	2.5	2.6	2.7	2.0	2.6	2.9	2.6	2.7	2.6	2.6	3.1	2.9	3.1	2.9	2.5	2.7	2.7	2.2	2.6	3.0	2.6	2.5	2.7	2.0	2.4	2.7	2.5
Total Suspended Solids	mg/L	mg/L	2	5	--	--	<1	1	1	2	<2	<1	<1	<1	<1	<5	<5	<5	<5	<5	<1	1	<1	<2	<2	<1	2	<1	<2	<5	<5	<5	<5	<5	1	<5	<5	<5	<5	<5
Dissolved Sulphate (SO4)	mg/L	mg/L	2	2	--	--	11	8	12	12	10	10	10	9	10	8	7	8	7	7	11	12	11	10	10	10	9	10	8	7	8	7	7	7	9	7	8	8	8	7
Turbidity (NTU)	NTU	NTU	0.1	0.1	50	--	0.7	1.4	0.6	0.3	0.5	0.6	0.6	0.6	0.4	0.8	0.7	1	0.7	2.4	0.5	1.0	0.3	0.3	0.2	0.8	0.7	0.7	0.4	0.7	0.4	0.8	0.7	2.6	0.9	1.1	0.7	0.9	0.7	0.8
Conductivity (uS/cm)	uS/cm	uS/cm	1	1	--	--	250	250	240	220	220	220	220	170	160	197	222	182	219	216	260	250	230	220	230	250	210	170	160	200	224	183	218	218	160	215	226	189	232	223
Calculated Parameters																																						
Anion Sum	me/L	me/L	N/A	N/A	--	--	2.11	2.17	2.08	1.90	1.93	1.87	1.90	1.58	1.36	2.03	1.90	1.55	1.68	1.38	2.23	2.22	2.09	1.91	1.94	1.85	1.88	1.62	1.36	2.04	1.94	1.45	1.68	1.31	1.42	2.13	1.95	1.58	1.82	1.52
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	mg/L	1	5	--	--	<1	7	7	6	7	7	6	7	7	23	6	5	<5	5	5	7	7	6	8	7	5	8	7	22	8	<5	<5	<5	9	21	8	<5	<5	6
Calculated TDS	mg/L	mg/L	1	1	--	--	128	130	123	110	117	116	115	88	82	111	113	91	106	78	132	135	125	111	118	116	113	90	81	111	114	87	103	75	84	118	111	96	110	82
Carb. Alkalinity (calc. as CaCO3)	mg/L	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<1	<10	<10	<10	<10	<10
Cation Sum	me/L	me/L	N/A	N/A	--	--	2.12	2.16	1.99	1.69	1.97	1.98	1.92	1.23	1.32	1.77	1.98	1.60	2.00	1.24	2.16	2.32	2.07	1.70	2.02	2.03	1.86	1.28	1.3	1.78	1.97	1.53	1.84	1.23	1.36	1.94	1.85	1.64	1.94	1.23
Hardness (CaCO3)	mg/L	mg/L	1	N/A	--	--	22	23	22	22	25	26	23	15	18	18.4	22.2	20.3	21.6	16.9	22	25	22	22	25	27	22	16	17	18.4	21.9	19.4	21.1	16.0	19	19.3	21.0	19.7	21.8	18.4
Ion Balance (% Difference)	%	%	N/A	N/A	--	--	0.24	0.23	2.21	5.85	1.03	2.86	0.52	12.50	1.49	6.8	2.1	1.6	8.6	5.5	1.59	2.20	0.48	5.82	2.02	4.64	0.53	11.70	2.26	6.6	0.8	2.8	4.5	3.2	2.16	4.7	2.6	2.0	3.2	10.6
Langelier Index (@ 20C)	N/A	N/A	N/A	N/A	--	--	NC	-3.00	-2.89	-2.92	-2.60	-2.73	-3.23	-3.33	-3.35	-2.77	-2.88	-3.21	-3.37	-3.19	-3.21	-2.89	-2.84	-2.92	-2.64	-2.75	-3.22	-3.18	-3.31	-2.79	-2.86	-3.22	-3.37	-3.21	-3.06	-2.79	-2.77	-3.62	-3.33	-3.11
Langelier Index (@ 4C)	N/A	N/A	N/A	N/A	--	--	NC	-3.25	-3.14	-3.17	-2.85	-2.99	-3.49	-3.58	-3.60	-3.09	-3.20	-3.53	-3.69	-3.51	-3.46	-3.14	-3.09	-3.17	-2.89	-3.00	-3.47	-3.43	-3.56	-3.11	-3.18	-3.54	-3.69	-3.53	-3.31	-3.11	-3.09	-3.94	-3.65	-3.43
Saturation pH (@ 20C)	N/A	N/A	N/A	N/A	--	--	NC	9.67	9.71	9.74	9.59	9.60	9.75	9.83	9.73	9.47	9.98	10.10	10.0	10.2	9.82	9.64	9.67	9.75	9.57	9.58	9.79	9.75	9.77	9.49	9.86	10.10	10.1	10.2	9.63	9.49	9.87	10.1	10.0	10.0
Saturation pH (@ 4C)	N/A	N/A	N/A	N/A	--	--	NC	9.92	9.96	9.99	9.84	9.86	10.00	10.10	9.98	9.79	10.3	10.4	10.4	10.5	10.1	9.9	9.9	10.0	9.8	9.8	10.0	10.0	10.0	9.8	10.2	10.4	10.4	10.5	9.88	9.81	10.2	10.4	10.4	10.4
Metals (ICP-MS)																																						
Total Aluminum (Al)	µg/L	µg/L	5	5	--	5-100	160	--	--	124	53.5	--	266	--	--	199	54	153	140	65	150	--	--	125	29.2	--	231	--	--	188	48	149	141	106	--	222	52	154	136	58
Total Antimony (Sb)	µg/L	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	µg/L	1	2	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	µg/L	1	5	--	--	16	--	--	15.7	13.2	--	19.1	--	--	18	17	15	19	9	16	--	--	16.6	17.8	--	18.2	--	--	18	17	16	18	10	--	18	16	15	19	9
Total Beryllium (Be)	µg/L	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	µg/L	5	5	--	1500	6	--	--	7.8	8.7	--	<50	--	--	5	9	17	7	7	6	--	--	8.6	9.1	--	<50	--	--	6	9	16	7	6	--	6	9	15	7	7
Total Cadmium (Cd)	µg/L	µg/L	0.017	0.017	--	0.017	<0.3	--	--	0.030	<0.017	--	0.046	--	--	0.019	0.021	0.027	0.028	<0.017	<0.3	--	--	0.031	<0.017	--	0.035	--	--	0.021	<0.017	0.027	0.027	0.017	--	0.022	0.027	0.029	0.024	<0.017
Total Chromium (Cr)	µg/L	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	6	<1	<1	--	<1	<1	5	<1	<1
Total Cobalt (Co)	µg/L	µg/L	0.4	1	--	--	<1	--	--	<0.40	<0.40	--	<0.40	--	--	<1	<1	<1	<1	<1	<1	--	--	<0.40	<0.40	--	<0.40	--	--	<1	<1	<1	<1	<1	--	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	µg/L	2	2	--	2.0-4.0	<2	--	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<1	<2	--	--	<2.0	2.4	<2.0	2.3	<2.0	<2.0	<2	<2	4	9	<1	<2.0	<2	<2	<2	<2	<1
Total Iron (Fe)	µg/L	µg/L	50	50	--	300	94	--	--	73	133	58	136	104	154	137	136	119	131	71	86	--	--	82	51	55	119	109	138	129	118	133	213	144	175	160	78	120	111	70
Total Lead (Pb)	µg/L	µg/L	0.5	0.5	--	1.0-7.0	<0.5	--	--	0.60	<0.50	--	<0.50	--	--	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	--	--	3.23	<0.50	--	<0.50	--	--	<0.5	<0.5	0.8	0.9	<0.5	--	<0.5	<0.5	0.6	<0.5	<0.5
Total Manganese (Mn)	µg/L	µg/L	2	2	--	--	57	--	--	36.8	67.1	32.1	41.5	33.1	32.5	25	47	46	37	20	51	--	--	34.5	63.5	29.4	38.5	27.2	29.7	23	34	38	34	77	35.9	30	14	37	35	13
Total Molybdenum (Mo)	µg/L	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	µg/L	2	2	--	25-150	3	--	--	2.0	<2.0	--	2.3	--	--	<2	<2	<2	<2	<2	3	--	--	2.0	<2.0	--	<2.0	--	--	<2	<2	5	<2	<2	--	<2	<2	5	<2	<2
Total Selenium (Se)	µg/L	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	--	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	µg/L	2	5	--	--	34	--	--	33.5	35.9	--	33.2	--	--	25	33	29	33	18	34	--	--	33.1	36.7	--	32.7	--	--	25	32	28	32	17	--	27	31	29	31	18
Total Thallium (Tl)	µg/L	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	5	<2	--	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	µg/L	2	2	--	--	6	--	--	<2.0	<2.0	--	4.9	--	--	<2	<2	<2	<2	<2	<2	--	--	<2.0	<2.0	--	4.2	--	--	<2	<2	<2	<2	<2	--	3	<2	<2	<2	<2
Total Uranium (U)	µg/L	µg/L	0.1	0.1	--	15	<0.1	--	--	<0.10	<0.10	--	0.11	--	--	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	--	<0.10	<0.10	--	0.1	--	--	0.1	<0.1	<0.1	<0.1	<0.1	--	0.1	<0.1	<0.1	0.1	<0.1
Total Vanadium (V)	µg/L	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	µg/L	5	5	--	30	14	--	--	9.7	6.9	6.4	9.3	6.6	9.2	<5	<5	8	10	5	14	--	--	10.4	6.9	7	11.3	7.4	7	<5	<5	68	21	<5	9.3	5	<5	64	11	7
MICROBIOLOGICAL																																						
Total Coliform	CFU/100mL	MPN/100mL	1	1	--	--	120	24	--	190	16	58	72	110	--	291	1553	178	345	2420	28	58	--	100	16	75	83	95	--	345	>2420	921	548	>2420	--	461	613	93	461	308
E. coli	CFU/100mL	MPN/100mL	100	1	400	--	1	17	--	2	<1	8	5	37	<100	2	<1	3	8	21	4	33	--	1	<1	2	5	39	<100	4	<1	4	6	38	100	14	2	6	6	6
Fecal Coliform	MPN/ml	MPN/ml	1	--	400	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	µg/L	N/A	0.30	--	--	1.04	1.11	1.18	1.30	1.14	0.51	0.78	1.26	1.24	0.52	1.3	0.81	1.44	2.00	0.78	1.11	1.06	0.92	0.07	0.50	0.60	1.04	1.31	0.52	0.7	0.55	1.34	1.50	0.91	0.30	1.2	1.09	1.44	2.20
Chlorophyll A - Welschmeyer method	µg/L	µg/L	N/A	0.30	--	--	0.94	0.97	1.21	1.09	1.19	0.42	0.67	0.98	1.01	0.55	1.2	1.14	1.62	2.30	0.69	0.96	1.11	0.77	0.07	0.41	0.55	0.82	1.07	0.55	0.7	0.74	1.48	1.70	0.85	0.33	1.0	1.41	1.59	2.40
Total Kjeldahl Nitrogen as N		mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	<0.4	2.8	<0.4	--	1.3	--	--	--	--	--	--	--	--	--	0.5	<0.4	0.7	--	1.8	--	<0.4	2.3	1.0	--	0.6

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2013	Units	RDL (Maxxam)	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Highway 102																										
Sample Sites						HWY102-1														HWY102-2												
Sampling Date	yyyy-mm-dd	--				2009-06-29	2009-08-13	2009-10-01	2010-05-31	2010-08-24	2010-11-01	2011-05-13	2011-08-14	2011-10-16	2012-05-01	2012-08-15	2012-10-11	2013-05-15	2013/08/15	2009-06-29	2009-08-13	2009-10-01	2010-05-31	2010-08-24	2010-11-01	2011-05-13	2011-08-14	2011-10-16	2012-05-01	2012-08-15	2012-10-11	2013-05-15	2013-08-15
Sampling Time	hh:mm	--				07:00	12:45	08:00	13:00	10:20	09:00	13:40	11:00	11:00	14:50	11:00	9:50	14:15	12:22	12:30	12:15	12:30	12:40	09:30	12:30	11:20	15:00	15:30	11:20	12:20	10:35	10:40	10:00
FIELD DATA																																
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	0.1	--	--	11.8	18.8	15.7	14.9	19.6	7.4	11.4	17.8	14.6	10.7	21.8	13.6	11.7	19.5	16.7	19.2	16.4	17.2	17.0	8.7	10.8	24.2	15.1	7.8	23.7	14.3	11.5	22.0
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	11.44	5.80	4.34	8.18	4.25	6.05	8.15	3.88	5.34	5.65	1.03	3.33	7.55	3.32	10.01	5.90	4.30	4.91	2.45	2.99	6.92	7.03	5.09	3.73	12.1	3.28	6.30	1.57
pH	pH	N/A	N/A	--	--	7.98	5.35	5.25	6.31	5.26	5.62	5.75	5.77	5.99	8.76	5.73	6.38	6.19	7.10	6.57	5.71	5.40	6.33	5.86	5.64	6.22	5.89	5.29	7.3	6.37	6.72	6.01	6.92
Specific Conductance	uS/cm	1	1	--	--	194	153	104	135	106	109	114	108	89	288	225	155.5	226	173.2	37	457	162	415	167	101.2	92.2	123.1	96	225	226	159.1	288	188.5
INORGANICS																																
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	<5	<5	<5	<5	<5	<5	5	11	8	22	25	15	9	23	<5	<5	7	6	5	<5	<5	5	<5	17	7	<5	6	14
Dissolved Chloride (Cl)	mg/L	1	1	--	120	24	38	24	32	25	22	24	19	12	58	48	28	53	31	21	82	83	170	41	18	21	21	17	63	109	45	71	50
Colour	TCU	30	5	--	--	67	68	57	37	89	53	39	65	79	24	65	40	9	65	120	190	91	96	160	68	65	98	77	32	100	70	11	61
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	<0.05	<0.05	<0.05	0.69	<0.05	1.2	0.69	0.25	1.2	2.61	0.06	0.43	0.51	<0.05	<0.05	<0.05	<0.05	0.10	<0.05	0.62	0.26	1.8	3.2	1.54	<0.05	0.14	0.17	<0.05
Nitrate (N)	mg/L	0.05	0.05	--	13000	<0.05	--	--	0.69	<0.05	--	0.69	--	--	2.61	0.06	0.43	0.51	<0.05	<0.05	--	--	0.10	<0.05	--	0.26	--	--	1.54	<0.05	0.14	0.17	<0.05
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.05	0.29	<0.05	<0.05	<0.05	<0.05	0.05	0.1	0.07	0.31	0.19	0.04	<0.03	0.05	<0.05	0.06	<0.05	<0.05	0.20	<0.05	<0.05	0.30	0.08	0.09	<0.03	<0.03	<0.03	0.17
Total Organic Carbon	mg/L	0.5	0.5	--	--	6.5	10	7.7	4.7	11	6.3	4.5	7.2	7.4	5.5	10.0	7.0	5.1	10.1	8.5	13	13	7.2	14	7.4	5.7	9.2	8.4	7.0	15.8	11.2	6.1	10.6
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (units)	pH	N/A	N/A	5.0-9.0	6.5-9	4.54	5.24	5.40	5.48	6.24	5.31	6.42	6.55	6.28	6.4	6.9	6.8	6.86	6.87	5.43	5.96	6.30	6.05	6.32	5.47	5.93	6.18	5.92	5.9	6.7	6.8	6.61	6.59
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	1.7	1.8	1.6	4.93	3.34	5.09	4.9	5.21	5.55	12.5	11.7	7.5	11.1	10.5	1.6	4.0	4.8	7.44	3.84	4.01	3.07	2.22	3.80	7.0	8.4	5.6	7.6	8.5
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	0.3	0.5	0.5	1.08	0.79	1.09	0.91	0.92	1.19	1.7	2.0	1.4	1.4	1.5	0.4	0.7	0.9	0.96	0.59	1.00	0.68	0.68	1.38	1.2	1.4	1.2	1.2	1.3
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	0.07	0.14	0.020	0.006	0.007	0.011	0.009	0.012	0.010	0.019	0.039	0.02	0.006	0.021	<0.02	0.04	0.034	0.010	0.028	0.003	0.009	0.019	0.041	0.021	0.054	0.03	0.014	0.028
Total Potassium (K)	mg/L	0.1	0.1	--	--	0.5	1.2	0.7	1.140	1.630	1.310	1.100	1.500	1.880	1.6	2.5	1.5	1.3	1.7	0.5	0.8	1.1	0.984	0.956	1.390	0.844	1.310	1.880	1.2	1.7	1.6	1.3	1.5
Total Sodium (Na)	mg/L	0.1	0.1	--	--	15	25	13	15.9	14.5	14.6	14.8	10.2	8.26	36.3	27.7	14.6	30.8	15.0	15	51	55	83.7	32.0	12.1	13.3	13.1	13.3	41.5	63.6	20.4	39.0	19.1
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	2.5	2.2	2.0	1.1	3.8	5.1	2.8	5.2	4.6	4.1	6.1	5.1	3.1	5.1	2.2	4.4	4.0	3.0	6.4	5.4	2.5	6.5	6.7	4.1	6.9	5.8	1.6	6.2
Total Suspended Solids	mg/L	2	5	--	--	7	80	2	<2	11	<2	<1	1	<1	9	6	<5	<5	<5	<2	58	62	34	27	3	<1	10	14	<5	39	<5	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	5	3	3	8	<2	8	10	8	10	14	8	9	12	8	<2	3	8	11	<2	7	5	5	8	12	6	10	10	9
Turbidity (NTU)	NTU	0.1	0.1	50	--	14.0	35	0.9	1.4	1.2	0.6	0.4	0.6	1.1	0.9	1.9	0.9	0.5	1.6	0.7	3.8	4.2	2.6	3.1	0.5	0.4	1.2 (1)	3.9	0.6	10.8	2	1.5	3.3
Conductivity (uS/cm)	µS/cm	1	1	--	--	100	140	92	130	100	110	110	100	88	263	231	143	243	188	85	290	310	590	160	94	91	100	110	263	403	179	295	203
Calculated Parameters																																
Anion Sum	me/L	N/A	N/A	--	--	0.77	1.12	0.73	1.11	0.71	0.88	1.03	0.95	0.80	2.55	2.02	1.31	1.96	1.50	0.60	2.37	2.62	5.13	1.27	0.70	0.73	0.91	0.86	2.48	3.34	1.49	2.34	1.88
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	<1	<1	<1	<1	<1	<1	5	11	8	22	25	15	9	23	<1	<1	7	6	5	<1	<1	5	<1	17	7	<5	6	14
Calculated TDS	mg/L	1	1	--	--	50	73	45	67	50	63	65	58	54	150	117	73	117	83	42	150	165	282	93	52	48	62	67	143	200	86	135	100
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	0.84	1.32	0.74	1.06	0.93	1.02	1.00	0.83	0.80	2.43	6.04	1.19	2.06	1.40	0.81	2.65	2.89	4.17	1.81	0.86	0.82	0.83	0.97	2.32	2.10	1.40	2.24	1.50
Hardness (CaCO3)	mg/L	1	N/A	--	--	6	6	6	17	12	17	16	17	19	38.2	37.5	24.5	33.5	32.4	6	13	16	23	12	14	11	8	15	22.4	26.7	18.9	23.9	26.6
Ion Balance (% Difference)	%	N/A	N/A	--	--	4.35	8.20	0.68	2.30	13.40	7.37	1.48	6.74	0.00	2.6	1.9	4.6	2.4	3.5	14.90	5.58	4.90	10.30	17.50	10.30	5.81	4.60	6.01	3.3	3.6	3.1	2.3	11.3
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	NC	NC	NC	NC	NC	NC	-3.50	-2.99	-3.36	-2.77	-2.23	-2.72	-2.73	-2.33	NC	NC	-3.57	-3.72	-3.70	NC	NC	-4.07	NC	-3.63	-3.15	-3.34	-3.33	-2.92
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	NC	NC	NC	NC	NC	NC	-3.75	-3.25	-3.61	-3.09	-2.55	-3.04	-3.05	-2.65	NC	NC	-3.82	-3.97	-3.95	NC	NC	-4.32	NC	-3.95	-3.47	-3.66	-3.65	-3.24
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	NC	NC	NC	NC	NC	NC	9.92	9.54	9.64	9.17	9.13	9.52	9.59	9.20	NC	NC	9.87	9.77	10.00	NC	NC	10.30	NC	9.53	9.85	10.10	9.94	9.51
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	NC	NC	NC	NC	NC	NC	10.20	9.80	9.89	9.49	9.45	9.84	9.91	9.52	NC	NC	10.10	10.00	10.30	NC	NC	10.50	NC	9.85	10.2	10.5	10.3	9.83
Metals (ICP-MS)																																
Total Aluminum (Al)	µg/L	5	5	--	5-100	510	--	--	169	192	--	205	--	--	134	183	146	86	145	270	--	--	189	368	--	260	--	--	145	466	259	130	138
Total Antimony (Sb)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<1.0	2.1	--	<1.0	--	--	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	1	5	--	--	22	--	--	52.9	36.9	--	37.3	--	--	58	284	42	57	57	20	--	--	53.1	27.7	--	26.6	--	--	49	74	33	44	43
Total Beryllium (Be)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	5	--	1500	<5	--	--	11.4	10.9	--	<50	--	--	12	18	13	10	10	<5	--	--	7.9	7.8	--	<50	--	--	10	17	15	9	10
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	<0.3	--	--	0.043	<0.017	--	0.023	--	--	0.034	0.021	<0.017	<0.017	<0.017	<0.3	--	--	0.051	<0.017	--	<0.017	--	--	0.037	0.031	0.032	0.019	<0.017
Total Chromium (Cr)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<2	--	--	<1.0	1.0	--	<1.0	--	--	<1	<1	<1	<1	1
Total Cobalt (Co)	µg/L	0.4	1	--	--	<1	--	--	0.50	0.46	--	<0.40	--	--	<1	<1	<1	<1	<1	<1	--	--	0.66	0.77	--	<0.40	--	--	<1	1	1	<1	1
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	2	--	--	3.4	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	3	<2	<1	2	--	--	2.0	<2.0	<2.0	<2.0	2.5	2.8	<2	3	3	<2	1
Total Iron (Fe)	µg/L	50	50	--	300	720	--	--	146	637	150	107	209	219	102	1380	255	111	938	880	--	--	1380	3850	303	229	897	1110	214	5210	1550	383	1720
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	1.6	--	--	2.37	0.56	--	<0.50	--	--	<0.5	0.7	<0.5	<0.5	<0.5	1.9	--	--	1.61	2.70	--	0.59	--	--	<0.5	5.2	2.1	0.6	0.7
Total Manganese (Mn)	µg/L	2	2	--	--	40	--	--	55.3	39.0	67.0	28.1	21.0	31.3	34	79	28	23	45	110	--	--	387	135	52.9	40.5	106	176	78	219	207	83	173
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2
Total Selenium (Se)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	2	5	--	--	11	--	--	29.1	19.7	--	24.3	--	--	48	58	36	52	47	11	--	--	37.4	21.1	--	16.9	--	--	33	45	31	39	40
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	2	--	--	6	--	--	<2.0	<2.0	--	3.5	--	--	<2	3	<2	<2	<2	4	--	--	<2.0	6.4	--	4.9	--	--	<2	10	4	4	<2
Total Uranium (U)	µg/L	0.1	0.1	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1
Total Vanadium (V)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	5	--	30	21	--	--	16.4	6.9	6.9	<5.0	<5.0	6.9	<5	6	<5	<5	<5	12	--	--	13.6	12.3	9.3	5.5	9	12.5	<5	7	12	12	<5
MICROBIOLOGICAL																																
Total Coliform	MPN/100mL	1	1	--	--	84	>250	--	>250	>250	180	120	180	--	687	>2420	>2420	1550	>2420	28	>250	--	>250	75	41	110	>250	--	1553	>2420	>2420	2420	1990
E. coli	MPN/100mL	100	1	400	--	54	>250	--	12	17	5	1	78	<100	3	68	145	4	9	4	230	--	9	5	<1	7	>250	<100	<1	16	50	111	9
Fecal Coliform	MPN/ml	1	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	15.40	19.29	0.70	18.12	1.61	8.45	0.93	0.58	0.69	0.53	2.59	0.81	1.27	14.70	0.90	82.63	48.17	0.85	16.36	0.25	0.97	4.91	1.9	2.07	21.03	0.33	2.41	1.10
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	17.50	19.60	0.84	17.62	1.68	7.52	0.84	0.56	0.65	0.59	2.89	1.05	1.45	15.80	0.91	81.20	52.50	0.85	17.35	0.23	0.87	4.49	2.15	2.27	17.26	0.50	3.02	1.30
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	1.1	1.3	0.6	--	0.6	--	--	--	--	--	--	--	--	--	0.6	1.1	0.5	--	0.7

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)

" -- " = no guideline available / Not Tested.

CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)

Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)

Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.

Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2013	Units	RDL (Maxxam)	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Lake Shore Drive														Larry Uteck Blvd					
Sample Sites						LSD														LU					
Sampling Date	yyyy-mm-dd	--				2009-06-29	2009-08-13	2009-10-01	2010-05-31	2010-08-24	2010-11-01	2011-05-13	2011-08-14	2011-10-17	2012-05-01	2012-08-15	2012-10-11	2013-05-15	2013-08-15	2011-10-17	2012-05-01	2012-08-15	2012-10-11	2013-05-15	2013-08-15
Sampling Time	hh:mm	--				12:00	09:30	11:45	09:00	11:28	10:00	08:45	13:20	9:00	9:15	13:00	9:10	08:40	15:30	10:30	15:20	11:30	10:10	14:30	14:30
FIELD DATA																									
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	0.1	--	--	13.1	16.7	15.3	13.4	21.3	7.3	10.2	21.0	12.0	5.7	25.7	13.4	7.7	20.2	11.3	12.8	27.3	14.6	13.9	18.3
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	**10.84**	5.70	5.50	8.60	**5.41**	8.47	9.44	7.87	8.16	**4.06**	**2.69**	7.58	8.77	7.26	**4.24**	6.17	8.2	9.04	**10.15**	8.29
pH	pH	N/A	N/A	--	--	7.88	6.74	6.34	6.42	6.64	6.17	7.09	6.88	6.63	8.22	7.16	6.92	5.19	7.28	6.07	7.82	6.65	6.78	6.39	7.49
Specific Conductance	uS/cm	1	1	--	--	723	210	168	218	203	110	146	126	112	62	177.5	116.7	123.6	132.5	203	955	480	262	670	320
INORGANICS																									
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	13	16	12	13	21	9	9	15	12	21	14	11	8	20	12	14	14	14	6	22
Dissolved Chloride (Cl)	mg/L	1	1	--	120	41	34	31	49	45	25	38	27	22	22	33	23	39	32	34	**224**	116	52	**190**	99
Colour	TCU	30	5	--	--	32	27	37	20	26	33	32	41	49	13	20	40	10	21	94	18	14	18	7	7
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	0.14	0.14	0.06	0.23	0.10	0.12	0.25	0.17	0.09	0.13	0.80	<0.05	0.18	0.20	0.61	1.00	0.64	1.89	1.11	2.57
Nitrate (N)	mg/L	0.05	0.05	--	13000	0.14	--	--	0.23	0.10	--	0.25	--	--	0.13	0.80	<0.05	0.18	0.20	--	1.00	0.64	1.89	1.11	2.57
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	0.06	0.03	<0.03	<0.03	<0.03	0.03	0.06	0.04	0.16	<0.03	<0.03	0.04
Total Organic Carbon	mg/L	0.5	0.5	--	--	5.0	3.8	6.8	3.7	6.0	5.3	4.7	7.1	7.5	3.1	8.0	7.7	4.7	6.3	11.0	3.7	22.8	4.8	3.1	4.5
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (units)	pH	N/A	N/A	5.0-9.0	6.5-9	6.69	6.69	6.93	7.10	7.30	6.67	6.72	6.79	6.49	6.2	6.9	6.9	6.94	6.95	**6.43**	6.7	7.2	7.2	6.92	7.11
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	6.5	6.9	5.4	7.99	10.5	5.29	5.9	5.14	5.04	2.6	18.1	5.1	6.4	6.0	7.63	30.7	22.1	14.5	22.0	17.6
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	1.4	1.6	1.3	1.99	2.14	1.15	1.25	1.19	1.23	0.7	3.3	1.4	1.2	1.4	2.34	4.2	3.6	2.2	2.8	2.7
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	<0.02	0.03	0.009	0.018	0.100	0.009	0.018	0.028	0.014	0.022	0.063	0.003	0.007	0.015	0.034	0.043	0.036	0.030	0.006	0.027
Total Potassium (K)	mg/L	0.1	0.1	--	--	1.2	1.1	1.3	1.180	1.210	1.030	1.070	0.960	1.240	0.6	1.9	1.3	1.2	1.1	2.110	3.2	3.6	2.5	2.6	2.8
Total Sodium (Na)	mg/L	0.1	0.1	--	--	24	21	18	24.8	26.9	15.2	23.2	14.3	13.8	11.3	18.6	15.2	21.9	26.6	22.7	124	62.2	32.3	95.1	51.7
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	3.1	4.2	4.0	3.2	3.4	4.3	2.6	3.9	3.8	3.1	2.9	4.9	2.6	3.9	6.9	4.9	0.7	6.3	5.1	8.6
Total Suspended Solids	mg/L	2	5	--	--	16	98	5	6	110	7	4	77	5	<5	16	19	<5	17	13	5	165	<5	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	6	4	5	7	3	4	6	4	4	5	5	5	6	7	21	26	25	23	26	29
Turbidity (NTU)	NTU	0.1	0.1	50	--	0.6	12	2.5	12	6.2	1	0.6	2.5	1.7	6.7	**283**	2.1	1.1	31.6	3.3	4.1	23.0	2.3	1.8	1.6
Conductivity (uS/cm)	µS/cm	1	1	--	--	170	150	140	200	200	110	150	130	110	96	161	110	168	136	190	813	482	255	732	433
Calculated Parameters																									
Anion Sum	me/L	N/A	N/A	--	--	1.56	0.82	1.22	1.80	1.77	0.97	1.39	1.14	0.96	1.15	1.37	0.97	1.40	1.46	1.69	7.21	4.12	2.36	6.10	4.02
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	13	8	12	13	21	9	9	15	12	21	14	11	8	20	12	14	14	14	6	22
Calculated TDS	mg/L	1	1	--	--	92	55	74	104	107	62	84	66	60	56	163	58	82	87	109	426	246	144	347	229
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<1	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	1.53	0.99	1.20	1.69	1.94	1.05	1.44	1.02	1.00	0.76	3.59	1.10	1.43	1.62	1.70	7.40	4.30	2.43	5.55	3.51
Hardness (CaCO3)	mg/L	1	N/A	--	--	22	15	19	28	35	18	20	18	18	9.4	58.8	18.5	20.9	20.7	29	94.0	70.0	45.3	66.5	55.1
Ion Balance (% Difference)	%	N/A	N/A	--	--	0.97	9.39	0.83	3.15	4.58	3.96	1.77	5.56	2.04	20.7	63.0	6.1	1.0	5.2	0.29	1.3	2.2	1.4	4.7	6.8
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	-2.74	-3.20	-2.60	-2.22	-1.71	-2.99	-2.88	-2.64	-3.05	-3.62	-2.30	-2.91	-2.93	-2.55	-2.95	-2.32	-1.94	-2.10	-2.60	-1.93
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	-2.99	-3.45	-2.85	-2.47	-1.96	-3.24	-3.13	-2.89	-3.31	-3.94	-2.62	-3.23	-3.25	-2.87	-3.20	-2.64	-2.26	-2.42	-2.92	-2.25
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	9.43	9.78	9.53	9.32	9.01	9.66	9.60	9.43	9.54	9.82	9.20	9.81	9.87	9.50	9.38	9.02	9.14	9.30	9.52	9.04
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	9.68	10.00	9.78	9.57	9.26	9.91	9.85	9.68	9.80	10.10	9.52	10.10	10.20	9.82	9.63	9.34	9.46	9.62	9.84	9.36
Metals (ICP-MS)																									
Total Aluminum (Al)	µg/L	5	5	--	5-100	99	--	--	349	189	--	217	--	--	490	**19200**	**186**	**131**	93	--	218	**227**	**252**	**107**	**447**
Total Antimony (Sb)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	**8**	<2	<2	<2	--	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	1	5	--	--	14	--	--	15.3	19.2	--	13.9	--	--	11	86	12	12	7	--	225	201	116	133	134
Total Beryllium (Be)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	2	<2	<2	<2	--	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	5	--	1500	13	--	--	41.4	21.6	--	<50	--	--	6	24	16	10	15	--	11	17	22	10	22
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	<0.3	--	--	0.018	<0.017	--	<0.017	--	--	0.029	**1.050**	**0.023**	<0.017	<0.017	--	0.538	**0.171**	**0.168**	**0.300**	**0.236**
Total Chromium (Cr)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	**11**	<1	<1	<1	--	<1	<1	<1	<1	1
Total Cobalt (Co)	µg/L	0.4	1	--	--	<1	--	--	<0.40	0.88	--	<0.40	--	--	<1	34	<1	<1	<1	--	<1	1	<1	<1	<1
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	<2	--	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	**22**	2	<2	1	2.9	<2	3	16	2	**6**
Total Iron (Fe)	µg/L	50	50	--	300	180	--	--	**554**	**965**	120	211	**388**	**384**	161	**38900**	**312**	236	254	**2150**	**347**	**1320**	**500**	194	**890**
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	<0.5	--	--	3.02	0.54	--	<0.50	--	--	0.6	**82.4**	<0.5	<0.5	<0.5	--	0.8	0.7	1.0	<0.5	1.4
Total Manganese (Mn)	µg/L	2	2	--	--	51	--	--	113	632	22.8	30.2	53.4	38.5	26	13200	67	71	81	129	182	485	120	87	89
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	13	<2	<2	<2	--	<2	<2	<2	<2	<2
Total Selenium (Se)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	**2**	<1	<1	<1	--	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	2	5	--	--	30	--	--	36.3	42.1	--	24.4	--	--	12	82	22	24	24	--	112	94	60	93	90
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	0.2	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	2	--	--	<2	--	--	7.2	4.1	--	5.3	--	--	3	405	4	<2	2	--	4	3	7	3	11
Total Uranium (U)	µg/L	0.1	0.1	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	1.6	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1	0.1
Total Vanadium (V)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	30	<2	<2	<2	--	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	5	--	30	7	--	--	7.2	6.7	<5.0	<5.0	<5.0	5	<5	**110**	7	6	<5	9	**79**	**92**	**39**	**57**	**49**
MICROBIOLOGICAL																									
Total Coliform	MPN/100mL	1	1	--	--	53	>250	--	>250	>250	280	85	>250	--	1414	>2420	>2420	1990	>2420	--	>2420	>2420	2420	866	>2420
E. coli	MPN/100mL	100	1	400	--	22	24	--	4	45	6	10	>250	<100	2	26	10	10	20	<100	<1	2	19	3	86
Fecal Coliform	MPN/ml	1	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	1.46	10.70	4.68	1.21	6.64	0.21	1.19	1.93	1.41	1.88	6.62	0.13	<0.50	1.6	1.99	2.44	32.52	1.80	1.54	2.30
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	1.85	11.10	5.62	1.32	7.71	0.19	1.07	1.73	1.18	2.28	7.58	0.22	<0.50	2	2.08	2.71	31.31	2.15	1.77	2.50
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	0.5	3.5	0.5	--	0.7	--	0.4	4.2	0.7	--	0.5

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)

" -- " = no guideline available / Not Tested.

CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)

Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)

Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.

Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2013	Units	RDL (Maxxam)	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Paper Mill Lake																								
Sample Sites						PML1													PML2												
Sampling Date	yyyy-mm-dd	--				2009-06-29	2009-08-13	2009-10-01	2010-05-31	2010-08-24	2010-11-01	2011-05-13	2011-08-14	2011-10-16	2012-05-01	2012-08-15	2012-10-11	2013-05-15	2013-08-15	2009-06-29	2009-08-13	2009-10-01	2010-05-31	2010-08-24	2010-11-01	2011-05-13	2011-08-14	2011-10-16	2012-05-01	2012-08-15	2012-10-11	2013-05-15	2013-08-15
Sampling Time	hh:mm	--				13:45	13:00	13:00	13:35	15:15	13:00	13:00	16:50	17:00	12:50	--	10:55	10:51	11:35	13:15	13:40	13:45	14:30	16:20	13:00	12:40	16:20	16:15	13:16	--	--	13:40	10:45
FIELD DATA																																
Secchi Depth	Meters	--	--	1.2	--	3.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--	N/A	N/A	N/A	2.8	2.2	2.3	N/A	3.0	2.0	2.2	2.3	2.2	2.35	--	--	3.20	--
Water Temp	Celsius	0.1	0.1	--	--	15.7	17.1	16.2	13.2	22.7	9.1	10.3	22.1	13.6	8.3	--	14.9	11.6	22.5	14.8	24.2	19.7	17.8	25.3	10.1	10.9	23.1	15.2	11.6	--	--	14.8	--
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	10.56	8.10	6.90	8.76	7.83	10.43	10.39	8.17	9.54	8.41	--	8.60	9.39	7.65	10.20	8.30	8.40	8.78	8.09	10.58	9.88	8.7	8.94	7.75	--	--	9.26	--
pH	pH	N/A	N/A	--	--	7.39	6.57	6.64	7.06	7.35	5.89	6.28	6.20	6.11	7.58	--	6.63	6.39	7.20	6.36	6.82	6.84	7.09	7.39	6.53	6.31	6.67	6.13	8.61	--	--	6.49	--
Specific Conductance	uS/cm	1	1	--	--	561	279	223	265	234	125	177	174	106	366	--	186.4	215.1	199.0	267	264	241	237	234	201	159	173	156	231	--	--	234	--
INORGANICS																																
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	6	7	7	7	9	5	6	7	7	20	--	<5	<5	6	5	7	7	6	8	7	<5	8	7	21	--	--	<5	--
Dissolved Chloride (Cl)	mg/L	1	1	--	120	39	64	58	67	61	24	44	43	18	55	--	45	57	57	63	63	58	62	58	50	44	43	34	55	--	--	63	--
Colour	TCU	30	5	--	--	54	15	21	19	12	57	32	38	65	38	--	29	8	15	22	17	19	20	13	23	35	38	48	39	--	--	18	--
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	0.49	0.10	0.17	0.42	0.27	0.66	0.55	0.15	0.62	0.22	--	0.14	0.21	0.18	0.14	0.07	0.09	0.19	0.11	0.23	0.33	0.14	0.22	0.24	--	--	0.22	--
Nitrate (N)	mg/L	0.05	0.05	--	13000	0.49	--	--	0.42	0.27	--	0.55	--	--	0.22	--	0.14	0.21	0.18	0.14	--	--	0.19	0.11	--	0.33	--	--	0.24	--	--	0.22	--
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	--	<0.05	<0.05	<0.05	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	--	--	<0.05	--
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	0.06	--	<0.03	<0.03	0.04	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	--	--	0.03	--
Total Organic Carbon	mg/L	0.5	0.5	--	--	6.5	3.6	4.7	0.7	3.3	6.7	4.6	5	8.3	5.7	--	5.3	4.2	4.1	3.6	2.6	4.5	3.2	3.4	3.6	4	6	5.6	5.9	--	--	4.4	--
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	--	<0.01	--
pH (units)	pH	N/A	N/A	5.0-9.0	6.5-9	6.36	6.75	6.79	6.63	7.04	6.58	6.54	6.83	6.67	6.6	--	6.8	6.71	6.92	6.50	6.81	6.82	6.66	7.02	6.83	6.37	6.60	6.60	6.6	--	--	6.68	--
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	4.5	6.9	6.4	8.37	9.02	5.90	6.02	4.99	4.64	6.0	--	6.0	6.8	6.6	6.1	7.1	6.1	7.17	7.69	7.96	5.30	4.76	5.04	6.1	--	--	6.7	--
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	0.6	1.1	1.0	1.25	1.22	0.82	0.98	0.89	0.85	1.0	--	1.1	1.0	0.9	1.1	1.1	1.1	1.25	1.17	1.20	0.93	0.86	0.90	1.0	--	--	1.0	--
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	<0.02	<0.02	0.002	0.018	0.002	<0.002	0.014	0.011	0.030	0.019	--	0.03	0.006	0.007	<0.02	<0.02	0.002	0.010	0.002	<0.002	0.009	0.009	0.007	0.025	--	--	0.006	--
Total Potassium (K)	mg/L	0.1	0.1	--	--	0.9	0.9	0.9	1.160	1.060	1.340	1.230	0.771	1.430	0.8	--	1.0	0.8	1.0	0.9	1.0	0.9	0.984	0.900	1.020	0.861	0.801	0.968	0.8	--	--	0.8	--
Total Sodium (Na)	mg/L	0.1	0.1	--	--	25	38	34	35.2	40.2	18.4	26.8	22.8	13.7	33.6	--	29.8	35.3	28.5	35	40	34	31.1	35.1	30.8	25.7	21.3	20.9	34.6	--	--	37.5	--
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	4.5	2.6	2.8	3.8	3.4	5.9	3.7	2.6	5.4	2.9	--	3.2	2.8	2.6	2.6	2.5	2.3	2.6	2.3	3.3	2.9	2.5	3	2.8	--	--	2.7	--
Total Suspended Solids	mg/L	2	5	--	--	<2	3	9	7	<2	<1	1	<2	5	9	--	6	<5	<5	2	3	<1	15	<2	11	<1	8	<1	<5	--	--	<5	--
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	13	11	11	13	12	12	12	10	12	7	--	10	8	10	11	11	11	10	10	10	9	10	9	7	--	--	9	--
Turbidity (NTU)	NTU	0.1	0.1	50	--	0.4	0.5	0.6	8.2	0.9	0.5	0.6	1	1.2	0.7	--	1	0.7	1.1	0.8	0.7	0.6	1.0	0.8	0.4	0.4	3.4	0.5	0.7	--	--	1	--
Conductivity (uS/cm)	µS/cm	1	1	--	--	170	250	230	260	250	130	180	170	100	214	--	179	227	218	240	250	230	230	230	210	170	170	150	213	--	--	254	--
Calculated Parameters																																
Anion Sum	me/L	N/A	N/A	--	--	1.51	2.18	1.99	2.34	2.15	1.09	1.62	1.56	0.92	2.11	--	1.49	1.79	1.95	2.11	2.17	1.99	2.07	2.01	1.77	1.46	1.58	1.30	2.13	--	--	1.98	--
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	6	7	7	7	9	5	6	7	7	20	--	<5	<5	6	5	7	7	6	8	7	<1	8	7	21	--	--	<5	--
Calculated TDS	mg/L	1	1	--	--	93	129	118	137	134	75	100	90	63	117	--	95	110	109	123	131	117	120	120	110	91	89	79	119	--	--	119	--
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	--	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--	<10	--
Cation Sum	me/L	N/A	N/A	--	--	1.40	2.11	1.89	2.11	2.33	1.20	1.58	1.35	0.95	1.89	--	1.78	2.00	1.69	1.94	2.23	1.88	1.88	2.03	1.86	1.48	1.28	1.27	1.94	--	--	2.09	--
Hardness (CaCO3)	mg/L	1	N/A	--	--	14	22	20	26	28	18	19	16	15	19.1	--	19.5	21.1	20.2	20	22	20	23	24	25	17	15	16	19.3	--	--	20.8	--
Ion Balance (% Difference)	%	N/A	N/A	--	--	3.78	1.63	2.58	5.17	4.02	4.80	1.25	7.22	1.60	5.5	--	9.0	5.5	7.0	4.20	1.36	2.84	4.81	0.50	2.48	0.68	10.50	1.17	4.8	--	--	2.8	--
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	-3.57	-2.90	-2.94	-2.96	-2.43	-3.25	-3.27	-2.94	-3.13	-2.91	--	-3.31	-3.35	-3.07	-3.33	-2.83	-2.93	-3.06	-2.55	-2.80	NC	-3.18	-3.17	-2.89	--	--	-3.39	--
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	-3.82	-3.15	-3.19	-3.21	-2.68	-3.50	-3.53	-3.19	-3.38	-3.23	--	-3.63	-3.67	-3.39	-3.59	-3.08	-3.18	-3.31	-2.80	-3.05	NC	-3.43	-3.42	-3.21	--	--	-3.71	--
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	9.93	9.65	9.73	9.59	9.47	9.83	9.81	9.77	9.80	9.51	--	10.10	10.1	9.99	9.83	9.64	9.75	9.72	9.57	9.63	NC	9.78	9.77	9.49	--	--	10.1	--
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	10.20	9.90	9.98	9.84	9.72	10.10	10.10	10.00	10.10	9.83	--	10.40	10.4	10.3	10.10	9.89	10.00	9.97	9.82	9.88	NC	10.00	10.00	9.81	--	--	10.4	--
Metals (ICP-MS)																																
Total Aluminum (Al)	µg/L	5	5	--	5-100	260	--	--	665	45.9	--	233	--	--	177	--	306	141	103	130	--	--	1030	55.8	--	202	--	--	189	--	--	131	--
Total Antimony (Sb)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	<2	<2	<2	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	--	<2	--
Total Arsenic (As)	µg/L	1	2	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	<2	<2	<2	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	--	<2	--
Total Barium (Ba)	µg/L	1	5	--	--	23	--	--	35.3	24.4	--	26.6	--	--	22	--	19	20	12	16	--	--	23.0	12.2	--	23	--	--	22	--	--	22	--
Total Beryllium (Be)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	<2	<2	<2	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	--	<2	--
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--
Total Boron (B)	µg/L	5	5	--	1500	8	--	--	11.3	8.6	--	<50	--	--	6	--	9	6	8	5	--	--	8.2	8.8	--	<50	--	--	6	--	--	6	--
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	<0.3	--	--	0.032	<0.017	--	<0.017	--	--	<0.017	--	0.066	0.021	0.018	<0.3	--	--	0.037	<0.017	--	0.028	--	--	0.023	--	--	0.039	--
Total Chromium (Cr)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	<1	<1	<1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	--	<1	--
Total Cobalt (Co)	µg/L	0.4	1	--	--	<1	--	--	0.96	<0.40	--	<0.40	--	--	<1	--	2	<1	<1	<1	--	--	0.65	<0.40	--	<0.40	--	--	<1	--	--	<1	--
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	<2	--	--	2.0	<2.0	<2.0	4.0	<2.0	2.3	<2	--	<2	<2	1	<2	--	--	3.3	<2.0	<2.0	<2.0	<2.0	<2.0	<2	--	--	<2	--
Total Iron (Fe)	µg/L	50	50	--	300	140	--	--	837	89	161	141	315	528	137	--	742	130	205	100	--	--	1090	151	76	143	699	181	178	--	--	181	--
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	<0.5	--	--	1.73	<0.50	--	<0.50	--	--	<0.5	--	0.9	<0.5	<0.5	<0.5	--	--	2.39	<0.50	--	<0.50	--	--	<0.5	--	--	<0.5	--
Total Manganese (Mn)	µg/L	2	2	--	--	17	--	--	142	68.9	41.3	14.4	128	62.4	48	--	214	33	58	58	--	--	159	81.0	28.0	33.8	88.6	30.6	22	--	--	87	--
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--
Total Nickel (Ni)	µg/L	2	2	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	2	<2	<2	2	--	--	2.2	<2.0	--	<2.0	--	--	<2	--	--	<2	--
Total Selenium (Se)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	<1	<1	<1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	--	<1	--
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	<0.1	<0.1	<0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	--	<0.1	--
Total Strontium (Sr)	µg/L	2	5	--	--	18	--	--	36.3	37.1	--	25	--	--	26	--	30	31	25	30	--	--	34.7	32.8	--	25.7	--	--	27	--	--	31	--
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	<0.1	<0.1	<0.1	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	--	<0.1	--
Total Tin (Sn)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--
Total Titanium (Ti)	µg/L	2	2	--	--	<2	--	--	7.8	<2.0	--	3.9	--	--	<2	--	4	<2	<2	<2	--	--	21.3	<2.0	--	3.6	--	--	<2	--	--	<2	--
Total Uranium (U)	µg/L	0.1	0.1	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	0.1	--	<0.1	<0.1	<0.1	<0.1	--	--	0.10	<0.10	--	<0.10	--	--	0.1	--	--	<0.1	--
Total Vanadium (V)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--
Total Zinc (Zn)	µg/L	5	5	--	30	8	--	--	10.0	5.4	5.7	6.3	6.2	5.4	<5	--	13	8	<5	12	--	--	18.3	<5.0	5.8	6.6	7.5	10	8	--	--	11	--
MICROBIOLOGICAL																																
Total Coliform	MPN/100mL	1	1	--	--	200	73	--	>250	>250	>250	85	>250	--	411	--	2420	866	1730	49	40	--	>250	46	97	64	>250	--	261	--	--	1410	--
E. coli	MPN/100mL	100	1	400	--	33	45	--	19	>250	2	2	34	<100	2	--	20	12	4	10	31	--	69	<1	6	17	>250	<100	1	--	--	12	--
Fecal Coliform	MPN/ml	1	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	12	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	0.62	2.31	0.57	0.82	1.12	0.07	2.85	0.86	0.15	1.03	--	0.69	1.17	1.10	1.15	1.36	0.59	3.50	1.54	0.53	0.55	2.48	1.33	0.76	--	--	1.18	--
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	0.64	2.21	0.64	0.74	1.04	0.06	2.75	0.76	0.15	1.10	--	0.91	1.37	1.10	1.22	1.33	0.66	3.39	1.51	0.42	0.51	2.26	1.13	0.76	--	--	1.34	--
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	<0.4	--	0.4	--	0.4	--	--	--	--	--	--	--	--	--	<0.4	--	--	--	--

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

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ATTACHMENT 1

Field Reports

FIELD REPORT – AUGUST 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Kearney Lake		**Site ID: KL1**
Watercourse: Kearney Lake		**Location:** Kearney Lake Road
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0445718E, 4948496N (UTM, NAD83)	
SLE Field Personnel:	Alex Duguay/ Ghislain Pitre	

Site Conditions

Weather:	Sunny
Air Temperature:	19°C
Cloud Cover:	No
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Off Kearney Lake Road

Field Parameter Data

	Remarks
Date (d.m.y):	August 16, 2013
Time (hh:mm):	11:10
Sample Depth (m):	1.0
pH:	8.24
Dissolved Oxygen (mg/L):	8.57
Secchi Depth (m):	2.03
Water Temperature (degrees Celsius):	22.2
Conductivity (µs/cm):	216.5

Additional Comments / Notes

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FIELD REPORT – AUGUST 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Kearney Lake		**Site ID: KL2**
Watercourse: Kearney Lake		**Location:** Kearney Lake Road
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0443942E, 4949803N (UTM, NAD83)	
SLE Field Personnel:	Alex Duguay/ Ghislain Pitre	

Site Conditions

Weather:	Sunny
Air Temperature:	23°C
Cloud Cover:	No
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Collins Road, through wooded area

Field Parameter Data

	Remarks
Date (d.m.y):	15 August, 2013
Time (hh:mm):	16:10
Sample Depth (m):	1.0
pH:	7.47
Dissolved Oxygen (mg/L):	6.38
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	22.9
Conductivity (µs/cm):	65.3

Additional Comments / Notes

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FIELD REPORT – AUGUST 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Kearney Lake Run		**Site ID: KL3**
Watercourse: Kearney Lake Run		**Location:** Kearney Lake Road
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0444390E, 4950406N (UTM, NAD83)	
SLE Field Personnel:	Alex Duguay/ Ghislain Pitre	

Site Conditions

Weather:	Sunny
Air Temperature:	19°C
Cloud Cover:	No
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Via walking path off Kearney Lake Road

Field Parameter Data

	Remarks
Date (d.m.y):	16 May 2013
Time (hh:mm):	10:00
Sample Depth (m):	1.0
pH:	7.25
Dissolved Oxygen (mg/L):	9.20
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	21.5
Conductivity (µs/cm):	194.4

Additional Comments / Notes

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FIELD REPORT – AUGUST 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Kearney Lake Run		**Site ID: KL4**
Watercourse: Kearney Lake Run		**Location:** Kearney Lake Road
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0444463E, 4950571N (UTM, NAD83)	
SLE Field Personnel:	Alex Duguay/ Ghislain Pitre	

Site Conditions

Weather:	Sunny
Air Temperature:	19°C
Cloud Cover:	No
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Via walking path off Kearney Lake Road

Field Parameter Data

	Remarks
Date (d.m.y):	16 August 2013
Time (hh:mm):	10:30
Sample Depth (m):	1.0
pH:	7.08
Dissolved Oxygen (mg/L):	8.89
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	20.4
Conductivity (µs/cm):	196.2

Additional Comments / Notes

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FIELD REPORT – AUGUST 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 9	
Client:	Halifax Regional Municipality		
Site: Kearney Lake		**Site ID: KL5**	
Watercourse: Kearney Lake		**Location:** Kearney Lake Road	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:			
GPS Coordinates:	20T 4949142E, 445280N (UTM, NAD83)		
SLE Field Personnel:	Alex Duguay/ Ghislain Pitre		

Site Conditions

Weather:	Sunny
Air Temperature:	19°C
Cloud Cover:	No
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Along Kearney Lake Road

Field Parameter Data

	Remarks
Date (d.m.y):	16 August 2013
Time (hh:mm):	10:50
Sample Depth (m):	1.0
pH:	8.57
Dissolved Oxygen (mg/L):	8.89
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	22.7
Conductivity (µs/cm):	202.1

Additional Comments / Notes

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FIELD REPORT – AUGUST 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Highway 102	**Site ID: HWY 102-1**	
Watercourse: Marsh area	**Location:** Highway 102, south of exit 3	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0444708E, 4951644N (UTM, NAD83)	
SLE Field Personnel:	Alex Duguay/ Ghislain Pitre	

Site Conditions

Weather:	Sunny
Air Temperature:	22°C
Cloud Cover:	No
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Off Highway 102

Field Parameter Data

	Remarks
Date (d.m.y):	15 August 2013
Time (hh:mm):	12:22
Sample Depth (m):	1.0
pH:	7.10
Dissolved Oxygen (mg/L):	3.32
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	19.5
Conductivity (µs/cm):	173.2

Additional Comments / Notes

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FIELD REPORT – AUGUST 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Highway 102		**Site ID: HWY 102-2**
Watercourse: Marsh area		**Location:** HWY 102, south of exit 3
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0444829E, 4951778N (UTM, NAD83)	
SLE Field Personnel:	Alex Duguay/ Ghislain Pitre	

Site Conditions

Weather:	Sunny
Air Temperature:	18
Cloud Cover:	No
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Off Highway 102

Field Parameter Data

	Remarks
Date (d.m.y):	15 August 2013
Time (hh:mm):	10:00
Sample Depth (m):	1.0
pH:	6.92
Dissolved Oxygen (mg/L):	1.57
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	22.0
Conductivity (µs/cm):	188.5

Additional Comments / Notes

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FIELD REPORT – AUGUST 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Lake Shore Drive		**Site ID: LSD**
Watercourse: Marsh @ Lakeshore Dr.		**Location:** Kingswood Subdivision
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0442583E, 4950431N (UTM, NAD83)	
SLE Field Personnel:	Alex Duguay/ Ghislain Pitre	

Site Conditions

Weather:	Sunny
Air Temperature:	23
Cloud Cover:	No
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Via Lakeshore Drive in Kingswood Subdivision

Field Parameter Data

	Remarks
Date (d.m.y):	15 August 2013
Time (hh:mm):	15:30
Sample Depth (m):	1.0
pH:	7.28
Dissolved Oxygen (mg/L):	7.26
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	20.2
Conductivity (µs/cm):	132.5

Additional Comments / Notes

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FIELD REPORT – MAY 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 9
Client:	Halifax Regional Municipality	
Site: Larry Uteck Blvd.		**Site ID: LU**
Watercourse: Pond		**Location:** Larry Uteck off-ramp
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 4949816E, 445042N (UTM, NAD83)	
SLE Field Personnel:	Allain Thebeau/ Ghislain Pitre	

Site Conditions

Weather:	Sunny
Air Temperature:	23℃
Cloud Cover:	No
Wildlife Sightings:	N/A
Site Accessibility: Accessible	From Larry Uteck Blvd. off-ramp, Halifax-bound

Field Parameter Data

	Remarks
Date (d.m.y):	15 August 2013
Time (hh:mm):	14:30
Sample Depth (m):	1.0
pH:	7.49
Dissolved Oxygen (mg/L):	8.29
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	18.3
Conductivity (µs/cm):	320

Additional Comments / Notes

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FIELD REPORT – AUGUST 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Paper Mill Lake		**Site ID: PML1**
Watercourse: Paper Mill Lake		**Location:** Moirs Mill Subdivision
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0445129E, 4951154N (UTM, NAD83)	
SLE Field Personnel:	Alex Duguay/ Ghislain Pitre	

Site Conditions

Weather:	Sunny
Air Temperature:	18°C
Cloud Cover:	No
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Via French Mast Lane in Moirs Mill Subdivision

Field Parameter Data

	Remarks
Date (d.m.y):	15 August 2013
Time (hh:mm):	11:35
Sample Depth (m):	1.0
pH:	7.20
Dissolved Oxygen (mg/L):	7.65
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	22.5
Conductivity (µs/cm):	199.0

Additional Comments / Notes

Coast Line Retreated by approximately 25 feet.

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FIELD REPORT – AUGUST 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Paper Mill Lake		**Site ID: PML2**
Watercourse: Paper Mill Lake		**Location:** Moirs Mill Subdivision
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0445363E, 4951740N (UTM, NAD83)	
SLE Field Personnel:	Alex Duguay/ Ghislain Pitre	

Site Conditions

Weather:	Sunny
Air Temperature:	18°C
Cloud Cover:	No
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Via Lake Dr., off Hammonds Plains Rd.

Field Parameter Data

	Remarks
Date (d.m.y):	15 August 2013
Time (hh:mm):	10:45
Sample Depth (m):	N/A
pH:	N/A
Dissolved Oxygen (mg/L):	N/A
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	N/A
Conductivity (µs/cm):	N/A

Additional Comments / Notes

Coastal line retreated approximately 100 feet.
Coastal floor bed has unstable terrain
Field Parameters/ Water Sample not collected for Health and Safety reasons.

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ATTACHMENT 2

Site Photographs

Photo 1: KL1, Kearney Lake sample location

Photo 2: KL2, Kearney Lake sample location

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Photo 3: KL3, Kearney Lake sample location

Photo 4: KL4, Kearney Lake sample location

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Photo 5: KL5, Kearney Lake sample location

Photo 6: Hwy102-1 sample location

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Photo 7: Hwy102-2 sample location

Photo 8: LSD, Lake Shore Drive sample location

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Photo 9: LU, Larry Uteck off-ramp sample location

Photo 10: PML1, Paper Mill Lake sample location

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Photo 11: PML2, Paper Mill Lake sample location

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ATTACHMENT 3

Laboratory Certificates of Analysis

AGAT Laboratories

11 Morris Drive, Unit 122
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TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

CLIENT NAME: SNC-LAVALIN
5657 SPRING GARDEN RD, SUITE 200
HALIFAX , NS B3J3R4
(902) 492-4544

ATTENTION TO: Derek Heath

PROJECT NO: 510192-0001 Bedford West

AGAT WORK ORDER: 13X747917

WATER ANALYSIS REVIEWED BY: Laura Baker, Inorganics Data Reporter

DATE REPORTED: Aug 26, 2013

PAGES (INCLUDING COVER): 9

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

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Results relate only to the items tested and to all the items tested

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Certificate of Analysis

AGAT WORK ORDER: 13X747917

PROJECT NO: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

SNC Lavalin Bedford West Package

DATE RECEIVED: 2013-08-15

DATE REPORTED: 2013-08-26

		SAMPLE DESCRIPTION:		KL-2	LSD	HWY-102-1	HWY-102-2	PML-1	LU
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		8/15/2013	8/15/2013	8/15/2013	8/15/2013	8/15/2013	8/15/2013
Parameter	Unit	G / S	RDL	4655146	4655190	4655198	4655206	4655215	4655230
Total Suspended Solids	mg/L		5	135	17	<5	<5	<5	<5
Total Kjeldahl Nitrogen as N	mg/L		0.4	1.1	0.7	0.6	0.7	0.4	0.5
Chlorophyll A - Acidification Method	ug/L		0.5	1.0	1.6	14.7	1.1	1.1	2.3
Chlorophyll A - Welschmeyer Method	ug/L		0.5	1.0	2.0	15.8	1.3	1.1	2.5
E. Coli (MPN)	MPN/100 mL		1	6	20	34	9	4	86
Total Coliforms (MPN)	MPN/100 mL		1	>2420	>2420	>2420	1990	1730	>2420

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Original Signed

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 13X747917

PROJECT NO: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

Standard Water Analysis + Metals (Total)

DATE RECEIVED: 2013-08-15

DATE REPORTED: 2013-08-26

		SAMPLE DESCRIPTION:		KL-2	LSD	HWY-102-1	HWY-102-2	PML-1	LU
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		8/15/2013	8/15/2013	8/15/2013	8/15/2013	8/15/2013	8/15/2013
Parameter	Unit	G / S	RDL	4655146	4655190	4655198	4655206	4655215	4655230
pH				6.62	6.95	6.87	6.59	6.92	7.11
Reactive Silica as SiO2	mg/L		0.5	4.4	3.9	5.1	6.2	2.6	8.6
Chloride	mg/L		1	21	32	31	50	57	99
Fluoride	mg/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sulphate	mg/L		2	5	7	8	9	10	29
Alkalinity	mg/L		5	<5	20	23	14	6	22
True Color	TCU		5	90	21	65	61	15	7
Turbidity	NTU		0.1	2.2	31.6	1.6	3.3	1.1	1.6
Electrical Conductivity	umho/cm		1	69	136	188	203	218	433
Nitrate + Nitrite as N	mg/L		0.05	<0.05	0.20	<0.05	<0.05	0.18	2.57
Nitrate as N	mg/L		0.05	<0.05	0.20	<0.05	<0.05	0.18	2.57
Nitrite as N	mg/L		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ammonia as N	mg/L		0.03	0.04	0.03	0.05	0.17	0.04	0.04
Total Organic Carbon	mg/L		0.5	11.1	6.3	10.1	10.6	4.1	4.5
Ortho-Phosphate as P	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Sodium	mg/L		0.1	7.0	26.6	15.0	19.1	28.5	51.7
Total Potassium	mg/L		0.1	0.5	1.1	1.7	1.5	1.0	2.8
Total Calcium	mg/L		0.1	2.5	6.0	10.5	8.5	6.6	17.6
Total Magnesium	mg/L		0.1	0.5	1.4	1.5	1.3	0.9	2.7
Total Phosphorous	mg/L		0.02	0.02	0.02	0.02	0.03	0.02	0.04
Bicarb. Alkalinity (as CaCO3)	mg/L		5	<5	20	23	14	6	22
Carb. Alkalinity (as CaCO3)	mg/L		10	<10	<10	<10	<10	<10	<10
Hydroxide	mg/L		5	<5	<5	<5	<5	<5	<5
Calculated TDS	mg/L		1	37	87	83	100	109	229
Hardness	mg/L			8.3	20.7	32.4	26.6	20.2	55.1
Langelier Index (@20C)	NA			-3.83	-2.55	-2.33	-2.92	-3.07	-1.93
Langelier Index (@ 4C)	NA			-4.15	-2.87	-2.65	-3.24	-3.39	-2.25
Saturation pH (@ 20C)	NA			10.5	9.50	9.20	9.51	9.99	9.04
Saturation pH (@ 4C)	NA			10.8	9.82	9.52	9.83	10.3	9.36
Anion Sum	me/L			0.70	1.46	1.50	1.88	1.95	4.02
Cation sum	me/L			0.54	1.62	1.40	1.50	1.69	3.51

Original Signed

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 13X747917

PROJECT NO: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

Standard Water Analysis + Metals (Total)

DATE RECEIVED: 2013-08-15

DATE REPORTED: 2013-08-26

		SAMPLE DESCRIPTION:		KL-2	LSD	HWY-102-1	HWY-102-2	PML-1	LU
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		8/15/2013	8/15/2013	8/15/2013	8/15/2013	8/15/2013	8/15/2013
Parameter	Unit	G / S	RDL	4655146	4655190	4655198	4655206	4655215	4655230
% Difference/ Ion Balance (NS)	%			12.9	5.2	3.5	11.3	7.0	6.8
Total Aluminum	ug/L		5	270	93	145	138	103	447
Total Antimony	ug/L		2	<2	<2	<2	<2	<2	<2
Total Arsenic	ug/L		2	<2	<2	<2	<2	<2	<2
Total Barium	ug/L		5	<5	7	57	43	12	134
Total Beryllium	ug/L		2	<2	<2	<2	<2	<2	<2
Total Bismuth	ug/L		2	<2	<2	<2	<2	<2	<2
Total Boron	ug/L		5	11	15	10	10	8	22
Total Cadmium	ug/L		0.017	<0.017	<0.017	<0.017	<0.017	0.018	0.236
Total Chromium	ug/L		1	<1	<1	<1	1	<1	1
Total Cobalt	ug/L		1	<1	<1	<1	1	<1	<1
Total Copper	ug/L		1	<1	1	<1	1	1	6
Total Iron	ug/L		50	528	254	938	1720	205	890
Total Lead	ug/L		0.5	0.5	<0.5	<0.5	0.7	<0.5	1.4
Total Manganese	ug/L		2	67	81	45	173	58	89
Total Molybdenum	ug/L		2	<2	<2	<2	<2	<2	<2
Total Nickel	ug/L		2	<2	<2	<2	<2	<2	<2
Total Selenium	ug/L		1	<1	<1	<1	<1	<1	<1
Total Silver	ug/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium	ug/L		5	9	24	47	40	25	90
Total Thallium	ug/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin	ug/L		2	<2	<2	<2	<2	<2	<2
Total Titanium	ug/L		2	<2	2	<2	<2	<2	11
Total Uranium	ug/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
Total Vanadium	ug/L		2	<2	<2	<2	<2	<2	<2
Total Zinc	ug/L		5	<5	<5	<5	<5	<5	49

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

4655146 When the cation and anion sums are below 1 me/L, the acceptable criteria is less than 0.3me/L

4655206 Ion Balance is biased high. Contributing factors have been re-checked.

Original Signed

Certified By: _____

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Certificate of Analysis

AGAT WORK ORDER: 13X747917

PROJECT NO: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

Total Phosphorus - Low Level

DATE RECEIVED: 2013-08-15

DATE REPORTED: 2013-08-26

		SAMPLE DESCRIPTION:		KL-2	LSD	HWY-102-1	HWY-102-2	PML-1	LU
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		8/15/2013	8/15/2013	8/15/2013	8/15/2013	8/15/2013	8/15/2013
Parameter	Unit	G / S	RDL	4655146	4655190	4655198	4655206	4655215	4655230
Total Phosphorus	mg/L		0.006	0.051	0.015	0.021	0.028	0.007	0.027

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

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Certified By:

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Quality Assurance

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 13X747917

PROJECT NO: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

Water Analysis

RPT Date: Aug 26, 2013			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
SNC Lavalin Bedford West Package															
Total Suspended Solids	1	4651740	34	36	5.7%	< 5	98%	80%	120%		120%	120%	97%	80%	120%
Total Kjeldahl Nitrogen as N	1	4650187	0.7	0.6	15.4%	< 0.4	102%	80%	120%		80%	120%	113%	80%	120%
Standard Water Analysis + Metals (Total)															
pH	4655146	4655146	6.62	6.61	0.2%	<	101%	80%	120%	NA	80%	120%	NA	80%	120%
Reactive Silica as SiO2	1	4653554	4.2	4.2	0.0%	< 0.5	104%	80%	120%		80%	120%	100%	80%	120%
Chloride	1	4655129	26	29	10.9%	< 1	82%	80%	120%		80%	120%	95%	80%	120%
Fluoride	1	4655129	< 0.1	< 0.1	0.0%	< 0.1	94%	80%	120%		80%	120%	107%	80%	120%
Sulphate	1	4655129	102	102	0.0%	< 2	117%	80%	120%		80%	120%	102%	80%	120%
Alkalinity	4655146	4655146	<5	6	0.0%	< 5	91%	80%	120%	NA	80%	120%	NA	80%	120%
True Color	1	4653554	10	12	18.2%	< 5	100%	80%	120%		80%	120%		80%	120%
Turbidity	1		0.4	0.4	0.0%	< 0.1	102%	80%	120%		80%	120%		80%	120%
Electrical Conductivity	4655146	4655146	69	70	0.4%	< 1	101%	80%	120%	NA	80%	120%	NA	80%	120%
Nitrate as N	1	4655129	0.83	0.82	1.2%	< 0.05	88%	80%	120%		80%	120%	102%	80%	120%
Nitrite as N	1	4655129	< 0.05	< 0.05	0.0%	< 0.05	100%	80%	120%		80%	120%	100%	80%	120%
Ammonia as N	1	4653567	0.03	0.03	0.0%	< 0.03	112%	80%	120%		80%	120%	105%	80%	120%
Total Organic Carbon	1	4650197	4.0	4.2	4.9%	< 0.5	92%	80%	120%		80%	120%	111%	80%	120%
Ortho-Phosphate as P	1	4653554	<0.01	<0.01	0.0%	< 0.01	103%	80%	120%		80%	120%	97%	80%	120%
Total Sodium	8192013		8.94	9.30	3.9%	< 0.1	91%	80%	120%		80%	120%	117%	70%	130%
Total Potassium	8192013		< 0.1	< 0.1	0.0%	< 0.1	111%	80%	120%		80%	120%	91%	70%	130%
Total Calcium	8192013		< 0.1	< 0.1	0.0%	< 0.1	108%	80%	120%		80%	120%	89%	70%	130%
Total Magnesium	8192013		< 0.1	< 0.1	0.0%	< 0.1	99%	80%	120%		80%	120%	102%	80%	120%
Total Phosphorous	8192013		0.04	0.04	0.0%	< 0.02	103%	80%	120%		80%	120%	112%	70%	130%
Bicarb. Alkalinity (as CaCO3)	4655146	4655146	<5	6	0.0%	< 5	NA	80%	120%	NA	80%	120%	NA	80%	120%
Carb. Alkalinity (as CaCO3)	4655146	4655146	<10	<10	0.0%	< 10	NA	80%	120%	NA	80%	120%	NA	80%	120%
Hydroxide	4655146	4655146	<5	<5	0.0%	< 5	NA	80%	120%	NA	80%	120%	NA	80%	120%
Total Aluminum	8192013		64	61	4.8%	< 5	91%	80%	120%		80%	120%	127%	70%	130%
Total Antimony	8192013		< 2	< 2	0.0%	< 2	101%	80%	120%		80%	120%	70%	70%	130%
Total Arsenic	8192013		< 2	< 2	0.0%	< 2	96%	80%	120%		80%	120%	92%	70%	130%
Total Barium	8192013		< 5	< 5	0.0%	< 5	103%	80%	120%		80%	120%	99%	70%	130%
Total Beryllium	8192013		< 2	< 2	0.0%	< 2	115%	80%	120%		80%	120%	93%	70%	130%
Total Bismuth	8192013		< 2	< 2	0.0%	< 2	97%	80%	120%		80%	120%	116%	70%	130%
Total Boron	8192013		9	9	0.0%	< 5	109%	80%	120%		80%	120%	83%	70%	130%
Total Cadmium	8192013		< 0.017	< 0.017	0.0%	< 0.017	98%	80%	120%		80%	120%	82%	70%	130%
Total Chromium	8192013		1	< 1	NA	< 1	104%	80%	120%		80%	120%	80%	70%	130%
Total Cobalt	8192013		< 1	< 1	0.0%	< 1	113%	80%	120%		80%	120%	86%	70%	130%
Total Copper	8192013		300	291	3.0%	< 1	110%	80%	120%		80%	120%	105%	70%	130%
Total Iron	8192013		78	90	14.3%	< 50	98%	80%	120%		80%	120%	97%	70%	130%
Total Lead	8192013		2.1	2.0	4.9%	< 0.5	97%	80%	120%		80%	120%	121%	70%	130%

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Quality Assurance

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 13X747917

PROJECT NO: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

Water Analysis (Continued)

RPT Date: Aug 26, 2013			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Manganese	8192013		2	2	0.0%	< 2	108%	80%	120%		80%	120%	79%	70%	130%
Total Molybdenum	8192013		< 2	< 2	0.0%	< 2	100%	80%	120%		80%	120%	92%	70%	130%
Total Nickel	8192013		8	8	0.0%	< 2	112%	80%	120%		80%	120%	94%	70%	130%
Total Selenium	8192013		< 1	< 1	0.0%	< 1	104%	80%	120%		80%	120%	76%	70%	130%
Total Silver	8192013		< 0.1	< 0.1	0.0%	< 0.1	99%	80%	120%		80%	120%	85%	70%	130%
Total Strontium	8192013		< 5	< 5	0.0%	< 5	104%	80%	120%		80%	120%	88%	70%	130%
Total Thallium	8192013		< 0.1	< 0.1	0.0%	< 0.1	94%	80%	120%		80%	120%	114%	70%	130%
Total Tin	8192013		< 2	< 2	0.0%	< 2	99%	80%	120%		80%	120%	89%	70%	130%
Total Titanium	8192013		< 2	< 2	0.0%	< 2	102%	80%	120%		80%	120%	85%	70%	130%
Total Uranium	8192013		< 0.1	< 0.1	0.0%	< 0.1	95%	80%	120%		80%	120%	130%	70%	130%
Total Vanadium	8192013		< 2	< 2	0.0%	< 2	106%	80%	120%		80%	120%	81%	70%	130%
Total Zinc	8192013		56	56	0.0%	< 5	93%	80%	120%		80%	120%	88%	70%	130%
SNC Lavalin Bedford West Package															
E. Coli (MPN)	1	4655190	20	15	28.6%	< 1		0%	0%		0%	0%		0%	0%
Total Coliforms (MPN)	1	4655180	>2420	>2420	0.0%	< 1		0%	0%		0%	0%		0%	0%
Total Phosphorus - Low Level															
Total Phosphorus	1		0.008	0.009	11.8%	< 0.006	102%	90%	110%	100%	90%	110%	100%	80%	120%

Original Signed

Certified By:

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Method Summary

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 13X747917

PROJECT NO: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Suspended Solids	INOR-121-6024, 6025	SM 2540C, D	GRAVIMETRIC
Total Kjeldahl Nitrogen as N	INOR-121-6020	SM 4500 NORG D	COLORIMETER
Chlorophyll A - Acidification Method	Subcontracted	Subcontracted	
Chlorophyll A - Welschmeyer Method	Subcontracted	Subcontracted	ICP-MS
E. Coli (MPN)	MIC-121-7000	Based on SM 9223B	INCUBATOR
Total Coliforms (MPN)	MIC-121-7000	Based on SM 9223B	INCUBATOR
pH	INOR-121-6001	SM 4500 H+B	PC-TITRATE
Reactive Silica as SiO2	INORG-121-6028	SM 4110 B	COLORIMETER
Chloride	INORG-121-6005	SM 4110 B	IC
Fluoride	INORG-121-6005	SM 4110 B	IC
Sulphate	INORG-121-6005	SM 4110 B	IC
Alkalinity	INORG-121-6001	SM 2320 B	PC-TITRATE
True Color	INORG-121-6014	EPA 110.2	NEPHELOMETER
Turbidity	INORG-121-6022	SM 2130 B	NEPHELOMETER
Electrical Conductivity	INOR-121-6001	SM 2510 B	PC-TITRATE
Nitrate + Nitrite as N	INORG-121-6005	SM 4110 B	CALCULATION
Nitrate as N	INORG-121-6005	SM 4110 B	IC
Nitrite as N	INORG-121-6005	SM 4110 B	IC
Ammonia as N	INORG-121-6003	SM 4500-NH3 G	COLORIMETER
Total Organic Carbon	INORG-121-6026	SM 5310 B	TOC ANALYZER
Ortho-Phosphate as P	INORG-121-6005	SM 4110 B	COLORIMETER
Total Sodium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Potassium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Calcium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Magnesium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Phosphorous	MET-121-6104 & MET-121-6105	SM 3125	ICP/MS
Bicarb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Carb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Hydroxide	INORG-121-6001	SM 2320 B	PC-TITRATE
Calculated TDS		SM 1030E	CALCULATION
Hardness	CALCULATION	SM 2340B	CALCULATION
Langelier Index (@20C)	CALCULATION	CALCULATION	CALCULATION
Langelier Index (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 20C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Anion Sum	CALCULATION	SM 1030E	CALCULATION
Cation sum	CALCULATION	SM 1030E	CALCULATION
% Difference/ Ion Balance (NS)	CALCULATION	SM 1030E	CALCULATION
Total Aluminum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Antimony	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Arsenic	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Barium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS

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Method Summary

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 13X747917

PROJECT NO: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Beryllium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Bismuth	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Boron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cadmium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Chromium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cobalt	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Copper	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Iron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Lead	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Manganese	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Molybdenum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Nickel	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Selenium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Silver	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Strontium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Thallium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Tin	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Titanium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Uranium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Vanadium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Zinc	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Phosphorus	INOR-93-1022	SM 4500-P B & E	SPECTROPHOTOMETER

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Chain of Custody Record

Turnaround Time Required (TAT)
Regular TAT 5 to 7 working days ☑
Rush TAT 24 to 48 hours ☐
48 to 72 hours ☐
Date Required: _____

Report To
Company: SNC Lavalin
Contact: Derek Heath
Address: 5657 Spring Garden Road, Suite 200
Phone: +1 (902) 492-4544 Fax: _____
PO#: _____
AGAT Quotation: 12-761
Client Project Name/#: 510192-0001 Bedford West

Report Information
1. Name: _____
Email: _____
2. Name: Derek Heath
Email: derek.heath@snclavalin.com

Report Format
☐ Single Sample per page
☑ Multiple Samples per page
☑ Excel Format Included

Laboratory Use Only
Arrival Condition: ☐ Good ☐ Poor (see notes)
Arrival Temperature: 12.0 C
AGAT Job Number: 13X747917
Notes:

Invoice To Same Yes ☑ / No ☐
Company: _____
Contact: _____
Address: _____
Phone: _____ Fax: _____
PO#/Credit Card #: _____

Regulatory Requirements (Check):
☐ List Guidelines on Report ☐ Do not List Guidelines on Report
☐ PIRI
☐ Tier 1 ☐ Res ☐ Pot ☐ Coarse
☐ Tier 2 ☐ Com ☐ N/Pot ☐ Fine
☐ Gas ☐ Gas ☐ Lube
☐ CCME
☐ Industrial ☐ CDWQ ☐ Other
☐ Commercial ☐ NSDFOSP
☐ Res/Park ☐ HRM 101
☐ Agricultural ☐ Storm Water
☐ FWAL ☐ Waste Water
☐ Sediment

Sample Identification	Sample Matrix	Date/Time Sampled	Comments – Site/Sample Info. Sample Containment	Microtox	CCME PHC BTEX/F1-F4	Metals	AB Class II Landfill	Detailed Salinity	Routine Potability	Standard Water + Metals	Low Level Total Phosphorus	TSS & TKN	E.Coli (MPN)	Chlorophyll A	Number of Containers	Preserved (Y/N)	Hazardous (Y/N)	Lab Sample #
~~KL-1~~	~~WATER~~									✓	✓	✓	✓	✓				
KL-2	WATER									✓	✓	✓	✓	✓				
~~KL-3~~	~~WATER~~									✓	✓	✓	✓	✓				
~~KL-4~~	~~WATER~~									✓	✓	✓	✓	✓				
~~KL-5~~	~~WATER~~									✓	✓	✓	✓	✓				
LSD	WATER									✓	✓	✓	✓	✓				
HWY-102-1	WATER									✓	✓	✓	✓	✓				
HWY-102-2	WATER									✓	✓	✓	✓	✓				
* PML-1 (Extra)	WATER									✓	✓	✓	✓	✓				
~~PML-2~~	~~WATER~~									✓	✓	✓	✓	✓				
LU	WATER									✓	✓	✓	✓	✓				
	WATER									✓	✓	✓	✓	✓				

Samples Relinquished by (print name & sign):	Date	Samples Received by (Print name & sign):	Date	Special Instructions	Page ____ of ____
Alex Duguay		Tamara Foibert	Aug 17/11		
Original Signed	Date	Original Signed	Date 17:05		NO:
Samples Relinquished by (print name & sign):	Date	Samples Received by (Print name & sign):	Date		

* Please note that bottles labeled ~~KL-1~~ "Extra" were taken from site PML-1 and should be named so.

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CLIENT NAME: SNC-LAVALIN
5657 SPRING GARDEN RD, SUITE 200
HALIFAX , NS B3J3R4
(902) 492-4544

ATTENTION TO: Derek Heath

PROJECT NO: 510192-0001 Bedford West

AGAT WORK ORDER: 13X748118

WATER ANALYSIS REVIEWED BY: Laura Baker, Inorganics Data Reporter

DATE REPORTED: Aug 26, 2013

PAGES (INCLUDING COVER): 9

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

Member of: Association of Professional Engineers, Geologists and Geophysicists of Alberta (APEGGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

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Certificate of Analysis

AGAT WORK ORDER: 13X748118

PROJECT NO: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

SNC Lavalin Bedford West Package

DATE RECEIVED: 2013-08-16

DATE REPORTED: 2013-08-26

SAMPLE DESCRIPTION:				KL-1	KL-3	KL-4	KL-5
SAMPLE TYPE:				Water	Water	Water	Water
DATE SAMPLED:				8/16/2013	8/16/2013	8/16/2013	8/16/2013
Parameter	Unit	G / S	RDL	4657621	4657766	4657789	4657864
Total Suspended Solids	mg/L		5	<5	<5	<5	<5
Total Kjeldahl Nitrogen as N	mg/L		0.4	0.7	1.3	1.8	0.6
Chlorophyll A - Acidification Method	ug/L		0.5	1.4	2.0	1.5	2.2
Chlorophyll A - Welschmeyer Method	ug/L		0.5	1.4	2.3	1.7	2.4
E. Coli (MPN)	MPN/100 mL		1	2	21	38	6
Total Coliforms (MPN)	MPN/100 mL		1	866	2420	>2420	308

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Original Signed

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 13X748118

PROJECT NO: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

Standard Water Analysis + Metals (Total)

DATE RECEIVED: 2013-08-16

DATE REPORTED: 2013-08-26

		SAMPLE DESCRIPTION:		KL-1	KL-3	KL-4	KL-5
		SAMPLE TYPE:		Water	Water	Water	Water
		DATE SAMPLED:		8/16/2013	8/16/2013	8/16/2013	8/16/2013
Parameter	Unit	G / S	RDL	4657621	4657766	4657789	4657864
pH				6.93	6.96	6.96	6.93
Reactive Silica as SiO2	mg/L		0.5	1.8	2.6	2.6	2.5
Chloride	mg/L		1	59	40	41	44
Fluoride	mg/L		0.1	<0.1	<0.1	<0.1	<0.1
Sulphate	mg/L		2	9	7	7	7
Alkalinity	mg/L		5	<5	5	<5	6
True Color	TCU		5	37	23	21	22
Turbidity	NTU		0.1	3.3	2.4	2.6	0.8
Electrical Conductivity	umho/cm		1	241	216	218	223
Nitrate + Nitrite as N	mg/L		0.05	0.14	0.11	0.11	0.21
Nitrate as N	mg/L		0.05	0.14	0.11	0.11	0.21
Nitrite as N	mg/L		0.05	<0.05	<0.05	<0.05	<0.05
Ammonia as N	mg/L		0.03	0.03	<0.03	<0.03	<0.03
Total Organic Carbon	mg/L		0.5	4.1	4.4	4.5	4.6
Ortho-Phosphate as P	mg/L		0.01	<0.01	<0.01	<0.01	<0.01
Total Sodium	mg/L		0.1	26.2	20.1	20.1	19.2
Total Potassium	mg/L		0.1	0.7	0.6	0.6	0.7
Total Calcium	mg/L		0.1	6.6	5.3	5.1	5.7
Total Magnesium	mg/L		0.1	1.2	0.9	0.8	1.0
Total Phosphorous	mg/L		0.02	<0.02	<0.02	<0.02	<0.02
Bicarb. Alkalinity (as CaCO3)	mg/L		5	<5	5	<5	6
Carb. Alkalinity (as CaCO3)	mg/L		10	<10	<10	<10	<10
Hydroxide	mg/L		5	<5	<5	<5	<5
Calculated TDS	mg/L		1	104	78	75	82
Hardness	mg/L			21.4	16.9	16.0	18.4
Langelier Index (@20C)	NA			-3.14	-3.19	-3.21	-3.11
Langelier Index (@ 4C)	NA			-3.46	-3.51	-3.53	-3.43
Saturation pH (@ 20C)	NA			10.1	10.2	10.2	10.0
Saturation pH (@ 4C)	NA			10.4	10.5	10.5	10.4
Anion Sum	me/L			1.86	1.38	1.31	1.52
Cation sum	me/L			1.61	1.24	1.23	1.23

Original Signed

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 13X748118

PROJECT NO: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

Standard Water Analysis + Metals (Total)

DATE RECEIVED: 2013-08-16

DATE REPORTED: 2013-08-26

		SAMPLE DESCRIPTION:		KL-1	KL-3	KL-4	KL-5
		SAMPLE TYPE:		Water	Water	Water	Water
		DATE SAMPLED:		8/16/2013	8/16/2013	8/16/2013	8/16/2013
Parameter	Unit	G / S	RDL	4657621	4657766	4657789	4657864
% Difference/ Ion Balance (NS)	%			7.3	5.5	3.2	10.6
Total Aluminum	ug/L		5	120	65	106	58
Total Antimony	ug/L		2	<2	<2	<2	<2
Total Arsenic	ug/L		2	<2	<2	<2	<2
Total Barium	ug/L		5	7	9	10	9
Total Beryllium	ug/L		2	<2	<2	<2	<2
Total Bismuth	ug/L		2	<2	<2	<2	<2
Total Boron	ug/L		5	10	7	6	7
Total Cadmium	ug/L		0.017	<0.017	<0.017	0.017	<0.017
Total Chromium	ug/L		1	<1	<1	<1	<1
Total Cobalt	ug/L		1	<1	<1	<1	<1
Total Copper	ug/L		1	<1	<1	<1	<1
Total Iron	ug/L		50	132	71	144	70
Total Lead	ug/L		0.5	<0.5	<0.5	<0.5	<0.5
Total Manganese	ug/L		2	48	20	77	13
Total Molybdenum	ug/L		2	<2	<2	<2	<2
Total Nickel	ug/L		2	<2	<2	<2	<2
Total Selenium	ug/L		1	<1	<1	<1	<1
Total Silver	ug/L		0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium	ug/L		5	33	18	17	18
Total Thallium	ug/L		0.1	<0.1	<0.1	<0.1	<0.1
Total Tin	ug/L		2	<2	<2	<2	<2
Total Titanium	ug/L		2	2	<2	<2	<2
Total Uranium	ug/L		0.1	0.1	<0.1	<0.1	<0.1
Total Vanadium	ug/L		2	<2	<2	<2	<2
Total Zinc	ug/L		5	6	5	<5	7

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Original Signed

Certified By:

Results relate only to the items tested and to all the items tested

AGAT Laboratories

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 13X748118

PROJECT NO: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

Total Phosphorus - Low Level

DATE RECEIVED: 2013-08-16

DATE REPORTED: 2013-08-26

SAMPLE DESCRIPTION:				KL-1	KL-3	KL-4	KL-5
SAMPLE TYPE:				Water	Water	Water	Water
DATE SAMPLED:				8/16/2013	8/16/2013	8/16/2013	8/16/2013
Parameter	Unit	G / S	RDL	4657621	4657766	4657789	4657864
Total Phosphorus	mg/L		0.006	0.011	0.006	2.39	0.013

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Original Signed

Certified By:

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Quality Assurance

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 13X748118

PROJECT NO: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

Water Analysis

RPT Date: Aug 26, 2013			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
SNC Lavalin Bedford West Package															
Total Suspended Solids	1	4657621	<5	<5	0.0%	< 5	98%	80%	120%		120%	120%	98%	80%	120%
Total Kjeldahl Nitrogen as N	1	4657864	0.6	0.6	0.0%	< 0.4	101%	80%	120%		80%	120%	95%	80%	120%
Standard Water Analysis + Metals (Total)															
pH	4659480		6.89	6.34	8.3%	<	99%	80%	120%	NA	80%	120%	NA	80%	120%
Reactive Silica as SiO2	1	4659339	7.0	7.1	1.4%	< 0.5	100%	80%	120%		80%	120%	99%	80%	120%
Chloride	1	4657621	48	58	18.9%	< 1	97%	80%	120%		80%	120%	96%	80%	120%
Fluoride	1	4657621	< 0.1	< 0.1	0.0%	< 0.1	101%	80%	120%		80%	120%	118%	80%	120%
Sulphate	1	4657621	8	9	11.8%	< 2	109%	80%	120%		80%	120%	110%	80%	120%
Alkalinity	4659480		<5	<5	0.0%	< 5	90%	80%	120%	NA	80%	120%	NA	80%	120%
True Color	1	4666047	<5	<5	0.0%	< 5	101%	80%	120%		80%	120%		80%	120%
Turbidity	1	7659343	2.2	2.7	20.4%	< 0.1	103%	80%	120%		80%	120%		80%	120%
Electrical Conductivity	4659480		32	30	6.2%	< 1	99%	80%	120%	NA	80%	120%	NA	80%	120%
Nitrate as N	1	4657621	0.12	0.13	8.0%	< 0.05	106%	80%	120%		80%	120%	116%	80%	120%
Nitrite as N	1	4657621	< 0.05	< 0.05	0.0%	< 0.05	87%	80%	120%		80%	120%	105%	80%	120%
Ammonia as N	1	4653561	0.04	0.04	0.0%	< 0.03	110%	80%	120%		80%	120%	106%	80%	120%
Total Organic Carbon	1	4656746	<0.5	0.5		< 0.5	91%	80%	120%		80%	120%	86%	80%	120%
Ortho-Phosphate as P	1	4659339	<0.01	<0.01	0.0%	< 0.01	103%	80%	120%		80%	120%	103%	80%	120%
Total Sodium	8212013	4657621	26.2	24.6	6.3%	< 0.1	99%	80%	120%	105%	80%	120%	NA	70%	130%
Total Potassium	8212013	4657621	0.7	0.6	15.4%	< 0.1	91%	80%	120%	94%	80%	120%	NA	70%	130%
Total Calcium	8212013	4657621	6.6	6.0	9.5%	< 0.1	95%	80%	120%	96%	80%	120%	NA	70%	130%
Total Magnesium	8212013	4657621	1.2	1.1	8.7%	< 0.1	100%	80%	120%	99%	80%	120%	NA	80%	120%
Total Phosphorous	8212013	4657621	< 0.02	< 0.02	0.0%	< 0.02	96%	80%	120%	98%	80%	120%	NA	70%	130%
Bicarb. Alkalinity (as CaCO3)	4659480		<5	<5	0.0%	< 5	NA	80%	120%	NA	80%	120%	NA	80%	120%
Carb. Alkalinity (as CaCO3)	4659480		<10	<10	0.0%	< 10	NA	80%	120%	NA	80%	120%	NA	80%	120%
Hydroxide	4659480		<5	<5	0.0%	< 5	NA	80%	120%	NA	80%	120%	NA	80%	120%
Total Aluminum	8212013	4657621	121	107	12.3%	< 5	86%	80%	120%	105%	80%	120%	NA	70%	130%
Total Antimony	8212013	4657621	< 2	< 2	0.0%	< 2	97%	80%	120%	112%	80%	120%	NA	70%	130%
Total Arsenic	8212013	4657621	< 2	< 2	0.0%	< 2	95%	80%	120%	93%	80%	120%	NA	70%	130%
Total Barium	8212013	4657621	7	7	0.0%	< 5	94%	80%	120%	98%	80%	120%	NA	70%	130%
Total Beryllium	8212013	4657621	< 2	< 2	0.0%	< 2	98%	80%	120%	97%	80%	120%	NA	70%	130%
Total Bismuth	8212013	4657621	< 2	< 2	0.0%	< 2	98%	80%	120%	100%	80%	120%	NA	70%	130%
Total Boron	8212013	4657621	10	9	10.5%	< 5	100%	80%	120%	94%	80%	120%	NA	70%	130%
Total Cadmium	8212013	4657621	< 0.017	< 0.017	0.0%	< 0.017	94%	80%	120%	98%	80%	120%	NA	70%	130%
Total Chromium	8212013	4657621	< 1	< 1	0.0%	< 1	105%	80%	120%	99%	80%	120%	NA	70%	130%
Total Cobalt	8212013	4657621	< 1	< 1	0.0%	< 1	100%	80%	120%	105%	80%	120%	NA	70%	130%
Total Copper	8212013	4657621	< 1	< 1	0.0%	< 1	96%	80%	120%	100%	80%	120%	NA	70%	130%
Total Iron	8212013	4657621	163	139	15.9%	< 50	97%	80%	120%	106%	80%	120%	NA	70%	130%
Total Lead	8212013	4657621	< 0.5	< 0.5	0.0%	< 0.5	96%	80%	120%	102%	80%	120%	NA	70%	130%

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation.

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Quality Assurance

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 13X748118

PROJECT NO: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

Water Analysis (Continued)

RPT Date: Aug 26, 2013			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Manganese	8212013	4657621	48	44	8.7%	< 2	NA	80%	120%	87%	80%	120%	NA	70%	130%
Total Molybdenum	8212013	4657621	< 2	< 2	0.0%	< 2	93%	80%	120%	88%	80%	120%	NA	70%	130%
Total Nickel	8212013	4657621	< 2	< 2	0.0%	< 2	102%	80%	120%	106%	80%	120%	NA	70%	130%
Total Selenium	8212013	4657621	< 1	< 1	0.0%	< 1	90%	80%	120%	99%	80%	120%	NA	70%	130%
Total Silver	8212013	4657621	< 0.1	< 0.1	0.0%	< 0.1	89%	80%	120%	93%	80%	120%	NA	70%	130%
Total Strontium	8212013	4657621	33	31	6.3%	< 5	96%	80%	120%	96%	80%	120%	NA	70%	130%
Total Thallium	8212013	4657621	< 0.1	< 0.1	0.0%	< 0.1	96%	80%	120%	100%	80%	120%	NA	70%	130%
Total Tin	8212013	4657621	< 2	< 2	0.0%	< 2	93%	80%	120%	98%	80%	120%	NA	70%	130%
Total Titanium	8212013	4657621	2	2	0.0%	< 2	97%	80%	120%	100%	80%	120%	NA	70%	130%
Total Uranium	8212013	4657621	0.1	0.1	0.0%	< 0.1	93%	80%	120%	102%	80%	120%	NA	70%	130%
Total Vanadium	8212013	4657621	< 2	< 2	0.0%	< 2	101%	80%	120%	99%	80%	120%	NA	70%	130%
Total Zinc	8212013	4657621	7	5	33.3%	< 5	82%	80%	120%	90%	80%	120%	NA	70%	130%

Comments: Matrix spike not available (NA); results based on blank spike recovery.

Total Phosphorus - Low Level															
Total Phosphorus	1	4657621	0.011	0.010	9.5%	< 0.006	109%	90%	110%	100%	90%	110%	95%	80%	120%

Original Signed

Certified By:

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Method Summary

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 13X748118

PROJECT NO: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Suspended Solids	INOR-121-6024, 6025	SM 2540C, D	GRAVIMETRIC
Total Kjeldahl Nitrogen as N	INOR-121-6020	SM 4500 NORG D	COLORIMETER
Chlorophyll A - Acidification Method	Subcontracted	Subcontracted	
Chlorophyll A - Welschmeyer Method	Subcontracted	Subcontracted	ICP-MS
E. Coli (MPN)	MIC-121-7000	Based on SM 9223B	INCUBATOR
Total Coliforms (MPN)	MIC-121-7000	Based on SM 9223B	INCUBATOR
pH	INOR-121-6001	SM 4500 H+B	PC-TITRATE
Reactive Silica as SiO2	INORG-121-6028	SM 4110 B	COLORIMETER
Chloride	INORG-121-6005	SM 4110 B	IC
Fluoride	INORG-121-6005	SM 4110 B	IC
Sulphate	INORG-121-6005	SM 4110 B	IC
Alkalinity	INORG-121-6001	SM 2320 B	PC-TITRATE
True Color	INORG-121-6014	EPA 110.2	NEPHELOMETER
Turbidity	INORG-121-6022	SM 2130 B	NEPHELOMETER
Electrical Conductivity	INOR-121-6001	SM 2510 B	PC-TITRATE
Nitrate + Nitrite as N	INORG-121-6005	SM 4110 B	CALCULATION
Nitrate as N	INORG-121-6005	SM 4110 B	IC
Nitrite as N	INORG-121-6005	SM 4110 B	IC
Ammonia as N	INORG-121-6003	SM 4500-NH3 G	COLORIMETER
Total Organic Carbon	INORG-121-6026	SM 5310 B	TOC ANALYZER
Ortho-Phosphate as P	INORG-121-6005	SM 4110 B	COLORIMETER
Total Sodium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Potassium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Calcium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Magnesium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Phosphorous	MET-121-6104 & MET-121-6105	SM 3125	ICP/MS
Bicarb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Carb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Hydroxide	INORG-121-6001	SM 2320 B	PC-TITRATE
Calculated TDS		SM 1030E	CALCULATION
Hardness	CALCULATION	SM 2340B	CALCULATION
Langelier Index (@20C)	CALCULATION	CALCULATION	CALCULATION
Langelier Index (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 20C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Anion Sum	CALCULATION	SM 1030E	CALCULATION
Cation sum	CALCULATION	SM 1030E	CALCULATION
% Difference/ Ion Balance (NS)	CALCULATION	SM 1030E	CALCULATION
Total Aluminum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Antimony	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Arsenic	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Barium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS

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Method Summary

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 13X748118

PROJECT NO: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Beryllium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Bismuth	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Boron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cadmium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Chromium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cobalt	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Copper	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Iron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Lead	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Manganese	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Molybdenum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Nickel	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Selenium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Silver	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Strontium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Thallium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Tin	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Titanium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Uranium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Vanadium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Zinc	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Phosphorus	INOR-93-1022	SM 4500-P B & E	SPECTROPHOTOMETER

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AGAT Laboratories

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Ph.: 902.468.8718 • Fax: 902.468.8924

Chain of Custody Record

Turnaround Time Required (TAT)

Regular TAT 5 to 7 working days ☑
Rush TAT 24 to 48 hours ☐
48 to 72 hours ☐
Date Required: 13/748/18

Report To

Company: SNC Lavalin
Contact: Derek Heath
Address: 5657 Spring Garden Road, Suite 200
Phone: +1 (902) 492-4544 Fax:
PO#:
AGAT Quotation: 12-761
Client Project Name/#: 510192-0001 Bedford West

Report Information

1. Name:
Email:
2. Name: Derek Heath
Email: derek.heath@snclavalin.com

Report Format

☐ Single Sample per page
☑ Multiple Samples per page
☑ Excel Format Included

Laboratory Use Only

Arrival Condition: ☐ Good ☐ Poor (see notes)
Arrival Temperature: 8°C
AGAT Job Number:
Notes:

Invoice To Same Yes ☑ / No ☐

Company:
Contact:
Address:
Phone: Fax:
PO#/Credit Card #:

Regulatory Requirements (Check):

☐ List Guidelines on Report ☐ Do not List Guidelines on Report
☐ PIRI
☐ Tier 1 ☐ Res ☐ Pot ☐ Coarse
☐ Tier 2 ☐ Com ☐ N/Pot ☐ Fine
☐ Gas ☐ Gas ☐ Lube
☐ CCME
☐ Industrial ☐ CDWQ ☐ Other
☐ Commercial ☐ NSDFOSP
☐ Res/Park ☐ HRM 101
☐ Agricultural ☐ Storm Water
☐ FWAL ☐ Waste Water
☐ Sediment

Sample Identification	Sample Matrix	Date/Time Sampled	Comments – Site/Sample Info. Sample Containment	Microtox	CCME PHC BTEX/F1-F4	Metals	AB Class II Landfill	Detailed Salinity	Routine Potability	Standard Water + Metals	Low Level Total Phosphorus	TSS & TKN	E.Coli (MPN)	Chlorophyll A	Number of Containers	Preserved (Y/N)	Hazardous (Y/N)	Lab Sample #
KL-1	WATER	Aug 16/2013								✓	✓	✓	✓	✓				
~~KL-2~~	~~WATER~~									✓	✓	✓	✓	✓				
KL-3	WATER	Aug 16/2013								✓	✓	✓	✓	✓				
KL-4	WATER	Aug 16/2013								✓	✓	✓	✓	✓				
KL-5	WATER	Aug 16/2013								✓	✓	✓	✓	✓				
~~LSD~~	~~WATER~~									✓	✓	✓	✓	✓				
~~HWY-102-1~~	~~WATER~~									✓	✓	✓	✓	✓				
~~HWY-102-2~~	~~WATER~~									✓	✓	✓	✓	✓				
~~PML-1~~	~~WATER~~									✓	✓	✓	✓	✓				
~~PML-2~~	~~WATER~~									✓	✓	✓	✓	✓				
LU	WATER									✓	✓	✓	✓	✓				
	WATER									✓	✓	✓	✓	✓				

Samples Relinquished by (print name & sign):	Date	Samples Received by (print name & sign):	Date	Special Instructions	Page ____ of ____
Alex Duguay	Aug 16/2013	Chris Deane Original Signed	Aug 16/13		
Original Signed	Aug 16/2013		Date 12:00		NO:
Samples Relinquished by (print name & sign):	Date	Samples Received by (print name & sign):	Date		

SNC·LAVALIN

Certified ISO 9001

Division of
SNC-LAVALIN INC.
Suite 200
Park Lane Terraces
5657 Spring Garden Road
Halifax, Nova Scotia
Canada, B3J 3R4

Telephone: 902-492-4544
Fax: 902-492-4540

November 27, 2013

Halifax Regional Municipality
Energy and Environment
PO Box 1749
Halifax, Nova Scotia
B3J 3A5

Attention: Mr. Cameron Deacoff

Dear Mr. Deacoff:

RE: Draft Report: Water Quality Monitoring within Bedford West, Bedford, Nova Scotia – October 2013 Sampling Event

1. INTRODUCTION

SNC-Lavalin Inc. was retained by the Halifax Regional Municipality (HRM) to conduct water quality monitoring within Bedford West. The Paper Mill Lake watershed is the primary watershed within the area. The water sampling program consisted of collecting surface water samples from eleven (11) specified locations as part of the October 2013 sampling event. The purpose of the program is to determine water quality for watersheds impacted by the development in the Bedford West area. The overall purpose of the monitoring program is to conduct water quality testing prior to construction activities (establish baseline conditions) in order to detect any impacts on and/or changes to water quality during and after construction of the development project.

This report presents water quality data from Kearney Lake, Kearney Lake Run, Highway 102, Lakeshore Drive, Larry Uteck Boulevard and Paper Mill Lake, collected on October 16, 2013. The water quality test locations are presented on Figure 1.

2. METHODOLOGY

The October 2013 monitoring event methodology consisted of the sampling and analyses of general chemistry (RCAp), total metals, total phosphorous, total suspended solids, E. coli bacteria, TKN and chlorophyll-a from eleven (11) specified surface water sampling locations. Standard field measurements (pH, water temperature, dissolved oxygen, conductivity, secchi depth, air temperature, cloud cover, and wildlife sightings) were to be measured at the eleven (11) specified sampling locations for the October 2013 monitoring event. The field measurements were collected using an AM100 Aqua Meter and AP800 Aqua Probe. For 2009 SLE sampling events, Oakton Portable Waterproof Meters were used for collecting field measurements (Dissolved Oxygen Meter – 35601-Series; pH and Conductivity – 35630-00 and 35630-02, respectively), and for 2010-2011 SLE sampling events, Hach intelliCAL probes for pH, conductivity and dissolved oxygen (Product Numbers pHC30101, CDC40101 and LDO10101, respectively) were used. The samples and field parameter readings were collected from a 1.0 metre depth whenever possible.

The field parameters and site conditions for each sampling location were recorded on a field report. The field reports are provided in Attachment 1. Photographs of each sampling location are attached in Attachment 2.

A new pair of latex gloves was used at each sample location. Surface water samples were collected and placed in clean laboratory-supplied jars and stored in a chilled container together with a chain of custody record for transport to the laboratory. All surface water samples collected were submitted to AGAT Laboratories, located in Dartmouth, Nova Scotia.

Secchi depth measurements were taken from the shady side of the boat at two sample locations. The secchi disk was lowered in the water until no longer visible. The depth was measured to the nearest tenth of a metre. The disk was raised until visible in the water and the depth was measured. The secchi depth is the midpoint between the two measured depths.

3. ASSESSMENT STANDARDS

The Canadian Council of Ministers of the Environment (CCME) guidelines for water are broken down based on water use including Freshwater Aquatic Life, Marine Water Aquatic Life, Irrigation, Livestock Watering and Aesthetics and Drinking Water. The surface water quality results were compared to the CCME Freshwater Aquatic Life (FWAL) guidelines since the specified sampling locations are located at and/or near adjacent freshwater bodies.

Analytical data for total suspended solids (TSS) and turbidity are compared to the CCME for the Protection of Aquatic Life (CCME Narrative Total Particulate Matter – Table 1 Suspended Sediments and Turbidity, High Flow Conditions, 1999, updated 2002).

For TSS, the guideline value is equal to a maximum increase of 25 mg/L from background levels at any time when background levels are between 25 and 250 mg/L. When background is greater than 250 mg/L, the concentration should not increase more than 10% of background levels.

The Health Canada guidelines for Canadian Recreational Water Quality (2012, Third Edition) were used as reference guidelines. The Canadian Recreational Water Quality guidelines indicate that the clarity of the water should be sufficiently clear such that a Secchi disk is visible at a minimum of 1.2 metres. For turbidity, a limit of 50 Nephelometric Turbidity Units (NTU) is suggested.

4. RESULTS OF THE INVESTIGATION

4.1. FIELD MEASUREMENTS

Field parameters were measured at each of the eleven (11) sampling locations during the October 2013 monitoring event. Field measurements exceeding the applicable guidelines of dissolved oxygen and pH are presented in the Tables below.

Dissolved oxygen readings of 9.6 mg/L, 3.1mg/L, 4.2 mg/L, 4.5 mg/L and 9.9 mg/L for sample locations KL4, HWY 102-1, HWY 102-2, LU and PML1 respectively were recorded, which are outside the CCME FWAL guideline range of 5.5-9.5 mg/L All other dissolved oxygen readings for the remaining six sample locations were within the applied CCME

FWAL guideline range.

Table 4.1 Dissolved oxygen exceedances at sample locations

Sample	Dissolved Oxygen (mg/L)
KL4	9.6
HWY 102-1	3.1
HWY 102-2	4.2
LU	4.5
PML1	9.9
Guidelines	
CCME Fresh Water Aquatic Life (FWAL) (mg/L)	**5.5-9.5**

4.2. LABORATORY ANALYTICAL RESULTS

4.2.1. GENERAL CHEMISTRY

Reported pH levels of 6.34, 6.34, 6.49, 6.49 for sample locations KL2, HWY 102-2, LSD, LU respectively were recorded, which are outside the CCME FWAL guideline range of 6.5-9.

A dissolved chloride result exceeded the 120 mg/L guideline at sample location LU with a result of 258 mg/L.

All other general chemistry parameters analyzed were also within their respective applicable guidelines.

Table 4.2 pH exceedances at sample locations

Sample	pH
KL2	6.34
HWY 102-2	6.34
LSD	6.49
LU	6.49
Guidelines	
CCME Fresh Water Aquatic Life (FWAL)	**6.5-9.5**

4.2.2. METALS

Analytical results reported total aluminum concentrations of above the CCME FWAL guideline of 5-100 µg/L at KL2, KL4, HWY 102-1, HWY 102-2, LSD, PML1 and PML2 (total aluminum: 259 µg/L, 159 µg/L, 150 µg/L, 2760 µg/L, 3420 µg/L, 3920 µg/L, and 107 µg/L respectively).

Total cadmium concentrations above the CCME FWAL guideline of 0.017 µg/L at KL2, KL4, KL5, HWY 102-2, LSD, LU, PML1, and PML2 (total cadmium: 0.019 µg /L, 0.050 µg /L, 0.034 µg /L, 0.096 µg /L, 0.073 µg /L, 0.148 µg/L, 0.430 µg /L and 0.060 µg /L respectively).

Total chromium concentrations above the CCME FWAL guideline of 1 µg /L at HWY 102-2, LSD and PML1 (9 µg /L, 2 µg/L, and 3 µg/L respectively).

Total copper concentrations exceeded the CCME FWAL guideline of 2.0-4.0 µg/L at sample locations HWY 102-2, LSD, PML1, and PML2 (total copper: 12 µg /L, 12 µg /L, 6 µg /L, 1380 µg /L respectively).

Total iron concentrations exceeded the CCME FWAL guideline of 300 µg/L at sample locations KL2, HWY 102-1, HWY 102-2, LSD, PML1, and PML2 (total iron: 523 µg /L, 446 µg /L, 28400 µg /L, 4200 µg /L, 5300 µg /L, 1760 µg /L respectively).

Total lead concentrations exceeded the CCME FWAL guideline of 1.0-7.0 µg/L at sample location HWY 102-2, PML1, and PML2 (total lead: 19.4 µg/L, 13.5 µg/L and 49.7 µg/L).

Total zinc concentrations exceeded the CCME FWAL guideline of 30 µg/L at sample locations HWY 102-2, PML1, and PML2 (total zinc: 46 µg/L, 62 µg/L, and 762 µg/L respectively).

All other metals parameters were reported to be within the applied CCME FWAL guidelines. Surface water metals results have been provided in Table 1. Laboratory certificates have been provided in Attachment 3.

4.2.3. MICROBIOLOGICAL

The laboratory analytical results for E. Coli concentrations were reported to be within the referenced Health Canada Recreational Water Quality guidelines of 400 MPN/100 mL for all sample locations.

Surface water microbiological results have been provided in Table 1. Laboratory certificates have been provided in Attachment 3.

5. CONCLUSIONS

Water quality monitoring within Bedford West was conducted on August 15 and 16, 2013, and included the collection of field parameters (pH, water temperature, dissolved oxygen, conductivity, secchi depth, air temperature, cloud cover, and wildlife sightings) and the collection of surface water samples for the analysis of RCAp, total metals, total phosphorous, total suspended solids, E. Coli, total coliforms and chlorophyll-a.

Dissolved oxygen readings outside of the CCME FWAL guideline range were recorded at five (5) sample locations: KL4, HWY 102-1, HWY 102-2, LU, and PML1.

Reported pH levels were above the CCME FWAL guidelines at four (4) locations: KL2, HWY 102-2, LSD, and LU.

One (1) analytical result for dissolved chloride indicated exceeded the CCME FWAL guideline at location LU.

Total aluminum concentrations above the CCME FWAL guidelines were recorded at seven (7) sample locations: KL2, KL4, HWY 102-1, HWY 102-2, LSD, PML1 and PML2. Total cadmium concentrations above the CCME FWAL guideline were recorded at eight (8) sample locations: KL2, KL4, KL5, HWY 102-2, LSD, LU, PML1, and PML2. Three (3) total chromium concentrations were recorded above the CCME FWAL guideline at HWY 102-2, LSD and PML1. Total copper concentrations above the CCME FWAL guideline were recorded at four (4) sample locations: HWY 102-2, LSD, PML1, and PML2. Total iron exceeded the CCME FWAL guideline at six (6) sample locations: KL2, HWY 102-1, HWY 102-2, LSD, PML1, and PML2. Total lead concentrations exceeded the CCME FWAL guideline at three (3)

sample locations HWY 102-2, PML1, and PML2. Total zinc exceeded the CCME FWAL guideline at three (3) sample locations HWY 102-2, PML1, and PML2. All other metals parameters were reported to be within the applied CCME FWAL guidelines.

The laboratory analytical results reported E. Coli concentrations to be within the referenced Health Canada Recreational Water Quality guidelines of 400 MPN/100 mL for all sample locations.

If you have any questions or require anything further, please contact the undersigned at (902) 492-4544.

Yours truly,

SNC♦LAVALIN INC.
Environment and Water

Original Signed

Derek Heath, P.Geo.
Project Manager

DH/ad

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N

HWY102-2

PML2

HWY102-1

PAPER MILL LAKE

PML1

KL4

LSD

KL3

KL2

LU

KEARNEY LAKE

KL5

KL1

Legend

- Water Quality Monitoring Test Locations/Sample Identification

0 200 400 800 1,200 1,600

Meters

SNC•LAVALIN

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Member of the SNC•LAVALIN Group

Certified ISO 9001

HALIFAX REGIONAL MUNICIPALITY

PROJECT: WATER QUALITY MONITORING WITHIN BEDFORD WEST

TITLE: WATER QUALITY MONITORING TEST LOCATIONS

DESIGNED:	CH
DRAWN:	CH
CHECKED:	DH
SCALE:	AS SHOWN
DATE:	10-09-2012
PROJECT #:	510192-0001
DRAWING #:	1

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2013	Units	RDL	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Kearney Lake														
Sample Sites						KL1														
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/14	2012/10/10	2013/05/15	2013/08/16	2013/10/16
Sampling Time	hh:mm	--				08:00	11:45	08:30	11:00	13:10	12:00	11:00	14:30	14:00	8:30	11:20	9:50	10:20	11:10	13:30
FIELD DATA																				
Secchi Depth	Meters	--	--	1.2	--	4.1	4.2	5.0	N/A	5.0	4.9	2.4	3.2	2.4	2.35	5.36	N/A	2.50	2.03	2.90
Water Temp	Celsius	0.1	0.1	--	--	14.0	22.2	16.7	12.9	23.3	8.8	11.5	25.6	15.9	8.9	23.3	15.4	13.2	22.2	14.1
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	**10.77**	8.20	7.00	9.13	7.86	**10.48**	**10.69**	8.22	9.22	8.98	7.93	8.72	**9.76**	8.57	8.30
pH	pH	N/A	N/A	--	--	6.20	6.76	6.67	7.23	7.32	6.61	6.60	6.16	6.04	8.67	6.91	6.32	6.32	8.24	6.35
Specific Conductance	uS/cm	1	1	--	--	263	299	261	248	242	219	288	179	146	277	279	198.1	243	216.5	217.9
INORGANICS																				
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	6	8	8	7	8	6	<5	9	7	24	7	<5	<5	<5	8
Dissolved Chloride (Cl)	mg/L	1	1	--	120	81	74	64	62	60	55	73	45	33	66	70	50	66	59	48
Colour	TCU	30	5	--	--	18	18	16	26	8	21	28	40	45	50	11	20	11	37	20
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	0.18	0.09	0.12	0.21	0.16	0.23	0.2	0.11	0.13	0.20	0.09	0.10	0.18	0.14	0.19
Nitrate (N)	mg/L	0.05	0.05	--	13000	0.18	--	--	0.21	0.16	--	0.2	--	--	0.20	0.09	0.10	0.18	0.14	0.19
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.04	0.03	<0.03	0.03	0.03	<0.03
Total Organic Carbon	mg/L	0.5	0.5	--	--	2.4	2.9	4.7	3.3	3.2	3.1	3.4	5.9	5.5	5.4	2.9	5.2	4.4	4.1	4.3
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
pH (Lab)	pH	N/A	N/A	5.0-9.0	6.5-9	6.94	6.65	6.68	6.91	7.00	6.79	6.52	6.51	6.52	6.7	7.2	6.9	6.78	6.93	6.85
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	9.2	8.5	7.2	7.72	8.66	8.30	7.65	4.82	5.31	6.8	8.4	6.3	7.5	6.6	6.5
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	1.5	1.4	1.2	1.42	1.36	1.30	1.29	0.86	1.06	1.1	1.5	1.5	1.1	1.2	1.2
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	<0.02	<0.02	<0.002	0.009	0.007	0.005	0.008	0.012	0.009	0.037	0.043	0.007	0.007	0.011	0.008
Total Potassium (K)	mg/L	0.1	0.1	--	--	1.1	0.9	1.3	0.876	0.888	0.901	0.788	0.773	0.871	0.7	0.9	0.9	0.8	0.7	1.1
Total Sodium (Na)	mg/L	0.1	0.1	--	--	51	46	37	31.8	35.2	33.8	43.7	22.8	19.8	40.1	42.0	29.8	35.8	26.2	31.6
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	2.6	2.2	2.3	2.9	2.7	2.9	2.8	1.9	2.3	2.4	1.3	2.2	2.5	1.8	2.2
Total Suspended Solids	mg/L	2	5	--	--	1	1	<1	4	17	3	2	2	3	<5	<5	<5	<5	<5	5
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	14	13	12	11	11	11	12	10	8	8	9	9	11	9	9
Turbidity (NTU)	NTU	0.1	0.1	50	--	0.7	0.8	1.0	1.3	0.6	1	1	1	0.9	2.4	0.8	1.3	1.6	3.3	0.5
Conductivity (uS/cm)	µS/cm	1	1	--	--	310	290	250	240	240	230	290	180	140	246	274	196	259	241	212
Calculated Parameters																				
Anion Sum	me/L	N/A	N/A	--	--	2.72	2.52	2.23	2.12	2.08	1.91	2.33	1.66	1.27	2.52	2.31	1.60	2.10	1.86	1.71
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	6	8	8	7	8	6	<1	9	7	24	7	<5	<5	<5	8
Calculated TDS	mg/L	1	1	--	--	166	151	131	123	125	118	143	92	77	139	137	98	124	104	103
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	2.85	2.57	2.12	1.92	2.10	2.02	2.42	1.33	1.25	2.24	2.41	1.79	2.08	1.61	1.84
Hardness (CaCO3)	mg/L	1	N/A	--	--	29	27	23	25	27	26	24	16	18	21.5	27.2	21.9	23.3	21.4	21.2
Ion Balance (% Difference)	%	N/A	N/A	--	--	2.33	0.98	2.53	4.95	0.48	2.80	1.89	11.00	0.79	5.9	2.1	5.3	0.7	7.3	3.4
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	-2.68	-2.87	-2.94	-2.72	-2.51	-2.87	NC	-3.18	-3.21	-2.69	-2.63	-3.19	-3.24	-3.14	-3.02
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	-2.93	-3.12	-3.19	-2.97	-2.76	-3.12	NC	-3.43	-3.46	-3.01	-2.95	-3.51	-3.56	-3.46	-3.34
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	9.62	9.52	9.62	9.63	9.51	9.66	NC	9.69	9.73	9.39	9.83	10.10	10.0	10.1	9.87
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	9.87	9.77	9.87	9.88	9.76	9.91	NC	9.94	9.98	9.71	10.2	10.4	10.3	10.4	10.2
Metals (ICP-MS)																				
Total Aluminum (Al)	µg/L	5	5	--	5-100	**230**	--	--	**289**	47.8	--	**338**	--	--	**321**	43	**168**	**191**	**120**	56
Total Antimony (Sb)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	1	5	--	--	16	--	--	18.5	15.9	--	13	--	--	12	15	9	12	7	16
Total Beryllium (Be)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	5	--	1500	8	--	--	11.4	9.1	--	<50	--	--	<5	11	33	6	10	9
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	<0.3	--	--	**0.053**	<0.017	--	**0.056**	--	--	**0.032**	**0.027**	**0.021**	**0.020**	<0.017	0.017
Total Chromium (Cr)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1
Total Cobalt (Co)	µg/L	0.4	1	--	--	1	--	--	0.54	<0.40	--	0.79	--	--	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	<2	--	--	**5.8**	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<1	1
Total Iron (Fe)	µg/L	50	50	--	300	130	--	--	**313**	62	125	177	162	**384**	229	137	195	207	132	92
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	<0.5	--	--	**10.3**	<0.50	--	<0.50	--	--	<0.5	<0.5	1.9	<0.5	<0.5	<0.5
Total Manganese (Mn)	µg/L	2	2	--	--	100	--	--	79.2	57.1	59	78.4	52.3	55.8	48	65	68	73	48	24
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	5	--	--	3.2	<2.0	--	3.2	--	--	<2	<2	2	2	<2	<2
Total Selenium (Se)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	2	5	--	--	46	--	--	39.1	37.7	--	36	--	--	32	41	32	37	33	30
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	2	--	--	11	--	--	6.4	<2.0	--	5.4	--	--	8	<2	3	4	2	<2
Total Uranium (U)	µg/L	0.1	0.1	--	15	0.1	--	--	0.11	<0.10	--	0.12	--	--	0.1	<0.1	0.1	0.1	0.1	<0.1
Total Vanadium (V)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	5	--	30	27	--	--	14.4	7.5	11.1	12.1	13.3	9.7	5	<5	11	11	6	5
MICROBIOLOGICAL																				
Total Coliform	MPN/100mL	1	1	--	--	200	65	--	>250	63	>250	91	>250	--	2420	>2420	1120	1200	866	488
E. coli	MPN/100mL	100	1	400	--	39	24	--	9	15	37	8	>250	<100	41	11	17	48	2	7
Fecal Coliform	MPN/ml	1	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	0.53	0.79	1.11	1.73	1.47	0.99	0.76	1.44	1.36	0.62	2.3	1.54	1.22	1.40	1.19
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	0.48	0.69	1.17	1.61	1.42	0.81	0.69	1.15	1.14	0.63	2.3	2.16	1.40	1.40	1.19
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	0.9	3.1	0.4	--	0.7	<0.4

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)

" -- " = no guideline available / Not Tested.

CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)

Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)

Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.

Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

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TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2013	Units	RDL	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Kearney Lake														
Sample Sites						KL2														
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/14	2012/10/10	2013/05/15	2013/08/15	2013/10/16
Sampling Time	hh:mm	--				11:00	10:30	10:45	10:15	12:25	10:50	09:30	14:00	13:15	9:50	10:30	10:20	09:10	16:10	14:30
FIELD DATA																				
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	0.1	--	--	16.8	18.2	15.4	13.5	20.4	8.0	9.9	19.1	14.1	7.6	21.8	12.3	10.1	22.9	9.7
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	**10.16**	8.50	5.70	6.28	**4.66**	**9.58**	**9.66**	7.06	8.43	6.47	5.82	7.63	9.37	6.38	7.40
pH	pH	N/A	N/A	--	--	6.33	6.35	6.19	6.61	6.96	6.25	6.77	5.90	5.62	7.72	6.41	6.29	5.75	7.47	5.57
Specific Conductance	uS/cm	1	1	--	--	46	106	89	199	104	75	80	67	54	58	96.6	61.1	77.9	65.3	64.5
INORGANICS																				
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	8	8	8	8	7	<5	<5	7	<5	20	<5	8	<5	<5	<5
Dissolved Chloride (Cl)	mg/L	1	1	--	120	48	48	48	48	25	17	19	14	10	16	20	12	19	21	14
Colour	TCU	30	5	--	--	20	20	20	20	63	95	80	110	120	52	60	94	37	90	71
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	0.19	0.19	0.19	0.19	0.07	0.06	0.12	0.07	<0.05	0.11	0.08	<0.05	0.12	<0.05	<0.05
Nitrate (N)	mg/L	0.05	0.05	--	13000	0.19	0.19	0.19	0.19	0.07	--	0.12	--	--	0.11	0.08	<0.05	0.12	<0.05	<0.05
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.05	<0.05	<0.05	<0.05	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03	<0.03	<0.03	0.04	<0.03
Total Organic Carbon	mg/L	0.5	0.5	--	--	4.3	4.3	4.3	4.3	6.6	9.7	6.5	10	12	8.1	7.1	10.9	7.5	11.1	10.9
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.09	<0.01	<0.01	<0.01	<0.01
pH (Lab)	pH	N/A	N/A	5.0-9.0	6.5-9	6.85	6.85	6.85	6.85	6.78	**6.11**	**6.27**	**6.4**	**6.05**	6.5	6.7	6.5	**6.37**	6.62	**6.34**
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	6.5	6.5	6.5	6.5	4.08	3.55	2.51	2.48	2.21	2.4	3.6	2.9	2.7	2.5	2.4
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	1.2	1.2	1.2	1.2	0.98	0.84	0.63	0.64	0.36	0.7	1.0	1.0	0.7	0.5	0.8
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	0.02	0.02	0.02	0.02	0.009	0.009	0.009	0.008	0.013	0.021	0.059	0.013	0.010	0.020	0.029
Total Potassium (K)	mg/L	0.1	0.1	--	--	1.1	1.1	1.1	1.1	0.634	0.826	0.534	0.497	0.734	0.5	0.7	0.8	0.5	0.5	0.7
Total Sodium (Na)	mg/L	0.1	0.1	--	--	31.6	31.6	31.6	31.6	14.7	10.6	11.1	7.8	6.9	9.8	14.2	9.5	8.9	7.0	7.9
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	2.2	2.2	2.2	2.2	4.2	4.7	2.7	4.3	4	2.6	4.0	4.9	2.8	4.4	4.9
Total Suspended Solids	mg/L	2	5	--	--	103	103	103	103	7	<1	<1	<2	<1	<5	<5	<5	<5	135	<5
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	9	9	9	9	<2	<2	<2	<2	<2	3	3	2	4	5	4
Turbidity (NTU)	NTU	0.1	0.1	50	--	0.5	0.5	0.5	0.5	1.0	1.0	0.4	0.7	0.6	0.5	1.1	1.0	1.9	2.2	1.0
Conductivity (uS/cm)	µS/cm	1	1	--	--	212	212	212	212	100	97	79	66	54	71	91	61	83	69	62
Calculated Parameters																				
Anion Sum	me/L	N/A	N/A	--	--	0.49	0.82	0.45	0.77	0.85	0.49	0.53	0.53	0.28	0.92	0.63	0.54	0.63	0.70	0.48
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	<1	8	<1	5	7	<1	<1	7	<1	20	<5	8	<5	<5	<5
Calculated TDS	mg/L	1	1	--	--	36	55	35	46	55	38	37	34	25	45	44	34	37	37	31
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	0.71	0.99	0.67	0.74	0.95	0.74	0.68	0.55	0.49	0.65	0.94	0.73	0.63	0.54	0.60
Hardness (CaCO3)	mg/L	1	N/A	--	--	10	15	10	12	14	12	9	9	8	8.9	13.1	11.4	9.6	8.3	9.3
Ion Balance (% Difference)	%	N/A	N/A	--	--	18.30	9.39	19.60	1.99	5.56	20.30	12.40	1.85	27.30	17.6	19.7	15.1	0.3	12.9	11.0
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	NC	-3.20	NC	-3.44	-3.05	NC	NC	-3.66	NC	-3.37	-3.60	-3.68	-4.05	-3.83	-4.12
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	NC	-3.45	NC	-3.70	-3.30	NC	NC	-3.91	NC	-3.69	-3.92	-4.00	-4.37	-4.15	-4.44
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	NC	9.78	NC	10.00	9.83	NC	NC	10.10	NC	9.87	10.3	10.2	10.4	10.5	10.5
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	NC	10.00	NC	10.30	10.10	NC	NC	10.30	NC	10.2	10.6	10.5	10.7	10.8	10.8
Metals (ICP-MS)																				
Total Aluminum (Al)	µg/L	5	5	--	5-100	**290**	--	--	**175**	**151**	--	**271**	--	--	**209**	**205**	**338**	**256**	**270**	**259**
Total Antimony (Sb)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	1	5	--	--	9	--	--	11.7	14.3	--	9.5	--	--	9	11	10	8	<5	13
Total Beryllium (Be)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	5	--	1500	8	--	--	14.7	12.7	--	<50	--	--	6	14	22	6	11	9
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	<0.3	--	--	**0.018**	<0.017	--	<0.017	--	--	<0.017	<0.017	<0.017	<0.017	<0.017	**0.019**
Total Chromium (Cr)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1
Total Cobalt (Co)	µg/L	0.4	1	--	--	<1	--	--	<0.40	<0.40	--	<0.40	--	--	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	<2	--	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<1	2
Total Iron (Fe)	µg/L	50	50	--	300	250	--	--	227	**403**	238	202	**418**	**358**	154	**541**	**813**	269	**528**	**523**
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	<0.5	--	--	1.01	<0.50	--	<0.50	--	--	<0.5	<0.5	1.1	<0.5	0.5	<0.5
Total Manganese (Mn)	µg/L	2	2	--	--	26	--	--	43.2	83.3	34.7	12.1	68.4	22.6	17	90	114	24	67	53
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Selenium (Se)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	**0.42**	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	2	5	--	--	14	--	--	17.8	19.5	--	11.9	--	--	10	18	15	12	9	12
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	3	<2	<2	<2
Total Titanium (Ti)	µg/L	2	2	--	--	2	--	--	<2.0	<2.0	--	2.8	--	--	<2	2	3	4	<2	2
Total Uranium (U)	µg/L	0.1	0.1	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Vanadium (V)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	5	--	30	8	--	--	5.4	5.3	6.5	<5.0	<5.0	<5.0	<5	<5	7	<5	<5	<5
MICROBIOLOGICAL																				
Total Coliform	MPN/100mL	1	1	--	--	1800	170	--	>250	11	>250	59	>250	--	>2420	1986	>2420	>2420	>2420	>2420
E. coli	MPN/100mL	100	1	400	--	**1500**	100	--	**>250**	6	6	2	>250	<100	3	7	3	12	6	2
Fecal Coliform	MPN/ml	1	--	400	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	0.82	6.05	1.97	0.73	0.55	0.22	0.44	0.89	0.97	0.53	2.2	0.07	0.62	1.00	0.73
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	0.87	5.97	1.95	0.66	0.54	0.21	0.42	0.73	0.82	0.56	2.2	0.12	0.72	1.00	0.74
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	<0.4	2.2	0.7	--	1.1	<0.4

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)

" -- " = no guideline available / Not Tested.

CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)

Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)

Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.

Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2013	Units	RDL	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Kearney Lake													
Sample Sites						KL3													
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012-08.14	2012/10/10	2013/05/15	2013/08/16	2013/10/16
Sampling Time	hh:mm	--				09:00	11:00	09:30	11:30	14:12	11:40	10:30	12:20	12:00	10:26	12:20	11:20	9:50	10:00	14:00
FIELD DATA																				
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	0.1	--	--	14.0	21.6	17.3	14.7	23.1	9.9	10.3	21.1	15.5	9	24.5	15.6	11.7	21.5	13.6
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	**10.79**	8.00	8.00	9.26	7.83	**10.35**	**11.06**	8.42	**9.60**	8.89	8.17	7.72	**10.20**	9.20	8.90
pH	pH	N/A	N/A	--	--	7.27	6.74	6.97	7.27	7.33	6.76	6.83	6.96	6.30	7.68	6.85	6.51	5.86	7.25	6.49
Specific Conductance	uS/cm	1	1	--	--	95	282	246	220	228	199	220	175	161	204	225	177.2	207.3	194.4	210.6
INORGANICS																				
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	<5	7	7	6	7	7	6	7	7	23	6	5	<5	5	7
Dissolved Chloride (Cl)	mg/L	1	1	--	120	66	63	60	55	55	53	56	43	37	50	57	46	54	40	46
Colour	TCU	30	5	--	--	22	20	20	28	12	20	31	38	40	57	15	31	19	23	20
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	0.14	0.12	0.14	0.24	0.15	0.22	0.24	0.15	0.16	0.19	0.09	0.09	0.21	0.11	<0.05
Nitrate (N)	mg/L	0.05	0.05	--	13000	0.14	--	--	0.24	0.15	--	0.24	--	--	0.19	0.09	0.09	0.21	0.11	<0.05
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	0.04	<0.03	<0.03	<0.03	<0.03
Total Organic Carbon	mg/L	0.5	0.5	--	--	2.6	3.9	4.3	3.6	3.1	3.3	3.8	5.1	5	5.9	3.4	4.9	4.3	4.4	4.6
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (Lab)	pH	N/A	N/A	5.0-9.0	6.5-9	**6.38**	6.67	6.82	6.82	6.99	6.87	6.52	6.5	**6.38**	6.7	7.1	6.9	6.68	6.96	6.86
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	6.7	7.1	6.8	6.81	7.98	8.29	7.09	4.73	5.63	5.7	6.9	6.0	7.0	5.3	6.8
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	1.2	1.2	1.11	1.22	1.28	1.27	1.21	0.83	1.01	1.0	1.2	1.3	1.0	0.9	1.3
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	<0.02	<0.02	0.005	0.005	<0.002	0.003	0.008	0.003	0.012	0.019	0.045	0.007	0.006	0.006	0.012
Total Potassium (K)	mg/L	0.1	0.1	--	--	0.9	1.1	0.9	0.791	0.837	0.990	0.879	0.681	0.921	0.7	0.9	0.9	0.8	0.6	1.2
Total Sodium (Na)	mg/L	0.1	0.1	--	--	38	38	35	28.3	33.1	33.0	33.0	20.8	21.3	31.2	34.5	26.37	35.1	20.1	32.1
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	2.7	2.6	2.6	3.2	2.9	3.2	2.9	2.5	2.6	2.7	2.0	2.6	2.9	2.6	2.7
Total Suspended Solids	mg/L	2	5	--	--	<1	1	1	2	<2	<1	<1	<1	<1	<5	<5	<5	<5	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	11	12	12	10	10	10	9	10	8	7	8	7	7	7	8
Turbidity (NTU)	NTU	0.1	0.1	50	--	0.7	1.4	0.6	0.3	0.5	0.6	0.6	0.6	0.4	0.8	0.7	1	0.7	2.4	0.4
Conductivity (uS/cm)	µS/cm	1	1	--	--	250	250	240	220	220	220	220	170	160	197	222	182	219	216	204
Calculated Parameters																				
Anion Sum	me/L	N/A	N/A	--	--	2.11	2.17	2.08	1.90	1.93	1.87	1.90	1.58	1.36	2.03	1.90	1.55	1.68	1.38	1.60
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	<1	7	7	6	7	7	6	7	7	23	6	5	<5	5	7
Calculated TDS	mg/L	1	1	--	--	128	130	123	110	117	116	115	88	82	111	113	91	106	78	100
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	2.12	2.16	1.99	1.69	1.97	1.98	1.92	1.23	1.32	1.77	1.98	1.60	2.00	1.24	1.89
Hardness (CaCO3)	mg/L	1	N/A	--	--	22	23	22	22	25	26	23	15	18	18.4	22.2	20.3	21.6	16.9	22.3
Ion Balance (% Difference)	%	N/A	N/A	--	--	0.24	0.23	2.21	5.85	1.03	2.86	0.52	12.50	1.49	6.8	2.1	1.6	8.6	5.5	8.3
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	NC	-3.00	-2.89	-2.92	-2.60	-2.73	-3.23	-3.33	-3.35	-2.77	-2.88	-3.21	-3.37	-3.19	-3.05
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	NC	-3.25	-3.14	-3.17	-2.85	-2.99	-3.49	-3.58	-3.60	-3.09	-3.20	-3.53	-3.69	-3.51	-3.37
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	NC	9.67	9.71	9.74	9.59	9.60	9.75	9.83	9.73	9.47	9.98	10.10	10.0	10.2	9.91
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	NC	9.92	9.96	9.99	9.84	9.86	10.00	10.10	9.98	9.79	10.3	10.4	10.4	10.5	10.2
Metals (ICP-MS)																				
Total Aluminum (Al)	µg/L	5	5	--	5-100	259	259	--	**124**	53.5	--	**266**	--	--	**199**	54	**153**	**140**	65	100
Total Antimony (Sb)	µg/L	1	2	--	--	<2	<2	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	<2	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	1	5	--	--	13	13	--	15.7	13.2	--	19.1	--	--	18	17	15	19	9	18
Total Beryllium (Be)	µg/L	1	2	--	--	<2	<2	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	<2	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	5	--	1500	9	9	--	7.8	8.7	--	<50	--	--	5	9	17	7	7	10
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	0.019	0.019	--	**0.030**	<0.017	--	**0.046**	--	--	**0.019**	**0.021**	**0.027**	**0.028**	<0.017	<0.017
Total Chromium (Cr)	µg/L	1	1	--	1	<1	<1	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1
Total Cobalt (Co)	µg/L	0.4	1	--	--	<1	<1	--	<0.40	<0.40	--	<0.40	--	--	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	2	2	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<1	1
Total Iron (Fe)	µg/L	50	50	--	300	523	523	--	73	133	58	136	104	154	137	136	119	131	71	172
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	<0.5	<0.5	--	0.60	<0.50	--	<0.50	--	--	<0.5	<0.5	0.7	<0.5	<0.5	0.9
Total Manganese (Mn)	µg/L	2	2	--	--	53	53	--	36.8	67.1	32.1	41.5	33.1	32.5	25	47	46	37	20	92
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	<2	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	<2	<2	--	2.0	<2.0	--	2.3	--	--	<2	<2	<2	<2	<2	<2
Total Selenium (Se)	µg/L	1	1	--	1	<1	<1	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.1	<0.1	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	2	5	--	--	12	12	--	33.5	35.9	--	33.2	--	--	25	33	29	33	18	32
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	<0.1	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	2	--	--	<2	<2	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	2	--	--	2	2	--	<2.0	<2.0	--	4.9	--	--	<2	<2	<2	<2	<2	2
Total Uranium (U)	µg/L	0.1	0.1	--	15	<0.1	<0.1	--	<0.10	<0.10	--	0.11	--	--	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Vanadium (V)	µg/L	2	2	--	--	<2	<2	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	5	--	30	<5	<5	--	9.7	6.9	6.4	9.3	6.6	9.2	<5	<5	8	10	5	7
MICROBIOLOGICAL																				
Total Coliform	MPN/100mL	1	1	--	--	120	24	--	190	16	58	72	110	--	291	1553	178	345	2420	1300
E. coli	MPN/100mL	100	1	400	--	1	17	--	2	<1	8	5	37	<100	2	<1	3	8	21	<1
Fecal Coliform	MPN/ml	1	--	400	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	1.04	1.11	1.18	1.30	1.14	0.51	0.78	1.26	1.24	0.52	1.3	0.81	1.44	2.00	0.65
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	0.94	0.97	1.21	1.09	1.19	0.42	0.67	0.98	1.01	0.55	1.2	1.14	1.62	2.30	0.61
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	<0.4	2.8	<0.4	--	1.3	<0.4

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)

" -- " = no guideline available / Not Tested.

CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)

Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)

Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.

Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2013	Units	RDL	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Kearney Lake																		
Sample Sites						KL4														KL5				
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/14	2012/10/10	2013/05/15	2013/08/16	2013/10/16	2011-10-17	2012/05/01	2012/08/14	2012/10/10	2013/05/15	2013/08/16	2013/10/16
Sampling Time	hh:mm	--				10:00	11:30	10:00	11:20	13:50	11:15	10:10	11:40	11:40	10:16	12:00	11:40	9:41	10:30	14:20	9:40	10:52	13:10	12:10	10:03	10:50	13:45
FIELD DATA																										
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	0.1	--	--	13.4	21.9	17.3	14.5	21.9	9.8	10.1	21.2	15.3	9.0	24.4	15.7	11.7	20.4	13.5	14.7	10.5	26.1	16.6	13.3	22.7	14.7
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	**10.87**	8.10	8.30	9.01	6.27	**10.89**	**10.99**	**8.55**	**9.65**	8.70	7.32	8.87	**10.09**	8.89	**9.60**	9.38	7.88	7.90	8.16	**9.67**	8.89	8.60
pH	pH	N/A	N/A	--	--	8.00	6.71	6.94	7.19	6.98	6.07	6.49	6.43	6.02	9.0	6.71	6.77	5.72	7.08	6.41	6.52	7.76	6.69	6.72	6.20	8.57	6.51
Specific Conductance	uS/cm	1	1	--	--	771	262	247	224	226	215	218	172	126	206	225	185.9	207.1	196.2	209.0	112	230	229	189.0	219.5	202.1	212.9
INORGANICS																										
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	5	7	7	6	8	7	5	8	7	22	8	<5	<5	<5	<5	9	21	8	<5	<5	6	5
Dissolved Chloride (Cl)	mg/L	1	1	--	120	67	65	60	56	56	53	56	44	37	51	57	46	54	41	47	37	55	57	48	58	44	46
Colour	TCU	30	5	--	--	22	18	20	27	11	20	32	38	43	48	11	20	17	21	20	35	43	10	27	10	22	18
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	0.15	0.12	0.14	0.23	0.19	0.21	0.23	0.15	0.17	0.19	0.11	0.09	0.20	0.11	0.17	0.17	0.19	0.15	0.83	0.21	0.21	0.25
Nitrate (N)	mg/L	0.05	0.05	--	13000	0.15	--	--	0.23	0.19	--	0.23	--	--	0.19	0.11	0.09	0.20	0.11	0.17	--	0.19	0.15	0.83	0.21	0.21	0.20
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05	0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	0.05	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.03	0.03	<0.03	<0.03	<0.03	<0.03
Total Organic Carbon	mg/L	0.5	0.5	--	--	2.5	2.6	4.0	3.3	2.6	3.1	3.7	6	5.4	7.5	3.2	4.8	4.2	4.5	4.3	4.8	5.8	3.4	4.7	4.0	4.6	7.0
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (Lab)	pH	N/A	N/A	5.0-9.0	6.5-9	6.61	6.75	6.83	6.83	6.93	6.83	6.57	6.57	**6.46**	6.7	7.0	6.9	6.69	6.96	6.85	6.57	6.7	7.1	6.5	6.71	6.93	6.89
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	6.8	7.7	7.0	6.81	8.00	8.45	6.84	4.93	5.24	5.7	6.8	5.8	6.8	5.1	6.8	5.79	6.1	6.6	5.9	7.1	5.7	6.4
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	1.2	1.3	1.2	1.22	1.24	1.31	1.19	0.86	0.99	1.0	1.2	1.2	1.0	0.8	1.2	1.05	1.0	1.1	1.2	1.0	1.0	1.1
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	<0.02	<0.02	<0.002	0.004	<0.002	<0.002	0.007	0.003	0.026	0.022	0.043	0.007	0.006	2.39	0.016	0.009	0.018	0.040	0.006	0.005	0.013	0.010
Total Potassium (K)	mg/L	0.1	0.1	--	--	1	1	1	0.807	0.905	0.968	0.826	0.733	1.130	0.7	1.0	0.9	0.8	0.6	1.2	0.858	0.7	0.9	0.8	0.8	0.7	1.1
Total Sodium (Na)	mg/L	0.1	0.1	--	--	39	41	37	28.5	34.3	33.9	32.1	21.5	21.1	31.5	34.5	25.2	31.6	20.1	30.7	22.0	34.6	32.0	27.7	33.6	19.2	31.3
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	2.7	2.6	2.6	3.1	2.9	3.1	2.9	2.5	2.7	2.7	2.2	2.6	3.0	2.6	2.5	2.5	2.7	2.0	2.4	2.7	2.5	2.5
Total Suspended Solids	mg/L	2	5	--	--	<1	1	<1	<2	<2	<1	2	<1	<2	<5	<5	<5	<5	<5	<5	1	<5	<5	<5	<5	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	11	12	11	10	10	10	9	10	8	7	8	7	7	7	9	9	7	8	8	8	7	8
Turbidity (NTU)	NTU	0.1	0.1	50	--	0.5	1.0	0.3	0.3	0.2	0.8	0.7	0.7	0.4	0.7	0.4	0.8	0.7	2.6	2.1	0.9	1.1	0.7	0.9	0.7	0.8	0.4
Conductivity (uS/cm)	µS/cm	1	1	--	--	260	250	230	220	230	250	210	170	160	200	224	183	218	218	204	160	215	226	189	232	223	204
Calculated Parameters																										
Anion Sum	me/L	N/A	N/A	--	--	2.23	2.22	2.09	1.91	1.94	1.85	1.88	1.62	1.36	2.04	1.94	1.45	1.68	1.31	1.53	1.42	2.13	1.95	1.58	1.82	1.52	1.58
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	5	7	7	6	8	7	5	8	7	22	8	<5	<5	<5	<5	9	21	8	<5	<5	6	5
Calculated TDS	mg/L	1	1	--	--	132	135	125	111	118	116	113	90	81	111	114	87	103	75	97	84	118	111	96	110	82	98
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<1	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	2.16	2.32	2.07	1.70	2.02	2.03	1.86	1.28	1.3	1.78	1.97	1.53	1.84	1.23	1.84	1.36	1.94	1.85	1.64	1.94	1.23	1.81
Hardness (CaCO3)	mg/L	1	N/A	--	--	22	25	22	22	25	27	22	16	17	18.4	21.9	19.4	21.1	16.0	21.9	19	19.3	21.0	19.7	21.8	18.4	20.5
Ion Balance (% Difference)	%	N/A	N/A	--	--	1.59	2.20	0.48	5.82	2.02	4.64	0.53	11.70	2.26	6.6	0.8	2.8	4.5	3.2	9.2	2.16	4.7	2.6	2.0	3.2	10.6	6.7
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	-3.21	-2.89	-2.84	-2.92	-2.64	-2.75	-3.22	-3.18	-3.31	-2.79	-2.86	-3.22	-3.37	-3.21	-3.21	-3.06	-2.79	-2.77	-3.62	-3.33	-3.11	-3.19
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	-3.46	-3.14	-3.09	-3.17	-2.89	-3.00	-3.47	-3.43	-3.56	-3.11	-3.18	-3.54	-3.69	-3.53	-3.53	-3.31	-3.11	-3.09	-3.94	-3.65	-3.43	-3.51
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	9.82	9.64	9.67	9.75	9.57	9.58	9.79	9.75	9.77	9.49	9.86	10.10	10.1	10.2	10.1	9.63	9.49	9.87	10.1	10.0	10.0	10.1
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	10.1	9.9	9.9	10.0	9.8	9.8	10.0	10.0	10.0	9.8	10.2	10.4	10.4	10.5	10.4	9.88	9.81	10.2	10.4	10.4	10.4	10.4
Metals (ICP-MS)																										
Total Aluminum (Al)	µg/L	5	5	--	5-100	**150**	--	--	**125**	29.2	--	**231**	--	--	**188**	48	**149**	**141**	**106**	**159**	--	**222**	52	**154**	**136**	58	61
Total Antimony (Sb)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	1	5	--	--	16	--	--	16.6	17.8	--	18.2	--	--	18	17	16	18	10	19	--	18	16	15	19	9	16
Total Beryllium (Be)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	5	--	1500	6	--	--	8.6	9.1	--	<50	--	--	6	9	16	7	6	9	--	6	9	15	7	7	9
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	<0.3	--	--	**0.031**	<0.017	--	**0.035**	--	--	**0.021**	<0.017	**0.027**	**0.027**	0.017	**0.050**	--	**0.022**	**0.027**	**0.029**	**0.024**	<0.017	**0.034**
Total Chromium (Cr)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	6	<1	<1	<1	--	<1	<1	5	<1	<1	<1
Total Cobalt (Co)	µg/L	0.4	1	--	--	<1	--	--	<0.40	<0.40	--	<0.40	--	--	<1	<1	<1	<1	<1	<1	--	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	<2	--	--	<2.0	2.4	<2.0	2.3	<2.0	<2.0	<2	<2	4	**9**	<1	1	<2.0	<2	<2	<2	<2	<1	1
Total Iron (Fe)	µg/L	50	50	--	300	86	--	--	82	51	55	119	109	138	129	118	133	213	144	248	175	160	78	120	111	70	79
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	<0.5	--	--	3.23	<0.50	--	<0.50	--	--	<0.5	<0.5	0.8	0.9	<0.5	<0.5	--	<0.5	<0.5	0.6	<0.5	<0.5	<0.5
Total Manganese (Mn)	µg/L	2	2	--	--	51	--	--	34.5	63.5	29.4	38.5	27.2	29.7	23	34	38	34	77	130	35.9	30	14	37	35	13	12
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	3	--	--	2.0	<2.0	--	<2.0	--	--	<2	<2	5	<2	<2	<2	--	<2	<2	5	<2	<2	<2
Total Selenium (Se)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	--	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	2	5	--	--	34	--	--	33.1	36.7	--	32.7	--	--	25	32	28	32	17	31	--	27	31	29	31	18	31
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	5	<2	<2	--	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	4.2	--	--	<2	<2	<2	<2	<2	3	--	3	<2	<2	<2	<2	<2
Total Uranium (U)	µg/L	0.1	0.1	--	15	<0.1	--	--	<0.10	<0.10	--	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
Total Vanadium (V)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	5	--	30	14	--	--	10.4	6.9	7	11.3	7.4	7	<5	<5	**68**	21	<5	9	9.3	5	<5	**64**	11	7	5
MICROBIOLOGICAL																										
Total Coliform	MPN/100mL	1	1	--	--	28	58	--	100	16	75	83	95	--	345	>2420	921	548	>2420	770	--	461	613	93	461	308	461
E. coli	MPN/100mL	100	1	400	--	4	33	--	1	<1	2	5	39	<100	4	<1	4	6	38	<1	100	14	2	6	6	6	4
Fecal Coliform	MPN/ml	1	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	0.78	1.11	1.06	0.92	0.07	0.50	0.60	1.04	1.31	0.52	0.7	0.55	1.34	1.50	0.40	0.91	0.30	1.2	1.09	1.44	2.20	0.64
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	0.69	0.96	1.11	0.77	0.07	0.41	0.55	0.82	1.07	0.55	0.7	0.74	1.48	1.70	0.39	0.85	0.33	1.0	1.41	1.59	2.40	0.62
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	0.5	<0.4	0.7	--	1.8	1.1	--	<0.4	2.3	1.0	--	0.6	1.1

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)

" -- " = no guideline available / Not Tested.

CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)

Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)

Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.

Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

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TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2013	Units	RDL	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Highway 102													
Sample Sites						HWY102-1													
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011-08-14	2011-10-16	2012-05-01	2012-08-15	2012-10-11	2013-05-15	2013/08/15	2013/10/16
Sampling Time	hh:mm	--				07:00	12:45	08:00	13:00	10:20	09:00	13:40	11:00	11:00	14:50	11:00	9:50	14:15	12:22	12:30
FIELD DATA																				
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	0.1	--	--	11.8	18.8	15.7	14.9	19.6	7.4	11.4	17.8	14.6	10.7	21.8	13.6	11.7	19.5	8.9
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	**11.44**	5.80	**4.34**	8.18	**4.25**	6.05	8.15	**3.88**	**5.34**	5.65	**1.03**	**3.83**	7.55	**3.32**	**3.10**
pH	pH	N/A	N/A	--	--	7.98	5.35	5.25	6.31	5.26	5.62	5.75	5.77	5.99	8.76	5.73	6.38	6.19	7.10	6.79
Specific Conductance	uS/cm	1	1	--	--	194	153	104	135	106	109	114	108	89	288	225	155.5	226	173.2	234.0
INORGANICS																				
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	<5	<5	<5	<5	<5	<5	5	11	8	22	25	15	9	23	20
Dissolved Chloride (Cl)	mg/L	1	1	--	120	24	38	24	32	25	22	24	19	12	58	48	28	53	31	40
Colour	TCU	30	5	--	--	67	68	57	37	89	53	39	65	79	24	65	40	9	65	25
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	<0.05	<0.05	<0.05	0.69	<0.05	1.2	0.69	0.25	1.2	2.61	0.06	0.43	0.51	<0.05	<0.05
Nitrate (N)	mg/L	0.05	0.05	--	13000	<0.05	--	--	0.69	<0.05	--	0.69	--	--	2.61	0.06	0.43	0.51	<0.05	<0.05
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.05	0.29	<0.05	<0.05	<0.05	<0.05	0.05	0.1	0.07	0.31	0.19	0.04	<0.03	0.05	0.06
Total Organic Carbon	mg/L	0.5	0.5	--	--	6.5	10	7.7	4.7	11	6.3	4.5	7.2	7.4	5.5	10.0	7.0	5.1	10.1	17.7
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (units)	pH	N/A	N/A	5.0-9.0	6.5-9	**4.54**	**5.24**	**5.40**	**5.48**	**6.24**	**5.31**	**6.42**	6.55	**6.28**	**6.4**	6.9	6.8	6.86	6.87	6.73
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	1.7	1.8	1.6	4.93	3.34	5.09	4.9	5.21	5.55	12.5	11.7	7.5	11.1	10.5	13.9
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	0.3	0.5	0.5	1.08	0.79	1.09	0.91	0.92	1.19	1.7	2.0	1.4	1.4	1.5	2.3
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	0.07	0.14	0.020	0.006	0.007	0.011	0.009	0.012	0.010	0.019	0.039	0.02	0.006	0.021	0.022
Total Potassium (K)	mg/L	0.1	0.1	--	--	0.5	1.2	0.7	1.140	1.630	1.310	1.100	1.500	1.880	1.6	2.5	1.5	1.3	1.7	2.4
Total Sodium (Na)	mg/L	0.1	0.1	--	--	15	25	13	15.9	14.5	14.6	14.8	10.2	8.26	36.3	27.7	14.6	30.8	15.0	20.5
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	2.5	2.2	2.0	1.1	3.8	5.1	2.8	5.2	4.6	4.1	6.1	5.1	3.1	5.1	5.8
Total Suspended Solids	mg/L	2	5	--	--	7	80	2	<2	11	<2	<1	1	<1	9	6	<5	<5	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	5	3	3	8	<2	8	10	8	10	14	8	9	12	8	12
Turbidity (NTU)	NTU	0.1	0.1	50	--	14.0	35	0.9	1.4	1.2	0.6	0.4	0.6	1.1	0.9	1.9	0.9	0.5	1.6	0.5
Conductivity (uS/cm)	µS/cm	1	1	--	--	100	140	92	130	100	110	110	100	88	263	231	143	243	188	218
Calculated Parameters																				
Anion Sum	me/L	N/A	N/A	--	--	0.77	1.12	0.73	1.11	0.71	0.88	1.03	0.95	0.80	2.55	2.02	1.31	1.96	1.50	1.78
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	<1	<1	<1	<1	<1	<1	5	11	8	22	25	15	9	23	20
Calculated TDS	mg/L	1	1	--	--	50	73	45	67	50	63	65	58	54	150	117	73	117	83	104
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	0.84	1.32	0.74	1.06	0.93	1.02	1.00	0.83	0.80	2.43	6.04	1.19	2.06	1.40	1.87
Hardness (CaCO3)	mg/L	1	N/A	--	--	6	6	6	17	12	17	16	17	19	38.2	37.5	24.5	33.5	32.4	44.2
Ion Balance (% Difference)	%	N/A	N/A	--	--	4.35	8.20	0.68	2.30	13.40	7.37	1.48	6.74	0.00	2.6	1.9	4.6	2.4	3.5	2.6
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	NC	NC	NC	NC	NC	NC	-3.50	-2.99	-3.36	-2.77	-2.23	-2.72	-2.73	-2.33	-2.41
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	NC	NC	NC	NC	NC	NC	-3.75	-3.25	-3.61	-3.09	-2.55	-3.04	-3.05	-2.65	-2.73
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	NC	NC	NC	NC	NC	NC	9.92	9.54	9.64	9.17	9.13	9.52	9.59	9.20	9.14
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	NC	NC	NC	NC	NC	NC	10.20	9.80	9.89	9.49	9.45	9.84	9.91	9.52	9.46
Metals (ICP-MS)																				
Total Aluminum (Al)	µg/L	5	5	--	5-100	**510**	--	--	**169**	**192**	--	**205**	--	--	**134**	**183**	**146**	86	**145**	**150**
Total Antimony (Sb)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	1	5	--	--	22	--	--	52.9	36.9	--	37.3	--	--	58	284	42	57	57	80
Total Beryllium (Be)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	5	--	1500	<5	--	--	11.4	10.9	--	<50	--	--	12	18	13	10	10	11
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	<0.3	--	--	**0.043**	<0.017	--	**0.023**	--	--	**0.034**	**0.021**	<0.017	<0.017	<0.017	0.040
Total Chromium (Cr)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1
Total Cobalt (Co)	µg/L	0.4	1	--	--	<1	--	--	0.50	0.46	--	<0.40	--	--	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	2	--	--	3.4	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	3	<2	<1	2
Total Iron (Fe)	µg/L	50	50	--	300	**720**	--	--	146	**637**	150	107	209	219	102	**1380**	255	111	**938**	**446**
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	1.6	--	--	2.37	0.56	--	<0.50	--	--	<0.5	0.7	<0.5	<0.5	<0.5	0.6
Total Manganese (Mn)	µg/L	2	2	--	--	40	--	--	55.3	39.0	67.0	28.1	21.0	31.3	34	79	28	23	45	31
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Selenium (Se)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	2	5	--	--	11	--	--	29.1	19.7	--	24.3	--	--	48	58	36	52	47	62
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	2	--	--	6	--	--	<2.0	<2.0	--	3.5	--	--	<2	3	<2	<2	<2	4
Total Uranium (U)	µg/L	0.1	0.1	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Vanadium (V)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	5	--	30	21	--	--	16.4	6.9	6.9	<5.0	<5.0	6.9	<5	6	<5	<5	<5	10
MICROBIOLOGICAL																				
Total Coliform	MPN/100mL	1	1	--	--	84	>250	--	>250	>250	180	120	180	--	687	>2420	>2420	1550	>2420	1553
E. coli	MPN/100mL	100	1	400	--	54	**>250**	--	12	17	5	1	78	<100	3	68	145	4	9	5
Fecal Coliform	MPN/ml	1	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	15.40	19.29	0.70	18.12	1.61	8.45	0.93	0.58	0.69	0.53	2.59	0.81	1.27	14.70	1.99
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	17.50	19.60	0.84	17.62	1.68	7.52	0.84	0.56	0.65	0.59	2.89	1.05	1.45	15.80	2.20
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	1.1	1.3	0.6	--	0.6	0.6

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)

" -- " = no guideline available / Not Tested.

CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)

Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)

Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.

Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

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TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2013	Units	RDL	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Highway 102														
Sample Sites						HWY102-2														
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011-08-14	2011-10-16	2012-05-01	2012-08-15	2012-10-11	2013-05-15	2013-08-15	2013/10/16
Sampling Time	hh:mm	--				12:30	12:15	12:30	12:40	09:30	12:30	11:20	15:00	15:30	11:20	12:20	10:35	10:40	10:00	10:22
FIELD DATA																				
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	0.1	--	--	16.7	19.2	16.4	17.2	17.0	8.7	10.8	24.2	15.1	7.8	23.7	14.3	11.5	22.0	10.7
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	**10.01**	5.90	**4.80**	**4.91**	**2.45**	**2.99**	6.92	7.03	**5.09**	**3.73**	**13.1**	**3.28**	6.30	**1.57**	**4.20**
pH	pH	N/A	N/A	--	--	6.57	5.71	5.40	6.33	5.86	5.64	6.22	5.89	5.29	7.3	6.37	6.72	6.01	6.92	5.40
Specific Conductance	uS/cm	1	1	--	--	37	457	162	415	167	101.2	92.2	123.1	96	225	226	159.1	288	188.5	204.4
INORGANICS																				
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	<5	<5	7	6	5	<5	<5	5	<5	17	7	<5	6	14	7
Dissolved Chloride (Cl)	mg/L	1	1	--	120	21	82	83	**170**	41	18	21	21	17	63	109	45	71	50	52
Colour	TCU	30	5	--	--	120	190	91	96	160	68	65	98	77	32	100	70	11	61	36
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	<0.05	<0.05	<0.05	0.10	<0.05	0.62	0.26	1.8	3.2	1.54	<0.05	0.14	0.17	<0.05	<0.05
Nitrate (N)	mg/L	0.05	0.05	--	13000	<0.05	--	--	0.10	<0.05	--	0.26	--	--	1.54	<0.05	0.14	0.17	<0.05	<0.05
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.05	0.06	<0.05	<0.05	0.20	<0.05	<0.05	0.30	0.08	0.09	<0.03	<0.03	<0.03	0.17	0.09
Total Organic Carbon	mg/L	0.5	0.5	--	--	8.5	13	13	7.2	14	7.4	5.7	9.2	8.4	7.0	15.8	11.2	6.1	10.6	5.1
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (units)	pH	N/A	N/A	5.0-9.0	6.5-9	5.43	5.96	6.30	6.05	6.32	5.47	5.93	6.18	5.92	5.9	6.7	6.8	6.61	6.59	**6.34**
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	1.6	4.0	4.8	7.44	3.84	4.01	3.07	2.22	3.80	7.0	8.4	5.6	7.6	8.5	8.2
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	0.4	0.7	0.9	0.96	0.59	1.00	0.68	0.68	1.38	1.2	1.4	1.2	1.2	1.3	2.2
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	<0.02	0.04	0.034	0.010	0.028	0.003	0.009	0.019	0.041	0.021	0.054	0.03	0.014	0.028	0.199
Total Potassium (K)	mg/L	0.1	0.1	--	--	0.5	0.8	1.1	0.984	0.956	1.390	0.844	1.310	1.880	1.2	1.7	1.6	1.3	1.5	2.5
Total Sodium (Na)	mg/L	0.1	0.1	--	--	15	51	55	83.7	32.0	12.1	13.3	13.1	13.3	41.5	63.6	20.4	39.0	19.1	34.5
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	2.2	4.4	4.0	3.0	6.4	5.4	2.5	6.5	6.7	4.1	6.9	5.8	1.6	6.2	6.6
Total Suspended Solids	mg/L	2	5	--	--	<2	58	62	34	27	3	<1	10	14	<5	39	<5	<5	<5	194
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	<2	3	8	11	<2	7	5	5	8	12	6	10	10	9	10
Turbidity (NTU)	NTU	0.1	0.1	50	--	0.7	3.8	4.2	2.6	3.1	0.5	0.4	1.2 (1)	3.9	0.6	10.8	2	1.5	3.3	144
Conductivity (uS/cm)	µS/cm	1	1	--	--	85	290	310	590	160	94	91	100	110	263	403	179	295	203	223
Calculated Parameters																				
Anion Sum	me/L	N/A	N/A	--	--	0.60	2.37	2.62	5.13	1.27	0.70	0.73	0.91	0.86	2.48	3.34	1.49	2.34	1.88	1.81
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	<1	<1	7	6	5	<1	<1	5	<1	17	7	<5	6	14	7
Calculated TDS	mg/L	1	1	--	--	42	150	165	282	93	52	48	62	67	143	200	86	135	100	145
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	0.81	2.65	2.89	4.17	1.81	0.86	0.82	0.83	0.97	2.32	2.10	1.40	2.24	1.50	3.50
Hardness (CaCO3)	mg/L	1	N/A	--	--	6	13	16	23	12	14	11	8	15	22.4	26.7	18.9	23.9	26.6	29.5
Ion Balance (% Difference)	%	N/A	N/A	--	--	14.90	5.58	4.90	10.30	17.50	10.30	5.81	4.60	6.01	3.3	3.6	3.1	2.3	11.3	31.7
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	NC	NC	-3.57	-3.72	-3.70	NC	NC	-4.07	NC	-3.63	-3.15	-3.34	-3.33	-2.92	-3.50
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	NC	NC	-3.82	-3.97	-3.95	NC	NC	-4.32	NC	-3.95	-3.47	-3.66	-3.65	-3.24	-3.82
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	NC	NC	9.87	9.77	10.00	NC	NC	10.30	NC	9.53	9.85	10.10	9.94	9.51	9.84
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	NC	NC	10.10	10.00	10.30	NC	NC	10.50	NC	9.85	10.2	10.5	10.3	9.83	10.2
Metals (ICP-MS)																				
Total Aluminum (Al)	µg/L	5	5	--	5-100	270	--	--	189	368	--	260	--	--	145	**466**	**259**	**130**	**138**	**2760**
Total Antimony (Sb)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	--	--	<1.0	2.1	--	<1.0	--	--	<2	<2	<2	<2	<2	6
Total Barium (Ba)	µg/L	1	5	--	--	20	--	--	53.1	27.7	--	26.6	--	--	49	74	33	44	43	213
Total Beryllium (Be)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	5	--	1500	<5	--	--	7.9	7.8	--	<50	--	--	10	17	15	9	10	13
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	<0.3	--	--	0.051	<0.017	--	<0.017	--	--	0.037	**0.031**	**0.032**	**0.019**	<0.017	**0.096**
Total Chromium (Cr)	µg/L	1	1	--	1	<2	--	--	<1.0	1.0	--	<1.0	--	--	<1	<1	<1	<1	1	**9**
Total Cobalt (Co)	µg/L	0.4	1	--	--	<1	--	--	0.66	0.77	--	<0.40	--	--	<1	1	1	<1	1	3
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	2	--	--	2.0	<2.0	<2.0	<2.0	2.5	2.8	<2	3	3	<2	1	**12**
Total Iron (Fe)	µg/L	50	50	--	300	**880**	--	--	**1380**	**3850**	**303**	229	**897**	**1110**	214	**5210**	**1550**	**383**	**1720**	**28400**
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	1.9	--	--	1.61	2.70	--	0.59	--	--	<0.5	5.2	2.1	0.6	**0.7**	**19.4**
Total Manganese (Mn)	µg/L	2	2	--	--	110	--	--	387	135	52.9	40.5	106	176	78	219	207	83	173	327
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	4
Total Selenium (Se)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	2	5	--	--	11	--	--	37.4	21.1	--	16.9	--	--	33	45	31	39	40	45
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	2	--	--	4	--	--	<2.0	6.4	--	4.9	--	--	<2	10	4	4	<2	60
Total Uranium (U)	µg/L	0.1	0.1	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
Total Vanadium (V)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	2	<2	<2	<2	11
Total Zinc (Zn)	µg/L	5	5	--	30	12	--	--	13.6	12.3	9.3	5.5	9	12.5	<5	7	12	12	<5	**46**
MICROBIOLOGICAL																				
Total Coliform	MPN/100mL	1	1	--	--	28	>250	--	>250	75	41	110	>250	--	1553	>2420	>2420	2420	1990	>2420
E. coli	MPN/100mL	100	1	400	--	4	230	--	9	5	<1	7	>250	<100	<1	16	50	111	9	4
Fecal Coliform	MPN/ml	1	--	400	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	0.90	82.63	48.17	0.85	16.36	0.25	0.97	4.91	1.9	2.07	21.03	0.33	2.41	1.10	21.62
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	0.91	81.20	52.50	0.85	17.35	0.23	0.87	4.49	2.15	2.27	17.26	0.50	3.02	1.30	27.02
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	0.6	1.1	0.5	--	0.7	2.0

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)

" -- " = no guideline available / Not Tested.

CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)

Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)

Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.

Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2013	Units	RDL	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Lake Shore Drive														Larry Uteck Blvd						
Sample Sites						LSD														LU						
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011-08-14	2011-10-17	2012-05-01	2012-08-15	2012-10-11	2013-05-15	2013-08-15	2013/10/16	2011-10-17	2012-05-01	2012-08-15	2012-10-11	2013-05-15	2013-08-15	2013/10/16
Sampling Time	hh:mm	--				12:00	09:30	11:45	09:00	11:28	10:00	08:45	13:20	9:00	9:15	13:00	9:10	08:40	15:30	11:55	10:30	15:20	11:30	10:10	14:30	14:30	13:00
FIELD DATA																										
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	0.1	--	--	13.1	16.7	15.3	13.4	21.3	7.3	10.2	21.0	12.0	5.7	25.7	13.4	7.7	20.2	8.8	11.3	12.8	27.3	14.6	13.9	18.3	10.9
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	**10.84**	5.70	5.50	8.60	**5.41**	8.47	9.44	7.87	8.16	**4.06**	**2.69**	7.58	8.77	7.26	7.60	**4.24**	6.17	8.2	9.04	**10.15**	8.29	**4.50**
pH	pH	N/A	N/A	--	--	7.88	6.74	6.34	6.42	6.64	6.17	7.09	6.88	6.63	8.22	7.16	6.92	5.19	7.28	6.23	6.07	7.82	6.65	6.78	6.39	7.49	5.45
Specific Conductance	uS/cm	1	1	--	--	723	210	168	218	203	110	146	126	112	62	177.5	116.7	123.6	132.5	147.8	203	955	480	262	670	320	845.0
INORGANICS																										
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	13	16	12	13	21	9	9	15	12	21	14	11	8	20	11	12	14	14	14	6	22	7
Dissolved Chloride (Cl)	mg/L	1	1	--	120	41	34	31	49	45	25	38	27	22	22	33	23	39	32	23	34	**224**	116	52	**190**	99	**258**
Colour	TCU	30	5	--	--	32	27	37	20	26	33	32	41	49	13	20	40	10	21	25	94	18	14	18	7	7	19
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	0.14	0.14	0.06	0.23	0.10	0.12	0.25	0.17	0.09	0.13	0.80	<0.05	0.18	0.20	<0.05	0.61	1.00	0.64	1.89	1.11	2.57	0.34
Nitrate (N)	mg/L	0.05	0.05	--	13000	0.14	--	--	0.23	0.10	--	0.25	--	--	0.13	0.80	<0.05	0.18	0.20	<0.05	--	1.00	0.64	1.89	1.11	2.57	0.34
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	0.06	0.03	<0.03	<0.03	<0.03	0.03	0.03	0.06	0.04	0.16	<0.03	<0.03	0.04	0.04
Total Organic Carbon	mg/L	0.5	0.5	--	--	5.0	3.8	6.8	3.7	6.0	5.3	4.7	7.1	7.5	3.1	8.0	7.7	4.7	6.3	6.9	11.0	3.7	22.8	4.8	3.1	4.5	2.9
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (units)	pH	N/A	N/A	5.0-9.0	6.5-9	6.69	6.69	6.93	7.10	7.30	6.67	6.72	6.79	6.49	6.2	6.9	6.9	6.94	6.95	**6.49**	**6.43**	6.7	7.2	7.2	6.92	7.11	**6.49**
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	6.5	6.9	5.4	7.99	10.5	5.29	5.9	5.14	5.04	2.6	18.1	5.1	6.4	6.0	5.6	7.63	30.7	22.1	14.5	22.0	17.6	21.8
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	1.4	1.6	1.3	1.99	2.14	1.15	1.25	1.19	1.23	0.7	3.3	1.4	1.2	1.4	1.6	2.34	4.2	3.6	2.2	2.8	2.7	4.0
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	<0.02	0.03	0.009	0.018	0.100	0.009	0.018	0.028	0.014	0.022	0.063	0.003	0.007	0.015	0.078	0.034	0.043	0.036	0.030	0.006	0.027	0.046
Total Potassium (K)	mg/L	0.1	0.1	--	--	1.2	1.1	1.3	1.180	1.210	1.030	1.070	0.960	1.240	0.6	1.9	1.3	1.2	1.1	1.4	2.110	3.2	3.6	2.5	2.6	2.8	2.9
Total Sodium (Na)	mg/L	0.1	0.1	--	--	24	21	18	24.8	26.9	15.2	23.2	14.3	13.8	11.3	18.6	15.2	21.9	26.6	14.6	22.7	124	62.2	32.3	95.1	51.7	170
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	3.1	4.2	4.0	3.2	3.4	4.3	2.6	3.9	3.8	3.1	2.9	4.9	2.6	3.9	5.0	6.9	4.9	0.7	6.3	5.1	8.6	7.0
Total Suspended Solids	mg/L	2	5	--	--	16	98	5	6	110	7	4	77	5	<5	16	19	<5	17	9	13	5	165	<5	<5	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	6	4	5	7	3	4	6	4	4	5	5	5	6	7	5	21	26	25	23	26	29	33
Turbidity (NTU)	NTU	0.1	0.1	50	--	0.6	12	2.5	12	6.2	1	0.6	2.5	1.7	6.7	**283**	2.1	1.1	31.6	82.6	3.3	4.1	23.0	2.3	1.8	1.6	0.7
Conductivity (uS/cm)	µS/cm	1	1	--	--	170	150	140	200	200	110	150	130	110	96	161	110	168	136	105	190	813	482	255	732	433	840
Calculated Parameters																										
Anion Sum	me/L	N/A	N/A	--	--	1.56	0.82	1.22	1.80	1.77	0.97	1.39	1.14	0.96	1.15	1.37	0.97	1.40	1.46	0.97	1.69	7.21	4.12	2.36	6.10	4.02	8.13
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	13	8	12	13	21	9	9	15	12	21	14	11	8	20	11	12	14	14	14	6	22	7
Calculated TDS	mg/L	1	1	--	--	92	55	74	104	107	62	84	66	60	56	163	58	82	87	66	109	426	246	144	347	229	496
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<1	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	1.53	0.99	1.20	1.69	1.94	1.05	1.44	1.02	1.00	0.76	3.59	1.10	1.43	1.62	1.62	1.70	7.40	4.30	2.43	5.55	3.51	8.90
Hardness (CaCO3)	mg/L	1	N/A	--	--	22	15	19	28	35	18	20	18	18	9.4	58.8	18.5	20.9	20.7	20.6	29	94.0	70.0	45.3	66.5	55.1	70.9
Ion Balance (% Difference)	%	N/A	N/A	--	--	0.97	9.39	0.83	3.15	4.58	3.96	1.77	5.56	2.04	20.7	63.0	6.1	1.0	5.2	25.0	0.29	1.3	2.2	1.4	4.7	6.8	4.5
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	-2.74	-3.20	-2.60	-2.22	-1.71	-2.99	-2.88	-2.64	-3.05	-3.62	-2.30	-2.91	-2.93	-2.55	-3.29	-2.95	-2.32	-1.94	-2.10	-2.60	-1.93	-2.98
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	-2.99	-3.45	-2.85	-2.47	-1.96	-3.24	-3.13	-2.89	-3.31	-3.94	-2.62	-3.23	-3.25	-2.87	-3.61	-3.20	-2.64	-2.26	-2.42	-2.92	-2.25	-3.30
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	9.43	9.78	9.53	9.32	9.01	9.66	9.60	9.43	9.54	9.82	9.20	9.81	9.87	9.50	9.78	9.38	9.02	9.14	9.30	9.52	9.04	9.47
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	9.68	10.00	9.78	9.57	9.26	9.91	9.85	9.68	9.80	10.10	9.52	10.10	10.20	9.82	10.1	9.63	9.34	9.46	9.62	9.84	9.36	9.79
Metals (ICP-MS)																										
Total Aluminum (Al)	µg/L	5	5	--	5-100	99	--	--	349	189	--	217	--	--	490	**19200**	**186**	**131**	93	**3420**	--	218	**227**	**252**	**107**	**447**	31
Total Antimony (Sb)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	**8**	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	1	5	--	--	14	--	--	15.3	19.2	--	13.9	--	--	11	86	12	12	7	24	--	225	201	116	133	134	119
Total Beryllium (Be)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	5	--	1500	13	--	--	41.4	21.6	--	<50	--	--	6	24	16	10	15	15	--	11	17	22	10	22	18
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	<0.3	--	--	0.018	<0.017	--	<0.017	--	--	0.029	**1.050**	**0.023**	<0.017	<0.017	**0.073**	--	0.538	**0.171**	**0.168**	**0.300**	0.236	**0.148**
Total Chromium (Cr)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	**11**	<1	<1	<1	**2**	--	<1	<1	<1	<1	1	<1
Total Cobalt (Co)	µg/L	0.4	1	--	--	<1	--	--	<0.40	0.88	--	<0.40	--	--	<1	34	<1	<1	<1	1	--	<1	1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	<2	--	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	**22**	2	<2	1	**12**	2.9	<2	3	16	2	**6**	2
Total Iron (Fe)	µg/L	50	50	--	300	180	--	--	**554**	**965**	120	211	**388**	**384**	161	**38900**	**312**	236	254	**4200**	**2150**	**347**	**1320**	**500**	194	890	157
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	<0.5	--	--	3.02	0.54	--	<0.50	--	--	0.6	**82.4**	<0.5	<0.5	<0.5	5.2	--	0.8	0.7	1.0	<0.5	1.4	<0.5
Total Manganese (Mn)	µg/L	2	2	--	--	51	--	--	113	632	22.8	30.2	53.4	38.5	26	13200	67	71	81	124	129	182	485	120	87	89	26
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	13	<2	<2	<2	2	--	<2	<2	<2	<2	<2	<2
Total Selenium (Se)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	**2**	<1	<1	<1	<1	--	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	2	5	--	--	30	--	--	36.3	42.1	--	24.4	--	--	12	82	22	24	24	25	--	112	94	60	93	90	96
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	2	--	--	<2	--	--	7.2	4.1	--	5.3	--	--	3	405	4	<2	2	36	--	4	3	7	3	11	2
Total Uranium (U)	µg/L	0.1	0.1	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	1.6	<0.1	<0.1	<0.1	0.1	--	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
Total Vanadium (V)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	30	<2	<2	<2	2	--	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	5	--	30	7	--	--	7.2	6.7	<5.0	<5.0	<5.0	5	<5	**110**	7	6	<5	15	9	**79**	**92**	**39**	**57**	**49**	26
MICROBIOLOGICAL																										
Total Coliform	MPN/100mL	1	1	--	--	53	>250	--	>250	>250	280	85	>250	--	1414	>2420	>2420	1990	>2420	>2420	--	>2420	>2420	2420	866	>2420	866
E. coli	MPN/100mL	100	1	400	--	22	24	--	4	45	6	10	>250	<100	2	26	10	10	20	2	<100	<1	2	19	3	86	<1
Fecal Coliform	MPN/ml	1	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	1.46	10.70	4.68	1.21	6.64	0.21	1.19	1.93	1.41	1.88	6.62	0.13	<0.50	1.6	2.02	1.99	2.44	32.52	1.80	1.54	2.30	0.12
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	1.85	11.10	5.62	1.32	7.71	0.19	1.07	1.73	1.18	2.28	7.58	0.22	<0.50	2	2.98	2.08	2.71	31.31	2.15	1.77	2.50	0.11
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	0.5	3.5	0.5	--	0.7	3.0	--	0.4	4.2	0.7	--	0.5	<0.4

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)

" -- " = no guideline available / Not Tested.

CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)

Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)

Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.

Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

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TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2013	Units	RDL	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Paper Mill Lake													
Sample Sites						PML1													
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011-08-14	2011-10-16	2012-05-01	2012-08-15	2012-10-11	2013-05-15	2013-08-15	2013/10/16
Sampling Time	hh:mm	--				13:45	13:00	13:00	13:35	15:15	13:00	13:00	16:50	17:00	12:50	--	10:55	10:51	11:35	10:45
FIELD DATA																				
Secchi Depth	Meters	--	--	1.2	--	3.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	0.1	--	--	15.7	17.1	16.2	13.2	22.7	9.1	10.3	22.1	13.6	8.3	--	14.9	11.6	22.5	12.3
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	**10.56**	8.10	6.90	8.76	7.83	**10.43**	**10.39**	8.17	**9.54**	8.41	--	8.60	**9.98**	7.65	**9.90**
pH	pH	N/A	N/A	--	--	7.39	6.57	6.64	7.06	7.35	5.89	6.28	6.20	6.11	7.58	--	6.63	6.39	7.20	6.32
Specific Conductance	uS/cm	1	1	--	--	561	279	223	265	234	125	177	174	106	366	--	186.4	215.1	199.0	250.5
INORGANICS																				
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	6	7	7	7	9	5	6	7	7	20	--	<5	<5	6	7
Dissolved Chloride (Cl)	mg/L	1	1	--	120	39	64	58	67	61	24	44	43	18	55	--	45	57	57	48
Colour	TCU	30	5	--	--	54	15	21	19	12	57	32	38	65	38	--	29	8	15	11
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	0.49	0.10	0.17	0.42	0.27	0.66	0.55	0.15	0.62	0.22	--	0.14	0.21	0.18	0.18
Nitrate (N)	mg/L	0.05	0.05	--	13000	0.49	--	--	0.42	0.27	--	0.55	--	--	0.22	--	0.14	0.21	0.18	0.18
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	--	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	0.06	--	<0.03	<0.03	0.04	<0.03
Total Organic Carbon	mg/L	0.5	0.5	--	--	6.5	3.6	4.7	0.7	3.3	6.7	4.6	5	8.3	5.7	--	5.3	4.2	4.1	5.1
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	<0.01	<0.01
pH (units)	pH	N/A	N/A	5.0-9.0	6.5-9	**6.36**	6.75	6.79	6.63	7.04	6.58	6.54	6.83	6.67	6.6	--	6.8	6.71	6.92	6.88
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	4.5	6.9	6.4	8.37	9.02	5.90	6.02	4.99	4.64	6.0	--	6.0	6.8	6.6	6.9
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	0.6	1.1	1.0	1.25	1.22	0.82	0.98	0.89	0.85	1.0	--	1.1	1.0	0.9	1.5
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	<0.02	<0.02	0.002	0.018	0.002	<0.002	0.014	0.011	0.030	0.019	--	0.03	0.006	0.007	0.047
Total Potassium (K)	mg/L	0.1	0.1	--	--	0.9	0.9	0.9	1.160	1.060	1.340	1.230	0.771	1.430	0.8	--	1.0	0.8	1.0	1.5
Total Sodium (Na)	mg/L	0.1	0.1	--	--	25	38	34	35.2	40.2	18.4	26.8	22.8	13.7	33.6	--	29.8	35.3	28.5	32.2
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	4.5	2.6	2.8	3.8	3.4	5.9	3.7	2.6	5.4	2.9	--	3.2	2.8	2.6	2.6
Total Suspended Solids	mg/L	2	5	--	--	<2	3	9	7	<2	<1	1	<2	5	9	--	6	<5	<5	23
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	13	11	11	13	12	12	12	10	12	7	--	10	8	10	10
Turbidity (NTU)	NTU	0.1	0.1	50	--	0.4	0.5	0.6	8.2	0.9	0.5	0.6	1	1.2	0.7	--	1	0.7	1.1	19.2
Conductivity (uS/cm)	µS/cm	1	1	--	--	170	250	230	260	250	130	180	170	100	214	--	179	227	218	209
Calculated Parameters																				
Anion Sum	me/L	N/A	N/A	--	--	1.51	2.18	1.99	2.34	2.15	1.09	1.62	1.56	0.92	2.11	--	1.49	1.79	1.95	1.71
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	6	7	7	7	9	5	6	7	7	20	--	<5	<5	6	7
Calculated TDS	mg/L	1	1	--	--	93	129	118	137	134	75	100	90	63	117	--	95	110	109	115
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	--	<10	<10	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	1.40	2.11	1.89	2.11	2.33	1.20	1.58	1.35	0.95	1.89	--	1.78	2.00	1.69	2.56
Hardness (CaCO3)	mg/L	1	N/A	--	--	14	22	20	26	28	18	19	16	15	19.1	--	19.5	21.1	20.2	23.4
Ion Balance (% Difference)	%	N/A	N/A	--	--	3.78	1.63	2.58	5.17	4.02	4.80	1.25	7.22	1.60	5.5	--	9.0	5.5	7.0	19.8
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	-3.57	-2.90	-2.94	-2.96	-2.43	-3.25	-3.27	-2.94	-3.13	-2.91	--	-3.31	-3.35	-3.07	-3.03
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	-3.82	-3.15	-3.19	-3.21	-2.68	-3.50	-3.53	-3.19	-3.38	-3.23	--	-3.63	-3.67	-3.39	-3.35
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	9.93	9.65	9.73	9.59	9.47	9.83	9.81	9.77	9.80	9.51	--	10.10	10.1	9.99	9.91
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	10.20	9.90	9.98	9.84	9.72	10.10	10.10	10.00	10.10	9.83	--	10.40	10.4	10.3	10.2
Metals (ICP-MS)																				
Total Aluminum (Al)	µg/L	5	5	--	5-100	**260**	--	--	**665**	45.9	--	**233**	--	--	**177**	--	**306**	**141**	**103**	**3920**
Total Antimony (Sb)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	<2	<2	<2	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	<2	<2	<2	2
Total Barium (Ba)	µg/L	1	5	--	--	23	--	--	35.3	24.4	--	26.6	--	--	22	--	19	20	12	40
Total Beryllium (Be)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	<2
Total Boron (B)	µg/L	5	5	--	1500	8	--	--	11.3	8.6	--	<50	--	--	6	--	9	6	8	9
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	<0.3	--	--	**0.032**	<0.017	--	<0.017	--	--	<0.017	--	**0.066**	**0.021**	**0.018**	**0.430**
Total Chromium (Cr)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	<1	<1	<1	**3**
Total Cobalt (Co)	µg/L	0.4	1	--	--	<1	--	--	0.96	<0.40	--	<0.40	--	--	<1	--	2	<1	<1	9
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	<2	--	--	2.0	<2.0	<2.0	4.0	<2.0	2.3	<2	--	<2	<2	1	**6**
Total Iron (Fe)	µg/L	50	50	--	300	140	--	--	**837**	89	161	141	**315**	**528**	137	--	**742**	130	205	**5300**
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	<0.5	--	--	1.73	<0.50	--	<0.50	--	--	<0.5	--	0.9	<0.5	<0.5	**13.5**
Total Manganese (Mn)	µg/L	2	2	--	--	17	--	--	142	68.9	41.3	14.4	128	62.4	48	--	214	33	58	693
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	2	<2	<2	9
Total Selenium (Se)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	2	5	--	--	18	--	--	36.3	37.1	--	25	--	--	26	--	30	31	25	34
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	2	--	--	<2	--	--	7.8	<2.0	--	3.9	--	--	<2	--	4	<2	<2	65
Total Uranium (U)	µg/L	0.1	0.1	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	0.1	--	<0.1	<0.1	<0.1	0.6
Total Vanadium (V)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	10
Total Zinc (Zn)	µg/L	5	5	--	30	8	--	--	10.0	5.4	5.7	6.3	6.2	5.4	<5	--	13	8	<5	**62**
MICROBIOLOGICAL																				
Total Coliform	MPN/100mL	1	1	--	--	200	73	--	>250	>250	>250	85	>250	--	411	--	2420	866	1730	1011
E. coli	MPN/100mL	100	1	400	--	33	45	--	19	**>250**	2	2	34	<100	2	--	20	12	4	6
Fecal Coliform	MPN/ml	1	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	0.62	2.31	0.57	0.82	1.12	0.07	2.85	0.86	0.15	1.03	--	0.69	1.17	1.10	5.07
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	0.64	2.21	0.64	0.74	1.04	0.06	2.75	0.76	0.15	1.10	--	0.91	1.37	1.10	6.39
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	<0.4	--	0.4	--	0.4	0.8

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)

" -- " = no guideline available / Not Tested.

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Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.

Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

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TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2013	Units	RDL	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Paper Mill Lake														
Sample Sites						PML2														
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011-08-14	2011-10-16	2012/05/01	2012/08/15	2012/10/11	2013/05/15	2013/08/15	2013/10/16
Sampling Time	hh:mm	--				13:15	13:40	13:45	14:30	16:20	13:00	12:40	16:20	16:15	13:16	--	--	13:40	10:45	11:20
FIELD DATA																				
Secchi Depth	Meters	--	--	1.2	--	2.8	2.2	2.3	N/A	3.0	2.0	2.2	2.3	2.2	2.35	--	--	3.20	--	N/A
Water Temp	Celsius	0.1	0.1	--	--	14.8	24.2	19.7	17.8	25.3	10.1	10.9	23.1	15.2	11.6	--	--	14.8	--	12.6
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	**10.20**	8.30	8.40	8.78	8.09	**10.58**	**9.88**	8.7	8.94	7.75	--	--	9.26	--	8.90
pH	pH	N/A	N/A	--	--	6.36	6.82	6.84	7.09	7.39	6.53	6.31	6.67	6.13	8.61	--	--	6.49	--	6.13
Specific Conductance	uS/cm	1	1	--	--	267	264	241	237	234	201	159	173	156	231	--	--	234	--	250.5
INORGANICS																				
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	5	7	7	6	8	7	<5	8	7	21	--	--	<5	--	8
Dissolved Chloride (Cl)	mg/L	1	1	--	120	63	63	58	62	58	50	44	43	34	55	--	--	63	--	64
Colour	TCU	30	5	--	--	22	17	19	20	13	23	35	38	48	39	--	--	18	--	8
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	0.14	0.07	0.09	0.19	0.11	0.23	0.33	0.14	0.22	0.24	--	--	0.22	--	<0.05
Nitrate (N)	mg/L	0.05	0.05	--	13000	0.14	--	--	0.19	0.11	--	0.33	--	--	0.24	--	--	0.22	--	<0.05
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	--	--	<0.05	--	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	--	--	0.03	--	0.23
Total Organic Carbon	mg/L	0.5	0.5	--	--	3.6	2.6	4.5	3.2	3.4	3.6	4	6	5.6	5.9	--	--	4.4	--	4.0
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	--	<0.01	--	<0.01
pH (units)	pH	N/A	N/A	5.0-9.0	6.5-9	6.50	6.81	6.82	6.66	7.02	6.83	**6.37**	6.60	6.60	6.6	--	--	6.68	--	6.73
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	6.1	7.1	6.1	7.17	7.69	7.96	5.30	4.76	5.04	6.1	--	--	6.7	--	7.7
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	1.1	1.1	1.1	1.25	1.17	1.20	0.93	0.86	0.90	1.0	--	--	1.0	--	1.4
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	<0.02	<0.02	0.002	0.010	0.002	<0.002	0.009	0.009	0.007	0.025	--	--	0.006	--	0.026
Total Potassium (K)	mg/L	0.1	0.1	--	--	0.9	1.0	0.9	0.984	0.900	1.020	0.861	0.801	0.968	0.8	--	--	0.8	--	1.3
Total Sodium (Na)	mg/L	0.1	0.1	--	--	35	40	34	31.1	35.1	30.8	25.7	21.3	20.9	34.6	--	--	37.5	--	42.0
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	2.6	2.5	2.3	2.6	2.3	3.3	2.9	2.5	3	2.8	--	--	2.7	--	4.2
Total Suspended Solids	mg/L	2	5	--	--	2	3	<1	15	<2	11	<1	8	<1	<5	--	--	<5	--	<5
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	11	11	11	10	10	10	9	10	9	7	--	--	9	--	11
Turbidity (NTU)	NTU	0.1	0.1	50	--	0.8	0.7	0.6	1.0	0.8	0.4	0.4	3.4	0.5	0.7	--	--	1	--	3.3
Conductivity (uS/cm)	µS/cm	1	1	--	--	240	250	230	230	230	210	170	170	150	213	--	--	254	--	277
Calculated Parameters																				
Anion Sum	me/L	N/A	N/A	--	--	2.11	2.17	1.99	2.07	2.01	1.77	1.46	1.58	1.30	2.13	--	--	1.98	--	2.19
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	5	7	7	6	8	7	<1	8	7	21	--	--	<5	--	8
Calculated TDS	mg/L	1	1	--	--	123	131	117	120	120	110	91	89	79	119	--	--	119	--	137
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	--	--	<10	--	<10
Cation Sum	me/L	N/A	N/A	--	--	1.94	2.23	1.88	1.88	2.03	1.86	1.48	1.28	1.27	1.94	--	--	2.09	--	2.55
Hardness (CaCO3)	mg/L	1	N/A	--	--	20	22	20	23	24	25	17	15	16	19.3	--	--	20.8	--	25.0
Ion Balance (% Difference)	%	N/A	N/A	--	--	4.20	1.36	2.84	4.81	0.50	2.48	0.68	10.50	1.17	4.8	--	--	2.8	--	7.5
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	-3.33	-2.83	-2.93	-3.06	-2.55	-2.80	NC	-3.18	-3.17	-2.89	--	--	-3.39	--	-3.08
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	-3.59	-3.08	-3.18	-3.31	-2.80	-3.05	NC	-3.43	-3.42	-3.21	--	--	-3.71	--	-3.40
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	9.83	9.64	9.75	9.72	9.57	9.63	NC	9.78	9.77	9.49	--	--	10.1	--	9.81
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	10.10	9.89	10.00	9.97	9.82	9.88	NC	10.00	10.00	9.81	--	--	10.4	--	10.1
Metals (ICP-MS)																				
Total Aluminum (Al)	µg/L	5	5	--	5-100	**130**	--	--	**1030**	55.8	--	**202**	--	--	**189**	--	--	**131**	--	**107**
Total Antimony (Sb)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	--	<2	--	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	--	<2	--	<2
Total Barium (Ba)	µg/L	1	5	--	--	16	--	--	23.0	12.2	--	23	--	--	22	--	--	22	--	37
Total Beryllium (Be)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	--	<2	--	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--	<2
Total Boron (B)	µg/L	5	5	--	1500	5	--	--	8.2	8.8	--	<50	--	--	6	--	--	6	--	9
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	<0.3	--	--	**0.037**	<0.017	--	**0.028**	--	--	**0.023**	--	--	**0.039**	--	**0.060**
Total Chromium (Cr)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	--	<1	--	<1
Total Cobalt (Co)	µg/L	0.4	1	--	--	<1	--	--	0.65	<0.40	--	<0.40	--	--	<1	--	--	<1	--	2
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	<2	--	--	3.3	<2.0	<2.0	<2.0	<2.0	<2.0	<2	--	--	<2	--	**1380**
Total Iron (Fe)	µg/L	50	50	--	300	100	--	--	**1090**	151	76	143	**699**	181	178	--	--	181	--	**1760**
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	<0.5	--	--	2.39	<0.50	--	<0.50	--	--	<0.5	--	--	<0.5	--	**49.7**
Total Manganese (Mn)	µg/L	2	2	--	--	58	--	--	159	81.0	28.0	33.8	88.6	30.6	22	--	--	87	--	866
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	2	--	--	2.2	<2.0	--	<2.0	--	--	<2	--	--	<2	--	3
Total Selenium (Se)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	--	<1	--	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	--	<0.1	--	0.1
Total Strontium (Sr)	µg/L	2	5	--	--	30	--	--	34.7	32.8	--	25.7	--	--	27	--	--	31	--	35
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	--	<0.1	--	<0.1
Total Tin (Sn)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--	3
Total Titanium (Ti)	µg/L	2	2	--	--	<2	--	--	21.3	<2.0	--	3.6	--	--	<2	--	--	<2	--	2
Total Uranium (U)	µg/L	0.1	0.1	--	15	<0.1	--	--	0.10	<0.10	--	<0.10	--	--	0.1	--	--	<0.1	--	<0.1
Total Vanadium (V)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--	<2
Total Zinc (Zn)	µg/L	5	5	--	30	12	--	--	18.3	<5.0	5.8	6.6	7.5	10	8	--	--	11	--	**762**
MICROBIOLOGICAL																				
Total Coliform	MPN/100mL	1	1	--	--	49	40	--	>250	46	97	64	>250	--	261	--	--	1410	--	411
E. coli	MPN/100mL	100	1	400	--	10	31	--	69	<1	6	17	>250	<100	1	--	--	12	--	2
Fecal Coliform	MPN/ml	1	--	400	--	--	--	12	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	1.15	1.36	0.59	3.50	1.54	0.53	0.55	2.48	1.33	0.76	--	--	1.18	--	0.25
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	1.22	1.33	0.66	3.39	1.51	0.42	0.51	2.26	1.13	0.76	--	--	1.34	--	0.27
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	<0.4	--	--	--	--	1.7

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)

" -- " = no guideline available / Not Tested.

CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)

Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)

Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.

Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

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ATTACHMENT 1

Field Reports

FIELD REPORT – OCTOBER 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5	
Client:	Halifax Regional Municipality		
Site: Kearney Lake		**Site ID: KL1**	
Watercourse: Kearney Lake		**Location:** Kearney Lake Road	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:			
GPS Coordinates:	20T 0445718E, 4948496N (UTM, NAD83)		
SLE Field Personnel:	Alex Duguay/ Ghislain Pitre		

Site Conditions

Weather:	Overcast
Air Temperature:	14 Celsius
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Accessible	Yes

Field Parameter Data

	Remarks
Date (d.m.y):	16/10/2013
Time (hh:mm):	13:30
Sample Depth (m):	1.0
pH:	6.35
Dissolved Oxygen (mg/L):	8.30
Secchi Depth (m):	2.9
Water Temperature (degrees Celsius):	14.1
Conductivity (µs/cm):	217.9

Additional Comments / Notes

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FIELD REPORT – OCTOBER 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Kearney Lake		**Site ID: KL2**
Watercourse: Kearney Lake		**Location:** Kearney Lake Road
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0443942E, 4949803N (UTM, NAD83)	
SLE Field Personnel:	Alex Duguay	

Site Conditions

Weather:	Overcast
Air Temperature:	14 Celsius
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Accessible	Yes

Field Parameter Data

	Remarks
Date (d.m.y):	16/10/2013
Time (hh:mm):	14:30
Sample Depth (m):	1.0
pH:	5.57
Dissolved Oxygen (mg/L):	7.40
Secchi Depth (m):	NA
Water Temperature (degrees Celsius):	9.7
Conductivity (µs/cm):	64.5

Additional Comments / Notes

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FIELD REPORT – OCTOBER 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Kearney Lake Run		**Site ID: KL3**
Watercourse: Kearney Lake Run		**Location:** Kearney Lake Road
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0444390E, 4950406N (UTM, NAD83)	
SLE Field Personnel:	Alex Duguay	

Site Conditions

Weather:	Overcast
Air Temperature:	14 Celsius
Cloud Cover:	Yes
Wildlife Sightings:	Yes
Site Accessibility: Accessible	Yes

Field Parameter Data

	Remarks
Date (d.m.y):	16/10/2013
Time (hh:mm):	14:00
Sample Depth (m):	1.0
pH:	6.49
Dissolved Oxygen (mg/L):	8.90
Secchi Depth (m):	NA
Water Temperature (degrees Celsius):	13.6
Conductivity (µs/cm):	210.6

Additional Comments / Notes

Squirrel and Crow spotted.

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FIELD REPORT – OCTOBER 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Kearney Lake Run		**Site ID: KL4**
Watercourse: Kearney Lake Run		**Location:** Kearney Lake Road
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0444463E, 4950571N (UTM, NAD83)	
SLE Field Personnel:	Alex Duguay	

Site Conditions

Weather:	Overcast
Air Temperature:	14 Celsius
Cloud Cover:	Yes
Wildlife Sightings:	yes
Site Accessibility: Accessible	Yes

Field Parameter Data

	Remarks
Date (d.m.y):	16/10/2013
Time (hh:mm):	14:20
Sample Depth (m):	1.0
pH:	6.41
Dissolved Oxygen (mg/L):	9.60
Secchi Depth (m):	NA
Water Temperature (degrees Celsius):	13.5
Conductivity (µs/cm):	209

Additional Comments / Notes

Squirrel

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FIELD REPORT – OCTOBER 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 9	
Client:	Halifax Regional Municipality		
Site: Kearney Lake		**Site ID: KL5**	
Watercourse: Kearney Lake		**Location:** Kearney Lake Road	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:			
GPS Coordinates:	20T 4949142E, 445280N (UTM, NAD83)		
SLE Field Personnel:	Alex Duguay		

Site Conditions

Weather:	Overcast
Air Temperature:	14 Celsius
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Accessible	Yes

Field Parameter Data

	Remarks
Date (d.m.y):	16/10/2013
Time (hh:mm):	13:45
Sample Depth (m):	1.0
pH:	6.51
Dissolved Oxygen (mg/L):	8.60
Secchi Depth (m):	NA
Water Temperature (degrees Celsius):	14.7
Conductivity (µs/cm):	212.9

Additional Comments / Notes

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FIELD REPORT – OCTOBER 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5	
Client:	Halifax Regional Municipality		
Site: Highway 102		**Site ID: HWY 102-1**	
Watercourse: Marsh area		**Location:** Highway 102, south of exit 3	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:			
GPS Coordinates:	20T 0444708E, 4951644N (UTM, NAD83)		
SLE Field Personnel:	Alex Duguay		

Site Conditions

Weather:	Overcast
Air Temperature:	13 Celsius
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Accessible	Yes

Field Parameter Data

	Remarks
Date (d.m.y):	16/10/2013
Time (hh:mm):	12:30
Sample Depth (m):	1.0
pH:	6.79
Dissolved Oxygen (mg/L):	3.10
Secchi Depth (m):	NA
Water Temperature (degrees Celsius):	8.9
Conductivity (µs/cm):	234.0

Additional Comments / Notes

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FIELD REPORT – OCTOBER 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5	
Client:	Halifax Regional Municipality		
Site: Highway 102		**Site ID: HWY 102-2**	
Watercourse: Marsh area		**Location:** HWY 102, south of exit 3	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:			
GPS Coordinates:	20T 0444829E, 4951778N (UTM, NAD83)		
SLE Field Personnel:	Alex Duguay		

Site Conditions

Weather:	Overcast
Air Temperature:	12 Celsius
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Accessible	Yes

Field Parameter Data

	Remarks
Date (d.m.y):	16/10/2013
Time (hh:mm):	10:22
Sample Depth (m):	1.0
pH:	5.40
Dissolved Oxygen (mg/L):	4.20
Secchi Depth (m):	NA
Water Temperature (degrees Celsius):	18.7
Conductivity (µs/cm):	204.4

Additional Comments / Notes

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FIELD REPORT – OCTOBER 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Lake Shore Drive		**Site ID: LSD**
Watercourse: Marsh @ Lakeshore Dr.		**Location:** Kingswood Subdivision
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0442583E, 4950431N (UTM, NAD83)	
SLE Field Personnel:	Alex Duguay	

Site Conditions

Weather:	Overcast
Air Temperature:	12 Celsius
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Accessible	Yes

Field Parameter Data

	Remarks
Date (d.m.y):	16/10/2013
Time (hh:mm):	11:55
Sample Depth (m):	1.0
pH:	6.23
Dissolved Oxygen (mg/L):	7.60
Secchi Depth (m):	NA
Water Temperature (degrees Celsius):	8.8
Conductivity (µs/cm):	147.8

Additional Comments / Notes

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FIELD REPORT – OCTOBER 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 9
Client:	Halifax Regional Municipality	
Site: Larry Uteck Blvd.	**Site ID: LU**	
Watercourse: Pond	**Location:** Larry Uteck off-ramp	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 4949816E, 445042N (UTM, NAD83)	
SLE Field Personnel:	Alex Duguay	

Site Conditions

Weather:	Overcast
Air Temperature:	14 Celsius
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Accessible	Yes

Field Parameter Data

	Remarks
Date (d.m.y):	16/10/2013
Time (hh:mm):	13:00
Sample Depth (m):	1.0
pH:	5.45
Dissolved Oxygen (mg/L):	4.50
Secchi Depth (m):	NA
Water Temperature (degrees Celsius):	10.9
Conductivity (µs/cm):	845.0

Additional Comments / Notes

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FIELD REPORT – OCTOBER 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Paper Mill Lake		**Site ID: PML1**
Watercourse: Paper Mill Lake		**Location:** Moirs Mill Subdivision
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0445129E, 4951154N (UTM, NAD83)	
SLE Field Personnel:	Alex Duguay/ Ghislain Pitre	

Site Conditions

Weather:	Overcast
Air Temperature:	12 Celsius
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Accessible	Yes

Field Parameter Data

	Remarks
Date (d.m.y):	16/10/2013
Time (hh:mm):	11:20
Sample Depth (m):	1.0
pH:	6.32
Dissolved Oxygen (mg/L):	9.90
Secchi Depth (m):	NA
Water Temperature (degrees Celsius):	12.3
Conductivity (µs/cm):	250.5

Additional Comments / Notes

Coast Line Retreated by approximately 15 feet.

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FIELD REPORT – OCTOBER 2013

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Paper Mill Lake		**Site ID: PML2**
Watercourse: Paper Mill Lake		**Location:** Moirs Mill Subdivision
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0445363E, 4951740N (UTM, NAD83)	
SLE Field Personnel:	Alex Duguay	

Site Conditions

Weather:	Overcast
Air Temperature:	12 Celsius
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Accessible	Yes

Field Parameter Data

	Remarks
Date (d.m.y):	16/10/2013
Time (hh:mm):	11:20
Sample Depth (m):	1.0
pH:	6.13
Dissolved Oxygen (mg/L):	8.90
Secchi Depth (m):	NA
Water Temperature (degrees Celsius):	12.6
Conductivity (µs/cm):	250.5

Additional Comments / Notes

Coastal line retreated
Coastal floor bed has unstable terrain
Secchi Depth measurement not collected for Health and Safety reasons.

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ATTACHMENT 2

Site Photographs

Photo 1: KL1, Kearney Lake sample location

Photo 2: KL2, Kearney Lake sample location

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Photo 3: KL3, Kearney Lake sample location

Photo 4: KL4, Kearney Lake sample location

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Photo 5: KL5, Kearney Lake sample location

Photo 6: Hwy102-1 sample location

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Photo 7: Hwy102-2 sample location

Photo 8: LSD, Lake Shore Drive sample location

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Photo 9: LU, Larry Uteck off-ramp sample location

Photo 10: PML1, Paper Mill Lake sample location

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Photo 11: PML2, Paper Mill Lake sample location

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ATTACHMENT 3

Laboratory Certificates of Analysis

AGAT Laboratories

11 Morris Drive, Unit 122
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TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

CLIENT NAME: SNC-LAVALIN
5657 SPRING GARDEN RD, SUITE 200
HALIFAX , NS B3J3R4
(902) 492-4544

ATTENTION TO: Derek Heath

PROJECT NO: 510192-0001 Bedford West

AGAT WORK ORDER: 13X771059

MICROBIOLOGY ANALYSIS REVIEWED BY: Laura Baker, Inorganics Data Reporter

WATER ANALYSIS REVIEWED BY: Jason Coughtrey, Inorganics Supervisor

DATE REPORTED: Oct 28, 2013

PAGES (INCLUDING COVER): 15

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

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Certificate of Analysis

AGAT WORK ORDER: 13X771059

PROJECT NO: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

Total Coliforms and E.coli (MPN)

DATE RECEIVED: 2013-10-16

DATE REPORTED: 2013-10-17

		SAMPLE DESCRIPTION:		KL-1	KL-2	KL-3	KL-4	KL-5	LSD	HWY-102-1	HWY-102-2
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013
Parameter	Unit	G / S	RDL	4846677	4846680	4846689	4846697	4846705	4846717	4846725	4846732
E. Coli (MPN)	MPN/100 mL		1	7	2	<1	<1	4	2	5	4
Total Coliforms (MPN)	MPN/100 mL		1	488	>2420	1300	770	461	>2420	1553	>2420

		SAMPLE DESCRIPTION:		PML-1	PML-2	LU
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		10/16/2013	10/16/2013	10/16/2013
Parameter	Unit	G / S	RDL	4846740	4846750	4846759
E. Coli (MPN)	MPN/100 mL		1	6	2	<1
Total Coliforms (MPN)	MPN/100 mL		1	1011	411	866

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

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AGAT WORK ORDER: 13X771059

PROJECT NO: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

Chlorophyll A

DATE RECEIVED: 2013-10-16

DATE REPORTED: 2013-10-18

		SAMPLE DESCRIPTION:		KL-1	KL-2	KL-3	KL-4	KL-5	LSD	HWY-102-1	HWY-102-2
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013
Parameter	Unit	G / S	RDL	4846677	4846680	4846689	4846697	4846705	4846717	4846725	4846732
Chlorophyll A - Acidification Method	ug/L		0.05	1.19	0.73	0.65	0.40	0.64	2.02	1.99	21.62
Chlorophyll A - Welschmeyer Method	ug/L		0.05	1.19	0.74	0.61	0.39	0.62	2.98	2.20	27.02

		SAMPLE DESCRIPTION:		PML-1	PML-2	LU
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		10/16/2013	10/16/2013	10/16/2013
Parameter	Unit	G / S	RDL	4846740	4846750	4846759
Chlorophyll A - Acidification Method	ug/L		0.05	5.07	0.25	0.12
Chlorophyll A - Welschmeyer Method	ug/L		0.05	6.39	0.27	0.11

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

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AGAT WORK ORDER: 13X771059

PROJECT NO: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

Standard Water Analysis + Metals (Total)

DATE RECEIVED: 2013-10-16

DATE REPORTED: 2013-10-25

		SAMPLE DESCRIPTION:		KL-1	KL-2	KL-3	KL-4	KL-5	LSD	HWY-102-1	HWY-102-2
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013
Parameter	Unit	G / S	RDL	4846677	4846680	4846689	4846697	4846705	4846717	4846725	4846732
pH				6.85	6.34	6.86	6.85	6.89	6.49	6.73	6.34
Reactive Silica as SiO2	mg/L		0.5	2.2	4.9	2.7	2.5	2.5	5.0	5.8	6.6
Chloride	mg/L		1	48	14	46	47	46	23	40	52
Fluoride	mg/L		0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1
Sulphate	mg/L		2	9	4	8	9	8	5	12	10
Alkalinity	mg/L		5	8	<5	7	<5	5	11	20	7
True Color	TCU		5	20	71	20	20	18	25	25	36
Turbidity	NTU		0.1	0.5	1.0	0.4	2.1	0.4	82.6	0.5	144
Electrical Conductivity	umho/cm		1	212	62	204	204	204	105	218	223
Nitrate + Nitrite as N	mg/L		0.05	0.19	<0.05	<0.05	0.17	0.25	<0.05	<0.05	<0.05
Nitrate as N	mg/L		0.05	0.19	<0.05	<0.05	0.17	0.20	<0.05	<0.05	<0.05
Nitrite as N	mg/L		0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	<0.05	<0.05
Ammonia as N	mg/L		0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	0.06	0.09
Total Organic Carbon	mg/L		0.5	4.3	10.9	4.6	4.3	7.0	6.9	17.7	5.1
Ortho-Phosphate as P	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Sodium	mg/L		0.1	31.6	7.9	32.1	30.7	31.3	14.6	20.5	34.5
Total Potassium	mg/L		0.1	1.1	0.7	1.2	1.2	1.1	1.4	2.4	2.5
Total Calcium	mg/L		0.1	6.5	2.4	6.8	6.8	6.4	5.6	13.9	8.2
Total Magnesium	mg/L		0.1	1.2	0.8	1.3	1.2	1.1	1.6	2.3	2.2
Total Phosphorous	mg/L		0.02	0.02	0.02	0.02	0.02	0.02	0.16	0.03	0.23
Bicarb. Alkalinity (as CaCO3)	mg/L		5	8	<5	7	<5	5	11	20	7
Carb. Alkalinity (as CaCO3)	mg/L		10	<10	<10	<10	<10	<10	<10	<10	<10
Hydroxide	mg/L		5	<5	<5	<5	<5	<5	<5	<5	<5
Calculated TDS	mg/L		1	103	31	100	97	98	66	104	145
Hardness	mg/L			21.2	9.3	22.3	21.9	20.5	20.6	44.2	29.5
Langelier Index (@20C)	NA			-3.02	-4.12	-3.05	-3.21	-3.19	-3.29	-2.41	-3.50
Langelier Index (@ 4C)	NA			-3.34	-4.44	-3.37	-3.53	-3.51	-3.61	-2.73	-3.82
Saturation pH (@ 20C)	NA			9.87	10.5	9.91	10.1	10.1	9.78	9.14	9.84
Saturation pH (@ 4C)	NA			10.2	10.8	10.2	10.4	10.4	10.1	9.46	10.2
Anion Sum	me/L			1.71	0.48	1.60	1.53	1.58	0.97	1.78	1.81
Cation sum	me/L			1.84	0.60	1.89	1.84	1.81	1.62	1.87	3.50

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Certificate of Analysis

AGAT WORK ORDER: 13X771059

PROJECT NO: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

Standard Water Analysis + Metals (Total)

DATE RECEIVED: 2013-10-16

DATE REPORTED: 2013-10-25

		SAMPLE DESCRIPTION:		KL-1	KL-2	KL-3	KL-4	KL-5	LSD	HWY-102-1	HWY-102-2
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013
Parameter	Unit	G / S	RDL	4846677	4846680	4846689	4846697	4846705	4846717	4846725	4846732
% Difference/ Ion Balance (NS)	%			3.4	11.0	8.3	9.2	6.7	25.0	2.6	31.7
Total Aluminum	ug/L		5	56	259	100	159	61	3420	150	2760
Total Antimony	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Arsenic	ug/L		2	<2	<2	<2	<2	<2	<2	<2	6
Total Barium	ug/L		5	16	13	18	19	16	24	80	213
Total Beryllium	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Bismuth	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Boron	ug/L		5	9	9	10	9	9	15	11	13
Total Cadmium	ug/L		0.017	0.017	0.019	<0.017	0.050	0.034	0.073	0.040	0.096
Total Chromium	ug/L		1	<1	<1	<1	<1	<1	2	<1	9
Total Cobalt	ug/L		1	<1	<1	<1	<1	<1	1	<1	3
Total Copper	ug/L		1	1	2	1	1	1	12	2	12
Total Iron	ug/L		50	92	523	172	248	79	4200	446	28400
Total Lead	ug/L		0.5	<0.5	<0.5	0.9	<0.5	<0.5	5.2	0.6	19.4
Total Manganese	ug/L		2	24	53	92	130	12	124	31	327
Total Molybdenum	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Nickel	ug/L		2	<2	<2	<2	<2	<2	2	<2	4
Total Selenium	ug/L		1	<1	<1	<1	<1	<1	<1	<1	<1
Total Silver	ug/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium	ug/L		5	30	12	32	31	31	25	62	45
Total Thallium	ug/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Titanium	ug/L		2	<2	2	2	3	<2	36	4	60
Total Uranium	ug/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.1
Total Vanadium	ug/L		2	<2	<2	<2	<2	<2	2	<2	11
Total Zinc	ug/L		5	5	<5	7	9	5	15	10	46

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Certificate of Analysis

AGAT WORK ORDER: 13X771059

PROJECT NO: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

Standard Water Analysis + Metals (Total)

DATE RECEIVED: 2013-10-16

DATE REPORTED: 2013-10-25

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION: PML-1 SAMPLE TYPE: Water DATE SAMPLED: 10/16/2013 4846740	PML-2 Water 10/16/2013 4846750	LU Water 10/16/2013 4846759
pH				6.88	6.73	6.49
Reactive Silica as SiO2	mg/L		0.5	2.6	4.2	7.0
Chloride	mg/L		1	48	64	258
Fluoride	mg/L		0.1	<0.1	<0.1	<0.1
Sulphate	mg/L		2	10	11	33
Alkalinity	mg/L		5	7	8	7
True Color	TCU		5	11	8	19
Turbidity	NTU		0.1	19.2	3.3	0.7
Electrical Conductivity	umho/cm		1	209	277	840
Nitrate + Nitrite as N	mg/L		0.05	0.18	<0.05	0.34
Nitrate as N	mg/L		0.05	0.18	<0.05	0.34
Nitrite as N	mg/L		0.05	<0.05	<0.05	<0.05
Ammonia as N	mg/L		0.03	<0.03	0.23	0.04
Total Organic Carbon	mg/L		0.5	5.1	4.0	2.9
Ortho-Phosphate as P	mg/L		0.01	<0.01	<0.01	<0.01
Total Sodium	mg/L		0.1	32.2	42.0	170
Total Potassium	mg/L		0.1	1.5	1.3	2.9
Total Calcium	mg/L		0.1	6.9	7.7	21.8
Total Magnesium	mg/L		0.1	1.5	1.4	4.0
Total Phosphorous	mg/L		0.02	0.14	0.02	<0.02
Bicarb. Alkalinity (as CaCO3)	mg/L		5	7	8	7
Carb. Alkalinity (as CaCO3)	mg/L		10	<10	<10	<10
Hydroxide	mg/L		5	<5	<5	<5
Calculated TDS	mg/L		1	115	137	496
Hardness	mg/L			23.4	25.0	70.9
Langelier Index (@20C)	NA			-3.03	-3.08	-2.98
Langelier Index (@ 4C)	NA			-3.35	-3.40	-3.30
Saturation pH (@ 20C)	NA			9.91	9.81	9.47
Saturation pH (@ 4C)	NA			10.2	10.1	9.79
Anion Sum	me/L			1.71	2.19	8.13
Cation sum	me/L			2.56	2.55	8.90

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Certificate of Analysis

AGAT WORK ORDER: 13X771059

PROJECT NO: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

Standard Water Analysis + Metals (Total)

DATE RECEIVED: 2013-10-16

DATE REPORTED: 2013-10-25

		SAMPLE DESCRIPTION:		PML-1	PML-2	LU
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		10/16/2013	10/16/2013	10/16/2013
Parameter	Unit	G / S	RDL	4846740	4846750	4846759
% Difference/ Ion Balance (NS)	%			19.8	7.5	4.5
Total Aluminum	ug/L		5	3920	107	31
Total Antimony	ug/L		2	<2	<2	<2
Total Arsenic	ug/L		2	2	<2	<2
Total Barium	ug/L		5	40	37	119
Total Beryllium	ug/L		2	<2	<2	<2
Total Bismuth	ug/L		2	<2	<2	<2
Total Boron	ug/L		5	9	9	18
Total Cadmium	ug/L		0.017	0.430	0.060	0.148
Total Chromium	ug/L		1	3	<1	<1
Total Cobalt	ug/L		1	9	2	<1
Total Copper	ug/L		1	6	1380	2
Total Iron	ug/L		50	5300	1760	157
Total Lead	ug/L		0.5	13.5	49.7	<0.5
Total Manganese	ug/L		2	693	866	26
Total Molybdenum	ug/L		2	<2	<2	<2
Total Nickel	ug/L		2	9	3	<2
Total Selenium	ug/L		1	<1	<1	<1
Total Silver	ug/L		0.1	<0.1	0.1	<0.1
Total Strontium	ug/L		5	34	35	96
Total Thallium	ug/L		0.1	<0.1	<0.1	<0.1
Total Tin	ug/L		2	<2	3	<2
Total Titanium	ug/L		2	65	2	2
Total Uranium	ug/L		0.1	0.6	<0.1	<0.1
Total Vanadium	ug/L		2	10	<2	<2
Total Zinc	ug/L		5	62	762	26

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

4846680 The cation and anion sums are at, or below, 1 me/L, therefore the acceptable criteria is a difference of less than 0.3me/L.

4846717 Ion Balance is greater than 10% due to the fact that samples are digested for total metals and any particulates in the water could be increasing the concentrations of certain elements.

4846732-4846740 Ion Balance is greater than 10% due to the fact that samples are digested for total metals and any particulates in the water could be increasing the concentrations of certain elements.

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Certified By:

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AGAT WORK ORDER: 13X771059

PROJECT NO: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

TSS, TKN

DATE RECEIVED: 2013-10-16

DATE REPORTED: 2013-10-24

		SAMPLE DESCRIPTION:		KL-1	KL-2	KL-3	KL-4	KL-5	LSD	HWY-102-1	HWY-102-2
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013
Parameter	Unit	G / S	RDL	4846677	4846680	4846689	4846697	4846705	4846717	4846725	4846732
Total Suspended Solids	mg/L		5	<5	<5	<5	<5	<5	9	<5	194
Total Kjeldahl Nitrogen as N	mg/L		0.4	<0.4	<0.4	<0.4	1.1	1.1	3.0	0.6	2.0

		SAMPLE DESCRIPTION:		PML-1	PML-2	LU
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		10/16/2013	10/16/2013	10/16/2013
Parameter	Unit	G / S	RDL	4846740	4846750	4846759
Total Suspended Solids	mg/L		5	23	<5	<5
Total Kjeldahl Nitrogen as N	mg/L		0.4	0.8	1.7	<0.4

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Original Signed

Certified By:

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AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 13X771059

PROJECT NO: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

Total Phosphorus - Low Level

DATE RECEIVED: 2013-10-16

DATE REPORTED: 2013-10-22

		SAMPLE DESCRIPTION:		KL-1	KL-2	KL-3	KL-4	KL-5	LSD	HWY-102-1	HWY-102-2
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013	10/16/2013
Parameter	Unit	G / S	RDL	4846677	4846680	4846689	4846697	4846705	4846717	4846725	4846732
Total Phosphorus	mg/L		0.006	0.008	0.029	0.012	0.016	0.010	0.078	0.022	0.199

		SAMPLE DESCRIPTION:		PML-1	PML-2	LU
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		10/16/2013	10/16/2013	10/16/2013
Parameter	Unit	G / S	RDL	4846740	4846750	4846759
Total Phosphorus	mg/L		0.006	0.047	0.026	0.046

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Original Signed

Certified By:

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Quality Assurance

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 13X771059

PROJECT NO: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

Microbiology Analysis

RPT Date:			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Coliforms and E.coli (MPN)															
E. Coli (MPN)	1		365	517	34.5%	< 1		0%	0%		0%	0%		0%	0%
Total Coliforms (MPN)	1		1203	1046	14.0%	< 1		0%	0%		0%	0%		0%	0%

Original Signed

Certified By:

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Quality Assurance

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 13X771059

PROJECT NO: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

Water Analysis

RPT Date:			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Standard Water Analysis + Metals (Total)															
Reactive Silica as SiO2	1	4846951	8.4	8.3	1.2%	< 0.5	103%	80%	120%		80%	120%	103%	80%	120%
Chloride	1	4846697	49	49	0.0%	< 1	116%	80%	120%		80%	120%	99%	80%	120%
Fluoride	1	4846697	< 0.1	< 0.1	0.0%	< 0.1	105%	80%	120%		80%	120%	112%	80%	120%
Sulphate	1	4846697	9	9	0.0%	< 2	112%	80%	120%		80%	120%	101%	80%	120%
True Color	1	4846717	25	21	17.4%	< 5	100%	80%	120%		80%	120%		80%	120%
Turbidity	1	4846740	19.2	17.8	7.6%	< 0.1	88%	80%	120%		80%	120%		80%	120%
Nitrate as N	1	4846697	0.17	0.17	0.0%	< 0.05	105%	80%	120%		80%	120%	98%	80%	120%
Nitrite as N	1	4846697	< 0.05	< 0.05	0.0%	< 0.05	102%	80%	120%		80%	120%	104%	80%	120%
Ammonia as N	1	4846951	<0.03	<0.03	0.0%	< 0.03	112%	80%	120%		80%	120%	112%	80%	120%
Ortho-Phosphate as P	1	4846591	0.21	0.22	4.7%	< 0.01	107%	80%	120%		80%	120%	108%	80%	120%
Total Sodium	1023201	4846740	30.7	31.6	2.9%	< 0.1	120%	80%	120%	120%	80%	120%	98%	70%	130%
Total Potassium	1023201	4846740	1.4	1.5	6.9%	< 0.1	120%	80%	120%	120%	80%	120%	88%	70%	130%
Total Calcium	1023201	4846740	6.9	7.0	1.4%	< 0.1	100%	80%	120%	98%	80%	120%	95%	70%	130%
Total Magnesium	1023201	4846740	1.5	1.5	0.0%	< 0.1	97%	80%	120%	98%	80%	120%	95%	80%	120%
Total Phosphorous	1023201	4846740	0.142	0.149	4.8%	< 0.02	120%	80%	120%	115%	80%	120%	95%	70%	130%
Total Aluminum	1023201	4846740	3050	3330	8.8%	< 5	95%	80%	120%	95%	80%	120%	113%	70%	130%
Total Antimony	1023201	4846740	< 2	< 2	0.0%	< 2	102%	80%	120%	104%	80%	120%	100%	70%	130%
Total Arsenic	1023201	4846740	2	2	0.0%	< 2	111%	80%	120%	109%	80%	120%	99%	70%	130%
Total Barium	1023201	4846740	40	42	4.9%	< 5	106%	80%	120%	106%	80%	120%	115%	70%	130%
Total Beryllium	1023201	4846740	< 2	< 2	0.0%	< 2	110%	80%	120%	106%	80%	120%	103%	70%	130%
Total Bismuth	1023201	4846740	< 2	< 2	0.0%	< 2	106%	80%	120%	102%	80%	120%	96%	70%	130%
Total Boron	1023201	4846740	9	9	0.0%	< 5	112%	80%	120%	103%	80%	120%	106%	70%	130%
Total Cadmium	1023201	4846740	0.430	0.549	24.3%	< 0.017	102%	80%	120%	101%	80%	120%	92%	70%	130%
Total Chromium	1023201	4846740	3	3	0.0%	< 1	104%	80%	120%	99%	80%	120%	98%	70%	130%
Total Cobalt	1023201	4846740	9	10	10.5%	< 1	100%	80%	120%	101%	80%	120%	99%	70%	130%
Total Copper	1023201	4846740	6	7	15.4%	< 1	101%	80%	120%	102%	80%	120%	95%	70%	130%
Total Iron	1023201	4846740	5040	5350	6.0%	< 50	100%	80%	120%	101%	80%	120%	103%	70%	130%
Total Lead	1023201	4846740	13.5	13.6	0.7%	< 0.5	108%	80%	120%	108%	80%	120%	99%	70%	130%
Total Manganese	1023201	4846740	622	663	6.4%	< 2	98%	80%	120%	102%	80%	120%	98%	70%	130%
Total Molybdenum	1023201	4846740	< 2	< 2	0.0%	< 2	105%	80%	120%	99%	80%	120%	97%	70%	130%
Total Nickel	1023201	4846740	9	9	0.0%	< 2	100%	80%	120%	99%	80%	120%	97%	70%	130%
Total Selenium	1023201	4846740	< 1	< 1	0.0%	< 1	91%	80%	120%	103%	80%	120%	112%	70%	130%
Total Silver	1023201	4846740	< 0.1	< 0.1	0.0%	< 0.1	108%	80%	120%	103%	80%	120%	94%	70%	130%
Total Strontium	1023201	4846740	34	34	0.0%	< 5	101%	80%	120%	99%	80%	120%	103%	70%	130%
Total Thallium	1023201	4846740	< 0.1	< 0.1	0.0%	< 0.1	109%	80%	120%	104%	80%	120%	99%	70%	130%
Total Tin	1023201	4846740	< 2	< 2	0.0%	< 2	104%	80%	120%	98%	80%	120%	94%	70%	130%
Total Titanium	1023201	4846740	64	67	4.6%	< 2	102%	80%	120%	103%	80%	120%	121%	70%	130%
Total Uranium	1023201	4846740	0.6	0.6	0.0%	< 0.1	108%	80%	120%	109%	80%	120%	94%	70%	130%
Total Vanadium	1023201	4846740	10	10	0.0%	< 2	101%	80%	120%	102%	80%	120%	99%	70%	130%

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Quality Assurance

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 13X771059

PROJECT NO: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

Water Analysis (Continued)

RPT Date:			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Zinc	1023201	4846740	62	66	6.3%	< 5	116%	80%	120%	118%	80%	120%	99%	70%	130%
Standard Water Analysis + Metals (Total)															
Chloride	1	485271	72	75	4.1%	< 1	118%	80%	120%		80%	120%	100%	80%	120%
Fluoride	1	485271	< 0.1	< 0.1	0.0%	< 0.1	87%	80%	120%		80%	120%	108%	80%	120%
Sulphate	1	485271	16	17	6.1%	< 2	113%	80%	120%		80%	120%	105%	80%	120%
Nitrate as N	1	485271	2.08	2.09	0.5%	< 0.05	99%	80%	120%		80%	120%	103%	80%	120%
Nitrite as N	1	485271	< 0.05	< 0.05	0.0%	< 0.05	102%	80%	120%		80%	120%	102%	80%	120%
Standard Water Analysis + Metals (Total)															
True Color	1	4846759	19	23	19.0%	< 5	100%	80%	120%		80%	120%		80%	120%
Standard Water Analysis + Metals (Total)															
Turbidity	1	4846986	0.3	0.3	0.0%	< 0.1	88%	80%	120%		80%	120%		80%	120%
TSS, TKN															
Total Suspended Solids	1	4853725	<5	<5	0.0%	< 5	98%	80%	120%		120%	120%	92%	80%	120%
Total Kjeldahl Nitrogen as N	1	4846759	<0.4	<0.4	0.0%	< 0.4	109%	80%	120%		80%	120%	103%	80%	120%
Total Phosphorus - Low Level															
Total Phosphorus	1	4846677	0.008	0.008	0.0%	< 0.006	95%	90%	110%	103%	90%	110%	101%	80%	120%

Original Signed

Certified By:

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Method Summary

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 13X771059

PROJECT NO: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Microbiology Analysis			
E. Coli (MPN)	MIC-121-7000	Based on SM 9223B	INCUBATOR
Total Coliforms (MPN)	MIC-121-7000	Based on SM 9223B	INCUBATOR

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Method Summary

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 13X771059

PROJECT NO: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Chlorophyll A - Acidification Method	Subcontracted	Subcontracted	
Chlorophyll A - Welschmeyer Method	Subcontracted	Subcontracted	ICP-MS
pH	INOR-121-6001	SM 4500 H+B	PC-TITRATE
Reactive Silica as SiO2	INORG-121-6028	SM 4110 B	COLORIMETER
Chloride	INORG-121-6005	SM 4110 B	IC
Fluoride	INORG-121-6005	SM 4110 B	IC
Sulphate	INORG-121-6005	SM 4110 B	IC
Alkalinity	INORG-121-6001	SM 2320 B	PC-TITRATE
True Color	INORG-121-6014	EPA 110.2	NEPHELOMETER
Turbidity	INORG-121-6022	SM 2130 B	NEPHELOMETER
Electrical Conductivity	INOR-121-6001	SM 2510 B	PC-TITRATE
Nitrate + Nitrite as N	INORG-121-6005	SM 4110 B	CALCULATION
Nitrate as N	INORG-121-6005	SM 4110 B	IC
Nitrite as N	INORG-121-6005	SM 4110 B	IC
Ammonia as N	INORG-121-6003	SM 4500-NH3 G	COLORIMETER
Total Organic Carbon	INORG-121-6026	SM 5310 B	TOC ANALYZER
Ortho-Phosphate as P	INORG-121-6005	SM 4110 B	COLORIMETER
Total Sodium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Potassium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Calcium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Magnesium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Phosphorous	MET-121-6104 & MET-121-6105	SM 3125	ICP/MS
Bicarb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Carb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Hydroxide	INORG-121-6001	SM 2320 B	PC-TITRATE
Calculated TDS		SM 1030E	CALCULATION
Hardness	CALCULATION	SM 2340B	CALCULATION
Langelier Index (@20C)	CALCULATION	CALCULATION	CALCULATION
Langelier Index (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 20C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Anion Sum	CALCULATION	SM 1030E	CALCULATION
Cation sum	CALCULATION	SM 1030E	CALCULATION
% Difference/ Ion Balance (NS)	CALCULATION	SM 1030E	CALCULATION
Total Aluminum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Antimony	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Arsenic	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Barium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Beryllium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Bismuth	MET121-6104 & MET-121-6105	SM 3125	ICP/MS

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AGAT WORK ORDER: 13X771059

PROJECT NO: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Boron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cadmium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Chromium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cobalt	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Copper	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Iron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Lead	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Manganese	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Molybdenum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Nickel	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Selenium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Silver	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Strontium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Thallium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Tin	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Titanium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Uranium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Vanadium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Zinc	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Suspended Solids	INOR-121-6024, 6025	SM 2540C, D	GRAVIMETRIC
Total Kjeldahl Nitrogen as N	INOR-121-6020	SM 4500 NORG D	COLORIMETER
Total Phosphorus	INOR-93-1022	SM 4500-P B & E	SPECTROPHOTOMETER

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Chain of Custody Record

Turnaround Time Required (TAT)

Regular TAT	5 to 7 working days	☑
Rush TAT	24 to 48 hours	☐
	48 to 72 hours	☐

Date Required: _____

Report To

Company: SNC Lavalin
Contact: Derek Heath
Address: 5657 Spring Garden Road, Suite 200
Phone: +1 (902) 492-4544 Fax: _____
PO#: _____
AGAT Quotation: 12-761
Client Project Name/#: 510192-0001 Bedford West

Report Information

1. Name: _____
Email: _____
2. Name: Derek Heath
Email: derek.heath@snclavalin.com

Report Format

☐ Single Sample per page
☑ Multiple Samples per page
☑ Excel Format Included

Laboratory Use Only

Arrival Condition: ☐ Good ☐ Poor (see notes)
Arrival Temperature: 13.0 C
AGAT Job Number: 13X771059
Notes:

Invoice To Same Yes ☑ / No ☐

Company: _____
Contact: _____
Address: _____
Phone: _____ Fax: _____
PO#/Credit Card #: _____

Regulatory Requirements (Check):

☐ List Guidelines on Report ☐ Do not List Guidelines on Report
☐ PIRI
☐ Tier 1 ☐ Res ☐ Pot ☐ Coarse
☐ Tier 2 ☐ Com ☐ N/Pot ☐ Fine
☐ Gas ☐ Gas ☐ Lube
☐ CCME
☐ Industrial ☐ CDWQ ☐ Other
☐ Commercial ☐ NSDFOSP
☐ Res/Park ☐ HRM 101
☐ Agricultural ☐ Storm Water
☐ FWAL ☐ Waste Water
☐ Sediment

Sample Identification	Sample Matrix	Date/Time Sampled	Comments – Site/Sample Info. Sample Containment	Microtox	CCME PHC BTEX/F1-F4	Metals	AB Class II Landfill	Detailed Salinity	Routine Potability	Standard Water + Metals	Low Level Total Phosphorus	TSS & TKN	E.Coli (MPN)	Chlorophyll A	Number of Containers	Preserved (Y/N)	Hazardous (Y/N)	Lab Sample #
KL-1	WATER	Oct 16/2013	2:00 pm							✓	✓	✓	✓	✓				
KL-2	WATER	"	2:15 pm							✓	✓	✓	✓	✓				
KL-3	WATER	"	2:45 pm							✓	✓	✓	✓	✓				
KL-4	WATER	"	3:15 pm							✓	✓	✓	✓	✓				
KL-5	WATER	"	3:30 pm							✓	✓	✓	✓	✓				
LSD	WATER	"	11:45 am							✓	✓	✓	✓	✓				
HWY-102-1	WATER	"	10:30 am							✓	✓	✓	✓	✓				
HWY-102-2	WATER	"	10:00 am							✓	✓	✓	✓	✓				
PML-1	WATER	"	11:30 am							✓	✓	✓	✓	✓				
PML-2	WATER	"	11:30 am							✓	✓	✓	✓	✓				
LU	WATER	"	12:15 pm							✓	✓	✓	✓	✓				
	WATER									✓	✓	✓	✓	✓				

Original Signed	Date Oct 16/2013	Samples Received by (Print name & sign): Tammy Lobs	Date Oct 16/13	Special Instructions	Page ____ of ____
Samples Relinquished by (print name & sign):	Date	Samples Received by (Print name & sign): Original Signed	Date 16/Oct		NO:
Samples Relinquished by (print name & sign):	Date	Samples Received by (Print name & sign):	Date		

Attachment D. May 2014 Water Sampling Report

SNC·LAVALIN

FINAL REPORT : WATER QUALITY MONITORING WITHIN BEDFORD WEST, BEDFORD, NOVA SCOTIA

MAY 2014 SAMPLING EVENT

Halifax Regional Municipality, Energy and Environment

21 | 07 | 2014

Internal ref. 510192-0001-T-EN-REP-0007_

C01

SNC·LAVALIN

Certified ISO 9001

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July 21, 2014

Halifax Regional Municipality
Energy and Environment
PO Box 1749
Halifax, Nova Scotia
B3J 3A5

Attention: Mr. Cameron Deacoff

Dear Mr. Deacoff:

RE: Final Report: Water Quality Monitoring within Bedford West, Bedford, Nova Scotia – May 2014 Sampling Event

1. INTRODUCTION

SNC-Lavalin Inc. was retained by the Halifax Regional Municipality (HRM) to conduct water quality monitoring within Bedford West. The Paper Mill Lake watershed is the primary watershed within the area. The water sampling program consisted of collecting surface water samples from eleven (11) specified locations as part of the May 2014 sampling event. The purpose of the program is to determine water quality for watersheds impacted by the development in the Bedford West area. The overall purpose of the monitoring program is to conduct water quality testing prior to construction activities (establish baseline conditions) in order to detect any impacts on and/or changes to water quality during and after construction of the development project.

This report presents water quality data from Kearney Lake, Kearney Lake Run, Highway 102, Lakeshore Drive, Larry Uteck Boulevard and Paper Mill Lake, collected on May 14/15, 2014. The water quality test locations are presented on Figure 1.

2. METHODOLOGY

The May 2014 monitoring event methodology consisted of the sampling and analyses of general chemistry (RCAp), total metals, total phosphorous, total suspended solids, E. coli bacteria, TKN and chlorophyll-a from eleven (11) specified surface water sampling locations. Standard field measurements (pH, water temperature, dissolved oxygen, conductivity, secchi depth, air temperature, cloud cover, and wildlife sightings) were to be measured at the eleven (11) specified sampling locations for the May 2014 monitoring event. The samples and field parameter readings were collected from a 1.0 metre depth whenever possible. The field parameters and site conditions for each sampling location were recorded on a field report. The field reports are provided in Attachment 1. Photographs of each sampling location are attached in Attachment 2.

A new pair of latex gloves was used at each sample location. Surface water samples were collected and placed in clean laboratory-supplied jars and stored in a chilled container together with a chain of custody record for transport to the laboratory. All surface water samples collected were submitted to AGAT Laboratories, located in Dartmouth, NS.

Secchi depth measurements were taken from the shady side of the boat at two sample locations. The secchi disk was lowered in the water until no longer visible. The depth was measured to the nearest tenth of a metre. The disk was raised until visible in the water and the depth was measured. The secchi depth is the midpoint between the two measured depths.

During the May 2014 field sampling event, the Horiba U-22 parameter monitor was used to collect water field parameters (pH, dissolved oxygen, conductivity and temperature). With respect to historical field parameter data collection: (a) 2009 sampling events, Oakton Portable Waterproof Meters were used for collecting water field parameters (Dissolved Oxygen Meter – 35601-Series; pH and conductivity – 35630-00 and 35630-02, respectively); (b) for 2010-2011 sampling events, Hach intelliCAL probes were used for collecting for pH, temperature, conductivity and dissolved oxygen (Product Numbers pHC30101, CDC40101 and LDO10101, respectively); and (c) 2012-2013 sampling events, the Waterra AM100 Aqua Meter and AP800 Aqua Probe were used for collecting water field parameters (pH, dissolved oxygen, conductivity and temperature).

3. ASSESSMENT STANDARDS

The Canadian Council of Ministers of the Environment (CCME) guidelines for water are broken down based on water use including Freshwater Aquatic Life, Marine Water Aquatic Life, Irrigation, Livestock Watering and Aesthetics and Drinking Water. The surface water quality results were compared to the CCME Freshwater Aquatic Life (FWAL) guidelines since the specified sampling locations are located at and/or near adjacent freshwater bodies.

Analytical data for total suspended solids (TSS) and turbidity are compared to the CCME for the Protection of Aquatic Life (CCME Narrative Total Particulate Matter – Table 1 Suspended Sediments and Turbidity, High Flow Conditions, 1999, updated 2002).

For TSS, the guideline value is equal to a maximum increase of 25 mg/L from background levels at any time when background levels are between 25 and 250 mg/L. When background is greater than 250 mg/L, the concentration should not increase more than 10% of background levels.

The Health Canada guidelines for Canadian Recreational Water Quality (2012, Third Edition) were used as reference guidelines. The Canadian Recreational Water Quality guidelines indicate that the clarity of the water should be sufficiently clear such that a Secchi disk is visible at a minimum of 1.2 metres. For turbidity, a limit of 50 Nephelometric Turbidity Units (NTU) is suggested.

4. RESULTS OF THE INVESTIGATION

4.1. FIELD MEASUREMENTS

Field parameters were measured at each of the eleven (11) sampling locations during the May 2014 monitoring event. Field measurements exceeding the applicable guidelines of dissolved oxygen are presented in the Table below.

Dissolved oxygen readings of 15.29 mg/L, 14.90 mg/L, 14.50 mg/L, 15.83 mg/L, 12.03 mg/L, 10.50 mg/L, 14.78 mg/L, 11.96 mg/L, 12.08 mg/L, and 12.44 mg/L at KL1, KL2, KL4, KL5, HWY102-1, HWY102-2, LSD, LU, PML1 and PML2, respectively were recorded, which are outside the CCME FWAL guideline range of 5.5-9.5 mg/L.

4.2. LABORATORY ANALYTICAL RESULTS

4.2.1. GENERAL CHEMISTRY

Analytical results reported dissolved chloride concentrations above the CCME FWAL guideline of 120 mg/L at LU and PML2 (dissolved chloride: 243 mg/L and 245 mg/L, respectively).

Analytical results reported pH levels outside the CCME FWAL guideline of 6.5 - 9.0 at LSD and LU (pH: 6.47 and 6.42, respectively).

4.2.2. METALS

Analytical results reported total aluminum concentrations above the CCME FWAL guideline of 5-100 µg/L at KL1, KL2, KL3, KL4, KL5, HWY102-1, HWY102-2, LSD, LU, PML1, and PML2 (total aluminum: 229 µg/L, 205 µg/L, 260 µg/L, 236 µg/L, 224 µg/L, 187 µg/L, 400 µg/L, 487 µg/L, 1400 µg/L, 305 µg/L, 181 µg/L, respectively).

Analytical results reported total cadmium concentrations above the CCME FWAL guideline of 0.017 µg/L at KL1, KL3, KL4, KL5, HWY102-1, HWY102-2, LSD, LU and PML2 (total cadmium: 0.037 µg/L, 0.038 µg/L, 0.027 µg/L, 0.036 µg/L, 0.022 µg/L, 0.051 µg/L, 0.032 µg/L, 0.171 µg/L, 0.062 µg/L, respectively).

Analytical results reported total chromium concentrations above the CCME FWAL guideline of 1 µg/L at KL1, KL2, KL3, KL4, KL5, HWY102-1 and HWY102-2 (total chromium: 6 µg/L, 9 µg/L, 7 µg/L, 6 µg/L, 6 µg/L, 8 µg/L, 2 µg/L, respectively).

Total iron concentrations exceeded the CCME FWAL guideline of 300 µg/L at sample locations HWY102-2, LSD and LU (total iron: 1660 µg /L, 593 µg/L, 2000 µg/L, respectively).

Total zinc concentrations exceeded the CCME FWAL guideline of 30 µg/L at sample location HWY102-2 (total zinc: 36 µg/L).

All other metals parameters were reported to be within the applied CCME FWAL guidelines.

Surface water total metals analytical results are available in the attached Table 1. Laboratory certificates have been provided in Attachment 3.

4.2.3. MICROBIOLOGICAL

The laboratory analytical results for E. Coli concentrations were reported to be within the referenced Health Canada Recreational Water Quality guidelines of 400 MPN/100 mL for all sample locations.

Surface water microbiological results have been provided in the attached Table 1. Laboratory certificates have been provided in Attachment 3.

5. CONCLUSIONS

Water quality monitoring within Bedford West was conducted on May 14 and 15, 2014, and included the collection of field parameters (pH, water temperature, dissolved oxygen, conductivity, secchi depth, air temperature, cloud cover, and wildlife sightings) and the collection of surface water samples for the analysis of RCAp, total metals, total phosphorous, total suspended solids, E. Coli, total coliforms and chlorophyll-a.

Dissolved oxygen readings at KL1, KL2, KL4, KL5, HWY102-1, HWY102-2, LSD, LU, PML1 and PML2 respectively were recorded, which are outside the CCME FWAL guideline range of 5.5-9.5 mg/L.

Analytical results reported dissolved chloride concentrations above the CCME FWAL guideline of 120 mg/L at LU and PML2.

Analytical results reported pH levels outside the CCME FWAL guideline of 6.5 - 9.0 at LSD and LU.

Analytical results reported total aluminum concentrations above the CCME FWAL guideline of 5-100 µg/L at KL1, KL2, KL3, KL4, KL5, HWY102-1, HWY102-2, LSD, LU, PML1, and PML2.

Analytical results reported total cadmium concentrations above the CCME FWAL guideline of 0.017 µg/L at KL1, KL3, KL4, KL5, HWY102-1, HWY102-2, LSD, LU and PML2.

Analytical results reported total chromium concentrations above the CCME FWAL guideline of 1 µg/L at KL1, KL2, KL3, KL4, KL5, HWY102-1 and HWY102-2.

Total iron concentrations exceeded the CCME FWAL guideline of 300 µg/L at sample locations HWY102-2, LSD and LU.

Total zinc concentrations exceeded the CCME FWAL guideline of 30 µg/L at sample location HWY102-2.

The laboratory analytical results reported E. Coli concentrations to be within the referenced Health Canada Recreational Water Quality guidelines of 400 MPN/100 mL for all sample locations.

If you have any questions or require anything further, please contact the undersigned at (902) 492-4544.

Yours truly,

SNC♦LAVALIN INC.

Original Signed

Derek Heath, P.Geo.
Project Manager

DH/ad

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N

HWY102-2

PML2

HWY102-1

PAPER MILL LAKE

PML1

KL4

LSD

KL3

KL2

LU

KEARNEY LAKE

KL5

KL1

Legend

- Water Quality Monitoring Test Locations/Sample Identification

0 200 400 800 1,200 1,600

Meters

SNC•LAVALIN

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Certified ISO 9001

HALIFAX REGIONAL MUNICIPALITY

PROJECT: WATER QUALITY MONITORING WITHIN BEDFORD WEST

TITLE: WATER QUALITY MONITORING TEST LOCATIONS

DESIGNED:	CH
DRAWN:	CH
CHECKED:	DH
SCALE:	AS SHOWN
DATE:	10-09-2012
PROJECT #:	510192-0001
DRAWING #:	1

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2014	Units	RDL	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Kearney Lake														
Sample Sites						KL1														
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/14	2012/10/10	2013/05/15	2013/08/16	2013/10/16	2014/05/14
Sampling Time	hh:mm	--				08:00	11:45	08:30	11:00	13:10	12:00	11:00	14:30	14:00	8:30	11:20	9:50	10:20	11:10	13:30	10:30
FIELD DATA																					
Secchi Depth	Meters	--	--	1.2	--	4.1	4.2	5.0	N/A	5.0	4.9	2.4	3.2	2.4	2.35	5.36	N/A	2.50	2.03	2.90	2.36
Water Temp	Celsius	0.1	0.1	--	--	14.0	22.2	16.7	12.9	23.3	8.8	11.5	25.6	15.9	8.9	23.3	15.4	13.2	22.2	14.1	12.7
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	**10.77**	8.20	7.00	9.13	7.86	**10.48**	**10.69**	8.22	9.22	8.98	7.93	8.72	**9.76**	8.57	8.30	**15.29**
pH	pH	N/A	N/A	--	--	6.20	6.76	6.67	7.23	7.32	6.61	6.60	6.16	6.04	8.67	6.91	6.32	6.32	8.24	6.35	6.74
Specific Conductance	uS/cm	1	1	--	--	263	299	261	248	242	219	288	179	146	277	279	198.1	243	216.5	217.9	547.0
INORGANICS																					
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	6	8	8	7	8	6	<5	9	7	24	7	<5	<5	<5	8	30
Dissolved Chloride (Cl)	mg/L	1	1	--	120	81	74	64	62	60	55	73	45	33	66	70	50	66	59	48	80
Colour	TCU	30	5	--	--	18	18	16	26	8	21	28	40	45	50	11	20	11	37	20	13
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	0.18	0.09	0.12	0.21	0.16	0.23	0.2	0.11	0.13	0.20	0.09	0.10	0.18	0.14	0.19	0.11
Nitrate (N)	mg/L	0.05	0.05	--	13000	0.18	--	--	0.21	0.16	--	0.2	--	--	0.20	0.09	0.10	0.18	0.14	0.19	0.11
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.04	0.03	<0.03	0.03	0.03	<0.03	<0.03
Total Organic Carbon	mg/L	0.5	0.5	--	--	2.4	2.9	4.7	3.3	3.2	3.1	3.4	5.9	5.5	5.4	2.9	5.2	4.4	4.1	4.3	4.6
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
pH (Lab)	pH	N/A	N/A	5.0-9.0	6.5-9	6.94	6.65	6.68	6.91	7.00	6.79	6.52	6.51	6.52	6.7	7.2	6.9	6.78	6.93	6.85	6.72
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	9.2	8.5	7.2	7.72	8.66	8.30	7.65	4.82	5.31	6.8	8.4	6.3	7.5	6.6	6.5	8.1
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	1.5	1.4	1.2	1.42	1.36	1.30	1.29	0.86	1.06	1.1	1.5	1.5	1.1	1.2	1.2	1.6
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	<0.02	<0.02	<0.002	0.009	0.007	0.005	0.008	0.012	0.009	0.037	0.043	0.007	0.007	0.011	0.008	0.011
Total Potassium (K)	mg/L	0.1	0.1	--	--	1.1	0.9	1.3	0.876	0.888	0.901	0.788	0.773	0.871	0.7	0.9	0.9	0.8	0.7	1.1	0.9
Total Sodium (Na)	mg/L	0.1	0.1	--	--	51	46	37	31.8	35.2	33.8	43.7	22.8	19.8	40.1	42.0	29.8	35.8	26.2	31.6	50.2
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	2.6	2.2	2.3	2.9	2.7	2.9	2.8	1.9	2.3	2.4	1.3	2.2	2.5	1.8	2.2	2.0
Total Suspended Solids	mg/L	2	5	--	--	1	1	<1	4	17	3	2	2	3	<5	<5	<5	<5	<5	5	<5
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	14	13	12	11	11	11	12	10	8	8	9	9	11	9	9	12
Turbidity (NTU)	NTU	0.1	0.1	50	--	0.7	0.8	1.0	1.3	0.6	1	1	1	0.9	2.4	0.8	1.3	1.6	3.3	0.5	2.9
Conductivity (uS/cm)	µS/cm	1	1	--	--	310	290	250	240	240	230	290	180	140	246	274	196	259	241	212	290
Calculated Parameters																					
Anion Sum	me/L	N/A	N/A	--	--	2.72	2.52	2.23	2.12	2.08	1.91	2.33	1.66	1.27	2.52	2.31	1.60	2.10	1.86	1.71	3.11
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	6	8	8	7	8	6	<1	9	7	24	7	<5	<5	<5	8	30
Calculated TDS	mg/L	1	1	--	--	166	151	131	123	125	118	143	92	77	139	137	98	124	104	103	172
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	2.85	2.57	2.12	1.92	2.10	2.02	2.42	1.33	1.25	2.24	2.41	1.79	2.08	1.61	1.84	2.77
Hardness (CaCO3)	mg/L	1	N/A	--	--	29	27	23	25	27	26	24	16	18	21.5	27.2	21.9	23.3	21.4	21.2	26.8
Ion Balance (% Difference)	%	N/A	N/A	--	--	2.33	0.98	2.53	4.95	0.48	2.80	1.89	11.00	0.79	5.9	2.1	5.3	0.7	7.3	3.4	5.8
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	-2.68	-2.87	-2.94	-2.72	-2.51	-2.87	NC	-3.18	-3.21	-2.69	-2.63	-3.19	-3.24	-3.14	-3.02	-2.51
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	-2.93	-3.12	-3.19	-2.97	-2.76	-3.12	NC	-3.43	-3.46	-3.01	-2.95	-3.51	-3.56	-3.46	-3.34	-2.83
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	9.62	9.52	9.62	9.63	9.51	9.66	NC	9.69	9.73	9.39	9.83	10.10	10.0	10.1	9.87	9.23
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	9.87	9.77	9.87	9.88	9.76	9.91	NC	9.94	9.98	9.71	10.2	10.4	10.3	10.4	10.2	9.55
Metals (ICP-MS)																					
Total Aluminum (Al)	µg/L	5	5	--	5-100	**230**	--	--	**289**	47.8	--	**338**	--	--	**321**	43	**168**	**191**	**120**	56	**229**
Total Antimony (Sb)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	1	5	--	--	16	--	--	18.5	15.9	--	13	--	--	12	15	9	12	7	16	14
Total Beryllium (Be)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	5	--	1500	8	--	--	11.4	9.1	--	<50	--	--	<5	11	33	6	10	9	7
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	<0.3	--	--	**0.053**	<0.017	--	**0.056**	--	--	**0.032**	**0.027**	**0.021**	**0.020**	<0.017	0.017	**0.037**
Total Chromium (Cr)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	**6**
Total Cobalt (Co)	µg/L	0.4	1	--	--	1	--	--	0.54	<0.40	--	0.79	--	--	<1	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	<2	--	--	**5.8**	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<1	1	1
Total Iron (Fe)	µg/L	50	50	--	300	130	--	--	**313**	62	125	177	162	**384**	229	137	195	207	132	92	147
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	<0.5	--	--	**10.3**	<0.50	--	<0.50	--	--	<0.5	<0.5	1.9	<0.5	<0.5	<0.5	5.1
Total Manganese (Mn)	µg/L	2	2	--	--	100	--	--	79.2	57.1	59	78.4	52.3	55.8	48	65	68	73	48	24	48
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	5	--	--	3.2	<2.0	--	3.2	--	--	<2	<2	2	2	<2	<2	3
Total Selenium (Se)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	2	5	--	--	46	--	--	39.1	37.7	--	36	--	--	32	41	32	37	33	30	40
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	2	--	--	11	--	--	6.4	<2.0	--	5.4	--	--	8	<2	3	4	2	<2	2
Total Uranium (U)	µg/L	0.1	0.1	--	15	0.1	--	--	0.11	<0.10	--	0.12	--	--	0.1	<0.1	0.1	0.1	0.1	<0.1	0.1
Total Vanadium (V)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	5	--	30	27	--	--	14.4	7.5	11.1	12.1	13.3	9.7	5	<5	11	11	6	5	14
MICROBIOLOGICAL																					
Total Coliform	MPN/100mL	1	1	--	--	200	65	--	>250	63	>250	91	>250	--	2420	>2420	1120	1200	866	488	525
E. coli	MPN/100mL	100	1	400	--	39	24	--	9	15	37	8	>250	<100	41	11	17	48	2	7	<1
Fecal Coliform	MPN/ml	1	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	0.53	0.79	1.11	1.73	1.47	0.99	0.76	1.44	1.36	0.62	2.3	1.54	1.22	1.40	1.19	0.40
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	0.48	0.69	1.17	1.61	1.42	0.81	0.69	1.15	1.14	0.63	2.3	2.16	1.40	1.40	1.19	1.32
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	0.9	3.1	0.4	--	0.7	<0.4	1.1

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)
CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

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TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2014	Units	RDL	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Kearney Lake															
Sample Sites						KL2															
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/14	2012/10/10	2013/05/15	2013/08/15	2013/10/16	2014/05/14
Sampling Time	hh:mm	--				11:00	10:30	10:45	10:15	12:25	10:50	09:30	14:00	13:15	9:50	10:30	10:20	09:10	16:10	14:30	10:45
FIELD DATA																					
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	0.1	--	--	16.8	18.2	15.4	13.5	20.4	8.0	9.9	19.1	14.1	7.6	21.8	12.3	10.1	22.9	9.7	11.7
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	**10.16**	8.50	5.70	6.28	**4.66**	**9.58**	**9.66**	7.06	8.43	6.47	5.82	7.63	9.37	6.38	7.40	**14.90**
pH	pH	N/A	N/A	--	--	6.33	6.35	6.19	6.61	6.96	6.25	6.77	5.90	5.62	7.72	6.41	6.29	5.75	7.47	5.57	6.60
Specific Conductance	uS/cm	1	1	--	--	46	106	89	199	104	75	80	67	54	58	96.6	61.1	77.9	65.3	64.5	188.0
INORGANICS																					
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	8	8	8	8	7	<5	<5	7	<5	20	<5	8	<5	<5	<5	29
Dissolved Chloride (Cl)	mg/L	1	1	--	120	48	48	48	48	25	17	19	14	10	16	20	12	19	21	14	20
Colour	TCU	30	5	--	--	20	20	20	20	63	95	80	110	120	52	60	94	37	90	71	25
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	0.19	0.19	0.19	0.19	0.07	0.06	0.12	0.07	<0.05	0.11	0.08	<0.05	0.12	<0.05	<0.05	0.08
Nitrate (N)	mg/L	0.05	0.05	--	13000	0.19	0.19	0.19	0.19	0.07	--	0.12	--	--	0.11	0.08	<0.05	0.12	<0.05	<0.05	0.08
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.05	<0.05	<0.05	<0.05	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03	<0.03	<0.03	0.04	<0.03	<0.03
Total Organic Carbon	mg/L	0.5	0.5	--	--	4.3	4.3	4.3	4.3	6.6	9.7	6.5	10	12	8.1	7.1	10.9	7.5	11.1	10.9	6.2
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.09	<0.01	<0.01	<0.01	<0.01	<0.01
pH (Lab)	pH	N/A	N/A	5.0-9.0	6.5-9	6.85	6.85	6.85	6.85	6.78	**6.11**	**6.27**	**6.4**	**6.05**	6.5	6.7	6.5	**6.37**	6.62	**6.34**	6.53
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	6.5	6.5	6.5	6.5	4.08	3.55	2.51	2.48	2.21	2.4	3.6	2.9	2.7	2.5	2.4	3.4
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	1.2	1.2	1.2	1.2	0.98	0.84	0.63	0.64	0.36	0.7	1.0	1.0	0.7	0.5	0.8	1.1
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	0.02	0.02	0.02	0.02	0.009	0.009	0.009	0.008	0.013	0.021	0.059	0.013	0.010	0.020	0.029	0.013
Total Potassium (K)	mg/L	0.1	0.1	--	--	1.1	1.1	1.1	1.1	0.634	0.826	0.534	0.497	0.734	0.5	0.7	0.8	0.5	0.5	0.7	0.7
Total Sodium (Na)	mg/L	0.1	0.1	--	--	31.6	31.6	31.6	31.6	14.7	10.6	11.1	7.8	6.9	9.8	14.2	9.5	8.9	7.0	7.9	17.5
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	2.2	2.2	2.2	2.2	4.2	4.7	2.7	4.3	4	2.6	4.0	4.9	2.8	4.4	4.9	2.4
Total Suspended Solids	mg/L	2	5	--	--	103	103	103	103	7	<1	<1	<2	<1	<5	<5	<5	<5	135	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	9	9	9	9	<2	<2	<2	<2	<2	3	3	2	4	5	4	4
Turbidity (NTU)	NTU	0.1	0.1	50	--	0.5	0.5	0.5	0.5	1.0	1.0	0.4	0.7	0.6	0.5	1.1	1.0	1.9	2.2	1.0	0.9
Conductivity (uS/cm)	µS/cm	1	1	--	--	212	212	212	212	100	97	79	66	54	71	91	61	83	69	62	87
Calculated Parameters																					
Anion Sum	me/L	N/A	N/A	--	--	0.49	0.82	0.45	0.77	0.85	0.49	0.53	0.53	0.28	0.92	0.63	0.54	0.63	0.70	0.48	1.23
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	<1	8	<1	5	7	<1	<1	7	<1	20	<5	8	<5	<5	<5	29
Calculated TDS	mg/L	1	1	--	--	36	55	35	46	55	38	37	34	25	45	44	34	37	37	31	65
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	0.71	0.99	0.67	0.74	0.95	0.74	0.68	0.55	0.49	0.65	0.94	0.73	0.63	0.54	0.60	1.07
Hardness (CaCO3)	mg/L	1	N/A	--	--	10	15	10	12	14	12	9	9	8	8.9	13.1	11.4	9.6	8.3	9.3	13.0
Ion Balance (% Difference)	%	N/A	N/A	--	--	18.30	9.39	19.60	1.99	5.56	20.30	12.40	1.85	27.30	17.6	19.7	15.1	0.3	12.9	11.0	7.1
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	NC	-3.20	NC	-3.44	-3.05	NC	NC	-3.66	NC	-3.37	-3.60	-3.68	-4.05	-3.83	-4.12	-3.04
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	NC	-3.45	NC	-3.70	-3.30	NC	NC	-3.91	NC	-3.69	-3.92	-4.00	-4.37	-4.15	-4.44	-3.36
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	NC	9.78	NC	10.00	9.83	NC	NC	10.10	NC	9.87	10.3	10.2	10.4	10.5	10.5	9.57
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	NC	10.00	NC	10.30	10.10	NC	NC	10.30	NC	10.2	10.6	10.5	10.7	10.8	10.8	9.89
Metals (ICP-MS)																					
Total Aluminum (Al)	µg/L	5	5	--	5-100	**290**	--	--	**175**	**151**	--	**271**	--	--	**209**	**205**	**338**	**256**	**270**	**259**	**205**
Total Antimony (Sb)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	1	5	--	--	9	--	--	11.7	14.3	--	9.5	--	--	9	11	10	8	<5	13	13
Total Beryllium (Be)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	5	--	1500	8	--	--	14.7	12.7	--	<50	--	--	6	14	22	6	11	9	11
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	<0.3	--	--	**0.018**	<0.017	--	<0.017	--	--	<0.017	<0.017	<0.017	<0.017	<0.017	**0.019**	<0.017
Total Chromium (Cr)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	**9**
Total Cobalt (Co)	µg/L	0.4	1	--	--	<1	--	--	<0.40	<0.40	--	<0.40	--	--	<1	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	<2	--	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<1	2	<1
Total Iron (Fe)	µg/L	50	50	--	300	250	--	--	227	**403**	238	202	**418**	**358**	154	**541**	**813**	269	**528**	**523**	174
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	<0.5	--	--	1.01	<0.50	--	<0.50	--	--	<0.5	<0.5	1.1	<0.5	0.5	<0.5	5.8
Total Manganese (Mn)	µg/L	2	2	--	--	26	--	--	43.2	83.3	34.7	12.1	68.4	22.6	17	90	114	24	67	53	33
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Selenium (Se)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	**0.42**	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	2	5	--	--	14	--	--	17.8	19.5	--	11.9	--	--	10	18	15	12	9	12	16
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	3	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	2	--	--	2	--	--	<2.0	<2.0	--	2.8	--	--	<2	2	3	4	<2	2	2
Total Uranium (U)	µg/L	0.1	0.1	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Vanadium (V)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	5	--	30	8	--	--	5.4	5.3	6.5	<5.0	<5.0	<5.0	<5	<5	7	<5	<5	<5	<5
MICROBIOLOGICAL																					
Total Coliform	MPN/100mL	1	1	--	--	1800	170	--	>250	11	>250	59	>250	--	>2420	1986	>2420	>2420	>2420	>2420	525
E. coli	MPN/100mL	100	1	400	--	**1500**	100	--	**>250**	6	6	2	>250	<100	3	7	3	12	6	2	<1
Fecal Coliform	MPN/ml	1	--	400	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	0.13
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	0.82	6.05	1.97	0.73	0.55	0.22	0.44	0.89	0.97	0.53	2.2	0.07	0.62	1.00	0.73	0.13
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	0.87	5.97	1.95	0.66	0.54	0.21	0.42	0.73	0.82	0.56	2.2	0.12	0.72	1.00	0.74	0.14
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	<0.4	2.2	0.7	--	1.1	<0.4	<0.4

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
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Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

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TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2014	Units	RDL	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Kearney Lake															
Sample Sites						KL3															
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012-08.14	2012/10/10	2013/05/15	2013/08/16	2013/10/16	2014/05/14
Sampling Time	hh:mm	--				09:00	11:00	09:30	11:30	14:12	11:40	10:30	12:20	12:00	10:26	12:20	11:20	9:50	10:00	14:00	11:00
FIELD DATA																					
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	0.1	--	--	14.0	21.6	17.3	14.7	23.1	9.9	10.3	21.1	15.5	9	24.5	15.6	11.7	21.5	13.6	11.0
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	**10.79**	8.00	8.00	9.26	7.83	**10.35**	**11.06**	8.42	**9.60**	8.89	8.17	7.72	**10.20**	9.20	8.90	5.90
pH	pH	N/A	N/A	--	--	7.27	6.74	6.97	7.27	7.33	6.76	6.83	6.96	6.30	7.68	6.85	6.51	5.86	7.25	6.49	6.55
Specific Conductance	uS/cm	1	1	--	--	95	282	246	220	228	199	220	175	161	204	225	177.2	207.3	194.4	210.6	405.0
INORGANICS																					
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	<5	7	7	6	7	7	6	7	7	23	6	5	<5	5	7	15
Dissolved Chloride (Cl)	mg/L	1	1	--	120	66	63	60	55	55	53	56	43	37	50	57	46	54	40	46	58
Colour	TCU	30	5	--	--	22	20	20	28	12	20	31	38	40	57	15	31	19	23	20	16
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	0.14	0.12	0.14	0.24	0.15	0.22	0.24	0.15	0.16	0.19	0.09	0.09	0.21	0.11	<0.05	0.17
Nitrate (N)	mg/L	0.05	0.05	--	13000	0.14	--	--	0.24	0.15	--	0.24	--	--	0.19	0.09	0.09	0.21	0.11	<0.05	0.17
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	0.04	<0.03	<0.03	<0.03	<0.03	<0.03
Total Organic Carbon	mg/L	0.5	0.5	--	--	2.6	3.9	4.3	3.6	3.1	3.3	3.8	5.1	5	5.9	3.4	4.9	4.3	4.4	4.6	4.6
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (Lab)	pH	N/A	N/A	5.0-9.0	6.5-9	**6.38**	6.67	6.82	6.82	6.99	6.87	6.52	6.5	**6.38**	6.7	7.1	6.9	6.68	6.96	6.86	6.68
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	6.7	7.1	6.8	6.81	7.98	8.29	7.09	4.73	5.63	5.7	6.9	6.0	7.0	5.3	6.8	6.4
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	1.2	1.2	1.11	1.22	1.28	1.27	1.21	0.83	1.01	1.0	1.2	1.3	1.0	0.9	1.3	1.4
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	<0.02	<0.02	0.005	0.005	<0.002	0.003	0.008	0.003	0.012	0.019	0.045	0.007	0.006	0.006	0.012	0.009
Total Potassium (K)	mg/L	0.1	0.1	--	--	0.9	1.1	0.9	0.791	0.837	0.990	0.879	0.681	0.921	0.7	0.9	0.9	0.8	0.6	1.2	0.8
Total Sodium (Na)	mg/L	0.1	0.1	--	--	38	38	35	28.3	33.1	33.0	33.0	20.8	21.3	31.2	34.5	26.37	35.1	20.1	32.1	36.4
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	2.7	2.6	2.6	3.2	2.9	3.2	2.9	2.5	2.6	2.7	2.0	2.6	2.9	2.6	2.7	2.6
Total Suspended Solids	mg/L	2	5	--	--	<1	1	1	2	<2	<1	<1	<1	<1	<5	<5	<5	<5	<5	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	11	12	12	10	10	10	9	10	8	7	8	7	7	7	8	9
Turbidity (NTU)	NTU	0.1	0.1	50	--	0.7	1.4	0.6	0.3	0.5	0.6	0.6	0.6	0.4	0.8	0.7	1	0.7	2.4	0.4	0.4
Conductivity (uS/cm)	µS/cm	1	1	--	--	250	250	240	220	220	220	220	170	160	197	222	182	219	216	204	218
Calculated Parameters																					
Anion Sum	me/L	N/A	N/A	--	--	2.11	2.17	2.08	1.90	1.93	1.87	1.90	1.58	1.36	2.03	1.90	1.55	1.68	1.38	1.60	2.14
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	<1	7	7	6	7	7	6	7	7	23	6	5	<5	5	7	15
Calculated TDS	mg/L	1	1	--	--	128	130	123	110	117	116	115	88	82	111	113	91	106	78	100	122
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	2.12	2.16	1.99	1.69	1.97	1.98	1.92	1.23	1.32	1.77	1.98	1.60	2.00	1.24	1.89	2.07
Hardness (CaCO3)	mg/L	1	N/A	--	--	22	23	22	22	25	26	23	15	18	18.4	22.2	20.3	21.6	16.9	22.3	21.7
Ion Balance (% Difference)	%	N/A	N/A	--	--	0.24	0.23	2.21	5.85	1.03	2.86	0.52	12.50	1.49	6.8	2.1	1.6	8.6	5.5	8.3	1.5
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	NC	-3.00	-2.89	-2.92	-2.60	-2.73	-3.23	-3.33	-3.35	-2.77	-2.88	-3.21	-3.37	-3.19	-3.05	-2.93
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	NC	-3.25	-3.14	-3.17	-2.85	-2.99	-3.49	-3.58	-3.60	-3.09	-3.20	-3.53	-3.69	-3.51	-3.37	-3.25
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	NC	9.67	9.71	9.74	9.59	9.60	9.75	9.83	9.73	9.47	9.98	10.10	10.0	10.2	9.91	9.61
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	NC	9.92	9.96	9.99	9.84	9.86	10.00	10.10	9.98	9.79	10.3	10.4	10.4	10.5	10.2	9.93
Metals (ICP-MS)																					
Total Aluminum (Al)	µg/L	5	5	--	5-100	259	259	--	**124**	53.5	--	**266**	--	--	**199**	54	**153**	**140**	65	100	**260**
Total Antimony (Sb)	µg/L	1	2	--	--	<2	<2	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	<2	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	1	5	--	--	13	13	--	15.7	13.2	--	19.1	--	--	18	17	15	19	9	18	17
Total Beryllium (Be)	µg/L	1	2	--	--	<2	<2	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	<2	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	5	--	1500	9	9	--	7.8	8.7	--	<50	--	--	5	9	17	7	7	10	8
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	0.019	0.019	--	**0.030**	<0.017	--	**0.046**	--	--	**0.019**	**0.021**	**0.027**	**0.028**	<0.017	<0.017	**0.038**
Total Chromium (Cr)	µg/L	1	1	--	1	<1	<1	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	**7**
Total Cobalt (Co)	µg/L	0.4	1	--	--	<1	<1	--	<0.40	<0.40	--	<0.40	--	--	<1	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	2	2	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<1	1	1
Total Iron (Fe)	µg/L	50	50	--	300	523	523	--	73	133	58	136	104	154	137	136	119	131	71	172	137
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	<0.5	<0.5	--	0.60	<0.50	--	<0.50	--	--	<0.5	<0.5	0.7	<0.5	<0.5	0.9	3.6
Total Manganese (Mn)	µg/L	2	2	--	--	53	53	--	36.8	67.1	32.1	41.5	33.1	32.5	25	47	46	37	20	92	41
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	<2	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	<2	<2	--	2.0	<2.0	--	2.3	--	--	<2	<2	<2	<2	<2	<2	2
Total Selenium (Se)	µg/L	1	1	--	1	<1	<1	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.1	<0.1	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	2	5	--	--	12	12	--	33.5	35.9	--	33.2	--	--	25	33	29	33	18	32	31
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	<0.1	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	2	--	--	<2	<2	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	2	--	--	2	2	--	<2.0	<2.0	--	4.9	--	--	<2	<2	<2	<2	<2	2	3
Total Uranium (U)	µg/L	0.1	0.1	--	15	<0.1	<0.1	--	<0.10	<0.10	--	0.11	--	--	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Vanadium (V)	µg/L	2	2	--	--	<2	<2	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	5	--	30	<5	<5	--	9.7	6.9	6.4	9.3	6.6	9.2	<5	<5	8	10	5	7	10
MICROBIOLOGICAL																					
Total Coliform	MPN/100mL	1	1	--	--	120	24	--	190	16	58	72	110	--	291	1553	178	345	2420	1300	86
E. coli	MPN/100mL	100	1	400	--	1	17	--	2	<1	8	5	37	<100	2	<1	3	8	21	<1	<1
Fecal Coliform	MPN/ml	1	--	400	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	1.04	1.11	1.18	1.30	1.14	0.51	0.78	1.26	1.24	0.52	1.3	0.81	1.44	2.00	0.65	0.76
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	0.94	0.97	1.21	1.09	1.19	0.42	0.67	0.98	1.01	0.55	1.2	1.14	1.62	2.30	0.61	0.69
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	<0.4	2.8	<0.4	--	1.3	<0.4	0.6

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)
CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2014	Units	RDL	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Kearney Lake																							
Sample Sites						KL4																KL5							
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/14	2012/10/10	2013/05/15	2013/08/16	2013/10/16	2014/05/14	2011-10-17	2012/05/01	2012/08/14	2012/10/10	2013/05/15	2013/08/16	2013/10/16	2014/05/14
Sampling Time	hh:mm	--				10:00	11:30	10:00	11:20	13:50	11:15	10:10	11:40	11:40	10:16	12:00	11:40	9:41	10:30	14:20	11:15	9:40	10:52	13:10	12:10	10:03	10:50	13:45	11:30
FIELD DATA																													
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	0.1	--	--	13.4	21.9	17.3	14.5	21.9	9.8	10.1	21.2	15.3	9.0	24.4	15.7	11.7	20.4	13.5	11.0	14.7	10.5	26.1	16.6	13.3	22.7	14.7	13.7
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	**10.87**	8.10	8.30	9.01	6.27	**10.89**	**10.99**	**8.55**	**9.65**	8.70	7.32	8.87	**10.09**	8.89	**9.60**	**14.50**	9.38	7.88	7.90	8.16	**9.67**	8.89	8.60	**15.83**
pH	pH	N/A	N/A	--	--	8.00	6.71	6.94	7.19	6.98	6.07	6.49	6.43	6.02	9.0	6.71	6.77	5.72	7.08	6.41	6.30	6.52	7.76	6.69	6.72	6.20	8.57	6.51	6.79
Specific Conductance	uS/cm	1	1	--	--	771	262	247	224	226	215	218	172	126	206	225	185.9	207.1	196.2	209.0	273.0	112	230	229	189.0	219.5	202.1	212.9	472.0
INORGANICS																													
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	5	7	7	6	8	7	5	8	7	22	8	<5	<5	<5	<5	30	9	21	8	<5	<5	6	5	32
Dissolved Chloride (Cl)	mg/L	1	1	--	120	67	65	60	56	56	53	56	44	37	51	57	46	54	41	47	59	37	55	57	48	58	44	46	61
Colour	TCU	30	5	--	--	22	18	20	27	11	20	32	38	43	48	11	20	17	21	20	13	35	43	10	27	10	22	18	14
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	0.15	0.12	0.14	0.23	0.19	0.21	0.23	0.15	0.17	0.19	0.11	0.09	0.20	0.11	0.17	0.25	0.17	0.19	0.15	0.83	0.21	0.21	0.25	0.16
Nitrate (N)	mg/L	0.05	0.05	--	13000	0.15	--	--	0.23	0.19	--	0.23	--	--	0.19	0.11	0.09	0.20	0.11	0.17	0.25	--	0.19	0.15	0.83	0.21	0.21	0.20	0.16
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	0.05	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.03	0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Total Organic Carbon	mg/L	0.5	0.5	--	--	2.5	2.6	4.0	3.3	2.6	3.1	3.7	6	5.4	7.5	3.2	4.8	4.2	4.5	4.3	4.4	4.8	5.8	3.4	4.7	4.0	4.6	7.0	4.3
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (Lab)	pH	N/A	N/A	5.0-9.0	6.5-9	6.61	6.75	6.83	6.83	6.93	6.83	6.57	6.57	**6.46**	6.7	7.0	6.9	6.69	6.96	6.85	6.69	6.57	6.7	7.1	6.5	6.71	6.93	6.89	6.64
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	6.8	7.7	7.0	6.81	8.00	8.45	6.84	4.93	5.24	5.7	6.8	5.8	6.8	5.1	6.8	6.4	5.79	6.1	6.6	5.9	7.1	5.7	6.4	6.5
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	1.2	1.3	1.2	1.22	1.24	1.31	1.19	0.86	0.99	1.0	1.2	1.2	1.0	0.8	1.2	1.3	1.05	1.0	1.1	1.2	1.0	1.0	1.1	1.4
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	<0.02	<0.02	<0.002	0.004	<0.002	<0.002	0.007	0.003	0.026	0.022	0.043	0.007	0.006	2.39	0.016	0.022	0.009	0.018	0.040	0.006	0.005	0.013	0.010	0.010
Total Potassium (K)	mg/L	0.1	0.1	--	--	1	1	1	0.807	0.905	0.968	0.826	0.733	1.130	0.7	1.0	0.9	0.8	0.6	1.2	0.8	0.858	0.7	0.9	0.8	0.8	0.7	1.1	0.8
Total Sodium (Na)	mg/L	0.1	0.1	--	--	39	41	37	28.5	34.3	33.9	32.1	21.5	21.1	31.5	34.5	25.2	31.6	20.1	30.7	35.9	22.0	34.6	32.0	27.7	33.6	19.2	31.3	37.5
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	2.7	2.6	2.6	3.1	2.9	3.1	2.9	2.5	2.7	2.7	2.2	2.6	3.0	2.6	2.5	2.6	2.5	2.7	2.0	2.4	2.7	2.5	2.5	2.7
Total Suspended Solids	mg/L	2	5	--	--	<1	1	<1	<2	<2	<1	2	<1	<2	<5	<5	<5	<5	<5	<5	<5	1	<5	<5	<5	<5	<5	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	11	12	11	10	10	10	9	10	8	7	8	7	7	7	9	9	9	7	8	8	8	7	8	9
Turbidity (NTU)	NTU	0.1	0.1	50	--	0.5	1.0	0.3	0.3	0.2	0.8	0.7	0.7	0.4	0.7	0.4	0.8	0.7	2.6	2.1	1.1	0.9	1.1	0.7	0.9	0.7	0.8	0.4	1.1
Conductivity (uS/cm)	µS/cm	1	1	--	--	260	250	230	220	230	250	210	170	160	200	224	183	218	218	204	219	160	215	226	189	232	223	204	228
Calculated Parameters																													
Anion Sum	me/L	N/A	N/A	--	--	2.23	2.22	2.09	1.91	1.94	1.85	1.88	1.62	1.36	2.04	1.94	1.45	1.68	1.31	1.53	2.47	1.42	2.13	1.95	1.58	1.82	1.52	1.58	2.56
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	5	7	7	6	8	7	5	8	7	22	8	<5	<5	<5	<5	30	9	21	8	<5	<5	6	5	32
Calculated TDS	mg/L	1	1	--	--	132	135	125	111	118	116	113	90	81	111	114	87	103	75	97	132	84	118	111	96	110	82	98	136
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10	<1	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	2.16	2.32	2.07	1.70	2.02	2.03	1.86	1.28	1.3	1.78	1.97	1.53	1.84	1.23	1.84	2.04	1.36	1.94	1.85	1.64	1.94	1.23	1.81	2.12
Hardness (CaCO3)	mg/L	1	N/A	--	--	22	25	22	22	25	27	22	16	17	18.4	21.9	19.4	21.1	16.0	21.9	21.3	19	19.3	21.0	19.7	21.8	18.4	20.5	22.0
Ion Balance (% Difference)	%	N/A	N/A	--	--	1.59	2.20	0.48	5.82	2.02	4.64	0.53	11.70	2.26	6.6	0.8	2.8	4.5	3.2	9.2	9.5	2.16	4.7	2.6	2.0	3.2	10.6	6.7	9.4
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	-3.21	-2.89	-2.84	-2.92	-2.64	-2.75	-3.22	-3.18	-3.31	-2.79	-2.86	-3.22	-3.37	-3.21	-3.21	-2.63	-3.06	-2.79	-2.77	-3.62	-3.33	-3.11	-3.19	-2.64
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	-3.46	-3.14	-3.09	-3.17	-2.89	-3.00	-3.47	-3.43	-3.56	-3.11	-3.18	-3.54	-3.69	-3.53	-3.53	-2.95	-3.31	-3.11	-3.09	-3.94	-3.65	-3.43	-3.51	-2.96
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	9.82	9.64	9.67	9.75	9.57	9.58	9.79	9.75	9.77	9.49	9.86	10.10	10.1	10.2	10.1	9.32	9.63	9.49	9.87	10.1	10.0	10.0	10.1	9.28
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	10.1	9.9	9.9	10.0	9.8	9.8	10.0	10.0	10.0	9.8	10.2	10.4	10.4	10.5	10.4	9.64	9.88	9.81	10.2	10.4	10.4	10.4	10.4	9.60
Metals (ICP-MS)																													
Total Aluminum (Al)	µg/L	5	5	--	5-100	**150**	--	--	**125**	29.2	--	**231**	--	--	**188**	48	**149**	**141**	**106**	**159**	**236**	--	**222**	52	**154**	**136**	58	61	**224**
Total Antimony (Sb)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	1	5	--	--	16	--	--	16.6	17.8	--	18.2	--	--	18	17	16	18	10	19	17	--	18	16	15	19	9	16	16
Total Beryllium (Be)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	5	--	1500	6	--	--	8.6	9.1	--	<50	--	--	6	9	16	7	6	9	8	--	6	9	15	7	7	9	7
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	<0.3	--	--	**0.031**	<0.017	--	**0.035**	--	--	**0.021**	<0.017	**0.027**	**0.027**	0.017	**0.050**	**0.027**	--	**0.022**	**0.027**	**0.029**	**0.024**	<0.017	**0.034**	**0.036**
Total Chromium (Cr)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	6	<1	<1	<1	**6**	--	<1	<1	5	<1	<1	<1	**6**
Total Cobalt (Co)	µg/L	0.4	1	--	--	<1	--	--	<0.40	<0.40	--	<0.40	--	--	<1	<1	<1	<1	<1	<1	<1	--	<1	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	<2	--	--	<2.0	2.4	<2.0	2.3	<2.0	<2.0	<2	<2	4	**9**	<1	1	<1	<2.0	<2	<2	<2	<2	<1	1	<1
Total Iron (Fe)	µg/L	50	50	--	300	86	--	--	82	51	55	119	109	138	129	118	133	213	144	248	129	175	160	78	120	111	70	79	111
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	<0.5	--	--	3.23	<0.50	--	<0.50	--	--	<0.5	<0.5	0.8	0.9	<0.5	<0.5	2.6	--	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	1.9
Total Manganese (Mn)	µg/L	2	2	--	--	51	--	--	34.5	63.5	29.4	38.5	27.2	29.7	23	34	38	34	77	130	34	35.9	30	14	37	35	13	12	40
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	3	--	--	2.0	<2.0	--	<2.0	--	--	<2	<2	5	<2	<2	<2	<2	--	<2	<2	5	<2	<2	<2	2
Total Selenium (Se)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	<1	--	<1	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<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
Total Strontium (Sr)	µg/L	2	5	--	--	34	--	--	33.1	36.7	--	32.7	--	--	25	32	28	32	17	31	31	--	27	31	29	31	18	31	31
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<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
Total Tin (Sn)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	5	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	4.2	--	--	<2	<2	<2	<2	<2	3	2	--	3	<2	<2	<2	<2	<2	<2
Total Uranium (U)	µg/L	0.1	0.1	--	15	<0.1	--	--	<0.10	<0.10	--	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
Total Vanadium (V)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	5	--	30	14	--	--	10.4	6.9	7	11.3	7.4	7	<5	<5	**68**	21	<5	9	9	9.3	5	<5	**64**	11	7	5	10
MICROBIOLOGICAL																													
Total Coliform	MPN/100mL	1	1	--	--	28	58	--	100	16	75	83	95	--	345	>2420	921	548	>2420	770	308	--	461	613	93	461	308	461	42
E. coli	MPN/100mL	100	1	400	--	4	33	--	1	<1	2	5	39	<100	4	<1	4	6	38	<1	<1	100	14	2	6	6	6	4	<1
Fecal Coliform	MPN/ml	1	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	0.78	1.11	1.06	0.92	0.07	0.50	0.60	1.04	1.31	0.52	0.7	0.55	1.34	1.50	0.40	0.44	0.91	0.30	1.2	1.09	1.44	2.20	0.64	0.20
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	0.69	0.96	1.11	0.77	0.07	0.41	0.55	0.82	1.07	0.55	0.7	0.74	1.48	1.70	0.39	0.40	0.85	0.33	1.0	1.41	1.59	2.40	0.62	0.20
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	0.5	<0.4	0.7	--	1.8	1.1	<0.4	--	<0.4	2.3	1.0	--	0.6	1.1	<0.4

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)
CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2014	Units	RDL	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Highway 102															
Sample Sites						HWY102-1															
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011-08-14	2011-10-16	2012-05-01	2012-08-15	2012-10-11	2013-05-15	2013/08/15	2013/10/16	2014/05/14
Sampling Time	hh:mm	--				07:00	12:45	08:00	13:00	10:20	09:00	13:40	11:00	11:00	14:50	11:00	9:50	14:15	12:22	12:30	12:00
FIELD DATA																					
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	0.1	--	--	11.8	18.8	15.7	14.9	19.6	7.4	11.4	17.8	14.6	10.7	21.8	13.6	11.7	19.5	8.9	12.06
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	**11.44**	5.80	**4.34**	8.18	**4.25**	6.05	8.15	**3.88**	**5.34**	5.65	**1.03**	**3.83**	7.55	**3.32**	**3.10**	**12.03**
pH	pH	N/A	N/A	--	--	7.98	5.35	5.25	6.31	5.26	5.62	5.75	5.77	5.99	8.76	5.73	6.38	6.19	7.10	6.79	6.02
Specific Conductance	uS/cm	1	1	--	--	194	153	104	135	106	109	114	108	89	288	225	155.5	226	173.2	234.0	880.0
INORGANICS																					
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	<5	<5	<5	<5	<5	<5	5	11	8	22	25	15	9	23	20	31
Dissolved Chloride (Cl)	mg/L	1	1	--	120	24	38	24	32	25	22	24	19	12	58	48	28	53	31	40	65
Colour	TCU	30	5	--	--	67	68	57	37	89	53	39	65	79	24	65	40	9	65	25	11
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	<0.05	<0.05	<0.05	0.69	<0.05	1.2	0.69	0.25	1.2	2.61	0.06	0.43	0.51	<0.05	<0.05	<0.05
Nitrate (N)	mg/L	0.05	0.05	--	13000	<0.05	--	--	0.69	<0.05	--	0.69	--	--	2.61	0.06	0.43	0.51	<0.05	<0.05	<0.05
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.05	0.29	<0.05	<0.05	<0.05	<0.05	0.05	0.1	0.07	0.31	0.19	0.04	<0.03	0.05	0.06	<0.03
Total Organic Carbon	mg/L	0.5	0.5	--	--	6.5	10	7.7	4.7	11	6.3	4.5	7.2	7.4	5.5	10.0	7.0	5.1	10.1	17.7	4.1
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (units)	pH	N/A	N/A	5.0-9.0	6.5-9	**4.54**	**5.24**	**5.40**	**5.48**	**6.24**	**5.31**	**6.42**	6.55	**6.28**	**6.4**	6.9	6.8	6.86	6.87	6.73	6.56
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	1.7	1.8	1.6	4.93	3.34	5.09	4.9	5.21	5.55	12.5	11.7	7.5	11.1	10.5	13.9	7.2
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	0.3	0.5	0.5	1.08	0.79	1.09	0.91	0.92	1.19	1.7	2.0	1.4	1.4	1.5	2.3	1.6
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	0.07	0.14	0.020	0.006	0.007	0.011	0.009	0.012	0.010	0.019	0.039	0.02	0.006	0.021	0.022	0.013
Total Potassium (K)	mg/L	0.1	0.1	--	--	0.5	1.2	0.7	1.140	1.630	1.310	1.100	1.500	1.880	1.6	2.5	1.5	1.3	1.7	2.4	1.2
Total Sodium (Na)	mg/L	0.1	0.1	--	--	15	25	13	15.9	14.5	14.6	14.8	10.2	8.26	36.3	27.7	14.6	30.8	15.0	20.5	39.1
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	2.5	2.2	2.0	1.1	3.8	5.1	2.8	5.2	4.6	4.1	6.1	5.1	3.1	5.1	5.8	1.7
Total Suspended Solids	mg/L	2	5	--	--	7	80	2	<2	11	<2	<1	1	<1	9	6	<5	<5	<5	<5	6
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	5	3	3	8	<2	8	10	8	10	14	8	9	12	8	12	10
Turbidity (NTU)	NTU	0.1	0.1	50	--	14.0	35	0.9	1.4	1.2	0.6	0.4	0.6	1.1	0.9	1.9	0.9	0.5	1.6	0.5	0.7
Conductivity (uS/cm)	µS/cm	1	1	--	--	100	140	92	130	100	110	110	100	88	263	231	143	243	188	218	252
Calculated Parameters																					
Anion Sum	me/L	N/A	N/A	--	--	0.77	1.12	0.73	1.11	0.71	0.88	1.03	0.95	0.80	2.55	2.02	1.31	1.96	1.50	1.78	2.66
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	<1	<1	<1	<1	<1	<1	5	11	8	22	25	15	9	23	20	31
Calculated TDS	mg/L	1	1	--	--	50	73	45	67	50	63	65	58	54	150	117	73	117	83	104	143
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	0.84	1.32	0.74	1.06	0.93	1.02	1.00	0.83	0.80	2.43	6.04	1.19	2.06	1.40	1.87	2.25
Hardness (CaCO3)	mg/L	1	N/A	--	--	6	6	6	17	12	17	16	17	19	38.2	37.5	24.5	33.5	32.4	44.2	24.6
Ion Balance (% Difference)	%	N/A	N/A	--	--	4.35	8.20	0.68	2.30	13.40	7.37	1.48	6.74	0.00	2.6	1.9	4.6	2.4	3.5	2.6	8.4
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	NC	NC	NC	NC	NC	NC	-3.50	-2.99	-3.36	-2.77	-2.23	-2.72	-2.73	-2.33	-2.41	-2.69
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	NC	NC	NC	NC	NC	NC	-3.75	-3.25	-3.61	-3.09	-2.55	-3.04	-3.05	-2.65	-2.73	-3.01
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	NC	NC	NC	NC	NC	NC	9.92	9.54	9.64	9.17	9.13	9.52	9.59	9.20	9.14	9.25
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	NC	NC	NC	NC	NC	NC	10.20	9.80	9.89	9.49	9.45	9.84	9.91	9.52	9.46	9.57
Metals (ICP-MS)																					
Total Aluminum (Al)	µg/L	5	5	--	5-100	**510**	--	--	**169**	**192**	--	**205**	--	--	**134**	**183**	**146**	86	**145**	**150**	**187**
Total Antimony (Sb)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	1	5	--	--	22	--	--	52.9	36.9	--	37.3	--	--	58	284	42	57	57	80	46
Total Beryllium (Be)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	5	--	1500	<5	--	--	11.4	10.9	--	<50	--	--	12	18	13	10	10	11	9
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	<0.3	--	--	**0.043**	<0.017	--	**0.023**	--	--	**0.034**	**0.021**	<0.017	<0.017	<0.017	**0.040**	**0.0228**
Total Chromium (Cr)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	<1
Total Cobalt (Co)	µg/L	0.4	1	--	--	<1	--	--	0.50	0.46	--	<0.40	--	--	<1	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	2	--	--	3.4	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	3	<2	<1	2	<1
Total Iron (Fe)	µg/L	50	50	--	300	**720**	--	--	146	**637**	150	107	209	219	102	**1380**	255	111	**938**	**446**	147
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	1.6	--	--	2.37	0.56	--	<0.50	--	--	<0.5	0.7	<0.5	<0.5	<0.5	0.6	2.6
Total Manganese (Mn)	µg/L	2	2	--	--	40	--	--	55.3	39.0	67.0	28.1	21.0	31.3	34	79	28	23	45	31	56
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Selenium (Se)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	2	5	--	--	11	--	--	29.1	19.7	--	24.3	--	--	48	58	36	52	47	62	38
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	2	--	--	6	--	--	<2.0	<2.0	--	3.5	--	--	<2	3	<2	<2	<2	4	2
Total Uranium (U)	µg/L	0.1	0.1	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Vanadium (V)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	5	--	30	21	--	--	16.4	6.9	6.9	<5.0	<5.0	6.9	<5	6	<5	<5	<5	10	10
MICROBIOLOGICAL																					
Total Coliform	MPN/100mL	1	1	--	--	84	>250	--	>250	>250	180	120	180	--	687	>2420	>2420	1550	>2420	1553	120
E. coli	MPN/100mL	100	1	400	--	54	**>250**	--	12	17	5	1	78	<100	3	68	145	4	9	5	3
Fecal Coliform	MPN/ml	1	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	15.40	19.29	0.70	18.12	1.61	8.45	0.93	0.58	0.69	0.53	2.59	0.81	1.27	14.70	1.99	0.25
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	17.50	19.60	0.84	17.62	1.68	7.52	0.84	0.56	0.65	0.59	2.89	1.05	1.45	15.80	2.20	0.82
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	1.1	1.3	0.6	--	0.6	0.6	0.7

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)

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CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)

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CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.

Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.

Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

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TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2014	Units	RDL	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Highway 102															
Sample Sites						HWY102-2															
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011-08-14	2011-10-16	2012-05-01	2012-08-15	2012-10-11	2013-05-15	2013-08-15	2013/10/16	2014/05/14
Sampling Time	hh:mm	--				12:30	12:15	12:30	12:40	09:30	12:30	11:20	15:00	15:30	11:20	12:20	10:35	10:40	10:00	10:22	12:15
FIELD DATA																					
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	0.1	--	--	16.7	19.2	16.4	17.2	17.0	8.7	10.8	24.2	15.1	7.8	23.7	14.3	11.5	22.0	10.7	11.4
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	**10.01**	5.90	**4.80**	**4.91**	**2.45**	**2.99**	6.92	7.03	**5.09**	**3.73**	**13.1**	**3.28**	6.30	**1.57**	**4.20**	**10.50**
pH	pH	N/A	N/A	--	--	6.57	5.71	5.40	6.33	5.86	5.64	6.22	5.89	5.29	7.3	6.37	6.72	6.01	6.92	5.40	5.40
Specific Conductance	uS/cm	1	1	--	--	37	457	162	415	167	101.2	92.2	123.1	96	225	226	159.1	288	188.5	204.4	204.4
INORGANICS																					
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	<5	<5	7	6	5	<5	<5	5	<5	17	7	<5	6	14	7	30
Dissolved Chloride (Cl)	mg/L	1	1	--	120	21	82	83	**170**	41	18	21	21	17	63	109	45	71	50	52	113
Colour	TCU	30	5	--	--	120	190	91	96	160	68	65	98	77	32	100	70	11	61	36	13
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	<0.05	<0.05	<0.05	0.10	<0.05	0.62	0.26	1.8	3.2	1.54	<0.05	0.14	0.17	<0.05	<0.05	<0.05
Nitrate (N)	mg/L	0.05	0.05	--	13000	<0.05	--	--	0.10	<0.05	--	0.26	--	--	1.54	<0.05	0.14	0.17	<0.05	<0.05	<0.05
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.05	0.06	<0.05	<0.05	0.20	<0.05	<0.05	0.30	0.08	0.09	<0.03	<0.03	<0.03	0.17	0.09	<0.03
Total Organic Carbon	mg/L	0.5	0.5	--	--	8.5	13	13	7.2	14	7.4	5.7	9.2	8.4	7.0	15.8	11.2	6.1	10.6	5.1	17.4
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (units)	pH	N/A	N/A	5.0-9.0	6.5-9	**5.43**	**5.96**	**6.30**	**6.05**	**6.32**	**5.47**	**5.93**	**6.18**	**5.92**	**5.9**	6.7	6.8	6.61	6.59	**6.34**	7.20
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	1.6	4.0	4.8	7.44	3.84	4.01	3.07	2.22	3.80	7.0	8.4	5.6	7.6	8.5	8.2	14.1
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	0.4	0.7	0.9	0.96	0.59	1.00	0.68	0.68	1.38	1.2	1.4	1.2	1.2	1.3	2.2	3.1
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	<0.02	0.04	0.034	0.010	0.028	0.003	0.009	0.019	0.041	0.021	0.054	0.03	0.014	0.028	0.199	,
Total Potassium (K)	mg/L	0.1	0.1	--	--	0.5	0.8	1.1	0.984	0.956	1.390	0.844	1.310	1.880	1.2	1.7	1.6	1.3	1.5	2.5	2.9
Total Sodium (Na)	mg/L	0.1	0.1	--	--	15	51	55	83.7	32.0	12.1	13.3	13.1	13.3	41.5	63.6	20.4	39.0	19.1	34.5	69.6
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	2.2	4.4	4.0	3.0	6.4	5.4	2.5	6.5	6.7	4.1	6.9	5.8	1.6	6.2	6.6	1.6
Total Suspended Solids	mg/L	2	5	--	--	<2	58	62	34	27	3	<1	10	14	<5	39	<5	<5	<5	194	34
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	<2	3	8	11	<2	7	5	5	8	12	6	10	10	9	10	12
Turbidity (NTU)	NTU	0.1	0.1	50	--	0.7	3.8	4.2	2.6	3.1	0.5	0.4	1.2 (1)	3.9	0.6	10.8	2	1.5	3.3	144	1.1
Conductivity (uS/cm)	µS/cm	1	1	--	--	85	290	310	590	160	94	91	100	110	263	403	179	295	203	223	433
Calculated Parameters																					
Anion Sum	me/L	N/A	N/A	--	--	0.60	2.37	2.62	5.13	1.27	0.70	0.73	0.91	0.86	2.48	3.34	1.49	2.34	1.88	1.81	4.04
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	<1	<1	7	6	5	<1	<1	5	<1	17	7	<5	6	14	7	30
Calculated TDS	mg/L	1	1	--	--	42	150	165	282	93	52	48	62	67	143	200	86	135	100	145	235
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	0.81	2.65	2.89	4.17	1.81	0.86	0.82	0.83	0.97	2.32	2.10	1.40	2.24	1.50	3.50	4.17
Hardness (CaCO3)	mg/L	1	N/A	--	--	6	13	16	23	12	14	11	8	15	22.4	26.7	18.9	23.9	26.6	29.5	48.0
Ion Balance (% Difference)	%	N/A	N/A	--	--	14.90	5.58	4.90	10.30	17.50	10.30	5.81	4.60	6.01	3.3	3.6	3.1	2.3	11.3	31.7	1.6
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	NC	NC	-3.57	-3.72	-3.70	NC	NC	-4.07	NC	-3.63	-3.15	-3.34	-3.33	-2.92	-3.50	-1.80
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	NC	NC	-3.82	-3.97	-3.95	NC	NC	-4.32	NC	-3.95	-3.47	-3.66	-3.65	-3.24	-3.82	-2.12
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	NC	NC	9.87	9.77	10.00	NC	NC	10.30	NC	9.53	9.85	10.10	9.94	9.51	9.84	9.00
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	NC	NC	10.10	10.00	10.30	NC	NC	10.50	NC	9.85	10.2	10.5	10.3	9.83	10.2	9.32
Metals (ICP-MS)																					
Total Aluminum (Al)	µg/L	5	5	--	5-100	270	--	--	189	368	--	260	--	--	145	**466**	**259**	**130**	**138**	**2760**	**400**
Total Antimony (Sb)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	--	--	<1.0	2.1	--	<1.0	--	--	<2	<2	<2	<2	<2	6	<2
Total Barium (Ba)	µg/L	1	5	--	--	20	--	--	53.1	27.7	--	26.6	--	--	49	74	33	44	43	213	381
Total Beryllium (Be)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	5	--	1500	<5	--	--	7.9	7.8	--	<50	--	--	10	17	15	9	10	13	11
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	<0.3	--	--	0.051	<0.017	--	<0.017	--	--	0.037	**0.031**	**0.032**	**0.019**	<0.017	**0.096**	**0.051**
Total Chromium (Cr)	µg/L	1	1	--	1	<2	--	--	<1.0	1.0	--	<1.0	--	--	<1	<1	<1	<1	1	**9**	**2**
Total Cobalt (Co)	µg/L	0.4	1	--	--	<1	--	--	0.66	0.77	--	<0.40	--	--	<1	1	1	<1	1	3	1
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	2	--	--	2.0	<2.0	<2.0	<2.0	2.5	2.8	<2	3	3	<2	1	**12**	4
Total Iron (Fe)	µg/L	50	50	--	300	**880**	--	--	**1380**	**3850**	**303**	229	**897**	**1110**	214	**5210**	**1550**	**383**	**1720**	**28400**	**1660**
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	1.9	--	--	1.61	2.70	--	0.59	--	--	<0.5	5.2	2.1	0.6	0.7	19.4	3.5
Total Manganese (Mn)	µg/L	2	2	--	--	110	--	--	387	135	52.9	40.5	106	176	78	219	207	83	173	327	212
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	4	2
Total Selenium (Se)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	2	5	--	--	11	--	--	37.4	21.1	--	16.9	--	--	33	45	31	39	40	45	75
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	2	--	--	4	--	--	<2.0	6.4	--	4.9	--	--	<2	10	4	4	<2	60	9
Total Uranium (U)	µg/L	0.1	0.1	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
Total Vanadium (V)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	2	<2	<2	<2	11	<2
Total Zinc (Zn)	µg/L	5	5	--	30	12	--	--	13.6	12.3	9.3	5.5	9	12.5	<5	7	12	12	<5	**46**	**36**
MICROBIOLOGICAL																					
Total Coliform	MPN/100mL	1	1	--	--	28	>250	--	>250	75	41	110	>250	--	1553	>2420	>2420	2420	1990	>2420	687
E. coli	MPN/100mL	100	1	400	--	4	230	--	9	5	<1	7	>250	<100	<1	16	50	111	9	4	<1
Fecal Coliform	MPN/ml	1	--	400	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	0.90	82.63	48.17	0.85	16.36	0.25	0.97	4.91	1.9	2.07	21.03	0.33	2.41	1.10	21.62	10.34
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	0.91	81.20	52.50	0.85	17.35	0.23	0.87	4.49	2.15	2.27	17.26	0.50	3.02	1.30	27.02	11.09
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	0.6	1.1	0.5	--	0.7	2.0	15.3

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)

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Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.

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TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2014	Units	RDL	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Lake Shore Drive															Larry Uteck Blvd								
Sample Sites						LSD															LU								
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011-08-14	2011-10-17	2012-05-01	2012-08-15	2012-10-11	2013-05-15	2013-08-15	2013/10/16	2014/05/15	2011-10-17	2012-05-01	2012-08-15	2012-10-11	2013-05-15	2013-08-15	2013/10/16	2014/05/15
Sampling Time	hh:mm	--				12:00	09:30	11:45	09:00	11:28	10:00	08:45	13:20	9:00	9:15	13:00	9:10	08:40	15:30	11:55	9:30	10:30	15:20	11:30	10:10	14:30	14:30	13:00	11:45
FIELD DATA																													
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	0.1	--	--	13.1	16.7	15.3	13.4	21.3	7.3	10.2	21.0	12.0	5.7	25.7	13.4	7.7	20.2	8.8	8.9	11.3	12.8	27.3	14.6	13.9	18.3	10.9	15.0
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	**10.84**	5.70	5.50	8.60	**5.41**	8.47	9.44	7.87	8.16	**4.06**	**2.69**	7.58	8.77	7.26	7.60	**14.78**	**4.24**	6.17	8.2	9.04	**10.15**	8.29	**4.50**	**11.96**
pH	pH	N/A	N/A	--	--	7.88	6.74	6.34	6.42	6.64	6.17	7.09	6.88	6.63	8.22	7.16	6.92	5.19	7.28	6.23	7.02	6.07	7.82	6.65	6.78	6.39	7.49	5.45	6.50
Specific Conductance	uS/cm	1	1	--	--	723	210	168	218	203	110	146	126	112	62	177.5	116.7	123.6	132.5	147.8	180.0	203	955	480	262	670	320	845.0	999.0
INORGANICS																													
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	13	16	12	13	21	9	9	15	12	21	14	11	8	20	11	35	12	14	14	14	6	22	7	30
Dissolved Chloride (Cl)	mg/L	1	1	--	120	41	34	31	49	45	25	38	27	22	22	33	23	39	32	23	29	34	**224**	116	52	**190**	99	**258**	**243**
Colour	TCU	30	5	--	--	32	27	37	20	26	33	32	41	49	13	20	40	10	21	25	9	94	18	14	18	7	7	19	6
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	0.14	0.14	0.06	0.23	0.10	0.12	0.25	0.17	0.09	0.13	0.80	<0.05	0.18	0.20	<0.05	0.09	0.61	1.00	0.64	1.89	1.11	2.57	0.34	1.22
Nitrate (N)	mg/L	0.05	0.05	--	13000	0.14	--	--	0.23	0.10	--	0.25	--	--	0.13	0.80	<0.05	0.18	0.20	<0.05	0.09	--	1.00	0.64	1.89	1.11	2.57	0.34	1.22
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	0.06	0.03	<0.03	<0.03	<0.03	0.03	0.03	0.04	0.06	0.04	0.16	<0.03	<0.03	0.04	0.04	0.05
Total Organic Carbon	mg/L	0.5	0.5	--	--	5.0	3.8	6.8	3.7	6.0	5.3	4.7	7.1	7.5	3.1	8.0	7.7	4.7	6.3	6.9	5.2	11.0	3.7	22.8	4.8	3.1	4.5	2.9	6.9
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (units)	pH	N/A	N/A	5.0-9.0	6.5-9	6.69	6.69	6.93	7.10	7.30	6.67	6.72	6.79	6.49	6.2	6.9	6.9	6.94	6.95	**6.49**	**6.47**	**6.43**	6.7	7.2	7.2	6.92	7.11	**6.49**	**6.42**
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	6.5	6.9	5.4	7.99	10.5	5.29	5.9	5.14	5.04	2.6	18.1	5.1	6.4	6.0	5.6	5.4	7.63	30.7	22.1	14.5	22.0	17.6	21.8	23.9
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	1.4	1.6	1.3	1.99	2.14	1.15	1.25	1.19	1.23	0.7	3.3	1.4	1.2	1.4	1.6	1.5	2.34	4.2	3.6	2.2	2.8	2.7	4.0	4.2
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	and 400	0.03	0.009	0.018	0.100	0.009	0.018	0.028	0.014	0.022	0.063	0.003	0.007	0.015	0.078	0.100	0.034	0.043	0.036	0.030	0.006	0.027	0.046	0.260
Total Potassium (K)	mg/L	0.1	0.1	--	--	1.2	1.1	1.3	1.180	1.210	1.030	1.070	0.960	1.240	0.6	1.9	1.3	1.2	1.1	1.4	1.1	2.110	3.2	3.6	2.5	2.6	2.8	2.9	3.1
Total Sodium (Na)	mg/L	0.1	0.1	--	--	24	21	18	24.8	26.9	15.2	23.2	14.3	13.8	11.3	18.6	15.2	21.9	26.6	14.6	23.4	22.7	124	62.2	32.3	95.1	51.7	170	147
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	3.1	4.2	4.0	3.2	3.4	4.3	2.6	3.9	3.8	3.1	2.9	4.9	2.6	3.9	5.0	2.9	6.9	4.9	0.7	6.3	5.1	8.6	7.0	2.1
Total Suspended Solids	mg/L	2	5	--	--	16	98	5	6	110	7	4	77	5	<5	16	19	<5	17	9	51	13	5	165	<5	<5	<5	<5	626
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	6	4	5	7	3	4	6	4	4	5	5	5	6	7	5	5	21	26	25	23	26	29	33	29
Turbidity (NTU)	NTU	0.1	0.1	50	--	0.6	12	2.5	12	6.2	1	0.6	2.5	1.7	6.7	**283**	2.1	1.1	31.6	**82.6**	6.6	3.3	4.1	23.0	2.3	1.8	1.6	0.7	42.7
Conductivity (uS/cm)	µS/cm	1	1	--	--	170	150	140	200	200	110	150	130	110	96	161	110	168	136	105	122	190	813	482	255	732	433	840	819
Calculated Parameters																													
Anion Sum	me/L	N/A	N/A	--	--	1.56	0.82	1.22	1.80	1.77	0.97	1.39	1.14	0.96	1.15	1.37	0.97	1.40	1.46	0.97	1.63	1.69	7.21	4.12	2.36	6.10	4.02	8.13	8.15
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	13	8	12	13	21	9	9	15	12	21	14	11	8	20	11	35	12	14	14	14	6	22	7	30
Calculated TDS	mg/L	1	1	--	--	92	55	74	104	107	62	84	66	60	56	163	58	82	87	66	88	109	426	246	144	347	229	496	477
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10	<1	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	1.53	0.99	1.20	1.69	1.94	1.05	1.44	1.02	1.00	0.76	3.59	1.10	1.43	1.62	1.62	1.52	1.70	7.40	4.30	2.43	5.55	3.51	8.90	8.24
Hardness (CaCO3)	mg/L	1	N/A	--	--	22	15	19	28	35	18	20	18	18	9.4	58.8	18.5	20.9	20.7	20.6	19.7	29	94.0	70.0	45.3	66.5	55.1	70.9	77.0
Ion Balance (% Difference)	%	N/A	N/A	--	--	0.97	9.39	0.83	3.15	4.58	3.96	1.77	5.56	2.04	20.7	63.0	6.1	1.0	5.2	25.0	3.4	0.29	1.3	2.2	1.4	4.7	6.8	4.5	0.6
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	-2.74	-3.20	-2.60	-2.22	-1.71	-2.99	-2.88	-2.64	-3.05	-3.62	-2.30	-2.91	-2.93	-2.55	-3.29	-2.84	-2.95	-2.32	-1.94	-2.10	-2.60	-1.93	-2.98	-2.38
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	-2.99	-3.45	-2.85	-2.47	-1.96	-3.24	-3.13	-2.89	-3.31	-3.94	-2.62	-3.23	-3.25	-2.87	-3.61	-3.16	-3.20	-2.64	-2.26	-2.42	-2.92	-2.25	-3.30	-2.70
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	9.43	9.78	9.53	9.32	9.01	9.66	9.60	9.43	9.54	9.82	9.20	9.81	9.87	9.50	9.78	9.31	9.38	9.02	9.14	9.30	9.52	9.04	9.47	8.80
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	9.68	10.00	9.78	9.57	9.26	9.91	9.85	9.68	9.80	10.10	9.52	10.10	10.20	9.82	10.1	9.63	9.63	9.34	9.46	9.62	9.84	9.36	9.79	9.12
Metals (ICP-MS)																													
Total Aluminum (Al)	µg/L	5	5	--	5-100	99	--	--	349	189	--	217	--	--	490	**19200**	**186**	**131**	93	**3420**	**487**	--	218	**227**	**252**	**107**	**447**	31	**1400**
Total Antimony (Sb)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	**8**	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	1	5	--	--	14	--	--	15.3	19.2	--	13.9	--	--	11	86	12	12	7	24	15	--	225	201	116	133	134	119	185
Total Beryllium (Be)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	5	--	1500	13	--	--	41.4	21.6	--	<50	--	--	6	24	16	10	15	15	14	--	11	17	22	10	22	18	22
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	<0.3	--	--	0.018	<0.017	--	<0.017	--	--	0.029	**1.050**	**0.023**	<0.017	<0.017	**0.073**	**0.032**	--	0.538	**0.171**	**0.168**	**0.300**	**0.236**	**0.148**	**0.171**
Total Chromium (Cr)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	**11**	<1	<1	<1	**2**	<1	--	<1	<1	<1	<1	1	<1	<1
Total Cobalt (Co)	µg/L	0.4	1	--	--	<1	--	--	<0.40	0.88	--	<0.40	--	--	<1	34	<1	<1	<1	1	<1	--	<1	1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	<2	--	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	**22**	2	<2	1	**12**	2	2.9	<2	3	16	2	**6**	2	2
Total Iron (Fe)	µg/L	50	50	--	300	180	--	--	**554**	**965**	120	211	**388**	**384**	161	**38900**	**312**	236	254	**4200**	**593**	**2150**	**347**	**1320**	**500**	194	**890**	157	**2000**
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	<0.5	--	--	3.02	0.54	--	<0.50	--	--	0.6	**82.4**	<0.5	<0.5	<0.5	5.2	0.5	--	0.8	0.7	1.0	<0.5	1.4	<0.5	1.8
Total Manganese (Mn)	µg/L	2	2	--	--	51	--	--	113	632	22.8	30.2	53.4	38.5	26	13200	67	71	81	124	140	129	182	485	120	87	89	26	71
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	13	<2	<2	<2	2	<2	--	<2	<2	<2	<2	<2	<2	3
Total Selenium (Se)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	**2**	<1	<1	<1	<1	<1	--	<1	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<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
Total Strontium (Sr)	µg/L	2	5	--	--	30	--	--	36.3	42.1	--	24.4	--	--	12	82	22	24	24	25	26	--	112	94	60	93	90	96	116
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	2	--	--	<2	--	--	7.2	4.1	--	5.3	--	--	3	405	4	<2	2	36	6	--	4	3	7	3	11	2	22
Total Uranium (U)	µg/L	0.1	0.1	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	1.6	<0.1	<0.1	<0.1	0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1
Total Vanadium (V)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	30	<2	<2	<2	2	<2	--	<2	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	5	--	30	7	--	--	7.2	6.7	<5.0	<5.0	<5.0	5	<5	**110**	7	6	<5	15	<5	9	**79**	**92**	**39**	**57**	**49**	26	17
MICROBIOLOGICAL																													
Total Coliform	MPN/100mL	1	1	--	--	53	>250	--	>250	>250	280	85	>250	--	1414	>2420	>2420	1990	>2420	>2420	1203	--	>2420	>2420	2420	866	>2420	866	>2420
E. coli	MPN/100mL	100	1	400	--	22	24	--	4	45	6	10	>250	<100	2	26	10	10	20	2	<1	<100	<1	2	19	3	86	<1	<1
Fecal Coliform	MPN/ml	1	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	1.46	10.70	4.68	1.21	6.64	0.21	1.19	1.93	1.41	1.88	6.62	0.13	<0.50	1.6	2.02	1.91	1.99	2.44	32.52	1.80	1.54	2.30	0.12	99.13
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	1.85	11.10	5.62	1.32	7.71	0.19	1.07	1.73	1.18	2.28	7.58	0.22	<0.50	2	2.98	1.91	2.08	2.71	31.31	2.15	1.77	2.50	0.11	98.00
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	0.5	3.5	0.5	--	0.7	3.0	1.0	--	0.4	4.2	0.7	--	0.5	<0.4	1.2

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)
CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2014	Units	RDL	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Paper Mill Lake														
Sample Sites						PML1														
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011-08-14	2011-10-16	2012-05-01	2012-08-15	2012-10-11	2013-05-15	2013-08-15	2013/10/16	2014/05/15
Sampling Time	hh:mm	--				13:45	13:00	13:00	13:35	15:15	13:00	13:00	16:50	17:00	12:50	--	10:55	10:51	11:35	10:45	10:30
FIELD DATA																					
Secchi Depth	Meters	--	--	1.2	--	3.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	0.1	--	--	15.7	17.1	16.2	13.2	22.7	9.1	10.3	22.1	13.6	8.3	--	14.9	11.6	22.5	12.3	12.1
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	**10.56**	8.10	6.90	8.76	7.83	**10.43**	**10.39**	8.17	**9.54**	8.41	--	8.60	**9.98**	7.65	**9.90**	**12.08**
pH	pH	N/A	N/A	--	--	7.39	6.57	6.64	7.06	7.35	5.89	6.28	6.20	6.11	7.58	--	6.63	6.39	7.20	6.32	6.60
Specific Conductance	uS/cm	1	1	--	--	561	279	223	265	234	125	177	174	106	366	--	186.4	215.1	199.0	250.5	431.0
INORGANICS																					
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	6	7	7	7	9	5	6	7	7	20	--	<5	<5	6	7	31
Dissolved Chloride (Cl)	mg/L	1	1	--	120	39	64	58	67	61	24	44	43	18	55	--	45	57	57	48	63
Colour	TCU	30	5	--	--	54	15	21	19	12	57	32	38	65	38	--	29	8	15	11	17
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	0.49	0.10	0.17	0.42	0.27	0.66	0.55	0.15	0.62	0.22	--	0.14	0.21	0.18	0.18	0.22
Nitrate (N)	mg/L	0.05	0.05	--	13000	0.49	--	--	0.42	0.27	--	0.55	--	--	0.22	--	0.14	0.21	0.18	0.18	0.22
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	0.06	--	<0.03	<0.03	0.04	<0.03	0.04
Total Organic Carbon	mg/L	0.5	0.5	--	--	6.5	3.6	4.7	0.7	3.3	6.7	4.6	5	8.3	5.7	--	5.3	4.2	4.1	5.1	4.0
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01
pH (units)	pH	N/A	N/A	5.0-9.0	6.5-9	**6.36**	6.75	6.79	6.63	7.04	6.58	6.54	6.83	6.67	6.6	--	6.8	6.71	6.92	6.88	6.66
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	4.5	6.9	6.4	8.37	9.02	5.90	6.02	4.99	4.64	6.0	--	6.0	6.8	6.6	6.9	6.9
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	0.6	1.1	1.0	1.25	1.22	0.82	0.98	0.89	0.85	1.0	--	1.1	1.0	0.9	1.5	1.3
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	<0.02	<0.02	0.002	0.018	0.002	<0.002	0.014	0.011	0.030	0.019	--	0.03	0.006	0.007	0.047	0.012
Total Potassium (K)	mg/L	0.1	0.1	--	--	0.9	0.9	0.9	1.160	1.060	1.340	1.230	0.771	1.430	0.8	--	1.0	0.8	1.0	1.5	0.9
Total Sodium (Na)	mg/L	0.1	0.1	--	--	25	38	34	35.2	40.2	18.4	26.8	22.8	13.7	33.6	--	29.8	35.3	28.5	32.2	38.1
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	4.5	2.6	2.8	3.8	3.4	5.9	3.7	2.6	5.4	2.9	--	3.2	2.8	2.6	2.6	2.5
Total Suspended Solids	mg/L	2	5	--	--	<2	3	9	7	<2	<1	1	<2	5	9	--	6	<5	<5	23	6
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	13	11	11	13	12	12	12	10	12	7	--	10	8	10	10	10
Turbidity (NTU)	NTU	0.1	0.1	50	--	0.4	0.5	0.6	8.2	0.9	0.5	0.6	1	1.2	0.7	--	1	0.7	1.1	19.2	1.4
Conductivity (uS/cm)	µS/cm	1	1	--	--	170	250	230	260	250	130	180	170	100	214	--	179	227	218	209	230
Calculated Parameters																					
Anion Sum	me/L	N/A	N/A	--	--	1.51	2.18	1.99	2.34	2.15	1.09	1.62	1.56	0.92	2.11	--	1.49	1.79	1.95	1.71	2.62
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	6	7	7	7	9	5	6	7	7	20	--	<5	<5	6	7	31
Calculated TDS	mg/L	1	1	--	--	93	129	118	137	134	75	100	90	63	117	--	95	110	109	115	140
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	--	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	1.40	2.11	1.89	2.11	2.33	1.20	1.58	1.35	0.95	1.89	--	1.78	2.00	1.69	2.56	2.18
Hardness (CaCO3)	mg/L	1	N/A	--	--	14	22	20	26	28	18	19	16	15	19.1	--	19.5	21.1	20.2	23.4	22.6
Ion Balance (% Difference)	%	N/A	N/A	--	--	3.78	1.63	2.58	5.17	4.02	4.80	1.25	7.22	1.60	5.5	--	9.0	5.5	7.0	19.8	9.2
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	-3.57	-2.90	-2.94	-2.96	-2.43	-3.25	-3.27	-2.94	-3.13	-2.91	--	-3.31	-3.35	-3.07	-3.03	-2.61
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	-3.82	-3.15	-3.19	-3.21	-2.68	-3.50	-3.53	-3.19	-3.38	-3.23	--	-3.63	-3.67	-3.39	-3.35	-2.93
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	9.93	9.65	9.73	9.59	9.47	9.83	9.81	9.77	9.80	9.51	--	10.10	10.1	9.99	9.91	9.27
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	10.20	9.90	9.98	9.84	9.72	10.10	10.10	10.00	10.10	9.83	--	10.40	10.4	10.3	10.2	9.59
Metals (ICP-MS)																					
Total Aluminum (Al)	µg/L	5	5	--	5-100	**260**	--	--	**665**	45.9	--	**233**	--	--	**177**	--	**306**	**141**	**103**	**3920**	**305**
Total Antimony (Sb)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	<2	<2	<2	2	<2
Total Barium (Ba)	µg/L	1	5	--	--	23	--	--	35.3	24.4	--	26.6	--	--	22	--	19	20	12	40	23
Total Beryllium (Be)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	5	--	1500	8	--	--	11.3	8.6	--	<50	--	--	6	--	9	6	8	9	8
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	<0.3	--	--	**0.032**	<0.017	--	<0.017	--	--	<0.017	--	**0.066**	**0.021**	**0.018**	**0.430**	<0.017
Total Chromium (Cr)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	<1	<1	<1	**3**	<1
Total Cobalt (Co)	µg/L	0.4	1	--	--	<1	--	--	0.96	<0.40	--	<0.40	--	--	<1	--	2	<1	<1	9	<1
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	<2	--	--	2.0	<2.0	<2.0	4.0	<2.0	2.3	<2	--	<2	<2	1	**6**	1
Total Iron (Fe)	µg/L	50	50	--	300	140	--	--	**837**	89	161	141	**315**	**528**	137	--	**742**	130	205	**5300**	239
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	<0.5	--	--	1.73	<0.50	--	<0.50	--	--	<0.5	--	0.9	<0.5	<0.5	**13.5**	0.9
Total Manganese (Mn)	µg/L	2	2	--	--	17	--	--	142	68.9	41.3	14.4	128	62.4	48	--	214	33	58	693	54
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	2	<2	<2	9	<2
Total Selenium (Se)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	2	5	--	--	18	--	--	36.3	37.1	--	25	--	--	26	--	30	31	25	34	35
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	2	--	--	<2	--	--	7.8	<2.0	--	3.9	--	--	<2	--	4	<2	<2	65	4
Total Uranium (U)	µg/L	0.1	0.1	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	0.1	--	<0.1	<0.1	<0.1	0.6	<0.1
Total Vanadium (V)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	10	<2
Total Zinc (Zn)	µg/L	5	5	--	30	8	--	--	10.0	5.4	5.7	6.3	6.2	5.4	<5	--	13	8	<5	**62**	<5
MICROBIOLOGICAL																					
Total Coliform	MPN/100mL	1	1	--	--	200	73	--	>250	>250	>250	85	>250	--	411	--	2420	866	1730	1011	613
E. coli	MPN/100mL	100	1	400	--	33	45	--	19	**>250**	2	2	34	<100	2	--	20	12	4	6	6
Fecal Coliform	MPN/ml	1	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	0.62	2.31	0.57	0.82	1.12	0.07	2.85	0.86	0.15	1.03	--	0.69	1.17	1.10	5.07	0.67
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	0.64	2.21	0.64	0.74	1.04	0.06	2.75	0.76	0.15	1.10	--	0.91	1.37	1.10	6.39	0.65
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	<0.4	--	0.4	--	0.4	0.8	0.4

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)

" -- " = no guideline available / Not Tested.

CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)

Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)

CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.

Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.

Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

May 2014	Units	RDL	RDL	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Paper Mill Lake														
Sample Sites						PML2														
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011-08-14	2011-10-16	2012/05/01	2012/08/15	2012/10/11	2013/05/15	2013/08/15	2013/10/16	2014/05/15
Sampling Time	hh:mm	--				13:15	13:40	13:45	14:30	16:20	13:00	12:40	16:20	16:15	13:16	--	--	13:40	10:45	11:20	11:00
FIELD DATA																					
Secchi Depth	Meters	--	--	1.2	--	2.8	2.2	2.3	N/A	3.0	2.0	2.2	2.3	2.2	2.35	--	--	3.20	--	N/A	N/A
Water Temp	Celsius	0.1	0.1	--	--	14.8	24.2	19.7	17.8	25.3	10.1	10.9	23.1	15.2	11.6	--	--	14.8	--	12.6	14.4
Dissolved Oxygen	mg/L	0.01	0.01	--	5.5-9.5	**10.20**	8.30	8.40	8.78	8.09	**10.58**	**9.88**	8.7	8.94	7.75	--	--	9.26	--	8.90	**12.44**
pH	pH	N/A	N/A	--	--	6.36	6.82	6.84	7.09	7.39	6.53	6.31	6.67	6.13	8.61	--	--	6.49	--	6.13	6.50
Specific Conductance	uS/cm	1	1	--	--	267	264	241	237	234	201	159	173	156	231	--	--	234	--	250.5	966.0
INORGANICS																					
Total Alkalinity (as CaCO3)	mg/L	5	5	--	--	5	7	7	6	8	7	<5	8	7	21	--	--	<5	--	8	32
Dissolved Chloride (Cl)	mg/L	1	1	--	120	63	63	58	62	58	50	44	43	34	55	--	--	63	--	64	**245**
Colour	TCU	30	5	--	--	22	17	19	20	13	23	35	38	48	39	--	--	18	--	8	6
Nitrite + Nitrate	mg/L	0.05	0.05	--	--	0.14	0.07	0.09	0.19	0.11	0.23	0.33	0.14	0.22	0.24	--	--	0.22	--	<0.05	0.13
Nitrate (N)	mg/L	0.05	0.05	--	13000	0.14	--	--	0.19	0.11	--	0.33	--	--	0.24	--	--	0.22	--	<0.05	0.13
Nitrite (N)	mg/L	0.01	0.01	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	--	--	<0.05	--	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	0.03	--	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	--	--	0.03	--	0.23	0.05
Total Organic Carbon	mg/L	0.5	0.5	--	--	3.6	2.6	4.5	3.2	3.4	3.6	4	6	5.6	5.9	--	--	4.4	--	4.0	2.7
Orthophosphate (as P)	mg/L	0.01	0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	--	<0.01	--	<0.01	<0.01
pH (units)	pH	N/A	N/A	5.0-9.0	6.5-9	6.50	6.81	6.82	6.66	7.02	6.83	**6.37**	6.60	6.60	6.6	--	--	6.68	--	6.73	7.13
Total Calcium (Ca)	mg/L	0.1	0.1	--	--	6.1	7.1	6.1	7.17	7.69	7.96	5.30	4.76	5.04	6.1	--	--	6.7	--	7.7	19.2
Total Magnesium (Mg)	mg/L	0.1	0.1	--	--	1.1	1.1	1.1	1.25	1.17	1.20	0.93	0.86	0.90	1.0	--	--	1.0	--	1.4	1.7
Total Phosphorus (1M depth)	mg/L	0.002	0.006	--	--	<0.02	<0.02	0.002	0.010	0.002	<0.002	0.009	0.009	0.007	0.025	--	--	0.006	--	0.026	0.011
Total Potassium (K)	mg/L	0.1	0.1	--	--	0.9	1.0	0.9	0.984	0.900	1.020	0.861	0.801	0.968	0.8	--	--	0.8	--	1.3	1.4
Total Sodium (Na)	mg/L	0.1	0.1	--	--	35	40	34	31.1	35.1	30.8	25.7	21.3	20.9	34.6	--	--	37.5	--	42.0	133
Reactive Silica (SiO2)	mg/L	0.5	0.5	--	--	2.6	2.5	2.3	2.6	2.3	3.3	2.9	2.5	3	2.8	--	--	2.7	--	4.2	2.4
Total Suspended Solids	mg/L	2	5	--	--	2	3	<1	15	<2	11	<1	8	<1	<5	--	--	<5	--	<5	16
Dissolved Sulphate (SO4)	mg/L	2	2	--	--	11	11	11	10	10	10	9	10	9	7	--	--	9	--	11	27
Turbidity (NTU)	NTU	0.1	0.1	50	--	0.8	0.7	0.6	1.0	0.8	0.4	0.4	3.4	0.5	0.7	--	--	1	--	3.3	2.6
Conductivity (uS/cm)	µS/cm	1	1	--	--	240	250	230	230	230	210	170	170	150	213	--	--	254	--	277	777
Calculated Parameters																					
Anion Sum	me/L	N/A	N/A	--	--	2.11	2.17	1.99	2.07	2.01	1.77	1.46	1.58	1.30	2.13	--	--	1.98	--	2.19	8.12
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5	--	--	5	7	7	6	8	7	<1	8	7	21	--	--	<5	--	8	32
Calculated TDS	mg/L	1	1	--	--	123	131	117	120	120	110	91	89	79	119	--	--	119	--	137	448
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	10	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	--	--	<10	--	<10	<10
Cation Sum	me/L	N/A	N/A	--	--	1.94	2.23	1.88	1.88	2.03	1.86	1.48	1.28	1.27	1.94	--	--	2.09	--	2.55	6.96
Hardness (CaCO3)	mg/L	1	N/A	--	--	20	22	20	23	24	25	17	15	16	19.3	--	--	20.8	--	25.0	54.9
Ion Balance (% Difference)	%	N/A	N/A	--	--	4.20	1.36	2.84	4.81	0.50	2.48	0.68	10.50	1.17	4.8	--	--	2.8	--	7.5	7.7
Langelier Index (@ 20C)	N/A	N/A	N/A	--	--	-3.33	-2.83	-2.93	-3.06	-2.55	-2.80	NC	-3.18	-3.17	-2.89	--	--	-3.39	--	-3.08	-1.73
Langelier Index (@ 4C)	N/A	N/A	N/A	--	--	-3.59	-3.08	-3.18	-3.31	-2.80	-3.05	NC	-3.43	-3.42	-3.21	--	--	-3.71	--	-3.40	-2.05
Saturation pH (@ 20C)	N/A	N/A	N/A	--	--	9.83	9.64	9.75	9.72	9.57	9.63	NC	9.78	9.77	9.49	--	--	10.1	--	9.81	8.86
Saturation pH (@ 4C)	N/A	N/A	N/A	--	--	10.10	9.89	10.00	9.97	9.82	9.88	NC	10.00	10.00	9.81	--	--	10.4	--	10.1	9.18
Metals (ICP-MS)																					
Total Aluminum (Al)	µg/L	5	5	--	5-100	**130**	--	--	**1030**	55.8	--	**202**	--	--	**189**	--	--	**131**	--	**107**	**181**
Total Antimony (Sb)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	--	<2	--	<2	<2
Total Arsenic (As)	µg/L	1	2	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	--	<2	--	<2	<2
Total Barium (Ba)	µg/L	1	5	--	--	16	--	--	23.0	12.2	--	23	--	--	22	--	--	22	--	37	50
Total Beryllium (Be)	µg/L	1	2	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	--	<2	--	<2	<2
Total Bismuth (Bi)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--	<2	<2
Total Boron (B)	µg/L	5	5	--	1500	5	--	--	8.2	8.8	--	<50	--	--	6	--	--	6	--	9	7
Total Cadmium (Cd)	µg/L	0.017	0.017	--	0.017	<0.3	--	--	**0.037**	<0.017	--	**0.028**	--	--	**0.023**	--	--	**0.039**	--	**0.060**	**0.062**
Total Chromium (Cr)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	--	<1	--	<1	<1
Total Cobalt (Co)	µg/L	0.4	1	--	--	<1	--	--	0.65	<0.40	--	<0.40	--	--	<1	--	--	<1	--	2	<1
Total Copper (Cu)	µg/L	2	2	--	2.0-4.0	<2	--	--	3.3	<2.0	<2.0	<2.0	<2.0	<2.0	<2	--	--	<2	--	**1380**	1
Total Iron (Fe)	µg/L	50	50	--	300	100	--	--	**1090**	151	76	143	**699**	181	178	--	--	181	--	**1760**	264
Total Lead (Pb)	µg/L	0.5	0.5	--	1.0-7.0	<0.5	--	--	2.39	<0.50	--	<0.50	--	--	<0.5	--	--	<0.5	--	**49.7**	0.7
Total Manganese (Mn)	µg/L	2	2	--	--	58	--	--	159	81.0	28.0	33.8	88.6	30.6	22	--	--	87	--	866	206
Total Molybdenum (Mo)	µg/L	2	2	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--	<2	<2
Total Nickel (Ni)	µg/L	2	2	--	25-150	2	--	--	2.2	<2.0	--	<2.0	--	--	<2	--	--	<2	--	3	<2
Total Selenium (Se)	µg/L	1	1	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	--	<1	--	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	--	<0.1	--	0.1	<0.1
Total Strontium (Sr)	µg/L	2	5	--	--	30	--	--	34.7	32.8	--	25.7	--	--	27	--	--	31	--	35	68
Total Thallium (Tl)	µg/L	0.1	0.1	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	--	<0.1	--	<0.1	<0.1
Total Tin (Sn)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--	3	<2
Total Titanium (Ti)	µg/L	2	2	--	--	<2	--	--	21.3	<2.0	--	3.6	--	--	<2	--	--	<2	--	2	3
Total Uranium (U)	µg/L	0.1	0.1	--	15	<0.1	--	--	0.10	<0.10	--	<0.10	--	--	0.1	--	--	<0.1	--	<0.1	<0.1
Total Vanadium (V)	µg/L	2	2	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--	<2	<2
Total Zinc (Zn)	µg/L	5	5	--	30	12	--	--	18.3	<5.0	5.8	6.6	7.5	10	8	--	--	11	--	**762**	<5
MICROBIOLOGICAL																					
Total Coliform	MPN/100mL	1	1	--	--	49	40	--	>250	46	97	64	>250	--	261	--	--	1410	--	411	291
E. coli	MPN/100mL	100	1	400	--	10	31	--	69	<1	6	17	>250	<100	1	--	--	12	--	2	<1
Fecal Coliform	MPN/ml	1	--	400	--	--	--	12	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	N/A	0.30	--	--	1.15	1.36	0.59	3.50	1.54	0.53	0.55	2.48	1.33	0.76	--	--	1.18	--	0.25	0.99
Chlorophyll A - Welschmeyer method	µg/L	N/A	0.30	--	--	1.22	1.33	0.66	3.39	1.51	0.42	0.51	2.26	1.13	0.76	--	--	1.34	--	0.27	1.13
Total Kjeldahl Nitrogen as N	mg/L		0.4	--	--	--	--	--	--	--	--	--	--	--	<0.4	--	--	--	--	1.7	<0.4

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)

" -- " = no guideline available / Not Tested.

CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)

Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)

CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.

Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.

Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

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ATTACHMENT 1

Field Reports

FIELD REPORT – MAY 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Kearney Lake		**Site ID: KL1**
Watercourse: Kearney Lake		**Location:** Kearney Lake Road
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0445718E, 4948496N (UTM, NAD83)	
SNC Field Personnel:	Alex Duguay	

Site Conditions

Weather:	Sunny
Air Temperature:	14°C
Cloud Cover:	none
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Off Kearney Lake Road

Field Parameter Data

	Remarks
Date (d.m.y):	14/05/2014
Time (hh:mm):	10:30
Sample Depth (m):	1.0
pH:	6.74
Dissolved Oxygen (mg/L):	15.29
Secchi Depth (m):	2.36
Water Temperature (degrees Celsius):	12.7
Conductivity (µs/cm):	547

Additional Comments / Notes

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Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Kearney Lake		**Site ID: KL2**
Watercourse: Kearney Lake		**Location:** Kearney Lake Road
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0443942E, 4949803N (UTM, NAD83)	
SNC Field Personnel:	Alex Duguay	

Site Conditions

Weather:	Sunny
Air Temperature:	14°C
Cloud Cover:	None
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Collins Road, through wooded area

Field Parameter Data

	Remarks
Date (d.m.y):	14/05/2014
Time (hh:mm):	10:45
Sample Depth (m):	1.0
pH:	6.6
Dissolved Oxygen (mg/L):	14.9
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	11.7
Conductivity (µs/cm):	188

Additional Comments / Notes

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Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Kearney Lake Run		**Site ID: KL3**
Watercourse: Kearney Lake Run		**Location:** Kearney Lake Road
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0444390E, 4950406N (UTM, NAD83)	
SNC Field Personnel:	Alex Duguay	

Site Conditions

Weather:	Sunny
Air Temperature:	14°C
Cloud Cover:	None
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Via walking path off Kearney Lake Road

Field Parameter Data

	Remarks
Date (d.m.y):	14/05/2014
Time (hh:mm):	11:00
Sample Depth (m):	1.0
pH:	6.55
Dissolved Oxygen (mg/L):	5.90
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	11.0
Conductivity (µs/cm):	405

Additional Comments / Notes

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FIELD REPORT – MAY 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Kearney Lake Run		**Site ID: KL4**
Watercourse: Kearney Lake Run		**Location:** Kearney Lake Road
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0444463E, 4950571N (UTM, NAD83)	
SNC Field Personnel:	Alex Duguay	

Site Conditions

Weather:	Sunny
Air Temperature:	14°C
Cloud Cover:	None
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Via walking path off Kearney Lake Road

Field Parameter Data

	Remarks
Date (d.m.y):	14/05/2014
Time (hh:mm):	11:15
Sample Depth (m):	1.0
pH:	6.3
Dissolved Oxygen (mg/L):	14.5
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	11.0
Conductivity (µs/cm):	273

Additional Comments / Notes

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FIELD REPORT – MAY 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 9
Client:	Halifax Regional Municipality	
Site: Kearney Lake		**Site ID: KL5**
Watercourse: Kearney Lake		**Location:** Kearney Lake Road
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 4949142E, 445280N (UTM, NAD83)	
SNC Field Personnel:	Alex Duguay	

Site Conditions

Weather:	Sunny
Air Temperature:	14°C
Cloud Cover:	Partial
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Along Kearney Lake Road

Field Parameter Data

	Remarks
Date (d.m.y):	14/05/2014
Time (hh:mm):	11:30
Sample Depth (m):	1.0
pH:	6.79
Dissolved Oxygen (mg/L):	15.83
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	13.7
Conductivity (µs/cm):	472

Additional Comments / Notes

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FIELD REPORT – MAY 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Highway 102		**Site ID: HWY 102-1**
Watercourse: Marsh area		**Location:** Highway 102, south of exit 3
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0444708E, 4951644N (UTM, NAD83)	
SNC Field Personnel:	Alex Duguay	

Site Conditions

Weather:	Sunny
Air Temperature:	14°C
Cloud Cover:	None
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Off Highway 102

Field Parameter Data

	Remarks
Date (d.m.y):	14/05/2014
Time (hh:mm):	12:00
Sample Depth (m):	1.0
pH:	6.02
Dissolved Oxygen (mg/L):	12.03
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	12.06
Conductivity (µs/cm):	880

Additional Comments / Notes

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Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Highway 102		**Site ID: HWY 102-2**
Watercourse: Marsh area		**Location:** HWY 102, south of exit 3
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0444829E, 4951778N (UTM, NAD83)	
SNC Field Personnel:	Alex Duguay	

Site Conditions

Weather:	Sunny
Air Temperature:	14°C
Cloud Cover:	None
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Off Kearney Lake Road

Field Parameter Data

	Remarks
Date (d.m.y):	14/05/2014
Time (hh:mm):	12:15
Sample Depth (m):	1.0
pH:	6.05
Dissolved Oxygen (mg/L):	10.50
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	11.40
Conductivity (µs/cm):	965

Additional Comments / Notes

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FIELD REPORT – MAY 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Lake Shore Drive	**Site ID: LSD**	
Watercourse: Marsh @ Lakeshore Dr.	**Location:** Kingswood Subdivision	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0442583E, 4950431N (UTM, NAD83)	
SNC Field Personnel:	Alex Duguay	

Site Conditions

Weather:	Sunny with Clouds
Air Temperature:	12°C
Cloud Cover:	Partial
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Via Lakeshore Drive in Kingswood Subdivision

Field Parameter Data

	Remarks
Date (d.m.y):	15/05/2014
Time (hh:mm):	9:30
Sample Depth (m):	1.0
pH:	7.02
Dissolved Oxygen (mg/L):	14.78
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	8.93
Conductivity (µs/cm):	180

Additional Comments / Notes

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FIELD REPORT – MAY 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 9
Client:	Halifax Regional Municipality	
Site: Larry Uteck Blvd.		**Site ID: LU**
Watercourse: Pond		**Location:** Larry Uteck off-ramp
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 4949816E, 445042N (UTM, NAD83)	
SNC Field Personnel:	Alex Duguay	

Site Conditions

Weather:	Sunny with Clouds
Air Temperature:	12°C
Cloud Cover:	Partial
Wildlife Sightings:	N/A
Site Accessibility: Accessible	From Larry Uteck Blvd. off-ramp, Halifax-bound

Field Parameter Data

	Remarks
Date (d.m.y):	15/05/2014
Time (hh:mm):	11:45
Sample Depth (m):	1.0
pH:	6.5
Dissolved Oxygen (mg/L):	11.96
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	15.02
Conductivity (µs/cm):	999

Additional Comments / Notes

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FIELD REPORT – MAY 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Paper Mill Lake		**Site ID: PML1**
Watercourse: Paper Mill Lake		**Location:** Moirs Mill Subdivision
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0445129E, 4951154N (UTM, NAD83)	
SNC Field Personnel:	Alex Duguay	

Site Conditions

Weather:	Sunny with Clouds
Air Temperature:	12°C
Cloud Cover:	Partial
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Via French Mast Lane in Moirs Mill Subdivision

Field Parameter Data

	Remarks
Date (d.m.y):	15/05/2014
Time (hh:mm):	10:30
Sample Depth (m):	1.0
pH:	6.6
Dissolved Oxygen (mg/L):	12.08
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	12.14
Conductivity (µs/cm):	431

Additional Comments / Notes

Low water level at this sampling area.

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Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Paper Mill Lake		**Site ID: PML2**
Watercourse: Paper Mill Lake		**Location:** Moirs Mill Subdivision
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0445363E, 4951740N (UTM, NAD83)	
SNC Field Personnel:	Alex Duguay	

Site Conditions

Weather:	Sunny with Clouds
Air Temperature:	12°C
Cloud Cover:	Partial
Wildlife Sightings:	N/A
Site Accessibility: Accessible	Via Lake Dr., off Hammonds Plains Rd.

Field Parameter Data

	Remarks
Date (d.m.y):	15/05/2014
Time (hh:mm):	11:00
Sample Depth (m):	1.0
pH:	6.5
Dissolved Oxygen (mg/L):	12.44
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	14.44
Conductivity (µs/cm):	966

Additional Comments / Notes

Low water level at this area. Sampling was achieved but a Secchi depth was not possible given the shallow water.

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ATTACHMENT 2

Site Photographs

Photo 1: KL1, Kearney Lake sample location

Photo 2: KL2, Kearney Lake sample location

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Photo 3: KL3, Kearney Lake sample location

Photo 4: KL4, Kearney Lake sample location

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Photo 5: KL5, Kearney Lake sample location.

Photo 6: LSD, Lake Shore Drive sample location.

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Photo 7: LU, Larry Uteck off-ramp sample location

Photo 8: Hwy102-1 sample location

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Photo 9: Hwy102-2 sample location

Photo 10: PML1, Paper Mill Lake sample location

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Photo 11: PML2, Paper Mill Lake sample location

Photo 12: PML2, Paper Mill Lake water level (secchi depth reading area).

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ATTACHMENT 3

Laboratory Certificates of Analysis

AGAT Laboratories

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

CLIENT NAME: SNC-LAVALIN
5657 SPRING GARDEN RD, SUITE 200
HALIFAX , NS B3J3R4
(902) 492-4544

ATTENTION TO: Derek Heath

PROJECT: 510192-0001 Bedford West

AGAT WORK ORDER: 14X839305

WATER ANALYSIS REVIEWED BY: Laura Baker, Inorganics Data Reporter

DATE REPORTED: May 23, 2014

PAGES (INCLUDING COVER): 8

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

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Results relate only to the items tested and to all the items tested

AGAT Laboratories

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 14X839305

PROJECT: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

SNC-Lavalin Bedford West Custom Inorganics Package

DATE RECEIVED: 2014-05-14

DATE REPORTED: 2014-05-23

		SAMPLE DESCRIPTION:		KL-1	KL-2	KL-3	KL-4	KL-5	HWY-102-1	HWY-102-2
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		5/14/2014	5/14/2014	5/14/2014	5/14/2014	5/14/2014	5/14/2014	5/14/2014
Parameter	Unit	G / S	RDL	5359110	5359166	5359184	5359199	5359207	5359216	5359223
Alkalinity	mg/L		5	30	29	15	30	32	31	30
Chloride	mg/L		1	80	20	58	59	61	65	113
True Color	TCU		5	13	25	16	13	14	11	13
Nitrate + Nitrite as N	mg/L		0.05	0.11	0.08	0.17	0.25	0.16	<0.05	<0.05
Nitrate as N	mg/L		0.05	0.11	0.08	0.17	0.25	0.16	<0.05	<0.05
Nitrite as N	mg/L		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ammonia as N	mg/L		0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Total Organic Carbon	mg/L		0.5	4.6	6.2	4.6	4.4	4.3	4.1	17.4
Ortho-Phosphate as P	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH				6.72	6.53	6.68	6.69	6.64	6.56	7.20
Total Calcium	mg/L		0.1	8.1	3.4	6.4	6.4	6.5	7.2	14.1
Total Magnesium	mg/L		0.1	1.6	1.1	1.4	1.3	1.4	1.6	3.1
Total Phosphorus	mg/L		0.006	0.011	0.013	0.009	0.022	0.010	0.013	0.028
Total Potassium	mg/L		0.1	0.9	0.7	0.8	0.8	0.8	1.2	2.9
Total Sodium	mg/L		0.1	50.2	17.5	36.4	35.9	37.5	39.1	69.6
Reactive Silica as SiO2	mg/L		0.5	2.0	2.4	2.6	2.6	2.7	1.7	1.6
Total Suspended Solids	mg/L		5	<5	<5	<5	<5	<5	6	34
Sulphate	mg/L		2	12	4	9	9	9	10	12
Turbidity	NTU		0.1	2.9	0.9	0.4	1.1	1.1	0.7	1.1
Electrical Conductivity	umho/cm		1	290	87	218	219	228	252	433
Anion Sum	me/L			3.11	1.23	2.14	2.47	2.56	2.66	4.04
Bicarb. Alkalinity (as CaCO3)	mg/L		5	30	29	15	30	32	31	30
Calculated TDS	mg/L		1	172	65	122	132	136	143	235
Carb. Alkalinity (as CaCO3)	mg/L		10	<10	<10	<10	<10	<10	<10	<10
Cation sum	me/L			2.77	1.07	2.07	2.04	2.12	2.25	4.17
Hardness	mg/L			26.8	13.0	21.7	21.3	22.0	24.6	48.0
% Difference/ Ion Balance (NS)	%			5.8	7.1	1.5	9.5	9.4	8.4	1.6
Langelier Index (@20C)	NA			-2.51	-3.04	-2.93	-2.63	-2.64	-2.69	-1.80
Langelier Index (@ 4C)	NA			-2.83	-3.36	-3.25	-2.95	-2.96	-3.01	-2.12
Saturation pH (@ 20C)	NA			9.23	9.57	9.61	9.32	9.28	9.25	9.00
Saturation pH (@ 4C)	NA			9.55	9.89	9.93	9.64	9.60	9.57	9.32

Original Signed

Certified By:

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 14X839305

PROJECT: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

SNC-Lavalin Bedford West Custom Inorganics Package

DATE RECEIVED: 2014-05-14

DATE REPORTED: 2014-05-23

		SAMPLE DESCRIPTION:		KL-1	KL-2	KL-3	KL-4	KL-5	HWY-102-1	HWY-102-2
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		5/14/2014	5/14/2014	5/14/2014	5/14/2014	5/14/2014	5/14/2014	5/14/2014
Parameter	Unit	G / S	RDL	5359110	5359166	5359184	5359199	5359207	5359216	5359223
Total Aluminum	ug/L		5	229	205	260	236	224	187	400
Total Antimony	ug/L		2	<2	<2	<2	<2	<2	<2	<2
Total Arsenic	ug/L		2	<2	<2	<2	<2	<2	<2	<2
Total Barium	ug/L		5	14	13	17	17	16	46	381
Total Beryllium	ug/L		2	<2	<2	<2	<2	<2	<2	<2
Total Bismuth	ug/L		2	<2	<2	<2	<2	<2	<2	<2
Total Boron	ug/L		5	7	11	8	8	7	9	11
Total Cadmium	ug/L		0.017	0.037	<0.017	0.038	0.027	0.036	0.022	0.051
Total Chromium	ug/L		1	6	9	7	6	6	8	2
Total Cobalt	ug/L		1	<1	<1	<1	<1	<1	<1	1
Total Copper	ug/L		1	1	<1	1	<1	<1	<1	4
Total Iron	ug/L		50	147	174	137	129	111	147	1660
Total Lead	ug/L		0.5	5.1	5.8	3.6	2.6	1.9	2.6	3.5
Total Manganese	ug/L		2	48	33	41	34	40	56	212
Total Molybdenum	ug/L		2	<2	<2	<2	<2	<2	<2	<2
Total Nickel	ug/L		2	3	<2	2	<2	2	<2	2
Total Selenium	ug/L		1	<1	<1	<1	<1	<1	<1	<1
Total Silver	ug/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium	ug/L		5	40	16	31	31	31	38	75
Total Thallium	ug/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin	ug/L		2	<2	<2	<2	<2	<2	<2	<2
Total Titanium	ug/L		2	2	2	3	2	<2	2	9
Total Uranium	ug/L		0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Vanadium	ug/L		2	<2	<2	<2	<2	<2	<2	<2
Total Zinc	ug/L		5	14	<5	10	9	10	10	36
Total Coliforms (MPN)	MPN/100 mL		1	525	525	86	308	42	120	687
E. Coli (MPN)	MPN/100 mL		1	<1	<1	<1	<1	<1	3	<1
Chlorophyll A - Acidification Method	ug/L		0.05	0.40	0.13	0.76	0.44	0.20	0.25	10.34
Chlorophyll A - Welschmeyer Method	ug/L		0.05	1.32	0.14	0.69	0.40	0.20	0.82	11.09
Total Kjeldahl Nitrogen as N	mg/L		0.4	1.1	<0.4	0.6	<0.4	<0.4	0.7	15.3

Original Signed

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 14X839305

PROJECT: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

SNC-Lavalin Bedford West Custom Inorganics Package

DATE RECEIVED: 2014-05-14

DATE REPORTED: 2014-05-23

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Original Signed

Certified By:

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Quality Assurance

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 14X839305

PROJECT: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

Water Analysis

RPT Date: May 23, 2014			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
SNC-Lavalin Bedford West Custom Inorganics Package															
Alkalinity	3		66	67	1.5%	< 5	91%	80%	120%	NA	80%	120%	NA	80%	120%
Chloride	1	5360874	2	2	0.0%	< 1	101%	80%	120%		80%	120%	118%	80%	120%
True Color	1	5360709	<5	7	NA	< 5	90%	80%	120%		80%	120%		80%	120%
Nitrate as N	1	5360874	< 0.05	< 0.05	0.0%	< 0.05	88%	80%	120%		80%	120%	115%	80%	120%
Nitrite as N	1	5360874	< 0.05	< 0.05	0.0%	< 0.05	108%	80%	120%		80%	120%	107%	80%	120%
Ammonia as N	1	5360368	<0.03	<0.03	0.0%	< 0.03	113%	80%	120%		80%	120%	107%	80%	120%
Total Organic Carbon	1		10.1	10.6	4.8%	< 0.5	117%	80%	120%		80%	120%	106%	80%	120%
Ortho-Phosphate as P	1	5363561	<0.01	<0.01	0.0%	< 0.01	107%	80%	120%		80%	120%	103%	80%	120%
pH	3		8.05	7.98	0.9%	<	103%	80%	120%	NA	80%	120%	NA	80%	120%
Total Calcium	5162014		3.5	3.6	2.8%	< 0.1	111%	80%	120%	112%	80%	120%	97%	70%	130%
Total Magnesium	5162014		0.3	0.3	0.0%	< 0.1	112%	80%	120%	111%	80%	120%	105%	80%	120%
Total Phosphorus	1		0.334	0.325	2.7%	< 0.006	96%	90%	110%	102%	90%	110%	114%	80%	120%
Total Potassium	5162014		0.1	0.1	0.0%	< 0.1	109%	80%	120%	110%	80%	120%	88%	70%	130%
Total Sodium	5162014		289	291	0.7%	< 0.1	113%	80%	120%	118%	80%	120%	100%	70%	130%
Reactive Silica as SiO2	1	5363614	2.6	2.6	0.0%	< 0.5	104%	80%	120%		80%	120%	108%	80%	120%
Total Suspended Solids	1	5357255	8	11	20.0%	< 5		80%	120%		120%	120%		80%	120%
Sulphate	1	5360874	33	33	0.0%	< 2	104%	80%	120%		80%	120%	104%	80%	120%
Turbidity	1	5362612	0.6	0.6	0.0%	< 0.1	87%	80%	120%		80%	120%		80%	120%
Electrical Conductivity	3		185	184	0.5%	< 1	101%	80%	120%	NA	80%	120%	NA	80%	120%
Total Aluminum	5162014		8	10	NA	< 5	109%	80%	120%	109%	80%	120%	123%	70%	130%
Total Antimony	5162014		< 2	< 2	0.0%	< 2	94%	80%	120%	110%	80%	120%	110%	70%	130%
Total Arsenic	5162014		2	2	0.0%	< 2	98%	80%	120%	102%	80%	120%	106%	70%	130%
Total Barium	5162014		52	55	5.6%	< 5	100%	80%	120%	102%	80%	120%	105%	70%	130%
Total Beryllium	5162014		< 2	< 2	0.0%	< 2	108%	80%	120%	105%	80%	120%	117%	70%	130%
Total Bismuth	5162014		< 2	< 2	0.0%	< 2	97%	80%	120%	96%	80%	120%	105%	70%	130%
Total Boron	5162014		35	37	5.6%	< 5	113%	80%	120%	110%	80%	120%	122%	70%	130%
Total Cadmium	5162014		< 0.017	< 0.017	0.0%	< 0.017	102%	80%	120%	100%	80%	120%	101%	70%	130%
Total Chromium	5162014		2	4	NA	< 1	101%	80%	120%	98%	80%	120%	111%	70%	130%
Total Cobalt	5162014		< 1	< 1	0.0%	< 1	99%	80%	120%	97%	80%	120%	91%	70%	130%
Total Copper	5162014		12	13	8.0%	< 1	100%	80%	120%	96%	80%	120%	103%	70%	130%
Total Iron	5162014		< 50	< 50	0.0%	< 50	99%	80%	120%	95%	80%	120%	100%	70%	130%
Total Lead	5162014		1.7	3.0	NA	< 0.5	101%	80%	120%	99%	80%	120%	113%	70%	130%
Total Manganese	5162014		3	5	NA	< 2	105%	80%	120%	101%	80%	120%	116%	70%	130%
Total Molybdenum	5162014		< 2	< 2	0.0%	< 2	99%	80%	120%	99%	80%	120%	108%	70%	130%
Total Nickel	5162014		< 2	< 2	0.0%	< 2	101%	80%	120%	96%	80%	120%	103%	70%	130%
Total Selenium	5162014		1	1	0.0%	< 1	102%	80%	120%	111%	80%	120%	100%	70%	130%
Total Silver	5162014		< 0.1	< 0.1	0.0%	< 0.1	101%	80%	120%	102%	80%	120%	102%	70%	130%
Total Strontium	5162014		79	82	3.7%	< 5	107%	80%	120%	111%	80%	120%	110%	70%	130%
Total Thallium	5162014		< 0.1	< 0.1	0.0%	< 0.1	102%	80%	120%	98%	80%	120%	108%	70%	130%

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Quality Assurance

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 14X839305

PROJECT: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

Water Analysis (Continued)

RPT Date: May 23, 2014			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Tin	5162014		< 2	< 2	0.0%	< 2	103%	80%	120%	105%	80%	120%	101%	70%	130%
Total Titanium	5162014		< 2	< 2	0.0%	< 2	100%	80%	120%	99%	80%	120%	86%	70%	130%
Total Uranium	5162014		3.72	3.89	4.5%	< 0.1	101%	80%	120%	93%	80%	120%	108%	70%	130%
Total Vanadium	5162014		7	7	0.0%	< 2	101%	80%	120%	100%	80%	120%	87%	70%	130%
Total Zinc	5162014		31	33	6.3%	< 5	98%	80%	120%	93%	80%	120%	94%	70%	130%
Total Kjeldahl Nitrogen as N	1	5359110	0.7	0.7	0.0%	< 0.4	101%	80%	120%		80%	120%	116%	80%	120%

Original Signed

Certified By:

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Method Summary

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 14X839305

PROJECT: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Alkalinity	INORG-121-6001	SM 2320 B	PC-TITRATE
Chloride	INORG-121-6005	SM 4110 B	IC
True Color	INORG-121-6014	EPA 110.2	NEPHELOMETER
Nitrate + Nitrite as N	INORG-121-6005	SM 4110 B	CALCULATION
Nitrate as N	INORG-121-6005	SM 4110 B	IC
Nitrite as N	INORG-121-6005	SM 4110 B	IC
Ammonia as N	INORG-121-6003	SM 4500-NH3 G	COLORIMETER
Total Organic Carbon	INORG-121-6026	SM 5310 B	TOC ANALYZER
Ortho-Phosphate as P	INORG-121-6005	SM 4110 B	COLORIMETER
pH	INOR-121-6001	SM 4500 H+B	PC-TITRATE
Total Calcium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Magnesium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Phosphorus	INOR-93-1022	SM 4500-P B & E	SPECTROPHOTOMETER
Total Potassium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Sodium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Reactive Silica as SiO2	INORG-121-6028	SM 4110 B	COLORIMETER
Total Suspended Solids	INOR-121-6024, 6025	SM 2540C, D	GRAVIMETRIC
Sulphate	INORG-121-6005	SM 4110 B	IC
Turbidity	INORG-121-6022	SM 2130 B	NEPHELOMETER
Electrical Conductivity	INOR-121-6001	SM 2510 B	PC-TITRATE
Anion Sum	CALCULATION	SM 1030E	CALCULATION
Bicarb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Calculated TDS		SM 1030E	CALCULATION
Carb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Cation sum	CALCULATION	SM 1030E	CALCULATION
Hardness	CALCULATION	SM 2340B	CALCULATION
% Difference/ Ion Balance (NS)	CALCULATION	SM 1030E	CALCULATION
Langelier Index (@20C)	CALCULATION	CALCULATION	CALCULATION
Langelier Index (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 20C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Total Aluminum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Antimony	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Arsenic	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Barium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Beryllium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Bismuth	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Boron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cadmium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS

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Method Summary

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 14X839305

PROJECT: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Chromium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cobalt	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Copper	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Iron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Lead	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Manganese	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Molybdenum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Nickel	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Selenium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Silver	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Strontium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Thallium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Tin	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Titanium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Uranium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Vanadium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Zinc	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Coliforms (MPN)	MIC-121-7000	Based on SM 9223B	INCUBATOR
E. Coli (MPN)	MIC-121-7000	Based on SM 9223B	INCUBATOR
Chlorophyll A - Acidification Method	Subcontracted	Subcontracted	
Chlorophyll A - Welschmeyer Method	Subcontracted	Subcontracted	ICP-MS
Total Kjeldahl Nitrogen as N	INOR-121-6020	SM 4500 NORG D	COLORIMETER

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Chain of Custody Record

Turnaround Time Required (TAT)

Regular TAT 5 to 7 working days ☑
Rush TAT 24 to 48 hours ☐
48 to 72 hours ☐
Date Required: 14x839305

Report To

Company: SNC Lavalin
Contact: Derek Heath
Address: 5657 Spring Garden Road, Suite 200
Phone: +1 (902) 492-4544 Fax:
PO#:
AGAT Quotation: 12-761
Client Project Name/#: 510192-0001 Bedford West

Report Information

1. Name:
Email:
2. Name: Derek Heath
Email: derek.heath@snclavalin.com

Report Format

☐ Single Sample per page
☑ Multiple Samples per page
☑ Excel Format Included

Laboratory Use Only

Arrival Condition: ☐ Good ☐ Poor (see notes)
Arrival Temperature:
AGAT Job Number:
Notes:

Invoice To Same Yes ☑ / No ☐

Company:
Contact:
Address:
Phone: Fax:
PO#/Credit Card #:

Regulatory Requirements (Check):

☐ List Guidelines on Report ☐ Do not List Guidelines on Report
☐ PIRI
☐ Tier 1 ☐ Res ☐ Pot ☐ Coarse
☐ Tier 2 ☐ Com ☐ N/Pot ☐ Fine
☐ Gas ☐ Gas ☐ Lube
☐ CCME
☐ Industrial ☐ CDWQ ☐ Other
☐ Commercial ☐ NSDFOSP
☐ Res/Park ☐ HRM 101
☐ Agricultural ☐ Storm Water
☐ FWAL ☐ Waste Water
☐ Sediment

Sample Identification	Sample Matrix	Date/Time Sampled	Comments – Site/Sample Info. Sample Containment	Microtox	CCME PHC BTEX/F1-F4	Metals	AB Class II Landfill	Detailed Salinity	Routine Potability	Standard Water + Metals	Low Level Total Phosphorus	TSS & TKN	E.Coli (MPN)	Chlorophyll A	Number of Containers	Preserved (Y/N)	Hazardous (Y/N)	Lab Sample #
KL-1	WATER	14/05/2014	10:30							✓	✓	✓	✓	✓				
KL-2	WATER	"	10:45							✓	✓	✓	✓	✓				
KL-3	WATER	"	11:00							✓	✓	✓	✓	✓				
KL-4	WATER	"	11:15							✓	✓	✓	✓	✓				
KL-5	WATER	"	11:30							✓	✓	✓	✓	✓				
~~FSD~~	WATER	"								✓	✓	✓	✓	✓				
HWY-102-1	WATER	"	12:00							✓	✓	✓	✓	✓				
HWY-102-2	WATER	"	12:15							✓	✓	✓	✓	✓				
~~PML-1~~	WATER									✓	✓	✓	✓	✓				
~~PML-2~~	WATER									✓	✓	✓	✓	✓				
~~LU~~	WATER									✓	✓	✓	✓	✓				
	WATER									✓	✓	✓	✓	✓				

Original Signed

Samples Relinquished by (print name & sign):	Date 14/05/2014	Samples Received by (Print name & sign): Tanner Doral	Date 14-May-14	Special Instructions	Page ____ of ____
Samples Relinquished by (print name & sign):	Date	Samples Received by (Print name & sign): Original Signed	Date 12:50		NO:
Samples Relinquished by (print name & sign):	Date	Samples Received by (Print name & sign):	Date		

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CLIENT NAME: SNC-LAVALIN
5657 SPRING GARDEN RD, SUITE 200
HALIFAX , NS B3J3R4
(902) 492-4544

ATTENTION TO: Derek Heath

PROJECT: 510192-0001 Bedford West

AGAT WORK ORDER: 14X839941

WATER ANALYSIS REVIEWED BY: Jason Coughtrey, Inorganics Supervisor

DATE REPORTED: May 26, 2014

PAGES (INCLUDING COVER): 8

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

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Certificate of Analysis

AGAT WORK ORDER: 14X839941

PROJECT: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

SNC-Lavalin Bedford West Custom Inorganics Package

DATE RECEIVED: 2014-05-15

DATE REPORTED: 2014-05-26

		SAMPLE DESCRIPTION:		LSD	PML - 1	PML - 2	LU
		SAMPLE TYPE:		Water	Water	Water	Water
		DATE SAMPLED:		5/15/2014	5/15/2014	5/15/2014	5/15/2014
Parameter	Unit	G / S	RDL	5364369	5364383	5364392	5364402
Alkalinity	mg/L		5	35	31	32	30
Chloride	mg/L		1	29	63	245	243
True Color	TCU		5	9	17	6	6
Nitrate + Nitrite as N	mg/L		0.05	0.09	0.22	0.13	1.22
Nitrate as N	mg/L		0.05	0.09	0.22	0.13	1.22
Nitrite as N	mg/L		0.05	<0.05	<0.05	<0.05	<0.05
Ammonia as N	mg/L		0.03	0.04	0.04	0.05	0.05
Total Organic Carbon	mg/L		0.5	5.2	4.0	2.7	6.9
Ortho-Phosphate as P	mg/L		0.01	<0.01	<0.01	<0.01	<0.01
pH				6.47	6.66	7.13	6.42
Total Calcium	mg/L		0.1	5.4	6.9	19.2	23.9
Total Magnesium	mg/L		0.1	1.5	1.3	1.7	4.2
Total Phosphorus	mg/L		0.006	0.100	0.012	0.011	0.260
Total Potassium	mg/L		0.1	1.1	0.9	1.4	3.1
Total Sodium	mg/L		0.1	23.4	38.1	133	147
Reactive Silica as SiO2	mg/L		0.5	2.9	2.5	2.4	2.1
Total Suspended Solids	mg/L		5	51	6	16	626
Sulphate	mg/L		2	5	10	27	29
Turbidity	NTU		0.1	6.6	1.4	2.6	42.7
Electrical Conductivity	umho/cm		1	122	230	777	819
Anion Sum	me/L			1.63	2.62	8.12	8.15
Bicarb. Alkalinity (as CaCO3)	mg/L		5	35	31	32	30
Calculated TDS	mg/L		1	88	140	448	477
Carb. Alkalinity (as CaCO3)	mg/L		10	<10	<10	<10	<10
Cation sum	me/L			1.52	2.18	6.96	8.24
Hardness	mg/L			19.7	22.6	54.9	77.0
% Difference/ Ion Balance (NS)	%			3.4	9.2	7.7	0.6
Langelier Index (@20C)	NA			-2.84	-2.61	-1.73	-2.38
Langelier Index (@ 4C)	NA			-3.16	-2.93	-2.05	-2.70
Saturation pH (@ 20C)	NA			9.31	9.27	8.86	8.80
Saturation pH (@ 4C)	NA			9.63	9.59	9.18	9.12

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Certified By:

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AGAT Laboratories
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Certificate of Analysis

AGAT WORK ORDER: 14X839941

PROJECT: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

SNC-Lavalin Bedford West Custom Inorganics Package

DATE RECEIVED: 2014-05-15

DATE REPORTED: 2014-05-26

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION: LSD SAMPLE TYPE: Water DATE SAMPLED: 5/15/2014 5364369	PML - 1 Water 5/15/2014 5364383	PML - 2 Water 5/15/2014 5364392	LU Water 5/15/2014 5364402
Total Aluminum	ug/L		5	487	305	181	1400
Total Antimony	ug/L		2	<2	<2	<2	<2
Total Arsenic	ug/L		2	<2	<2	<2	<2
Total Barium	ug/L		5	15	23	50	185
Total Beryllium	ug/L		2	<2	<2	<2	<2
Total Bismuth	ug/L		2	<2	<2	<2	<2
Total Boron	ug/L		5	14	8	7	22
Total Cadmium	ug/L		0.017	0.032	<0.017	0.062	0.171
Total Chromium	ug/L		1	<1	<1	<1	<1
Total Cobalt	ug/L		1	<1	<1	<1	<1
Total Copper	ug/L		1	2	1	1	2
Total Iron	ug/L		50	593	239	264	2000
Total Lead	ug/L		0.5	0.5	0.9	0.7	1.8
Total Manganese	ug/L		2	140	54	206	71
Total Molybdenum	ug/L		2	<2	<2	<2	<2
Total Nickel	ug/L		2	<2	<2	<2	3
Total Selenium	ug/L		1	<1	<1	<1	<1
Total Silver	ug/L		0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium	ug/L		5	26	35	68	116
Total Thallium	ug/L		0.1	<0.1	<0.1	<0.1	<0.1
Total Tin	ug/L		2	<2	<2	<2	<2
Total Titanium	ug/L		2	6	4	3	22
Total Uranium	ug/L		0.1	<0.1	<0.1	<0.1	<0.1
Total Vanadium	ug/L		2	<2	<2	<2	<2
Total Zinc	ug/L		5	<5	<5	<5	17
Total Coliforms (MPN)	MPN/100 mL		1	1203	613	291	>2420
E. Coli (MPN)	MPN/100 mL		1	<1	6	<1	<1
Chlorophyll A - Acidification Method	ug/L		0.05	1.91	0.67	0.99	99.13
Chlorophyll A - Welschmeyer Method	ug/L		0.05	1.91	0.65	1.13	98.00
Total Kjeldahl Nitrogen as N	mg/L		0.4	1.0	0.4	<0.4	1.2

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Certified By:

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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 14X839941

PROJECT: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

SNC-Lavalin Bedford West Custom Inorganics Package

DATE RECEIVED: 2014-05-15

DATE REPORTED: 2014-05-26

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

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Certified By:

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Quality Assurance

CLIENT NAME: SNC-LAVALIN
AGAT WORK ORDER: 14X839941
PROJECT: 510192-0001 Bedford West
ATTENTION TO: Derek Heath

Water Analysis

RPT Date: May 26, 2014

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
SNC-Lavalin Bedford West Custom Inorganics Package															
Alkalinity	5364369	5364369	35	32	9.0%	< 5	94%	80%	120%	NA	80%	120%	NA	80%	120%
Chloride	1	5362983	3	3	0.0%	< 1	105%	80%	120%		80%	120%	115%	80%	120%
True Color	1	5367476	<5	6		< 5	90%	80%	120%		80%	120%		80%	120%
Nitrate as N	1	5362983	< 0.05	< 0.05	0.0%	< 0.05	101%	80%	120%		80%	120%	115%	80%	120%
Nitrite as N	1	5362983	< 0.05	< 0.05	0.0%	< 0.05	110%	80%	120%		80%	120%	92%	80%	120%
Ammonia as N	1	5322998	<0.05	<0.05	0.0%	< 0.03	113%	80%	120%		80%	120%	104%	80%	120%
Total Organic Carbon	1	5364369	5.2	5.1	1.9%	< 0.5	119%	80%	120%		80%	120%		80%	120%
Ortho-Phosphate as P	1	5363022	<0.01	<0.01	0.0%	< 0.01	107%	80%	120%		80%	120%	105%	80%	120%
pH	5364369	5364369	6.47	6.49	0.3%	<	103%	80%	120%	NA	80%	120%	NA	80%	120%
Total Calcium	5162014		71.4	69.7	2.4%	< 0.1	107%	80%	120%	107%	80%	120%	102%	70%	130%
Total Magnesium	5162014		15.4	15.3	0.7%	< 0.1	104%	80%	120%	111%	80%	120%	114%	80%	120%
Total Phosphorus	1	5364369	0.100	0.102	2.0%	< 0.006	109%	90%	110%	100%	90%	110%	96%	80%	120%
Total Potassium	5162014		1.17	1.15	1.7%	< 0.1	106%	80%	120%	105%	80%	120%	95%	70%	130%
Total Sodium	5162014		23.5	23.0	2.2%	< 0.1	100%	80%	120%	108%	80%	120%	105%	70%	130%
Reactive Silica as SiO2	1	5363047	<0.5	<0.5	0.0%	< 0.5	104%	80%	120%		80%	120%	108%	80%	120%
Total Suspended Solids	1	5363588	6	6	0.0%	< 5	100%	80%	120%		120%	120%	108%	80%	120%
Sulphate	1	5362983	14	14	0.0%	< 2	109%	80%	120%		80%	120%	107%	80%	120%
Turbidity	1	5364402	42.7	41.1	3.8%	< 0.1	88%	80%	120%		80%	120%		80%	120%
Electrical Conductivity	5364369	5364369	122	121	0.1%	< 1	97%	80%	120%	NA	80%	120%	NA	80%	120%
Total Aluminum	5162014		21	21	0.0%	< 5	113%	80%	120%	113%	80%	120%	101%	70%	130%
Total Antimony	5162014		< 2	< 2	0.0%	< 2	95%	80%	120%	116%	80%	120%	118%	70%	130%
Total Arsenic	5162014		3	3	0.0%	< 2	99%	80%	120%	101%	80%	120%	98%	70%	130%
Total Barium	5162014		125	124	0.8%	< 5	104%	80%	120%	107%	80%	120%	104%	70%	130%
Total Beryllium	5162014		< 2	< 2	0.0%	< 2	117%	80%	120%	114%	80%	120%	111%	70%	130%
Total Bismuth	5162014		< 2	< 2	0.0%	< 2	97%	80%	120%	96%	80%	120%	92%	70%	130%
Total Boron	5162014		44	42	4.7%	< 5	112%	80%	120%	111%	80%	120%	113%	70%	130%
Total Cadmium	5162014		0.090	0.081	10.5%	< 0.017	99%	80%	120%	99%	80%	120%	104%	70%	130%
Total Chromium	5162014		< 1	< 1	0.0%	< 1	110%	80%	120%	101%	80%	120%	81%	70%	130%
Total Cobalt	5162014		< 1	< 1	0.0%	< 1	114%	80%	120%	104%	80%	120%	72%	70%	130%
Total Copper	5162014		437	434	0.7%	< 1	116%	80%	120%	107%	80%	120%	99%	70%	130%
Total Iron	5162014		949	928	2.2%	< 50	108%	80%	120%	104%	80%	120%	70%	70%	130%
Total Lead	5162014		33.0	32.4	1.8%	< 0.5	101%	80%	120%	99%	80%	120%	81%	70%	130%
Total Manganese	5162014		181	160	12.3%	< 2	116%	80%	120%	107%	80%	120%	94%	70%	130%
Total Molybdenum	5162014		< 2	< 2	0.0%	< 2	100%	80%	120%	99%	80%	120%	108%	70%	130%
Total Nickel	5162014		2	2	0.0%	< 2	114%	80%	120%	103%	80%	120%	73%	70%	130%
Total Selenium	5162014		< 1	< 1	0.0%	< 1	96%	80%	120%	95%	80%	120%	91%	70%	130%
Total Silver	5162014		< 0.1	< 0.1	0.0%	< 0.1	99%	80%	120%	108%	80%	120%	103%	70%	130%
Total Strontium	5162014		210	204	2.9%	< 5	100%	80%	120%	105%	80%	120%	91%	70%	130%
Total Thallium	5162014		< 0.1	< 0.1	0.0%	< 0.1	97%	80%	120%	100%	80%	120%	92%	70%	130%

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation.

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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Quality Assurance

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 14X839941

PROJECT: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

Water Analysis (Continued)

RPT Date: May 26, 2014			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Tin	5162014		4	4	0.0%	< 2	100%	80%	120%	106%	80%	120%	115%	70%	130%
Total Titanium	5162014		< 2	< 2	0.0%	< 2	108%	80%	120%	103%	80%	120%	98%	70%	130%
Total Uranium	5162014		1.45	1.45	0.0%	< 0.1	97%	80%	120%	92%	80%	120%	95%	70%	130%
Total Vanadium	5162014		< 2	< 2	0.0%	< 2	108%	80%	120%	101%	80%	120%	78%	70%	130%
Total Zinc	5162014		204	204	0.0%	< 5	120%	80%	120%	105%	80%	120%	92%	70%	130%
Total Kjeldahl Nitrogen as N	1	5360838	17.1	17.7	3.4%	< 0.4	101%	80%	120%		80%	120%	106%	80%	120%

Original Signed

Certified By:

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Method Summary

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 14X839941

PROJECT: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Alkalinity	INORG-121-6001	SM 2320 B	PC-TITRATE
Chloride	INORG-121-6005	SM 4110 B	IC
True Color	INORG-121-6014	EPA 110.2	NEPHELOMETER
Nitrate + Nitrite as N	INORG-121-6005	SM 4110 B	CALCULATION
Nitrate as N	INORG-121-6005	SM 4110 B	IC
Nitrite as N	INORG-121-6005	SM 4110 B	IC
Ammonia as N	INORG-121-6003	SM 4500-NH3 G	COLORIMETER
Total Organic Carbon	INORG-121-6026	SM 5310 B	TOC ANALYZER
Ortho-Phosphate as P	INORG-121-6005	SM 4110 B	COLORIMETER
pH	INOR-121-6001	SM 4500 H+B	PC-TITRATE
Total Calcium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Magnesium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Phosphorus	INOR-93-1022	SM 4500-P B & E	SPECTROPHOTOMETER
Total Potassium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Sodium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Reactive Silica as SiO2	INORG-121-6028	SM 4110 B	COLORIMETER
Total Suspended Solids	INOR-121-6024, 6025	SM 2540C, D	GRAVIMETRIC
Sulphate	INORG-121-6005	SM 4110 B	IC
Turbidity	INORG-121-6022	SM 2130 B	NEPHELOMETER
Electrical Conductivity	INOR-121-6001	SM 2510 B	PC-TITRATE
Anion Sum	CALCULATION	SM 1030E	CALCULATION
Bicarb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Calculated TDS		SM 1030E	CALCULATION
Carb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Cation sum	CALCULATION	SM 1030E	CALCULATION
Hardness	CALCULATION	SM 2340B	CALCULATION
% Difference/ Ion Balance (NS)	CALCULATION	SM 1030E	CALCULATION
Langelier Index (@20C)	CALCULATION	CALCULATION	CALCULATION
Langelier Index (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 20C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Total Aluminum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Antimony	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Arsenic	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Barium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Beryllium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Bismuth	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Boron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cadmium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS

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Method Summary

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 14X839941

PROJECT: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Chromium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cobalt	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Copper	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Iron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Lead	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Manganese	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Molybdenum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Nickel	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Selenium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Silver	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Strontium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Thallium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Tin	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Titanium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Uranium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Vanadium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Zinc	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Coliforms (MPN)	MIC-121-7000	Based on SM 9223B	INCUBATOR
E. Coli (MPN)	MIC-121-7000	Based on SM 9223B	INCUBATOR
Chlorophyll A - Acidification Method	Subcontracted	Subcontracted	
Chlorophyll A - Welschmeyer Method	Subcontracted	Subcontracted	ICP-MS
Total Kjeldahl Nitrogen as N	INOR-121-6020	SM 4500 NORG D	COLORIMETER

Results relate only to the items tested and to all the items tested

AGAT Laboratories

Unit 122 - 11 Morris Dr.
Dartmouth, Nova Scotia
B3B 1M2
http://webearth.agatlabs.com

Phone: 902-468-8718
Fax: 902-468-8924
www.agatlabs.com

Laboratory use Only
Arrival Condition: 90 ☑ Good ☐ Poor (complete 'notes') 14X839941.
Arrival Temperature: _____ AGAT Job Number: _____
Notes: _____

Drinking Water Sample (y/n): _____ Reg. No. _____
Waterworks Number: _____

Report To:
Company: SNC Lavalin
Contact: Derek Heath
Address: 5657 Spring Garden RD, suite 200,
Halifax,NS.
Phone: 902 492-4544 FAX: 902 492-4540
PO#:
AGAT Quotation: 12-761
Client Project #: 510192-0001 Bedford West

Invoice to: Same (Y/N) - Circle
Company: SNC Lavalin
Contact: Patricia Allison
Address: 5657 Spring Garden RD, suite 200,
Halifax,NS.
Phone: 902 492-4544 Fax: 902 492-4540

PO#/Credit Card #: _____

Report Information
1. Name: derek.heath@snclavalin.com
Email:
2. Name: Alex Duguay
Email: alexander.duguay@snclavalin.com

Regulatory Requirements (Check):
☐ List Guidelines on Report ☐ Do Not List Guidelines on Report
☐ PIRI
Site Info (check all that apply):
☐ Tier 1 ☐ Res. ☐ Pot. ☐ Coarse
☐ Tier 2 ☐ Com ☐ N/Pot. ☐ Fine
☐ Gas ☐ Fuel ☐ Lube
☐ CCME ☐ CDWQ
☐ Ind ☐ NSDFOSP
☐ Com ☐ HRM 101
☐ Res/P Storm Water
☐ Ag ☐ HRM 101
☐ FWAL Waste Water
☐ Sediment
☐ Other _____

Report Format
☐ Single PDF sample per page
■ Multiple PDF samples per page
■ Excel Format Included

Turnaround Time (TAT) Business Days
Regular TAT:
■ 5 - 7 days
Rush TAT:
☐ 1 day ☐ 2 days
☐ 3 - 4 days
Date Required: _____
Time Required: _____

SAMPLE IDENTIFICATION	DATE / TIME SAMPLED	SAMPLE TIME	SAMPLE TIME	COMMENTS - Site/Sample Info, Sample Containment	Field Filtered/ Preserved	Standard Water and Metals	Low Level Total Phosphorus	TSS and TKN	E.Coli (MPN)	Chlorophyll A	pH	TSS	TKN	Metals	Total Phosphorus	Phenols	TPH/BTEX (PIRI) Tier 1	TPH/BTEX-Fractionation Tier 2	VOC	THM	PAH	PCB	Other	Hazardous (Y/N)	Lab Sample #
LSD	15/05/2014	water	9:30			X	X	X	X	X														
PML-1	15/05/2014	water	10:30																					
PML-2	15/05/2014	water	11:00																					
LU	15/05/2014	water	11:45																					

Sample Relinquished By (print name & sign)	Date/Time	Samples Received By (print name and sign)	Date/Time	Special Instructions
Alex Duguay	15/05/2014	Chris Beaul	May 15/14	
Original Signed		Original Signed	14:35	Page of

SNC·LAVALIN

SNC-Lavalin Inc. 5657 Spring Garden Road
Halifax, NS, Canada, B3J 3R4
(902) 492-4544 - (902) 492-4540

Attachment E. August 2014 Water Monitoring Report

Division of
SNC-LAVALIN INC.
Suite 200
Park Lane Terraces
5657 Spring Garden Road
Halifax, Nova Scotia
Canada, B3J 3R4

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September 23, 2014

Halifax Regional Municipality
Energy and Environment
PO Box 1749
Halifax, Nova Scotia
B3J 3A5

Attention: Mr. Cameron Deacoff

Dear Mr. Deacoff:

RE: Final Report: Water Quality Monitoring Program within Bedford West, Bedford, Nova Scotia – August 2014 Sampling Event

1. INTRODUCTION

SNC-Lavalin Inc. (SLI) was retained by the Halifax Regional Municipality (HRM) to conduct a Water Quality Monitoring Program (the program) within Bedford West area.

The purpose of the program is to determine water quality for watersheds impacted by the development in the Bedford West area. The Paper Mill Lake watershed is the primary watershed within the subject area. The program consists of collecting surface water samples from eleven (11) specified test locations. The locations are presented on Figure 1.

The overall purpose of the program is to conduct water quality sampling and testing prior to construction activities to establish baseline conditions, in order to detect any impacts on and/or changes to water quality during and after construction of the development project.

As part of the August 2014 sampling event, this report presents water quality data of the following sites:

- Kearney Lake (KL1, KL2, KL5);
- Kearney Lake Run (KL3, KL4);
- Highway 102 (HWY 102-1);
- Larry Uteck Boulevard (LU);
- Paper Mill Lake (PML1); and
- Paper Mill Lake (PLM2).

It should be noted that due to low water levels and health and safety concerns, water samples were not collected from the following two sites (locations):

- Highway 102 (Location: HWY 102-2); and
- Lake Shore Drive (Location: LSD)

2. METHODOLOGY

The August 2014 program methodology consisted of one surface water sampling event and laboratory analyses of general chemistry (RCAp), total metals, total phosphorous, total suspended solids, E. coli bacteria, TKN and chlorophyll-a from the specified test locations. Additionally, standard field parameters (pH, water temperature, dissolved oxygen, conductivity, secchi depth, air temperature, cloud cover, and wildlife sightings) were to be measured at specified sampling locations.

The water samples and field parameter readings were collected from a 1.0 metre depth whenever possible. Site conditions (weather, air temperature, cloud cover, and site accessibility) and field parameters for each sampling location were recorded on a field report.

A new pair of latex gloves was used at each sample location. Surface water samples were collected and placed in clean laboratory-supplied jars and stored in a chilled container together with a chain of custody record for transport to the laboratory. All surface water samples collected were submitted to AGAT Laboratories, located in Dartmouth, NS.

Secchi depth measurements were taken from the shady side of the boat at two sample locations. The secchi disk was lowered in the water until no longer visible. The depth was measured to the nearest tenth of a metre. The disk was raised until visible in the water and the depth was measured. The secchi depth is the midpoint between the two measured depths.

During the August 2014 water sampling event, the Waterra AM100 Aqua Meter and AP800 Aqua Probe were used for collecting water field parameters (pH, dissolved oxygen, conductivity and temperature).

With respect to historical field parameter data collection, the following monitors have been used:

a) For the May 2014 water sampling event, the Horiba U-22 parameter monitor was used to collect water field parameters (pH, dissolved oxygen, conductivity and temperature).
b) For 2013-2012 sampling events: Waterra AM100 Aqua Meter and AP800 Aqua Probe were used for collecting water field parameters (pH, dissolved oxygen, conductivity and temperature).
c) For 2011-2010 sampling events: Hach intelliCAL probes were used for collecting for pH, temperature, conductivity and dissolved oxygen (Product Numbers pHC30101, CDC40101 and LDO10101, respectively); and
d) For 2009 sampling events: Oakton Portable Waterproof Meters were used for collecting water field parameters (dissolved oxygen meter 35601 Series; pH and conductivity 35630-00 and 35630-02, respectively).

3. ASSESSMENT STANDARDS

The Canadian Council of Ministers of the Environment (CCME) guidelines for water are broken down based on water use including Freshwater Aquatic Life, Marine Water Aquatic Life, Irrigation, Livestock Watering and Aesthetics and Drinking Water. The surface water quality results were compared to the CCME Freshwater Aquatic Life (FWAL) guidelines since the specified sampling locations are located at and/or near adjacent freshwater bodies.

Analytical data for total suspended solids (TSS) and turbidity are compared to the CCME for the Protection of Aquatic Life (CCME Narrative Total Particulate Matter – Table 1 Suspended Sediments and Turbidity, High Flow Conditions, 1999, updated 2002).

For TSS, the guideline value is equal to a maximum increase of 25 mg/L from background levels at any time when background levels are between 25 and 250 mg/L. When background is greater than 250 mg/L, the concentration should not increase more than 10% of background levels.

The Health Canada guidelines for Canadian Recreational Water Quality (2012, Third Edition) are presented as reference guidelines. The Canadian Recreational Water Quality guidelines indicate that the clarity of the water should be sufficiently clear such that a Secchi disk is visible at a minimum of 1.2 metres. For turbidity, a limit of 50 Nephelometric Turbidity Units (NTU) is suggested.

The Nova Scotia Environment Environmental Quality Standards for Surface Water (Notification of Contamination Protocol (PRO-100) July 6, 2013) are presented as reference guidelines (http://www.novascotia.ca/nse/contaminatedsites/protocols.asp).

4. WATER QUALITY RESULTS - AUGUST 2014 EVENT

The field parameters data and analytical results (such as inorganic, calculated parameters, metals and microbiological) are presented in Table 1 – Bedford West Sampling Program Results.

In addition, the field reports are provided in Attachment 1; photographs of each water sampling location are attached in Attachment 2, and laboratory certificates of analysis are enclosed in Attachment 3.

4.1. FIELD MEASUREMENTS

The standard field parameters were measured at nine (9) of the eleven (11) sampling locations. Field parameters data were not collected from the HWY102-2 and Lake Shore Drive (LSD) sample locations. A secchi disk measurement was not possible at the PML2 sample location due to low water levels.

The dissolved oxygen reading of 2.09 mg/L at HWY 102-1 was outside of the applicable CCME FWAL guideline range of 5.5 - 9.5 mg/L.

4.2. LABORATORY ANALYTICAL RESULTS

It should be noted that water samples were collected at nine (9) of the eleven (11) sampling locations. Water samples were not collected from HWY102-2, Lake Shore Drive (LSD) locations.

4.2.1. GENERAL CHEMISTRY

Analytical results reported for general chemistry were below the applicable CCME FWAL guidelines for all nine of the sampled locations during the August 2014 sampling program.

4.2.2. METALS

Analytical results reported three (3) total metals concentrations which exceeded the applicable CCME FWAL guidelines as shown in table below. All other metals parameters were reported to be within the applied CCME FWAL guidelines.

Total aluminum concentration above CCME FWAL guideline of 5-100 µg/L	▪ 236 µg/L at KL2 ▪ 129 µg/L at PLM1
Total cadmium concentrations above CCME FWAL guideline of 0.017 µg/L	▪ 0.031 µg/L at LU ▪ 0.020 µg/L at PML1 ▪ 0.019 µg/L at PLM2
Total iron concentrations above the CCME FWAL guideline of 300 µg/L	▪ 723 µg/L at KL2 ▪ 820 µg/L at HWY102-1 ▪ 316 µg/L at PLM2

4.2.3. MICROBIOLOGICAL

The laboratory analytical results for E. Coli concentrations were reported to be within the referenced Health Canada Recreational Water Quality guidelines of 400 MPN/100 mL for all nine (9) tested sample locations.

5. CONCLUSIONS

Water quality monitoring program within Bedford West was conducted on August 14, 2014 at nine (9) of the eleven (11) water test locations. The program included the collection of surface water samples for the analysis of general chemistry, total metals, total phosphorous, total suspended solids, E. Coli, total coliforms and chlorophyll-a, as well as the collection of standard field parameter data (pH, water temperature, dissolved oxygen, conductivity, secchi depth, air temperature, cloud cover, and wildlife sightings).

Based on the August 2014 laboratory analytical results and their comparison with the applicable guidelines (CCME FWAL and Health Canada Recreational Water Quality) for this water quality monitoring program, the following findings were identified:

- Dissolved oxygen reading of 2.09 mg/L at HWY 102-1 was outside of the applicable CCME FWAL guideline range of 5.5 - 9.5 mg/L.

- All general chemistry concentrations were within the CCME FWAL applicable guidelines for all nine (9) sample locations.

- Total aluminum concentrations exceeding the CCME FWAL guideline of 5-100 µg/L were reported as follows: 236 µg/L at KL2; and 129 µg/L at PLM1.

- Total cadmium concentrations above the CCME FWAL guideline of 0.017 µg/L were reported as follows: 0.031 µg/L at LU; 0.020 µg/L at PML1; and 0.019 µg/L at PLM2

- Total iron concentrations above the CCME FWAL guideline of 300 µg/L were reported as follows: 723 µg/L at KL2; 820 µg/L at HWY102-1; and 316 µg/L at PLM2.

- E. Coli concentrations were reported to be within the referenced Health Canada Recreational Water Quality guidelines of 400 MPN/100 mL for all nine (9) sample locations.

If you have any questions or require anything further, please contact the undersigned at (902) 492-4544.

Yours truly,

SNC♦LAVALIN INC.

Original Signed

Derek Heath, P.Geo.
Project Manager

DH/mg

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N

HWY102-2

PML2

HWY102-1

PAPER MILL LAKE

PML1

KL4

LSD

KL3

KL2

LU

KEARNEY LAKE

KL5

KL1

Legend

- Water Quality Monitoring Test Locations/Sample Identification

0 200 400 800 1,200 1,600

Meters

SNC•LAVALIN

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Member of the SNC•LAVALIN Group

Certified ISO 9001

HALIFAX REGIONAL MUNICIPALITY

PROJECT: WATER QUALITY MONITORING WITHIN BEDFORD WEST

TITLE: WATER QUALITY MONITORING TEST LOCATIONS

DESIGNED:	CH
DRAWN:	CH
CHECKED:	DH
SCALE:	AS SHOWN
DATE:	10-09-2012
PROJECT #:	510192-0001
DRAWING #:	1

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

August 2014	Units	RDL	NSE ESQs for Surface Water (Reference)	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Kearney Lake															
Sample Sites						KL1															
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/14	2012/10/10	2013/05/15	2013/08/16	2013/10/16	2014/05/14	2014/08/14
Sampling Time	hh:mm	--				08:00	11:45	08:30	11:00	13:10	12:00	11:00	14:30	14:00	8:30	11:20	9:50	10:20	11:10	13:30	10:30	14:15
FIELD DATA																						
Secchi Depth	Meters	--	--	1.2	--	4.1	4.2	5.0	N/A	5.0	4.9	2.4	3.2	2.4	2.35	5.36	N/A	2.50	2.03	2.90	2.36	2.70
Water Temp	Celsius	0.1	--	--	--	14.0	22.2	16.7	12.9	23.3	8.8	11.5	25.6	15.9	8.9	23.3	15.4	13.2	22.2	14.1	12.7	23.2
Dissolved Oxygen	mg/L	0.01	--	--	5.5-9.5	**10.77**	8.20	7.00	9.13	7.86	**10.48**	**10.69**	8.22	9.22	8.98	7.93	8.72	**9.76**	8.57	8.30	**15.29**	7.22
pH	pH	N/A	--	--	--	6.20	6.76	6.67	7.23	7.32	6.61	6.60	6.16	6.04	8.67	6.91	6.32	6.32	8.24	6.35	6.74	7.46
Specific Conductance	uS/cm	1	--	--	--	263	299	261	248	242	219	288	179	146	277	279	198.1	243	216.5	217.9	547.0	341.0
INORGANICS																						
Total Alkalinity (as CaCO3)	mg/L	5	--	--	--	6	8	8	7	8	6	<5	9	7	24	7	<5	<5	<5	8	30	14
Dissolved Chloride (Cl)	mg/L	1	--	--	120	81	74	64	62	60	55	73	45	33	66	70	50	66	59	48	80	76
Colour	TCU	30	--	--	--	18	18	16	26	8	21	28	40	45	50	11	20	11	37	20	13	8
Nitrite + Nitrate	mg/L	0.05	--	--	--	0.18	0.09	0.12	0.21	0.16	0.23	0.2	0.11	0.13	0.20	0.09	0.10	0.18	0.14	0.19	0.11	0.11
Nitrate (N)	mg/L	0.05	--	--	13000	0.18	--	--	0.21	0.16	--	0.2	--	--	0.20	0.09	0.10	0.18	0.14	0.19	0.11	0.11
Nitrite (N)	mg/L	0.05	--	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	--	--	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.04	0.03	<0.03	0.03	0.03	<0.03	<0.03	<0.03
Total Organic Carbon	mg/L	0.5	--	--	--	2.4	2.9	4.7	3.3	3.2	3.1	3.4	5.9	5.5	5.4	2.9	5.2	4.4	4.1	4.3	4.6	2.4
Orthophosphate (as P)	mg/L	0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
pH (Lab)	pH	N/A	--	5.0-9.0	6.5-9	6.94	6.65	6.68	6.91	7.00	6.79	6.52	6.51	6.52	6.7	7.2	6.9	6.78	6.93	6.85	6.72	7.06
Total Calcium (Ca)	mg/L	0.1	--	--	--	9.2	8.5	7.2	7.72	8.66	8.30	7.65	4.82	5.31	6.8	8.4	6.3	7.5	6.6	6.5	8.1	11
Total Magnesium (Mg)	mg/L	0.1	--	--	--	1.5	1.4	1.2	1.42	1.36	1.30	1.29	0.86	1.06	1.1	1.5	1.5	1.1	1.2	1.2	1.6	1.6
Total Phosphorus (1M depth)	mg/L	0.002	--	--	--	<0.02	<0.02	<0.002	0.009	0.007	0.005	0.008	0.012	0.009	0.037	0.043	0.007	0.007	0.011	0.008	0.011	0.026
Total Potassium (K)	mg/L	0.1	--	--	--	1.1	0.9	1.3	0.876	0.888	0.901	0.788	0.773	0.871	0.7	0.9	0.9	0.8	0.7	1.1	0.9	1.6
Total Sodium (Na)	mg/L	0.1	--	--	--	51	46	37	31.8	35.2	33.8	43.7	22.8	19.8	40.1	42.0	29.8	35.8	26.2	31.6	50.2	54.2
Reactive Silica (SiO2)	mg/L	0.5	--	--	--	2.6	2.2	2.3	2.9	2.7	2.9	2.8	1.9	2.3	2.4	1.3	2.2	2.5	1.8	2.2	2.0	1.5
Total Suspended Solids	mg/L	5	--	--	--	1	1	<1	4	17	3	2	2	3	<5	<5	<5	<5	<5	5	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	--	--	--	14	13	12	11	11	11	12	10	8	8	9	9	11	9	9	12	11
Turbidity (NTU)	NTU	0.1	--	50	--	0.7	0.8	1.0	1.3	0.6	1	1	1	0.9	2.4	0.8	1.3	1.6	3.3	0.5	2.9	0.7
Conductivity (uS/cm)	µS/cm	1	--	--	--	310	290	250	240	240	230	290	180	140	246	274	196	259	241	212	290	339
Calculated Parameters																						
Anion Sum	me/L	N/A	--	--	--	2.72	2.52	2.23	2.12	2.08	1.91	2.33	1.66	1.27	2.52	2.31	1.60	2.10	1.86	1.71	3.11	2.66
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5	--	--	--	6	8	8	7	8	6	<1	9	7	24	7	<5	<5	<5	8	30	14.00
Calculated TDS	mg/L	1	--	--	--	166	151	131	123	125	118	143	92	77	139	137	98	124	104	103	172	165.00
Carb. Alkalinity (calc. as CaCO3)	mg/L	10	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	--	--	--	2.85	2.57	2.12	1.92	2.10	2.02	2.42	1.33	1.25	2.24	2.41	1.79	2.08	1.61	1.84	2.77	3.09
Hardness (CaCO3)	mg/L	1	--	--	--	29	27	23	25	27	26	24	16	18	21.5	27.2	21.9	23.3	21.4	21.2	26.8	34.10
Ion Balance (% Difference)	%	N/A	--	--	--	2.33	0.98	2.53	4.95	0.48	2.80	1.89	11.00	0.79	5.9	2.1	5.3	0.7	7.3	3.4	5.8	7.50
Langelier Index (@ 20C)	N/A	N/A	--	--	--	-2.68	-2.87	-2.94	-2.72	-2.51	-2.87	NC	-3.18	-3.21	-2.69	-2.63	-3.19	-3.24	-3.14	-3.02	-2.51	-2.36
Langelier Index (@ 4C)	N/A	N/A	--	--	--	-2.93	-3.12	-3.19	-2.97	-2.76	-3.12	NC	-3.43	-3.46	-3.01	-2.95	-3.51	-3.56	-3.46	-3.34	-2.83	-2.68
Saturation pH (@ 20C)	N/A	N/A	--	--	--	9.62	9.52	9.62	9.63	9.51	9.66	NC	9.69	9.73	9.39	9.83	10.10	10.0	10.1	9.87	9.23	9.42
Saturation pH (@ 4C)	N/A	N/A	--	--	--	9.87	9.77	9.87	9.88	9.76	9.91	NC	9.94	9.98	9.71	10.2	10.4	10.3	10.4	10.2	9.55	9.74
Metals (ICP-MS)																						
Total Aluminum (Al)	µg/L	5	5	--	5-100	**230**	--	--	**289**	47.8	--	**338**	--	--	**321**	43	**168**	**191**	**120**	56	**229**	42
Total Antimony (Sb)	µg/L	2	20	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	2	5.0	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	5	1000	--	--	16	--	--	18.5	15.9	--	13	--	--	12	15	9	12	7	16	14	20
Total Beryllium (Be)	µg/L	2	5.3	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	1200	--	1500	8	--	--	11.4	9.1	--	<50	--	--	<5	11	33	6	10	9	7	22
Total Cadmium (Cd)	µg/L	0.017	0.01	--	0.017	<0.3	--	--	**0.053**	<0.017	--	**0.056**	--	--	**0.032**	**0.027**	**0.021**	**0.020**	<0.017	0.017	**0.037**	<0.017
Total Chromium (Cr)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	**6**	<1
Total Cobalt (Co)	µg/L	1	10	--	--	1	--	--	0.54	<0.40	--	0.79	--	--	<1	<1	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	1	2	--	2.0-4.0	<2	--	--	**5.8**	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<1	1	1	<1
Total Iron (Fe)	µg/L	50	300	--	300	130	--	--	**313**	62	125	177	162	**384**	229	137	195	207	132	92	147	124
Total Lead (Pb)	µg/L	0.5	1	--	1.0-7.0	<0.5	--	--	**10.3**	<0.50	--	<0.50	--	--	<0.5	<0.5	1.9	<0.5	<0.5	<0.5	5.1	<0.5
Total Manganese (Mn)	µg/L	2	820	--	--	100	--	--	79.2	57.1	59	78.4	52.3	55.8	48	65	68	73	48	24	48	115
Total Molybdenum (Mo)	µg/L	2	73	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	25	--	25-150	5	--	--	3.2	<2.0	--	3.2	--	--	<2	<2	2	2	<2	<2	3	<2
Total Selenium (Se)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	5	21000	--	--	46	--	--	39.1	37.7	--	36	--	--	32	41	32	37	33	30	40	45
Total Thallium (Tl)	µg/L	0.1	0.8	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	--	--	--	11	--	--	6.4	<2.0	--	5.4	--	--	8	<2	3	4	2	<2	2	<2
Total Uranium (U)	µg/L	0.1	300	--	15	0.1	--	--	0.11	<0.10	--	0.12	--	--	0.1	<0.1	0.1	0.1	0.1	<0.1	0.1	<0.1
Total Vanadium (V)	µg/L	2	6	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	30	--	30	27	--	--	14.4	7.5	11.1	12.1	13.3	9.7	5	<5	11	11	6	5	14	<5
MICROBIOLOGICAL																						
Total Coliform	MPN/100mL	1	--	--	--	200	65	--	>250	63	>250	91	>250	--	2420	>2420	1120	1200	866	488	525	1550
E. coli	MPN/100mL	1	--	400	--	39	24	--	9	15	37	8	>250	<100	41	11	17	48	2	7	<1	15
Fecal Coliform	MPN/ml	--	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	0.05	--	--	--	0.53	0.79	1.11	1.73	1.47	0.99	0.76	1.44	1.36	0.62	2.3	1.54	1.22	1.40	1.19	0.40	0.41
Chlorophyll A - Welschmeyer method	µg/L	0.05	--	--	--	0.48	0.69	1.17	1.61	1.42	0.81	0.69	1.15	1.14	0.63	2.3	2.16	1.40	1.40	1.19	1.32	0.36
Total Kjeldahl Nitrogen as N	mg/L	0.4	--	--	--	--	--	--	--	--	--	--	--	--	0.9	3.1	0.4	--	0.7	<0.4	1.1	<0.4

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September 2009)
NSE ESQs for Surface Water = Nova Scotia Environment Environmental Quality Standards for Surface Water (July 2013)
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

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TABLE 1: BEDFORD WEST SAMPLING PROGRAM

August 2014	Units	RDL	NSE ESQs for Surface Water (Reference)	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Kearney Lake																
Sample Sites						KL2																
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/14	2012/10/10	2013/05/15	2013/08/15	2013/10/16	2014/05/14	2014/08/14
Sampling Time	hh:mm	--				11:00	10:30	10:45	10:15	12:25	10:50	09:30	14:00	13:15	9:50	10:30	10:20	09:10	16:10	14:30	10:45	9:20
FIELD DATA																						
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--
Water Temp	Celsius	0.1	--	--	--	16.8	18.2	15.4	13.5	20.4	8.0	9.9	19.1	14.1	7.6	21.8	12.3	10.1	22.9	9.7	11.7	21.1
Dissolved Oxygen	mg/L	0.01	--	--	5.5-9.5	**10.16**	8.50	5.70	6.28	**4.66**	**9.58**	**9.66**	7.06	8.43	6.47	5.82	7.63	9.37	6.38	7.40	**14.90**	6.95
pH	pH	N/A	--	--	--	6.33	6.35	6.19	6.61	6.96	6.25	6.77	5.90	5.62	7.72	6.41	6.29	5.75	7.47	5.57	6.60	7.22
Specific Conductance	uS/cm	1	--	--	--	46	106	89	199	104	75	80	67	54	58	96.6	61.1	77.9	65.3	64.5	188.0	266.0
INORGANICS																						
Total Alkalinity (as CaCO3)	mg/L	5	--	--	--	8	8	8	8	7	<5	<5	7	<5	20	<5	8	<5	<5	<5	29	7
Dissolved Chloride (Cl)	mg/L	1	--	--	120	48	48	48	48	25	17	19	14	10	16	20	12	19	21	14	20	17
Colour	TCU	30	--	--	--	20	20	20	20	63	95	80	110	120	52	60	94	37	90	71	25	44
Nitrite + Nitrate	mg/L	0.05	--	--	--	0.19	0.19	0.19	0.19	0.07	0.06	0.12	0.07	<0.05	0.11	0.08	<0.05	0.12	<0.05	<0.05	0.08	<0.05
Nitrate (N)	mg/L	0.05	--	--	13000	0.19	0.19	0.19	0.19	0.07	--	0.12	--	--	0.11	0.08	<0.05	0.12	<0.05	<0.05	0.08	<0.05
Nitrite (N)	mg/L	0.05	--	--	60	<0.05	<0.05	<0.05	<0.05	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	--	--	19	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03	<0.03	<0.03	0.04	<0.03	<0.03	0.04
Total Organic Carbon	mg/L	0.5	--	--	--	4.3	4.3	4.3	4.3	6.6	9.7	6.5	10	12	8.1	7.1	10.9	7.5	11.1	10.9	6.2	6.6
Orthophosphate (as P)	mg/L	0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.09	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (Lab)	pH	N/A	--	5.0-9.0	6.5-9	6.85	6.85	6.85	6.85	6.78	**6.11**	**6.27**	**6.4**	**6.05**	6.5	6.7	6.5	**6.37**	6.62	**6.34**	6.53	6.87
Total Calcium (Ca)	mg/L	0.1	--	--	--	6.5	6.5	6.5	6.5	4.08	3.55	2.51	2.48	2.21	2.4	3.6	2.9	2.7	2.5	2.4	3.4	4.0
Total Magnesium (Mg)	mg/L	0.1	--	--	--	1.2	1.2	1.2	1.2	0.98	0.84	0.63	0.64	0.36	0.7	1.0	1.0	0.7	0.5	0.8	1.1	1.0
Total Phosphorus (1M depth)	mg/L	0.002	--	--	--	0.02	0.02	0.02	0.02	0.009	0.009	0.009	0.008	0.013	0.021	0.059	0.013	0.010	0.020	0.029	0.013	0.039
Total Potassium (K)	mg/L	0.1	--	--	--	1.1	1.1	1.1	1.1	0.634	0.826	0.534	0.497	0.734	0.5	0.7	0.8	0.5	0.5	0.7	0.7	0.9
Total Sodium (Na)	mg/L	0.1	--	--	--	31.6	31.6	31.6	31.6	14.7	10.6	11.1	7.8	6.9	9.8	14.2	9.5	8.9	7.0	7.9	17.5	14.0
Reactive Silica (SiO2)	mg/L	0.5	--	--	--	2.2	2.2	2.2	2.2	4.2	4.7	2.7	4.3	4	2.6	4.0	4.9	2.8	4.4	4.9	2.4	3.3
Total Suspended Solids	mg/L	5	--	--	--	103	103	103	103	7	<1	<1	<2	<1	<5	<5	<5	<5	135	<5	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	--	--	--	9	9	9	9	<2	<2	<2	<2	<2	3	3	2	4	5	4	4	2
Turbidity (NTU)	NTU	0.1	--	50	--	0.5	0.5	0.5	0.5	1.0	1.0	0.4	0.7	0.6	0.5	1.1	1.0	1.9	2.2	1.0	0.9	0.8
Conductivity (uS/cm)	µS/cm	1	--	--	--	212	212	212	212	100	97	79	66	54	71	91	61	83	69	62	87	94
Calculated Parameters																						
Anion Sum	me/L	N/A	--	--	--	0.49	0.82	0.45	0.77	0.85	0.49	0.53	0.53	0.28	0.92	0.63	0.54	0.63	0.70	0.48	1.23	0.66
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5	--	--	--	<1	8	<1	5	7	<1	<1	7	<1	20	<5	8	<5	<5	<5	29	7
Calculated TDS	mg/L	1	--	--	--	36	55	35	46	55	38	37	34	25	45	44	34	37	37	31	65	44
Carb. Alkalinity (calc. as CaCO3)	mg/L	10	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	--	--	--	0.71	0.99	0.67	0.74	0.95	0.74	0.68	0.55	0.49	0.65	0.94	0.73	0.63	0.54	0.60	1.07	0.97
Hardness (CaCO3)	mg/L	1	--	--	--	10	15	10	12	14	12	9	9	8	8.9	13.1	11.4	9.6	8.3	9.3	13.0	14.1
Ion Balance (% Difference)	%	N/A	--	--	--	18.30	9.39	19.60	1.99	5.56	20.30	12.40	1.85	27.30	17.6	19.7	15.1	0.3	12.9	11.0	7.1	19.1
Langelier Index (@ 20C)	N/A	N/A	--	--	--	NC	-3.20	NC	-3.44	-3.05	NC	NC	-3.66	NC	-3.37	-3.60	-3.68	-4.05	-3.83	-4.12	-3.04	-3.23
Langelier Index (@ 4C)	N/A	N/A	--	--	--	NC	-3.45	NC	-3.70	-3.30	NC	NC	-3.91	NC	-3.69	-3.92	-4.00	-4.37	-4.15	-4.44	-3.36	-3.55
Saturation pH (@ 20C)	N/A	N/A	--	--	--	NC	9.78	NC	10.00	9.83	NC	NC	10.10	NC	9.87	10.3	10.2	10.4	10.5	10.5	9.57	10.1
Saturation pH (@ 4C)	N/A	N/A	--	--	--	NC	10.00	NC	10.30	10.10	NC	NC	10.30	NC	10.2	10.6	10.5	10.7	10.8	10.8	9.89	10.4
Metals (ICP-MS)																						
Total Aluminum (Al)	µg/L	5	5	--	5-100	**290**	--	--	**175**	**151**	--	**271**	--	--	**209**	**205**	**338**	**256**	**270**	**259**	**205**	**236**
Total Antimony (Sb)	µg/L	2	20	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	2	5.0	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	5	1000	--	--	9	--	--	11.7	14.3	--	9.5	--	--	9	11	10	8	<5	13	13	18
Total Beryllium (Be)	µg/L	2	5.3	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	1200	--	1500	8	--	--	14.7	12.7	--	<50	--	--	6	14	22	6	11	9	11	12
Total Cadmium (Cd)	µg/L	0.017	0.01	--	0.017	<0.3	--	--	**0.018**	<0.017	--	<0.017	--	--	<0.017	<0.017	<0.017	<0.017	<0.017	**0.019**	<0.017	<0.017
Total Chromium (Cr)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	**9**	<1
Total Cobalt (Co)	µg/L	1	10	--	--	<1	--	--	<0.40	<0.40	--	<0.40	--	--	<1	<1	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	1	2	--	2.0-4.0	<2	--	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<1	2	<1	<1
Total Iron (Fe)	µg/L	50	300	--	300	250	--	--	227	**403**	238	202	**418**	**358**	154	**541**	**813**	269	**528**	**523**	174	**723**
Total Lead (Pb)	µg/L	0.5	1	--	1.0-7.0	<0.5	--	--	1.01	<0.50	--	<0.50	--	--	<0.5	<0.5	1.1	<0.5	0.5	<0.5	5.8	<0.5
Total Manganese (Mn)	µg/L	2	820	--	--	26	--	--	43.2	83.3	34.7	12.1	68.4	22.6	17	90	114	24	67	53	33	146
Total Molybdenum (Mo)	µg/L	2	73	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	25	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Selenium (Se)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	**0.42**	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	5	21000	--	--	14	--	--	17.8	19.5	--	11.9	--	--	10	18	15	12	9	12	16	17
Total Thallium (Tl)	µg/L	0.1	0.8	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	3	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	--	--	--	2	--	--	<2.0	<2.0	--	2.8	--	--	<2	2	3	4	<2	2	2	<2
Total Uranium (U)	µg/L	0.1	300	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Vanadium (V)	µg/L	2	6	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	30	--	30	8	--	--	5.4	5.3	6.5	<5.0	<5.0	<5.0	<5	<5	7	<5	<5	<5	<5	<5
MICROBIOLOGICAL																						
Total Coliform	MPN/100mL	1	--	--	--	1800	170	--	>250	11	>250	59	>250	--	>2420	1986	>2420	>2420	>2420	>2420	525	>2420
E. coli	MPN/100mL	1	--	400	--	**1500**	100	--	**>250**	6	6	2	>250	<100	3	7	3	12	6	2	<1	18
Fecal Coliform	MPN/ml	--	--	400	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	0.05	--	--	--	0.82	6.05	1.97	0.73	0.55	0.22	0.44	0.89	0.97	0.53	2.2	0.07	0.62	1.00	0.73	0.13	0.83
Chlorophyll A - Welschmeyer method	µg/L	0.05	--	--	--	0.87	5.97	1.95	0.66	0.54	0.21	0.42	0.73	0.82	0.56	2.2	0.12	0.72	1.00	0.74	0.14	0.86
Total Kjeldahl Nitrogen as N	mg/L	0.4	--	--	--	--	--	--	--	--	--	--	--	--	<0.4	2.2	0.7	--	1.1	<0.4	<0.4	0.4

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
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CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
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Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
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TABLE 1: BEDFORD WEST SAMPLING PROGRAM

August 2014	Units	RDL	NSE ESQs for Surface Water (Reference)	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Kearney Lake															
Sample Sites						KL3															
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/14	2012/10/10	2013/05/15	2013/08/16	2013/10/16	2014/05/14	2014/08/14
Sampling Time	hh:mm	--				09:00	11:00	09:30	11:30	14:12	11:40	10:30	12:20	12:00	10:26	12:20	11:20	9:50	10:00	14:00	11:00	11:50
FIELD DATA																						
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	--	--	--	14.0	21.6	17.3	14.7	23.1	9.9	10.3	21.1	15.5	9	24.5	15.6	11.7	21.5	13.6	11.0	22.7
Dissolved Oxygen	mg/L	0.01	--	--	5.5-9.5	**10.79**	8.00	8.00	9.26	7.83	**10.35**	**11.06**	8.42	**9.60**	8.89	8.17	7.72	**10.20**	9.20	8.90	5.90	7.87
pH	pH	N/A	--	--	--	7.27	6.74	6.97	7.27	7.33	6.76	6.83	6.96	6.30	7.68	6.85	6.51	5.86	7.25	6.49	6.55	7.37
Specific Conductance	uS/cm	1	--	--	--	95	282	246	220	228	199	220	175	161	204	225	177.2	207.3	194.4	210.6	405.0	252.0
INORGANICS																						
Total Alkalinity (as CaCO3)	mg/L	5	--	--	--	<5	7	7	6	7	7	6	7	7	23	6	5	<5	5	7	15	5
Dissolved Chloride (Cl)	mg/L	1	--	--	120	66	63	60	55	55	53	56	43	37	50	57	46	54	40	46	58	46
Colour	TCU	30	--	--	--	22	20	20	28	12	20	31	38	40	57	15	31	19	23	20	16	13
Nitrite + Nitrate	mg/L	0.05	--	--	--	0.14	0.12	0.14	0.24	0.15	0.22	0.24	0.15	0.16	0.19	0.09	0.09	0.21	0.11	<0.05	0.17	0.13
Nitrate (N)	mg/L	0.05	--	--	13000	0.14	--	--	0.24	0.15	--	0.24	--	--	0.19	0.09	0.09	0.21	0.11	<0.05	0.17	0.13
Nitrite (N)	mg/L	0.05	--	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	--	--	19	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Total Organic Carbon	mg/L	0.5	--	--	--	2.6	3.9	4.3	3.6	3.1	3.3	3.8	5.1	5	5.9	3.4	4.9	4.3	4.4	4.6	4.6	2.8
Orthophosphate (as P)	mg/L	0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (Lab)	pH	N/A	--	5.0-9.0	6.5-9	**6.38**	6.67	6.82	6.82	6.99	6.87	6.52	6.5	**6.38**	6.7	7.1	6.9	6.68	6.96	6.86	6.68	6.87
Total Calcium (Ca)	mg/L	0.1	--	--	--	6.7	7.1	6.8	6.81	7.98	8.29	7.09	4.73	5.63	5.7	6.9	6.0	7.0	5.3	6.8	6.4	7.9
Total Magnesium (Mg)	mg/L	0.1	--	--	--	1.2	1.2	1.11	1.22	1.28	1.27	1.21	0.83	1.01	1.0	1.2	1.3	1.0	0.9	1.3	1.4	1.2
Total Phosphorus (1M depth)	mg/L	0.002	--	--	--	<0.02	<0.02	0.005	0.005	<0.002	0.003	0.008	0.003	0.012	0.019	0.045	0.007	0.006	0.006	0.012	0.009	0.023
Total Potassium (K)	mg/L	0.1	--	--	--	0.9	1.1	0.9	0.791	0.837	0.990	0.879	0.681	0.921	0.7	0.9	0.9	0.8	0.6	1.2	0.8	1.1
Total Sodium (Na)	mg/L	0.1	--	--	--	38	38	35	28.3	33.1	33.0	33.0	20.8	21.3	31.2	34.5	26.37	35.1	20.1	32.1	36.4	39.0
Reactive Silica (SiO2)	mg/L	0.5	--	--	--	2.7	2.6	2.6	3.2	2.9	3.2	2.9	2.5	2.6	2.7	2.0	2.6	2.9	2.6	2.7	2.6	1.9
Total Suspended Solids	mg/L	5	--	--	--	<1	1	1	2	<2	<1	<1	<1	<1	<5	<5	<5	<5	<5	<5	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	--	--	--	11	12	12	10	10	10	9	10	8	7	8	7	7	7	8	9	7
Turbidity (NTU)	NTU	0.1	--	50	--	0.7	1.4	0.6	0.3	0.5	0.6	0.6	0.6	0.4	0.8	0.7	1	0.7	2.4	0.4	0.4	0.3
Conductivity (uS/cm)	µS/cm	1	--	--	--	250	250	240	220	220	220	220	170	160	197	222	182	219	216	204	218	243
Calculated Parameters																						
Anion Sum	me/L	N/A	--	--	--	2.11	2.17	2.08	1.90	1.93	1.87	1.90	1.58	1.36	2.03	1.90	1.55	1.68	1.38	1.60	2.14	1.55
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5	--	--	--	<1	7	7	6	7	7	6	7	7	23	6	5	<5	5	7	15	5
Calculated TDS	mg/L	1	--	--	--	128	130	123	110	117	116	115	88	82	111	113	91	106	78	100	122	106
Carb. Alkalinity (calc. as CaCO3)	mg/L	10	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	--	--	--	2.12	2.16	1.99	1.69	1.97	1.98	1.92	1.23	1.32	1.77	1.98	1.60	2.00	1.24	1.89	2.07	2.23
Hardness (CaCO3)	mg/L	1	--	--	--	22	23	22	22	25	26	23	15	18	18.4	22.2	20.3	21.6	16.9	22.3	21.7	24.7
Ion Balance (% Difference)	%	N/A	--	--	--	0.24	0.23	2.21	5.85	1.03	2.86	0.52	12.50	1.49	6.8	2.1	1.6	8.6	5.5	8.3	1.5	17.9
Langelier Index (@ 20C)	N/A	N/A	--	--	--	NC	-3.00	-2.89	-2.92	-2.60	-2.73	-3.23	-3.33	-3.35	-2.77	-2.88	-3.21	-3.37	-3.19	-3.05	-2.93	-3.12
Langelier Index (@ 4C)	N/A	N/A	--	--	--	NC	-3.25	-3.14	-3.17	-2.85	-2.99	-3.49	-3.58	-3.60	-3.09	-3.20	-3.53	-3.69	-3.51	-3.37	-3.25	-3.44
Saturation pH (@ 20C)	N/A	N/A	--	--	--	NC	9.67	9.71	9.74	9.59	9.60	9.75	9.83	9.73	9.47	9.98	10.10	10.0	10.2	9.91	9.61	9.99
Saturation pH (@ 4C)	N/A	N/A	--	--	--	NC	9.92	9.96	9.99	9.84	9.86	10.00	10.10	9.98	9.79	10.3	10.4	10.4	10.5	10.2	9.93	10.3
Metals (ICP-MS)																						
Total Aluminum (Al)	µg/L	5	5	--	5-100	259	259	--	**124**	53.5	--	**266**	--	--	**199**	54	**153**	**140**	65	100	**260**	52
Total Antimony (Sb)	µg/L	2	20	--	--	<2	<2	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	2	5.0	--	5	<2	<2	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	5	1000	--	--	13	13	--	15.7	13.2	--	19.1	--	--	18	17	15	19	9	18	17	17
Total Beryllium (Be)	µg/L	2	5.3	--	--	<2	<2	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	--	--	--	<2	<2	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	1200	--	1500	9	9	--	7.8	8.7	--	<50	--	--	5	9	17	7	7	10	8	10
Total Cadmium (Cd)	µg/L	0.017	0.01	--	0.017	0.019	0.019	--	**0.030**	<0.017	--	**0.046**	--	--	**0.019**	**0.021**	**0.027**	**0.028**	<0.017	<0.017	**0.038**	<0.017
Total Chromium (Cr)	µg/L	1	1.0	--	1	<1	<1	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	**7**	<1
Total Cobalt (Co)	µg/L	1	10	--	--	<1	<1	--	<0.40	<0.40	--	<0.40	--	--	<1	<1	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	1	2	--	2.0-4.0	2	2	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<1	1	1	<1
Total Iron (Fe)	µg/L	50	300	--	300	523	523	--	73	133	58	136	104	154	137	136	119	131	71	172	137	96
Total Lead (Pb)	µg/L	0.5	1	--	1.0-7.0	<0.5	<0.5	--	0.60	<0.50	--	<0.50	--	--	<0.5	<0.5	0.7	<0.5	<0.5	0.9	3.6	<0.5
Total Manganese (Mn)	µg/L	2	820	--	--	53	53	--	36.8	67.1	32.1	41.5	33.1	32.5	25	47	46	37	20	92	41	45
Total Molybdenum (Mo)	µg/L	2	73	--	73	<2	<2	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	25	--	25-150	<2	<2	--	2.0	<2.0	--	2.3	--	--	<2	<2	<2	<2	<2	<2	2	<2
Total Selenium (Se)	µg/L	1	1.0	--	1	<1	<1	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.1	<0.1	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	5	21000	--	--	12	12	--	33.5	35.9	--	33.2	--	--	25	33	29	33	18	32	31	32
Total Thallium (Tl)	µg/L	0.1	0.8	--	0.8	<0.1	<0.1	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	--	--	--	<2	<2	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	--	--	--	2	2	--	<2.0	<2.0	--	4.9	--	--	<2	<2	<2	<2	<2	2	3	<2
Total Uranium (U)	µg/L	0.1	300	--	15	<0.1	<0.1	--	<0.10	<0.10	--	0.11	--	--	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Vanadium (V)	µg/L	2	6	--	--	<2	<2	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	30	--	30	<5	<5	--	9.7	6.9	6.4	9.3	6.6	9.2	<5	<5	8	10	5	7	10	<5
MICROBIOLOGICAL																						
Total Coliform	MPN/100mL	1	--	--	--	120	24	--	190	16	58	72	110	--	291	1553	178	345	2420	1300	86	1730
E. coli	MPN/100mL	1	--	400	--	1	17	--	2	<1	8	5	37	<100	2	<1	3	8	21	<1	<1	<1
Fecal Coliform	MPN/ml	--	--	400	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	0.05	--	--	--	1.04	1.11	1.18	1.30	1.14	0.51	0.78	1.26	1.24	0.52	1.3	0.81	1.44	2.00	0.65	0.76	0.59
Chlorophyll A - Welschmeyer method	µg/L	0.05	--	--	--	0.94	0.97	1.21	1.09	1.19	0.42	0.67	0.98	1.01	0.55	1.2	1.14	1.62	2.30	0.61	0.69	0.51
Total Kjeldahl Nitrogen as N	mg/L	0.4	--	--	--	--	--	--	--	--	--	--	--	--	<0.4	2.8	<0.4	--	1.3	<0.4	0.6	0.4

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)
NSE ESQs for Surface Water = Nova Scotia Environment Environmental Quality Standards for Surface Water (July 2013)
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

August 2014	Units	RDL	NSE ESQs for Surface Water (Reference)	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Kearney Lake														Kearney Lake									
Sample Sites						KL4														KL5									
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/14	2012/10/10	2013/05/15	2013/08/16	2013/10/16	2014/05/14	2014/08/14	2011/10/17	2012/05/01	2012/08/14	2012/10/10	2013/05/15	2013/08/16	2013/10/16	2014/05/14	2014/08/14
Sampling Time	hh:mm	--				10:00	11:30	10:00	11:20	13:50	11:15	10:10	11:40	11:40	10:16	12:00	11:40	9:41	10:30	14:20	11:15	11:35	9:40	10:52	13:10	12:10	10:03	10:50	13:45	11:30	13:55
FIELD DATA																														
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	--	--	--	13.4	21.9	17.3	14.5	21.9	9.8	10.1	21.2	15.3	9.0	24.4	15.7	11.7	20.4	13.5	11.0	21.8	14.7	10.5	26.1	16.6	13.3	22.7	14.7	13.7	22.9
Dissolved Oxygen	mg/L	0.01	--	--	5.5-9.5	**10.87**	8.10	8.30	9.01	6.27	**10.89**	**10.99**	**8.55**	**9.65**	8.70	7.32	8.87	**10.09**	8.89	**9.60**	**14.50**	5.92	9.38	7.88	7.90	8.16	**9.67**	8.89	8.60	**15.83**	7.64
pH	pH	N/A	--	--	--	8.00	6.71	6.94	7.19	6.98	6.07	6.49	6.43	6.02	9.0	6.71	6.77	5.72	7.08	6.41	6.30	7.25	6.52	7.76	6.69	6.72	6.20	8.57	6.51	6.79	7.86
Specific Conductance	uS/cm	1	--	--	--	771	262	247	224	226	215	218	172	126	206	225	185.9	207.1	196.2	209.0	273.0	251.0	112	230	229	189.0	219.5	202.1	212.9	472.0	251.0
INORGANICS																														
Total Alkalinity (as CaCO3)	mg/L	5	--	--	--	5	7	7	6	8	7	5	8	7	22	8	<5	<5	<5	<5	30	5	9	21	8	<5	<5	6	5	32	<5
Dissolved Chloride (Cl)	mg/L	1	--	--	120	67	65	60	56	56	53	56	44	37	51	57	46	54	41	47	59	47	37	55	57	48	58	44	46	61	47
Colour	TCU	30	--	--	--	22	18	20	27	11	20	32	38	43	48	11	20	17	21	20	13	11	35	43	10	27	10	22	18	14	11
Nitrite + Nitrate	mg/L	0.05	--	--	--	0.15	0.12	0.14	0.23	0.19	0.21	0.23	0.15	0.17	0.19	0.11	0.09	0.20	0.11	0.17	0.25	0.17	0.17	0.19	0.15	0.83	0.21	0.21	0.25	0.16	0.10
Nitrate (N)	mg/L	0.05	--	--	13000	0.15	--	--	0.23	0.19	--	0.23	--	--	0.19	0.11	0.09	0.20	0.11	0.17	0.25	0.17	--	0.19	0.15	0.83	0.21	0.21	0.20	0.16	0.10
Nitrite (N)	mg/L	0.05	--	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	--	--	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	0.05	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.03	0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Total Organic Carbon	mg/L	0.5	--	--	--	2.5	2.6	4.0	3.3	2.6	3.1	3.7	6	5.4	7.5	3.2	4.8	4.2	4.5	4.3	4.4	2.1	4.8	5.8	3.4	4.7	4.0	4.6	7.0	4.3	2.7
Orthophosphate (as P)	mg/L	0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (Lab)	pH	N/A	--	5.0-9.0	6.5-9	6.61	6.75	6.83	6.83	6.93	6.83	6.57	6.57	**6.46**	6.7	7.0	6.9	6.69	6.96	6.85	6.69	6.91	6.57	6.7	7.1	6.5	6.71	6.93	6.89	6.64	6.84
Total Calcium (Ca)	mg/L	0.1	--	--	--	6.8	7.7	7.0	6.81	8.00	8.45	6.84	4.93	5.24	5.7	6.8	5.8	6.8	5.1	6.8	6.4	7.9	5.79	6.1	6.6	5.9	7.1	5.7	6.4	6.5	7.6
Total Magnesium (Mg)	mg/L	0.1	--	--	--	1.2	1.3	1.2	1.22	1.24	1.31	1.19	0.86	0.99	1.0	1.2	1.2	1.0	0.8	1.2	1.3	1.2	1.05	1.0	1.1	1.2	1.0	1.0	1.1	1.4	1.2
Total Phosphorus (1M depth)	mg/L	0.002	--	--	--	<0.02	<0.02	<0.002	0.004	<0.002	<0.002	0.007	0.003	0.026	0.022	0.043	0.007	0.006	2.39	0.016	0.022	0.031	0.009	0.018	0.040	0.006	0.005	0.013	0.010	0.010	0.026
Total Potassium (K)	mg/L	0.1	--	--	--	1	1	1	0.807	0.905	0.968	0.826	0.733	1.130	0.7	1.0	0.9	0.8	0.6	1.2	0.8	1.1	0.858	0.7	0.9	0.8	0.8	0.7	1.1	0.8	1.1
Total Sodium (Na)	mg/L	0.1	--	--	--	39	41	37	28.5	34.3	33.9	32.1	21.5	21.1	31.5	34.5	25.2	31.6	20.1	30.7	35.9	38.6	22.0	34.6	32.0	27.7	33.6	19.2	31.3	37.5	40.3
Reactive Silica (SiO2)	mg/L	0.5	--	--	--	2.7	2.6	2.6	3.1	2.9	3.1	2.9	2.5	2.7	2.7	2.2	2.6	3.0	2.6	2.5	2.6	2.1	2.5	2.7	2.0	2.4	2.7	2.5	2.5	2.7	2.1
Total Suspended Solids	mg/L	5	--	--	--	<1	1	<1	<2	<2	<1	2	<1	<2	<5	<5	<5	<5	<5	<5	<5	<5	1	<5	<5	<5	<5	<5	<5	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	--	--	--	11	12	11	10	10	10	9	10	8	7	8	7	7	7	9	9	8	9	7	8	8	8	7	8	9	8
Turbidity (NTU)	NTU	0.1	--	50	--	0.5	1.0	0.3	0.3	0.2	0.8	0.7	0.7	0.4	0.7	0.4	0.8	0.7	2.6	2.1	1.1	0.6	0.9	1.1	0.7	0.9	0.7	0.8	0.4	1.1	0.4
Conductivity (uS/cm)	µS/cm	1	--	--	--	260	250	230	220	230	250	210	170	160	200	224	183	218	218	204	219	241	160	215	226	189	232	223	204	228	246
Calculated Parameters																														
Anion Sum	me/L	N/A	--	--	--	2.23	2.22	2.09	1.91	1.94	1.85	1.88	1.62	1.36	2.04	1.94	1.45	1.68	1.31	1.53	2.47	1.60	1.42	2.13	1.95	1.58	1.82	1.52	1.58	2.56	1.50
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5	--	--	--	5	7	7	6	8	7	5	8	7	22	8	<5	<5	<5	<5	30	5	9	21	8	<5	<5	6	5	32	<5
Calculated TDS	mg/L	1	--	--	--	132	135	125	111	118	116	113	90	81	111	114	87	103	75	97	132	108	84	118	111	96	110	82	98	136	106
Carb. Alkalinity (calc. as CaCO3)	mg/L	10	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10	<10	<1	<10	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	--	--	--	2.16	2.32	2.07	1.70	2.02	2.03	1.86	1.28	1.3	1.78	1.97	1.53	1.84	1.23	1.84	2.04	2.21	1.36	1.94	1.85	1.64	1.94	1.23	1.81	2.12	2.27
Hardness (CaCO3)	mg/L	1	--	--	--	22	25	22	22	25	27	22	16	17	18.4	21.9	19.4	21.1	16.0	21.9	21.3	24.7	19	19.3	21.0	19.7	21.8	18.4	20.5	22.0	23.9
Ion Balance (% Difference)	%	N/A	--	--	--	1.59	2.20	0.48	5.82	2.02	4.64	0.53	11.70	2.26	6.6	0.8	2.8	4.5	3.2	9.2	9.5	15.8	2.16	4.7	2.6	2.0	3.2	10.6	6.7	9.4	20.3
Langelier Index (@ 20C)	N/A	N/A	--	--	--	-3.21	-2.89	-2.84	-2.92	-2.64	-2.75	-3.22	-3.18	-3.31	-2.79	-2.86	-3.22	-3.37	-3.21	-3.21	-2.63	-3.08	-3.06	-2.79	-2.77	-3.62	-3.33	-3.11	-3.19	-2.64	-3.17
Langelier Index (@ 4C)	N/A	N/A	--	--	--	-3.46	-3.14	-3.09	-3.17	-2.89	-3.00	-3.47	-3.43	-3.56	-3.11	-3.18	-3.54	-3.69	-3.53	-3.53	-2.95	-3.40	-3.31	-3.11	-3.09	-3.94	-3.65	-3.43	-3.51	-2.96	-3.49
Saturation pH (@ 20C)	N/A	N/A	--	--	--	9.82	9.64	9.67	9.75	9.57	9.58	9.79	9.75	9.77	9.49	9.86	10.10	10.1	10.2	10.1	9.32	9.99	9.63	9.49	9.87	10.1	10.0	10.0	10.1	9.28	10.0
Saturation pH (@ 4C)	N/A	N/A	--	--	--	10.1	9.9	9.9	10.0	9.8	9.8	10.0	10.0	10.0	9.8	10.2	10.4	10.4	10.5	10.4	9.64	10.3	9.88	9.81	10.2	10.4	10.4	10.4	10.4	9.60	10.3
Metals (ICP-MS)																														
Total Aluminum (Al)	µg/L	5	5	--	5-100	**150**	--	--	**125**	29.2	--	**231**	--	--	**188**	48	**149**	**141**	**106**	**159**	**236**	46	--	**222**	52	**154**	**136**	58	61	**224**	53
Total Antimony (Sb)	µg/L	2	20	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	2	5.0	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	5	1000	--	--	16	--	--	16.6	17.8	--	18.2	--	--	18	17	16	18	10	19	17	19	--	18	16	15	19	9	16	16	17
Total Beryllium (Be)	µg/L	2	5.3	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	1200	--	1500	6	--	--	8.6	9.1	--	<50	--	--	6	9	16	7	6	9	8	11	--	6	9	15	7	7	9	7	6
Total Cadmium (Cd)	µg/L	0.017	0.01	--	0.017	<0.3	--	--	**0.031**	<0.017	--	**0.035**	--	--	**0.021**	<0.017	**0.027**	**0.027**	0.017	**0.050**	**0.027**	<0.017	--	**0.022**	**0.027**	**0.029**	**0.024**	<0.017	**0.034**	**0.036**	<0.017
Total Chromium (Cr)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	6	<1	<1	<1	**6**	<1	--	<1	<1	5	<1	<1	<1	**6**	<1
Total Cobalt (Co)	µg/L	1	10	--	--	<1	--	--	<0.40	<0.40	--	<0.40	--	--	<1	<1	<1	<1	<1	<1	<1	<1	--	<1	<1	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	1	2	--	2.0-4.0	<2	--	--	<2.0	2.4	<2.0	2.3	<2.0	<2.0	<2	<2	4	**9**	<1	1	<1	<1	<2.0	<2	<2	<2	<2	<1	1	<1	<1
Total Iron (Fe)	µg/L	50	300	--	300	86	--	--	82	51	55	119	109	138	129	118	133	213	144	248	129	55	175	160	78	120	111	70	79	111	<50
Total Lead (Pb)	µg/L	0.5	1	--	1.0-7.0	<0.5	--	--	3.23	<0.50	--	<0.50	--	--	<0.5	<0.5	0.8	0.9	<0.5	<0.5	2.6	<0.5	--	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	1.9	<0.5
Total Manganese (Mn)	µg/L	2	820	--	--	51	--	--	34.5	63.5	29.4	38.5	27.2	29.7	23	34	38	34	77	130	34	29	35.9	30	14	37	35	13	12	40	18
Total Molybdenum (Mo)	µg/L	2	73	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	25	--	25-150	3	--	--	2.0	<2.0	--	<2.0	--	--	<2	<2	5	<2	<2	<2	<2	<2	--	<2	<2	5	<2	<2	<2	2	<2
Total Selenium (Se)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	<1	<1	--	<1	<1	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<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
Total Strontium (Sr)	µg/L	5	21000	--	--	34	--	--	33.1	36.7	--	32.7	--	--	25	32	28	32	17	31	31	31	--	27	31	29	31	18	31	31	30
Total Thallium (Tl)	µg/L	0.1	0.8	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<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
Total Tin (Sn)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	5	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	4.2	--	--	<2	<2	<2	<2	<2	3	2	<2	--	3	<2	<2	<2	<2	<2	<2	<2
Total Uranium (U)	µg/L	0.1	300	--	15	<0.1	--	--	<0.10	<0.10	--	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
Total Vanadium (V)	µg/L	2	6	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	30	--	30	14	--	--	10.4	6.9	7	11.3	7.4	7	<5	<5	**68**	21	<5	9	9	<5	9.3	5	<5	**64**	11	7	5	10	<5
MICROBIOLOGICAL																														
Total Coliform	MPN/100mL	1	--	--	--	28	58	--	100	16	75	83	95	--	345	>2420	921	548	>2420	770	308	1550	--	461	613	93	461	308	461	42	629
E. coli	MPN/100mL	1	--	400	--	4	33	--	1	<1	2	5	39	<100	4	<1	4	6	38	<1	<1	1	100	14	2	6	6	6	4	<1	1
Fecal Coliform	MPN/ml	--	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	0.05	--	--	--	0.78	1.11	1.06	0.92	0.07	0.50	0.60	1.04	1.31	0.52	0.7	0.55	1.34	1.50	0.40	0.44	0.50	0.91	0.30	1.2	1.09	1.44	2.20	0.64	0.20	0.61
Chlorophyll A - Welschmeyer method	µg/L	0.05	--	--	--	0.69	0.96	1.11	0.77	0.07	0.41	0.55	0.82	1.07	0.55	0.7	0.74	1.48	1.70	0.39	0.40	0.57	0.85	0.33	1.0	1.41	1.59	2.40	0.62	0.20	0.54
Total Kjeldahl Nitrogen as N	mg/L	0.4	--	--	--	--	--	--	--	--	--	--	--	--	0.5	<0.4	0.7	--	1.8	1.1	<0.4	<0.4	--	<0.4	2.3	1.0	--	0.6	1.1	<0.4	0.5

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)
NSE ESQs for Surface Water = Nova Scotia Environment Environmental Quality Standards for Surface Water (July 2013)
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

August 2014	Units	RDL	NSE ESQs for Surface Water (Reference)	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Highway 102																
Sample Sites						HWY102-1																
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/15	2012/10/11	2013/05/15	2013/08/15	2013/10/16	2014/05/14	2014/08/14
Sampling Time	hh:mm	--				07:00	12:45	08:00	13:00	10:20	09:00	13:40	11:00	11:00	14:50	11:00	9:50	14:15	12:22	12:30	12:00	10:10
FIELD DATA																						
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	--	--	--	11.8	18.8	15.7	14.9	19.6	7.4	11.4	17.8	14.6	10.7	21.8	13.6	11.7	19.5	8.9	12.1	19.6
Dissolved Oxygen	mg/L	0.01	--	--	5.5-9.5	**11.44**	5.80	**4.34**	8.18	**4.25**	6.05	8.15	**3.88**	**5.34**	5.65	**1.03**	**3.83**	7.55	**3.32**	**3.10**	**12.03**	**2.09**
pH	pH	N/A	--	--	--	7.98	5.35	5.25	6.31	5.26	5.62	5.75	5.77	5.99	8.76	5.73	6.38	6.19	7.10	6.79	6.02	6.63
Specific Conductance	uS/cm	1	--	--	--	194	153	104	135	106	109	114	108	89	288	225	155.5	226	173.2	234.0	880.0	337
INORGANICS																						
Total Alkalinity (as CaCO3)	mg/L	5	--	--	--	<5	<5	<5	<5	<5	<5	5	11	8	22	25	15	9	23	20	31	28
Dissolved Chloride (Cl)	mg/L	1	--	--	120	24	38	24	32	25	22	24	19	12	58	48	28	53	31	40	65	57
Colour	TCU	30	--	--	--	67	68	57	37	89	53	39	65	79	24	65	40	9	65	25	11	31
Nitrite + Nitrate	mg/L	0.05	--	--	--	<0.05	<0.05	<0.05	0.69	<0.05	1.2	0.69	0.25	1.2	2.61	0.06	0.43	0.51	<0.05	<0.05	<0.05	<0.05
Nitrate (N)	mg/L	0.05	--	--	13000	<0.05	--	--	0.69	<0.05	--	0.69	--	--	2.61	0.06	0.43	0.51	<0.05	<0.05	<0.05	<0.05
Nitrite (N)	mg/L	0.05	--	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	--	--	19	<0.05	0.29	<0.05	<0.05	<0.05	<0.05	0.05	0.1	0.07	0.31	0.19	0.04	<0.03	0.05	0.06	<0.03	0.04
Total Organic Carbon	mg/L	0.5	--	--	--	6.5	10	7.7	4.7	11	6.3	4.5	7.2	7.4	5.5	10.0	7.0	5.1	10.1	17.7	4.1	7.7
Orthophosphate (as P)	mg/L	0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (units)	pH	N/A	--	5.0-9.0	6.5-9	**4.54**	**5.24**	**5.40**	**5.48**	**6.24**	**5.31**	**6.42**	6.55	**6.28**	**6.4**	6.9	6.8	6.86	6.87	6.73	6.56	7.49
Total Calcium (Ca)	mg/L	0.1	--	--	--	1.7	1.8	1.6	4.93	3.34	5.09	4.9	5.21	5.55	12.5	11.7	7.5	11.1	10.5	13.9	7.2	23.3
Total Magnesium (Mg)	mg/L	0.1	--	--	--	0.3	0.5	0.5	1.08	0.79	1.09	0.91	0.92	1.19	1.7	2.0	1.4	1.4	1.5	2.3	1.6	3.2
Total Phosphorus (1M depth)	mg/L	0.002	--	--	--	0.07	0.14	0.020	0.006	0.007	0.011	0.009	0.012	0.010	0.019	0.039	0.02	0.006	0.021	0.022	0.013	0.038
Total Potassium (K)	mg/L	0.1	--	--	--	0.5	1.2	0.7	1.140	1.630	1.310	1.100	1.500	1.880	1.6	2.5	1.5	1.3	1.7	2.4	1.2	2.5
Total Sodium (Na)	mg/L	0.1	--	--	--	15	25	13	15.9	14.5	14.6	14.8	10.2	8.26	36.3	27.7	14.6	30.8	15.0	20.5	39.1	38.7
Reactive Silica (SiO2)	mg/L	0.5	--	--	--	2.5	2.2	2.0	1.1	3.8	5.1	2.8	5.2	4.6	4.1	6.1	5.1	3.1	5.1	5.8	1.7	7.1
Total Suspended Solids	mg/L	5	--	--	--	7	80	2	<2	11	<2	<1	1	<1	9	6	<5	<5	<5	<5	6	<5
Dissolved Sulphate (SO4)	mg/L	2	--	--	--	5	3	3	8	<2	8	10	8	10	14	8	9	12	8	12	10	7
Turbidity (NTU)	NTU	0.1	--	50	--	14.0	35	0.9	1.4	1.2	0.6	0.4	0.6	1.1	0.9	1.9	0.9	0.5	1.6	0.5	0.7	1.6
Conductivity (uS/cm)	µS/cm	1	--	--	--	100	140	92	130	100	110	110	100	88	263	231	143	243	188	218	252	338
Calculated Parameters																						
Anion Sum	me/L	N/A	--	--	--	0.77	1.12	0.73	1.11	0.71	0.88	1.03	0.95	0.80	2.55	2.02	1.31	1.96	1.50	1.78	2.66	2.31
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5	--	--	--	<1	<1	<1	<1	<1	<1	5	11	8	22	25	15	9	23	20	31	28
Calculated TDS	mg/L	1	--	--	--	50	73	45	67	50	63	65	58	54	150	117	73	117	83	104	143	150
Carb. Alkalinity (calc. as CaCO3)	mg/L	10	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	--	--	--	0.84	1.32	0.74	1.06	0.93	1.02	1.00	0.83	0.80	2.43	6.04	1.19	2.06	1.40	1.87	2.25	3.22
Hardness (CaCO3)	mg/L	1	--	--	--	6	6	6	17	12	17	16	17	19	38.2	37.5	24.5	33.5	32.4	44.2	24.6	71.4
Ion Balance (% Difference)	%	N/A	--	--	--	4.35	8.20	0.68	2.30	13.40	7.37	1.48	6.74	0.00	2.6	1.9	4.6	2.4	3.5	2.6	8.4	16.4
Langelier Index (@ 20C)	N/A	N/A	--	--	--	NC	NC	NC	NC	NC	NC	-3.50	-2.99	-3.36	-2.77	-2.23	-2.72	-2.73	-2.33	-2.41	-2.69	-1.30
Langelier Index (@ 4C)	N/A	N/A	--	--	--	NC	NC	NC	NC	NC	NC	-3.75	-3.25	-3.61	-3.09	-2.55	-3.04	-3.05	-2.65	-2.73	-3.01	-1.62
Saturation pH (@ 20C)	N/A	N/A	--	--	--	NC	NC	NC	NC	NC	NC	9.92	9.54	9.64	9.17	9.13	9.52	9.59	9.20	9.14	9.25	8.79
Saturation pH (@ 4C)	N/A	N/A	--	--	--	NC	NC	NC	NC	NC	NC	10.20	9.80	9.89	9.49	9.45	9.84	9.91	9.52	9.46	9.57	9.11
Metals (ICP-MS)																						
Total Aluminum (Al)	µg/L	5	5	--	5-100	**510**	--	--	**169**	**192**	--	**205**	--	--	**134**	**183**	**146**	86	**145**	**150**	**187**	83
Total Antimony (Sb)	µg/L	2	20	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	2	5.0	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	5	1000	--	--	22	--	--	52.9	36.9	--	37.3	--	--	58	284	42	57	57	80	46	142
Total Beryllium (Be)	µg/L	2	5.3	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	1200	--	1500	<5	--	--	11.4	10.9	--	<50	--	--	12	18	13	10	10	11	9	14
Total Cadmium (Cd)	µg/L	0.017	0.01	--	0.017	<0.3	--	--	**0.043**	<0.017	--	**0.023**	--	--	**0.034**	**0.021**	<0.017	<0.017	<0.017	**0.040**	**0.022**	<0.017
Total Chromium (Cr)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	**8**	<1
Total Cobalt (Co)	µg/L	1	10	--	--	<1	--	--	0.50	0.46	--	<0.40	--	--	<1	<1	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	1	2	--	2.0-4.0	2	--	--	3.4	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	3	<2	<1	2	<1	<1
Total Iron (Fe)	µg/L	50	300	--	300	**720**	--	--	146	**637**	150	107	209	219	102	**1380**	255	111	**938**	**446**	147	**820**
Total Lead (Pb)	µg/L	0.5	1	--	1.0-7.0	1.6	--	--	2.37	0.56	--	<0.50	--	--	<0.5	0.7	<0.5	<0.5	<0.5	0.6	2.6	<0.5
Total Manganese (Mn)	µg/L	2	820	--	--	40	--	--	55.3	39.0	67.0	28.1	21.0	31.3	34	79	28	23	45	31	56	122
Total Molybdenum (Mo)	µg/L	2	73	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	25	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Selenium (Se)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	5	21000	--	--	11	--	--	29.1	19.7	--	24.3	--	--	48	58	36	52	47	62	38	103
Total Thallium (Tl)	µg/L	0.1	0.8	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	--	--	--	6	--	--	<2.0	<2.0	--	3.5	--	--	<2	3	<2	<2	<2	4	2	<2
Total Uranium (U)	µg/L	0.1	300	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Vanadium (V)	µg/L	2	6	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	30	--	30	21	--	--	16.4	6.9	6.9	<5.0	<5.0	6.9	<5	6	<5	<5	<5	10	10	<5
MICROBIOLOGICAL																						
Total Coliform	MPN/100mL	1	--	--	--	84	>250	--	>250	>250	180	120	180	--	687	>2420	>2420	1550	>2420	1553	120	>2420
E. coli	MPN/100mL	1	--	400	--	54	**>250**	--	12	17	5	1	78	<100	3	68	145	4	9	5	3	179
Fecal Coliform	MPN/ml	--	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	0.05	--	--	--	15.40	19.29	0.70	18.12	1.61	8.45	0.93	0.58	0.69	0.53	2.59	0.81	1.27	14.70	1.99	0.25	1.10
Chlorophyll A - Welschmeyer method	µg/L	0.05	--	--	--	17.50	19.60	0.84	17.62	1.68	7.52	0.84	0.56	0.65	0.59	2.89	1.05	1.45	15.80	2.20	0.82	1.11
Total Kjeldahl Nitrogen as N	mg/L	0.4	--	--	--	--	--	--	--	--	--	--	--	--	1.1	1.3	0.6	--	0.6	0.6	0.7	0.6

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
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Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September 2009)
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Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

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TABLE 1: BEDFORD WEST SAMPLING PROGRAM

August 2014	Units	RDL	NSE ESQs for Surface Water (Reference)	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Highway 102																
Sample Sites						HWY102-2																
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/15	2012/10/11	2013/05/15	2013/08/15	2013/10/16	2014/05/14	2014/08/14
Sampling Time	hh:mm	--				12:30	12:15	12:30	12:40	09:30	12:30	11:20	15:00	15:30	11:20	12:20	10:35	10:40	10:00	10:22	12:15	14:25
FIELD DATA																						
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--
Water Temp	Celsius	0.1	--	--	--	16.7	19.2	16.4	17.2	17.0	8.7	10.8	24.2	15.1	7.8	23.7	14.3	11.5	22.0	10.7	11.4	--
Dissolved Oxygen	mg/L	0.01	--	--	5.5-9.5	**10.01**	5.90	**4.80**	**4.91**	**2.45**	**2.99**	6.92	7.03	**5.09**	**3.73**	**13.1**	**3.28**	6.30	**1.57**	**4.20**	**10.50**	--
pH	pH	N/A	--	--	--	6.57	5.71	5.40	6.33	5.86	5.64	6.22	5.89	5.29	7.3	6.37	6.72	6.01	6.92	5.40	5.40	--
Specific Conductance	uS/cm	1	--	--	--	37	457	162	415	167	101.2	92.2	123.1	96	225	226	159.1	288	188.5	204.4	204.4	--
INORGANICS																						
Total Alkalinity (as CaCO3)	mg/L	5	--	--	--	<5	<5	7	6	5	<5	<5	5	<5	17	7	<5	6	14	7	30	--
Dissolved Chloride (Cl)	mg/L	1	--	--	120	21	82	83	**170**	41	18	21	21	17	63	109	45	71	50	52	113	--
Colour	TCU	30	--	--	--	120	190	91	96	160	68	65	98	77	32	100	70	11	61	36	13	--
Nitrite + Nitrate	mg/L	0.05	--	--	--	<0.05	<0.05	<0.05	0.10	<0.05	0.62	0.26	1.8	3.2	1.54	<0.05	0.14	0.17	<0.05	<0.05	<0.05	--
Nitrate (N)	mg/L	0.05	--	--	13000	<0.05	--	--	0.10	<0.05	--	0.26	--	--	1.54	<0.05	0.14	0.17	<0.05	<0.05	<0.05	--
Nitrite (N)	mg/L	0.05	--	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	--
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	--	--	19	<0.05	0.06	<0.05	<0.05	0.20	<0.05	<0.05	0.30	0.08	0.09	<0.03	<0.03	<0.03	0.17	0.09	<0.03	--
Total Organic Carbon	mg/L	0.5	--	--	--	8.5	13	13	7.2	14	7.4	5.7	9.2	8.4	7.0	15.8	11.2	6.1	10.6	5.1	17.4	--
Orthophosphate (as P)	mg/L	0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--
pH (units)	pH	N/A	--	5.0-9.0	6.5-9	**5.43**	**5.96**	**6.30**	**6.05**	**6.32**	**5.47**	**5.93**	**6.18**	**5.92**	**5.9**	6.7	6.8	6.61	6.59	**6.34**	7.20	--
Total Calcium (Ca)	mg/L	0.1	--	--	--	1.6	4.0	4.8	7.44	3.84	4.01	3.07	2.22	3.80	7.0	8.4	5.6	7.6	8.5	8.2	14.1	--
Total Magnesium (Mg)	mg/L	0.1	--	--	--	0.4	0.7	0.9	0.96	0.59	1.00	0.68	0.68	1.38	1.2	1.4	1.2	1.2	1.3	2.2	3.1	--
Total Phosphorus (1M depth)	mg/L	0.002	--	--	--	<0.02	0.04	0.034	0.010	0.028	0.003	0.009	0.019	0.041	0.021	0.054	0.03	0.014	0.028	0.199	.	--
Total Potassium (K)	mg/L	0.1	--	--	--	0.5	0.8	1.1	0.984	0.956	1.390	0.844	1.310	1.880	1.2	1.7	1.6	1.3	1.5	2.5	2.9	--
Total Sodium (Na)	mg/L	0.1	--	--	--	15	51	55	83.7	32.0	12.1	13.3	13.1	13.3	41.5	63.6	20.4	39.0	19.1	34.5	69.6	--
Reactive Silica (SiO2)	mg/L	0.5	--	--	--	2.2	4.4	4.0	3.0	6.4	5.4	2.5	6.5	6.7	4.1	6.9	5.8	1.6	6.2	6.6	1.6	--
Total Suspended Solids	mg/L	5	--	--	--	<2	58	62	34	27	3	<1	10	14	<5	39	<5	<5	<5	194	34	--
Dissolved Sulphate (SO4)	mg/L	2	--	--	--	<2	3	8	11	<2	7	5	5	8	12	6	10	10	9	10	12	--
Turbidity (NTU)	NTU	0.1	--	50	--	0.7	3.8	4.2	2.6	3.1	0.5	0.4	1.2 (1)	3.9	0.6	10.8	2	1.5	3.3	144	1.1	--
Conductivity (uS/cm)	µS/cm	1	--	--	--	85	290	310	590	160	94	91	100	110	263	403	179	295	203	223	433	--
Calculated Parameters																						
Anion Sum	me/L	N/A	--	--	--	0.60	2.37	2.62	5.13	1.27	0.70	0.73	0.91	0.86	2.48	3.34	1.49	2.34	1.88	1.81	4.04	--
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5	--	--	--	<1	<1	7	6	5	<1	<1	5	<1	17	7	<5	6	14	7	30	--
Calculated TDS	mg/L	1	--	--	--	42	150	165	282	93	52	48	62	67	143	200	86	135	100	145	235	--
Carb. Alkalinity (calc. as CaCO3)	mg/L	10	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10	--
Cation Sum	me/L	N/A	--	--	--	0.81	2.65	2.89	4.17	1.81	0.86	0.82	0.83	0.97	2.32	2.10	1.40	2.24	1.50	3.50	4.17	--
Hardness (CaCO3)	mg/L	1	--	--	--	6	13	16	23	12	14	11	8	15	22.4	26.7	18.9	23.9	26.6	29.5	48.0	--
Ion Balance (% Difference)	%	N/A	--	--	--	14.90	5.58	4.90	10.30	17.50	10.30	5.81	4.60	6.01	3.3	3.6	3.1	2.3	11.3	31.7	1.6	--
Langelier Index (@ 20C)	N/A	N/A	--	--	--	NC	NC	-3.57	-3.72	-3.70	NC	NC	-4.07	NC	-3.63	-3.15	-3.34	-3.33	-2.92	-3.50	-1.80	--
Langelier Index (@ 4C)	N/A	N/A	--	--	--	NC	NC	-3.82	-3.97	-3.95	NC	NC	-4.32	NC	-3.95	-3.47	-3.66	-3.65	-3.24	-3.82	-2.12	--
Saturation pH (@ 20C)	N/A	N/A	--	--	--	NC	NC	9.87	9.77	10.00	NC	NC	10.30	NC	9.53	9.85	10.10	9.94	9.51	9.84	9.00	--
Saturation pH (@ 4C)	N/A	N/A	--	--	--	NC	NC	10.10	10.00	10.30	NC	NC	10.50	NC	9.85	10.2	10.5	10.3	9.83	10.2	9.32	--
Metals (ICP-MS)																						
Total Aluminum (Al)	µg/L	5	5	--	5-100	270	--	--	189	368	--	260	--	--	145	**466**	**259**	**130**	**138**	**2760**	**400**	--
Total Antimony (Sb)	µg/L	2	20	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	--
Total Arsenic (As)	µg/L	2	5.0	--	5	<2	--	--	<1.0	2.1	--	<1.0	--	--	<2	<2	<2	<2	<2	6	<2	--
Total Barium (Ba)	µg/L	5	1000	--	--	20	--	--	53.1	27.7	--	26.6	--	--	49	74	33	44	43	213	381	--
Total Beryllium (Be)	µg/L	2	5.3	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	--
Total Bismuth (Bi)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	--
Total Boron (B)	µg/L	5	1200	--	1500	<5	--	--	7.9	7.8	--	<50	--	--	10	17	15	9	10	13	11	--
Total Cadmium (Cd)	µg/L	0.017	0.01	--	0.017	<0.3	--	--	0.051	<0.017	--	<0.017	--	--	0.037	**0.031**	**0.032**	**0.019**	<0.017	**0.096**	**0.051**	--
Total Chromium (Cr)	µg/L	1	1.0	--	1	<2	--	--	<1.0	1.0	--	<1.0	--	--	<1	<1	<1	<1	1	**9**	**2**	--
Total Cobalt (Co)	µg/L	1	10	--	--	<1	--	--	0.66	0.77	--	<0.40	--	--	<1	1	1	<1	1	3	1	--
Total Copper (Cu)	µg/L	1	2	--	2.0-4.0	2	--	--	2.0	<2.0	<2.0	<2.0	2.5	2.8	<2	3	3	<2	1	**12**	4	--
Total Iron (Fe)	µg/L	50	300	--	300	**880**	--	--	**1380**	**3850**	**303**	229	**897**	**1110**	214	**5210**	**1550**	**383**	**1720**	**28400**	**1660**	--
Total Lead (Pb)	µg/L	0.5	1	--	1.0-7.0	1.9	--	--	1.61	2.70	--	0.59	--	--	<0.5	5.2	2.1	0.6	0.7	19.4	3.5	--
Total Manganese (Mn)	µg/L	2	820	--	--	110	--	--	387	135	52.9	40.5	106	176	78	219	207	83	173	327	212	--
Total Molybdenum (Mo)	µg/L	2	73	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	--
Total Nickel (Ni)	µg/L	2	25	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	4	2	--
Total Selenium (Se)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	<1	--
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--
Total Strontium (Sr)	µg/L	5	21000	--	--	11	--	--	37.4	21.1	--	16.9	--	--	33	45	31	39	40	45	75	--
Total Thallium (Tl)	µg/L	0.1	0.8	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--
Total Tin (Sn)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	--
Total Titanium (Ti)	µg/L	2	--	--	--	4	--	--	<2.0	6.4	--	4.9	--	--	<2	10	4	4	<2	60	9	--
Total Uranium (U)	µg/L	0.1	300	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	--
Total Vanadium (V)	µg/L	2	6	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	2	<2	<2	<2	11	<2	--
Total Zinc (Zn)	µg/L	5	30	--	30	12	--	--	13.6	12.3	9.3	5.5	9	12.5	<5	7	12	12	<5	**46**	**36**	--
MICROBIOLOGICAL																						
Total Coliform	MPN/100mL	1	--	--	--	28	>250	--	>250	75	41	110	>250	--	1553	>2420	>2420	2420	1990	>2420	687	--
E. coli	MPN/100mL	1	--	400	--	4	230	--	9	5	<1	7	>250	<100	<1	16	50	111	9	4	<1	--
Fecal Coliform	MPN/ml	--	--	400	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	0.05	--	--	--	0.90	82.63	48.17	0.85	16.36	0.25	0.97	4.91	1.9	2.07	21.03	0.33	2.41	1.10	21.62	10.34	--
Chlorophyll A - Welschmeyer method	µg/L	0.05	--	--	--	0.91	81.20	52.50	0.85	17.35	0.23	0.87	4.49	2.15	2.27	17.26	0.50	3.02	1.30	27.02	11.09	--
Total Kjeldahl Nitrogen as N	mg/L	0.4	--	--	--	--	--	--	--	--	--	--	--	--	0.6	1.1	0.5	--	0.7	2.0	15.3	--

Notes:

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TABLE 1: BEDFORD WEST SAMPLING PROGRAM

August 2014	Units	RDL	NSE ESQs for Surface Water (Reference)	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Lake Shore Drive																Larry Uteck Blvd									
Sample Sites						LSD																LU									
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/17	2012/05/01	2012/08/15	2012/10/11	2013/05/15	2013/08/15	2013/10/16	2014/05/15	2014/08/14	2011/10/17	2012/05/01	2012/08/15	2012/10/11	2013/05/15	2013/08/15	2013/10/16	2014/05/15	2014/08/14
Sampling Time	hh:mm	--				12:00	09:30	11:45	09:00	11:28	10:00	08:45	13:20	9:00	9:15	13:00	9:10	08:40	15:30	11:55	9:30	12:45	10:30	15:20	11:30	10:10	14:30	14:30	13:00	11:45	10:45
FIELD DATA																															
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	--	--	--	13.1	16.7	15.3	13.4	21.3	7.3	10.2	21.0	12.0	5.7	25.7	13.4	7.7	20.2	8.8	8.9	--	11.3	12.8	27.3	14.6	13.9	18.3	10.9	15.0	22.8
Dissolved Oxygen	mg/L	0.01	--	--	5.5-9.5	**10.84**	5.70	5.50	8.60	**5.41**	8.47	9.44	7.87	8.16	**4.06**	**2.69**	7.58	8.77	7.26	7.60	**14.78**	--	**4.24**	6.17	8.2	9.04	**10.15**	8.29	**4.50**	**11.96**	8.08
pH	pH	N/A	--	--	--	7.88	6.74	6.34	6.42	6.64	6.17	7.09	6.88	6.63	8.22	7.16	6.92	5.19	7.28	6.23	7.02	--	6.07	7.82	6.65	6.78	6.39	7.49	5.45	6.50	7.23
Specific Conductance	uS/cm	1	--	--	--	723	210	168	218	203	110	146	126	112	62	177.5	116.7	123.6	132.5	147.8	180.0	--	203	955	480	262	670	320	845.0	999.0	611.0
INORGANICS																															
Total Alkalinity (as CaCO3)	mg/L	5	--	--	--	13	16	12	13	21	9	9	15	12	21	14	11	8	20	11	35	--	12	14	14	14	6	22	7	30	21
Dissolved Chloride (Cl)	mg/L	1	--	--	120	41	34	31	49	45	25	38	27	22	22	33	23	39	32	23	29	--	34	**224**	116	52	**190**	99	**258**	**243**	104
Colour	TCU	30	--	--	--	32	27	37	20	26	33	32	41	49	13	20	40	10	21	25	9	--	94	18	14	18	7	7	19	6	8
Nitrite + Nitrate	mg/L	0.05	--	--	--	0.14	0.14	0.06	0.23	0.10	0.12	0.25	0.17	0.09	0.13	0.80	<0.05	0.18	0.20	<0.05	0.09	--	0.61	1.00	0.64	1.89	1.11	2.57	0.34	1.22	0.47
Nitrate (N)	mg/L	0.05	--	--	13000	0.14	--	--	0.23	0.10	--	0.25	--	--	0.13	0.80	<0.05	0.18	0.20	<0.05	0.09	--	--	1.00	0.64	1.89	1.11	2.57	0.34	1.22	0.47
Nitrite (N)	mg/L	0.05	--	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	--	--	19	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	0.06	0.03	<0.03	<0.03	<0.03	0.03	0.03	0.04	--	0.06	0.04	0.16	<0.03	<0.03	0.04	0.04	0.05	<0.03
Total Organic Carbon	mg/L	0.5	--	--	--	5.0	3.8	6.8	3.7	6.0	5.3	4.7	7.1	7.5	3.1	8.0	7.7	4.7	6.3	6.9	5.2	--	11.0	3.7	22.8	4.8	3.1	4.5	2.9	6.9	4.7
Orthophosphate (as P)	mg/L	0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (units)	pH	N/A	--	5.0-9.0	6.5-9	6.69	6.69	6.93	7.10	7.30	6.67	6.72	6.79	6.49	6.2	6.9	6.9	6.94	6.95	**6.49**	**6.47**	--	**6.43**	6.7	7.2	7.2	6.92	7.11	**6.49**	**6.42**	7.42
Total Calcium (Ca)	mg/L	0.1	--	--	--	6.5	6.9	5.4	7.99	10.5	5.29	5.9	5.14	5.04	2.6	18.1	5.1	6.4	6.0	5.6	5.4	--	7.63	30.7	22.1	14.5	22.0	17.6	21.8	23.9	27.6
Total Magnesium (Mg)	mg/L	0.1	--	--	--	1.4	1.6	1.3	1.99	2.14	1.15	1.25	1.19	1.23	0.7	3.3	1.4	1.2	1.4	1.6	1.5	--	2.34	4.2	3.6	2.2	2.8	2.7	4.0	4.2	3.8
Total Phosphorus (1M depth)	mg/L	0.002	--	--	--	and 400	0.03	0.009	0.018	0.100	0.009	0.018	0.028	0.014	0.022	0.063	0.003	0.007	0.015	0.078	0.100	--	0.034	0.043	0.036	0.030	0.006	0.027	0.046	0.260	0.028
Total Potassium (K)	mg/L	0.1	--	--	--	1.2	1.1	1.3	1.180	1.210	1.030	1.070	0.960	1.240	0.6	1.9	1.3	1.2	1.1	1.4	1.1	--	2.110	3.2	3.6	2.5	2.6	2.8	2.9	3.1	3.7
Total Sodium (Na)	mg/L	0.1	--	--	--	24	21	18	24.8	26.9	15.2	23.2	14.3	13.8	11.3	18.6	15.2	21.9	26.6	14.6	23.4	--	22.7	124	62.2	32.3	95.1	51.7	170	147	88.1
Reactive Silica (SiO2)	mg/L	0.5	--	--	--	3.1	4.2	4.0	3.2	3.4	4.3	2.6	3.9	3.8	3.1	2.9	4.9	2.6	3.9	5.0	2.9	--	6.9	4.9	0.7	6.3	5.1	8.6	7.0	2.1	2.5
Total Suspended Solids	mg/L	5	--	--	--	16	98	5	6	110	7	4	77	5	<5	16	19	<5	17	9	51	--	13	5	165	<5	<5	<5	<5	626	<5
Dissolved Sulphate (SO4)	mg/L	2	--	--	--	6	4	5	7	3	4	6	4	4	5	5	5	6	7	5	5	--	21	26	25	23	26	29	33	29	20
Turbidity (NTU)	NTU	0.1	--	50	--	0.6	12	2.5	12	6.2	1	0.6	2.5	1.7	6.7	**283**	2.1	1.1	31.6	**82.6**	6.6	--	3.3	4.1	23.0	2.3	1.8	1.6	0.7	42.7	10.1
Conductivity (uS/cm)	µS/cm	1	--	--	--	170	150	140	200	200	110	150	130	110	96	161	110	168	136	105	122	--	190	813	482	255	732	433	840	819	605
Calculated Parameters																															
Anion Sum	me/L	N/A	--	--	--	1.56	0.82	1.22	1.80	1.77	0.97	1.39	1.14	0.96	1.15	1.37	0.97	1.40	1.46	0.97	1.63	--	1.69	7.21	4.12	2.36	6.10	4.02	8.13	8.15	3.80
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5	--	--	--	13	8	12	13	21	9	9	15	12	21	14	11	8	20	11	35	--	12	14	14	14	6	22	7	30	21
Calculated TDS	mg/L	1	--	--	--	92	55	74	104	107	62	84	66	60	56	163	58	82	87	66	88	--	109	426	246	144	347	229	496	477	262
Carb. Alkalinity (calc. as CaCO3)	mg/L	10	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10	--	<1	<10	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	--	--	--	1.53	0.99	1.20	1.69	1.94	1.05	1.44	1.02	1.00	0.76	3.59	1.10	1.43	1.62	1.62	1.52	--	1.70	7.40	4.30	2.43	5.55	3.51	8.90	8.24	5.64
Hardness (CaCO3)	mg/L	1	--	--	--	22	15	19	28	35	18	20	18	18	9.4	58.8	18.5	20.9	20.7	20.6	19.7	--	29	94.0	70.0	45.3	66.5	55.1	70.9	77.0	84.6
Ion Balance (% Difference)	%	N/A	--	--	--	0.97	9.39	0.83	3.15	4.58	3.96	1.77	5.56	2.04	20.7	63.0	6.1	1.0	5.2	25.0	3.4	--	0.29	1.3	2.2	1.4	4.7	6.8	4.5	0.6	19.4
Langelier Index (@ 20C)	N/A	N/A	--	--	--	-2.74	-3.20	-2.60	-2.22	-1.71	-2.99	-2.88	-2.64	-3.05	-3.62	-2.30	-2.91	-2.93	-2.55	-3.29	-2.84	--	-2.95	-2.32	-1.94	-2.10	-2.60	-1.93	-2.98	-2.38	-1.45
Langelier Index (@ 4C)	N/A	N/A	--	--	--	-2.99	-3.45	-2.85	-2.47	-1.96	-3.24	-3.13	-2.89	-3.31	-3.94	-2.62	-3.23	-3.25	-2.87	-3.61	-3.16	--	-3.20	-2.64	-2.26	-2.42	-2.92	-2.25	-3.30	-2.70	-1.77
Saturation pH (@ 20C)	N/A	N/A	--	--	--	9.43	9.78	9.53	9.32	9.01	9.66	9.60	9.43	9.54	9.82	9.20	9.81	9.87	9.50	9.78	9.31	--	9.38	9.02	9.14	9.30	9.52	9.04	9.47	8.80	8.87
Saturation pH (@ 4C)	N/A	N/A	--	--	--	9.68	10.00	9.78	9.57	9.26	9.91	9.85	9.68	9.80	10.10	9.52	10.10	10.20	9.82	10.1	9.63	--	9.63	9.34	9.46	9.62	9.84	9.36	9.79	9.12	9.19
Metals (ICP-MS)																															
Total Aluminum (Al)	µg/L	5	5	--	5-100	99	--	--	349	189	--	217	--	--	490	**19200**	**186**	**131**	93	**3420**	**487**	--	--	218	**227**	**252**	**107**	**447**	31	**1400**	46
Total Antimony (Sb)	µg/L	2	20	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	2	5.0	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	**8**	<2	<2	<2	<2	<2	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	5	1000	--	--	14	--	--	15.3	19.2	--	13.9	--	--	11	86	12	12	7	24	15	--	--	225	201	116	133	134	119	185	157
Total Beryllium (Be)	µg/L	2	5.3	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	2	<2	<2	<2	<2	<2	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	1200	--	1500	13	--	--	41.4	21.6	--	<50	--	--	6	24	16	10	15	15	14	--	--	11	17	22	10	22	18	22	20
Total Cadmium (Cd)	µg/L	0.017	0.01	--	0.017	<0.3	--	--	0.018	<0.017	--	<0.017	--	--	0.029	**1.050**	**0.023**	<0.017	<0.017	**0.073**	**0.032**	--	--	0.538	**0.171**	**0.168**	**0.300**	**0.236**	**0.148**	**0.171**	**0.031**
Total Chromium (Cr)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	**11**	<1	<1	<1	**2**	<1	--	--	<1	<1	<1	<1	<1	1	<1	<1	<1
Total Cobalt (Co)	µg/L	1	10	--	--	<1	--	--	<0.40	0.88	--	<0.40	--	--	<1	34	<1	<1	<1	1	<1	--	--	<1	1	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	1	2	--	2.0-4.0	<2	--	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	**22**	2	<2	1	**12**	2	--	2.9	<2	3	16	2	**6**	2	2	<1
Total Iron (Fe)	µg/L	50	300	--	300	180	--	--	**554**	**965**	120	211	**388**	**384**	161	**38900**	**312**	236	254	**4200**	**593**	--	**2150**	**347**	**1320**	**500**	194	**890**	157	**2000**	207
Total Lead (Pb)	µg/L	0.5	1	--	1.0-7.0	<0.5	--	--	3.02	0.54	--	<0.50	--	--	0.6	**82.4**	<0.5	<0.5	<0.5	5.2	0.5	--	--	0.8	0.7	1.0	<0.5	1.4	<0.5	1.8	<0.5
Total Manganese (Mn)	µg/L	2	820	--	--	51	--	--	113	632	22.8	30.2	53.4	38.5	26	13200	67	71	81	124	140	--	129	182	485	120	87	89	26	71	182
Total Molybdenum (Mo)	µg/L	2	73	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	25	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	13	<2	<2	<2	2	<2	--	--	<2	<2	<2	<2	<2	<2	3	<2
Total Selenium (Se)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	**2**	<1	<1	<1	<1	<1	--	--	<1	<1	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<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
Total Strontium (Sr)	µg/L	5	21000	--	--	30	--	--	36.3	42.1	--	24.4	--	--	12	82	22	24	24	25	26	--	--	112	94	60	93	90	96	116	111
Total Thallium (Tl)	µg/L	0.1	0.8	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	0.2	<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
Total Tin (Sn)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	--	--	--	<2	--	--	7.2	4.1	--	5.3	--	--	3	405	4	<2	2	36	6	--	--	4	3	7	3	11	2	22	<2
Total Uranium (U)	µg/L	0.1	300	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	1.6	<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
Total Vanadium (V)	µg/L	2	6	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	30	<2	<2	<2	2	<2	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	30	--	30	7	--	--	7.2	6.7	<5.0	<5.0	<5.0	5	<5	**110**	7	6	<5	15	<5	--	9	**79**	**92**	**39**	**57**	**49**	26	17	8
MICROBIOLOGICAL																															
Total Coliform	MPN/100mL	1	--	--	--	53	>250	--	>250	>250	280	85	>250	--	1414	>2420	>2420	1990	>2420	>2420	1203	--	--	>2420	>2420	2420	866	>2420	866	>2420	961
E. coli	MPN/100mL	1	--	400	--	22	24	--	4	45	6	10	>250	<100	2	26	10	10	20	2	<1	--	<100	<1	2	19	3	86	<1	<1	7
Fecal Coliform	MPN/ml	--	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	0.05	--	--	--	1.46	10.70	4.68	1.21	6.64	0.21	1.19	1.93	1.41	1.88	6.62	0.13	<0.50	1.6	2.02	1.91	--	1.99	2.44	32.52	1.80	1.54	2.30	0.12	99.13	2.54
Chlorophyll A - Welschmeyer method	µg/L	0.05	--	--	--	1.85	11.10	5.62	1.32	7.71	0.19	1.07	1.73	1.18	2.28	7.58	0.22	<0.50	2	2.98	1.91	--	2.08	2.71	31.31	2.15	1.77	2.50	0.11	98.00	2.51
Total Kjeldahl Nitrogen as N	mg/L	0.4	--	--	--	--	--	--	--	--	--	--	--	--	0.5	3.5	0.5	--	0.7	3.0	1.0	--	--	0.4	4.2	0.7	--	0.5	<0.4	1.2	1.7

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)
NSE ESQs for Surface Water = Nova Scotia Environment Environmental Quality Standards for Surface Water (July 2013)
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

August 2014	Units	RDL	NSE ESQs for Surface Water (Reference)	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Paper Mill Lake															
Sample Sites						PML1															
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/15	2012/10/11	2013/05/15	2013/08/15	2013/10/16	2014/05/15	2014/08/14
Sampling Time	hh:mm	--				13:45	13:00	13:00	13:35	15:15	13:00	13:00	16:50	17:00	12:50	--	10:55	10:51	11:35	10:45	10:30	14:45
FIELD DATA																						
Secchi Depth	Meters	--	--	1.2	--	3.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	--	--	--	15.7	17.1	16.2	13.2	22.7	9.1	10.3	22.1	13.6	8.3	--	14.9	11.6	22.5	12.3	12.1	23.6
Dissolved Oxygen	mg/L	0.01	--	--	5.5-9.5	**10.56**	8.10	6.90	8.76	7.83	**10.43**	**10.39**	8.17	**9.54**	8.41	--	8.60	**9.98**	7.65	**9.90**	**12.08**	7.49
pH	pH	N/A	--	--	--	7.39	6.57	6.64	7.06	7.35	5.89	6.28	6.20	6.11	7.58	--	6.63	6.39	7.20	6.32	6.60	7.42
Specific Conductance	uS/cm	1	--	--	--	561	279	223	265	234	125	177	174	106	366	--	186.4	215.1	199.0	250.5	431.0	263.0
INORGANICS																						
Total Alkalinity (as CaCO3)	mg/L	5	--	--	--	6	7	7	7	9	5	6	7	7	20	--	<5	<5	6	7	31	7
Dissolved Chloride (Cl)	mg/L	1	--	--	120	39	64	58	67	61	24	44	43	18	55	--	45	57	57	48	63	50
Colour	TCU	30	--	--	--	54	15	21	19	12	57	32	38	65	38	--	29	8	15	11	17	10
Nitrite + Nitrate	mg/L	0.05	--	--	--	0.49	0.10	0.17	0.42	0.27	0.66	0.55	0.15	0.62	0.22	--	0.14	0.21	0.18	0.18	0.22	0.24
Nitrate (N)	mg/L	0.05	--	--	13000	0.49	--	--	0.42	0.27	--	0.55	--	--	0.22	--	0.14	0.21	0.18	0.18	0.22	0.24
Nitrite (N)	mg/L	0.05	--	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	--	--	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	0.06	--	<0.03	<0.03	0.04	<0.03	0.04	<0.03
Total Organic Carbon	mg/L	0.5	--	--	--	6.5	3.6	4.7	0.7	3.3	6.7	4.6	5	8.3	5.7	--	5.3	4.2	4.1	5.1	4.0	2.0
Orthophosphate (as P)	mg/L	0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (units)	pH	N/A	--	5.0-9.0	6.5-9	**6.36**	6.75	6.79	6.63	7.04	6.58	6.54	6.83	6.67	6.6	--	6.8	6.71	6.92	6.88	6.66	7.00
Total Calcium (Ca)	mg/L	0.1	--	--	--	4.5	6.9	6.4	8.37	9.02	5.90	6.02	4.99	4.64	6.0	--	6.0	6.8	6.6	6.9	6.9	9.1
Total Magnesium (Mg)	mg/L	0.1	--	--	--	0.6	1.1	1.0	1.25	1.22	0.82	0.98	0.89	0.85	1.0	--	1.1	1.0	0.9	1.5	1.3	1.4
Total Phosphorus (1M depth)	mg/L	0.002	--	--	--	<0.02	<0.02	0.002	0.018	0.002	<0.002	0.014	0.011	0.030	0.019	--	0.03	0.006	0.007	0.047	0.012	0.030
Total Potassium (K)	mg/L	0.1	--	--	--	0.9	0.9	0.9	1.160	1.060	1.340	1.230	0.771	1.430	0.8	--	1.0	0.8	1.0	1.5	0.9	1.3
Total Sodium (Na)	mg/L	0.1	--	--	--	25	38	34	35.2	40.2	18.4	26.8	22.8	13.7	33.6	--	29.8	35.3	28.5	32.2	38.1	41.6
Reactive Silica (SiO2)	mg/L	0.5	--	--	--	4.5	2.6	2.8	3.8	3.4	5.9	3.7	2.6	5.4	2.9	--	3.2	2.8	2.6	2.6	2.5	2.3
Total Suspended Solids	mg/L	5	--	--	--	<2	3	9	7	<2	<1	1	<2	5	9	--	6	<5	<5	23	6	<5
Dissolved Sulphate (SO4)	mg/L	2	--	--	--	13	11	11	13	12	12	12	10	12	7	--	10	8	10	10	10	8
Turbidity (NTU)	NTU	0.1	--	50	--	0.4	0.5	0.6	8.2	0.9	0.5	0.6	1	1.2	0.7	--	1	0.7	1.1	19.2	1.4	0.9
Conductivity (uS/cm)	µS/cm	1	--	--	--	170	250	230	260	250	130	180	170	100	214	--	179	227	218	209	230	261
Calculated Parameters																						
Anion Sum	me/L	N/A	--	--	--	1.51	2.18	1.99	2.34	2.15	1.09	1.62	1.56	0.92	2.11	--	1.49	1.79	1.95	1.71	2.62	1.73
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5	--	--	--	6	7	7	7	9	5	6	7	7	20	--	<5	<5	6	7	31	7
Calculated TDS	mg/L	1	--	--	--	93	129	118	137	134	75	100	90	63	117	--	95	110	109	115	140	117
Carb. Alkalinity (calc. as CaCO3)	mg/L	10	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	--	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	--	--	--	1.40	2.11	1.89	2.11	2.33	1.20	1.58	1.35	0.95	1.89	--	1.78	2.00	1.69	2.56	2.18	2.45
Hardness (CaCO3)	mg/L	1	--	--	--	14	22	20	26	28	18	19	16	15	19.1	--	19.5	21.1	20.2	23.4	22.6	28.5
Ion Balance (% Difference)	%	N/A	--	--	--	3.78	1.63	2.58	5.17	4.02	4.80	1.25	7.22	1.60	5.5	--	9.0	5.5	7.0	19.8	9.2	17.0
Langelier Index (@ 20C)	N/A	N/A	--	--	--	-3.57	-2.90	-2.94	-2.96	-2.43	-3.25	-3.27	-2.94	-3.13	-2.91	--	-3.31	-3.35	-3.07	-3.03	-2.61	-2.79
Langelier Index (@ 4C)	N/A	N/A	--	--	--	-3.82	-3.15	-3.19	-3.21	-2.68	-3.50	-3.53	-3.19	-3.38	-3.23	--	-3.63	-3.67	-3.39	-3.35	-2.93	-3.11
Saturation pH (@ 20C)	N/A	N/A	--	--	--	9.93	9.65	9.73	9.59	9.47	9.83	9.81	9.77	9.80	9.51	--	10.10	10.1	9.99	9.91	9.27	9.79
Saturation pH (@ 4C)	N/A	N/A	--	--	--	10.20	9.90	9.98	9.84	9.72	10.10	10.10	10.00	10.10	9.83	--	10.40	10.4	10.3	10.2	9.59	10.1
Metals (ICP-MS)																						
Total Aluminum (Al)	µg/L	5	5	--	5-100	**260**	--	--	**665**	45.9	--	**233**	--	--	**177**	--	**306**	**141**	**103**	**3920**	**305**	**129**
Total Antimony (Sb)	µg/L	2	20	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	2	5.0	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	<2	<2	<2	2	<2	<2
Total Barium (Ba)	µg/L	5	1000	--	--	23	--	--	35.3	24.4	--	26.6	--	--	22	--	19	20	12	40	23	23
Total Beryllium (Be)	µg/L	2	5.3	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	1200	--	1500	8	--	--	11.3	8.6	--	<50	--	--	6	--	9	6	8	9	8	13
Total Cadmium (Cd)	µg/L	0.017	0.01	--	0.017	<0.3	--	--	**0.032**	<0.017	--	<0.017	--	--	<0.017	--	**0.066**	**0.021**	**0.018**	**0.430**	<0.017	**0.020**
Total Chromium (Cr)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	<1	<1	<1	**3**	<1	<1
Total Cobalt (Co)	µg/L	1	10	--	--	<1	--	--	0.96	<0.40	--	<0.40	--	--	<1	--	2	<1	<1	9	<1	<1
Total Copper (Cu)	µg/L	1	2	--	2.0-4.0	<2	--	--	2.0	<2.0	<2.0	4.0	<2.0	2.3	<2	--	<2	<2	1	**6**	1	<1
Total Iron (Fe)	µg/L	50	300	--	300	140	--	--	**837**	89	161	141	**315**	**528**	137	--	**742**	130	205	**5300**	239	296
Total Lead (Pb)	µg/L	0.5	1	--	1.0-7.0	<0.5	--	--	1.73	<0.50	--	<0.50	--	--	<0.5	--	0.9	<0.5	<0.5	**13.5**	0.9	<0.5
Total Manganese (Mn)	µg/L	2	820	--	--	17	--	--	142	68.9	41.3	14.4	128	62.4	48	--	214	33	58	693	54	260
Total Molybdenum (Mo)	µg/L	2	73	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	25	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	2	<2	<2	9	<2	<2
Total Selenium (Se)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	5	21000	--	--	18	--	--	36.3	37.1	--	25	--	--	26	--	30	31	25	34	35	37
Total Thallium (Tl)	µg/L	0.1	0.8	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	--	--	--	<2	--	--	7.8	<2.0	--	3.9	--	--	<2	--	4	<2	<2	65	4	<2
Total Uranium (U)	µg/L	0.1	300	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	0.1	--	<0.1	<0.1	<0.1	0.6	<0.1	<0.1
Total Vanadium (V)	µg/L	2	6	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	10	<2	<2
Total Zinc (Zn)	µg/L	5	30	--	30	8	--	--	10.0	5.4	5.7	6.3	6.2	5.4	<5	--	13	8	<5	**62**	<5	<5
MICROBIOLOGICAL																						
Total Coliform	MPN/100mL	1	--	--	--	200	73	--	>250	>250	>250	85	>250	--	411	--	2420	866	1730	1011	613	2420
E. coli	MPN/100mL	1	--	400	--	33	45	--	19	**>250**	2	2	34	<100	2	--	20	12	4	6	6	10
Fecal Coliform	MPN/ml	--	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	0.05	--	--	--	0.62	2.31	0.57	0.82	1.12	0.07	2.85	0.86	0.15	1.03	--	0.69	1.17	1.10	5.07	0.67	0.64
Chlorophyll A - Welschmeyer method	µg/L	0.05	--	--	--	0.64	2.21	0.64	0.74	1.04	0.06	2.75	0.76	0.15	1.10	--	0.91	1.37	1.10	6.39	0.65	0.65
Total Kjeldahl Nitrogen as N	mg/L	0.4	--	--	--	--	--	--	--	--	--	--	--	--	<0.4	--	0.4	--	0.4	0.8	0.4	0.4

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)
NSE ESQs for Surface Water = Nova Scotia Environment Environmental Quality Standards for Surface Water (July 2013)
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

August 2014	Units	RDL	NSE ESQs for Surface Water (Reference)	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Paper Mill Lake																
Sample Sites						PML2																
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/15	2012/10/11	2013/05/15	2013/08/15	2013/10/16	2014/05/15	2014/08/14
Sampling Time	hh:mm	--				13:15	13:40	13:45	14:30	16:20	13:00	12:40	16:20	16:15	13:16	--	--	13:40	10:45	11:20	11:00	9:20
FIELD DATA																						
Secchi Depth	Meters	--	--	1.2	--	2.8	2.2	2.3	N/A	3.0	2.0	2.2	2.3	2.2	2.35	--	--	3.20	--	N/A	N/A	N/A
Water Temp	Celsius	0.1	--	--	--	14.8	24.2	19.7	17.8	25.3	10.1	10.9	23.1	15.2	11.6	--	--	14.8	--	12.6	14.4	21.1
Dissolved Oxygen	mg/L	0.01	--	--	5.5-9.5	**10.20**	8.30	8.40	8.78	8.09	**10.58**	**9.88**	8.7	8.94	7.75	--	--	9.26	--	8.90	**12.44**	6.95
pH	pH	N/A	--	--	--	6.36	6.82	6.84	7.09	7.39	6.53	6.31	6.67	6.13	8.61	--	--	6.49	--	6.13	6.50	7.22
Specific Conductance	uS/cm	1	--	--	--	267	264	241	237	234	201	159	173	156	231	--	--	234	--	250.5	966.0	266.0
INORGANICS																						
Total Alkalinity (as CaCO3)	mg/L	5	--	--	--	5	7	7	6	8	7	<5	8	7	21	--	--	<5	--	8	32	10
Dissolved Chloride (Cl)	mg/L	1	--	--	120	63	63	58	62	58	50	44	43	34	55	--	--	63	--	64	**245**	50
Colour	TCU	30	--	--	--	22	17	19	20	13	23	35	38	48	39	--	--	18	--	8	6	7
Nitrite + Nitrate	mg/L	0.05	--	--	--	0.14	0.07	0.09	0.19	0.11	0.23	0.33	0.14	0.22	0.24	--	--	0.22	--	<0.05	0.13	0.18
Nitrate (N)	mg/L	0.05	--	--	13000	0.14	--	--	0.19	0.11	--	0.33	--	--	0.24	--	--	0.22	--	<0.05	0.13	0.18
Nitrite (N)	mg/L	0.05	--	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	--	--	<0.05	--	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	--	--	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	--	--	0.03	--	0.23	0.05	0.03
Total Organic Carbon	mg/L	0.5	--	--	--	3.6	2.6	4.5	3.2	3.4	3.6	4	6	5.6	5.9	--	--	4.4	--	4.0	2.7	2.4
Orthophosphate (as P)	mg/L	0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	--	<0.01	--	<0.01	<0.01	<0.01
pH (units)	pH	N/A	--	5.0-9.0	6.5-9	6.50	6.81	6.82	6.66	7.02	6.83	**6.37**	6.60	6.60	6.6	--	--	6.68	--	6.73	7.13	7.04
Total Calcium (Ca)	mg/L	0.1	--	--	--	6.1	7.1	6.1	7.17	7.69	7.96	5.30	4.76	5.04	6.1	--	--	6.7	--	7.7	19.2	8.8
Total Magnesium (Mg)	mg/L	0.1	--	--	--	1.1	1.1	1.1	1.25	1.17	1.20	0.93	0.86	0.90	1.0	--	--	1.0	--	1.4	1.7	1.4
Total Phosphorus (1M depth)	mg/L	0.002	--	--	--	<0.02	<0.02	0.002	0.010	0.002	<0.002	0.009	0.009	0.007	0.025	--	--	0.006	--	0.026	0.011	0.026
Total Potassium (K)	mg/L	0.1	--	--	--	0.9	1.0	0.9	0.984	0.900	1.020	0.861	0.801	0.968	0.8	--	--	0.8	--	1.3	1.4	1.2
Total Sodium (Na)	mg/L	0.1	--	--	--	35	40	34	31.1	35.1	30.8	25.7	21.3	20.9	34.6	--	--	37.5	--	42.0	133	42.6
Reactive Silica (SiO2)	mg/L	0.5	--	--	--	2.6	2.5	2.3	2.6	2.3	3.3	2.9	2.5	3	2.8	--	--	2.7	--	4.2	2.4	2.3
Total Suspended Solids	mg/L	5	--	--	--	2	3	<1	15	<2	11	<1	8	<1	<5	--	--	<5	--	<5	16	<5
Dissolved Sulphate (SO4)	mg/L	2	--	--	--	11	11	11	10	10	10	9	10	9	7	--	--	9	--	11	27	7
Turbidity (NTU)	NTU	0.1	--	50	--	0.8	0.7	0.6	1.0	0.8	0.4	0.4	3.4	0.5	0.7	--	--	1	--	3.3	2.6	0.7
Conductivity (uS/cm)	µS/cm	1	--	--	--	240	250	230	230	230	210	170	170	150	213	--	--	254	--	277	777	273
Calculated Parameters																						
Anion Sum	me/L	N/A	--	--	--	2.11	2.17	1.99	2.07	2.01	1.77	1.46	1.58	1.30	2.13	--	--	1.98	--	2.19	8.12	1.77
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5	--	--	--	5	7	7	6	8	7	<1	8	7	21	--	--	<5	--	8	32	10
Calculated TDS	mg/L	1	--	--	--	123	131	117	120	120	110	91	89	79	119	--	--	119	--	137	448	118
Carb. Alkalinity (calc. as CaCO3)	mg/L	10	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	--	--	<10	--	<10	<10	<10
Cation Sum	me/L	N/A	--	--	--	1.94	2.23	1.88	1.88	2.03	1.86	1.48	1.28	1.27	1.94	--	--	2.09	--	2.55	6.96	2.47
Hardness (CaCO3)	mg/L	1	--	--	--	20	22	20	23	24	25	17	15	16	19.3	--	--	20.8	--	25.0	54.9	27.7
Ion Balance (% Difference)	%	N/A	--	--	--	4.20	1.36	2.84	4.81	0.50	2.48	0.68	10.50	1.17	4.8	--	--	2.8	--	7.5	7.7	16.5
Langelier Index (@ 20C)	N/A	N/A	--	--	--	-3.33	-2.83	-2.93	-3.06	-2.55	-2.80	NC	-3.18	-3.17	-2.89	--	--	-3.39	--	-3.08	-1.73	-2.61
Langelier Index (@ 4C)	N/A	N/A	--	--	--	-3.59	-3.08	-3.18	-3.31	-2.80	-3.05	NC	-3.43	-3.42	-3.21	--	--	-3.71	--	-3.40	-2.05	-2.93
Saturation pH (@ 20C)	N/A	N/A	--	--	--	9.83	9.64	9.75	9.72	9.57	9.63	NC	9.78	9.77	9.49	--	--	10.1	--	9.81	8.86	9.65
Saturation pH (@ 4C)	N/A	N/A	--	--	--	10.10	9.89	10.00	9.97	9.82	9.88	NC	10.00	10.00	9.81	--	--	10.4	--	10.1	9.18	9.97
Metals (ICP-MS)																						
Total Aluminum (Al)	µg/L	5	5	--	5-100	**130**	--	--	**1030**	55.8	--	**202**	--	--	**189**	--	--	**131**	--	**107**	**181**	52
Total Antimony (Sb)	µg/L	2	20	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	--	<2	--	<2	<2	<2
Total Arsenic (As)	µg/L	2	5.0	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	--	<2	--	<2	<2	<2
Total Barium (Ba)	µg/L	5	1000	--	--	16	--	--	23.0	12.2	--	23	--	--	22	--	--	22	--	37	50	27
Total Beryllium (Be)	µg/L	2	5.3	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	--	<2	--	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--	<2	<2	<2
Total Boron (B)	µg/L	5	1200	--	1500	5	--	--	8.2	8.8	--	<50	--	--	6	--	--	6	--	9	7	13
Total Cadmium (Cd)	µg/L	0.017	0.01	--	0.017	<0.3	--	--	**0.037**	<0.017	--	**0.028**	--	--	**0.023**	--	--	**0.039**	--	**0.060**	**0.062**	**0.019**
Total Chromium (Cr)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	--	<1	--	<1	<1	<1
Total Cobalt (Co)	µg/L	1	10	--	--	<1	--	--	0.65	<0.40	--	<0.40	--	--	<1	--	--	<1	--	2	<1	<1
Total Copper (Cu)	µg/L	1	2	--	2.0-4.0	<2	--	--	3.3	<2.0	<2.0	<2.0	<2.0	<2.0	<2	--	--	<2	--	**1380**	1	<1
Total Iron (Fe)	µg/L	50	300	--	300	100	--	--	**1090**	151	76	143	**699**	181	178	--	--	181	--	**1760**	264	**316**
Total Lead (Pb)	µg/L	0.5	1	--	1.0-7.0	<0.5	--	--	2.39	<0.50	--	<0.50	--	--	<0.5	--	--	<0.5	--	**49.7**	0.7	<0.5
Total Manganese (Mn)	µg/L	2	820	--	--	58	--	--	159	81.0	28.0	33.8	88.6	30.6	22	--	--	87	--	866	206	278
Total Molybdenum (Mo)	µg/L	2	73	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--	<2	<2	<2
Total Nickel (Ni)	µg/L	2	25	--	25-150	2	--	--	2.2	<2.0	--	<2.0	--	--	<2	--	--	<2	--	3	<2	<2
Total Selenium (Se)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	--	<1	--	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	--	<0.1	--	0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	5	21000	--	--	30	--	--	34.7	32.8	--	25.7	--	--	27	--	--	31	--	35	68	37
Total Thallium (Tl)	µg/L	0.1	0.8	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	--	<0.1	--	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--	3	<2	<2
Total Titanium (Ti)	µg/L	2	--	--	--	<2	--	--	21.3	<2.0	--	3.6	--	--	<2	--	--	<2	--	2	3	<2
Total Uranium (U)	µg/L	0.1	300	--	15	<0.1	--	--	0.10	<0.10	--	<0.10	--	--	0.1	--	--	<0.1	--	<0.1	<0.1	<0.1
Total Vanadium (V)	µg/L	2	6	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--	<2	<2	<2
Total Zinc (Zn)	µg/L	5	30	--	30	12	--	--	18.3	<5.0	5.8	6.6	7.5	10	8	--	--	11	--	**762**	<5	<5
MICROBIOLOGICAL																						
Total Coliform	MPN/100mL	1	--	--	--	49	40	--	>250	46	97	64	>250	--	261	--	--	1410	--	411	291	517
E. coli	MPN/100mL	1	--	400	--	10	31	--	69	<1	6	17	>250	<100	1	--	--	12	--	2	<1	3
Fecal Coliform	MPN/ml	--	--	400	--	--	--	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	0.05	--	--	--	1.15	1.36	0.59	3.50	1.54	0.53	0.55	2.48	1.33	0.76	--	--	1.18	--	0.25	0.99	0.48
Chlorophyll A - Welschmeyer method	µg/L	0.05	--	--	--	1.22	1.33	0.66	3.39	1.51	0.42	0.51	2.26	1.13	0.76	--	--	1.34	--	0.27	1.13	0.44
Total Kjeldahl Nitrogen as N	mg/L	0.4	--	--	--	--	--	--	--	--	--	--	--	--	<0.4	--	--	--	--	1.7	<0.4	0.4

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)
NSE ESQs for Surface Water = Nova Scotia Environment Environmental Quality Standards for Surface Water (July 2013)
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

ATTACHMENT 1

Field Reports

FIELD REPORT – AUGUST 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Kearney Lake	**Site ID: KL1**	
Watercourse: Kearney Lake	**Location:** Kearney Lake Road	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0445718E, 4948496N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Sunny with Clouds
Air Temperature:	24°C
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Accessible	Off Kearney Lake Road

Field Parameter Data

	Remarks
Date (d.m.y):	14/08/2014
Time (hh:mm):	14:15
Sample Depth (m):	1.0
pH:	7.46
Dissolved Oxygen (mg/L):	7.22
Secchi Depth (m):	2.7
Water Temperature (degrees Celsius):	23.2
Conductivity (µs/cm):	341

Additional Comments / Notes

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FIELD REPORT – AUGUST 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Kearney Lake	**Site ID: KL2**	
Watercourse: Kearney Lake	**Location:** Kearney Lake Road	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0443942E, 4949803N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Overcast
Air Temperature:	19.3
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Accessible	Yes (via Lake Dr. off Hammonds Plains Rd)

Field Parameter Data

	Remarks
Date (d.m.y):	14/08/2014
Time (hh:mm):	9:20
Sample Depth (m):	1.0
pH:	7.22
Dissolved Oxygen (mg/L):	6.95
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	21.1
Conductivity (µs/cm):	266

Additional Comments / Notes

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FIELD REPORT – AUGUST 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Kearney Lake Run	**Site ID: KL3**	
Watercourse: Kearney Lake Run	**Location:** Kearney Lake Road	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0444390E, 4950406N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Overcast
Air Temperature:	20.9°C
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Accessible	Walking through the woods off Kearney Lake Road

Field Parameter Data

	Remarks
Date (d.m.y):	14/08/2014
Time (hh:mm):	11:50
Sample Depth (m):	1.0
pH:	7.37
Dissolved Oxygen (mg/L):	7.87
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	22.7
Conductivity (µs/cm):	252

Additional Comments / Notes

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FIELD REPORT – AUGUST 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Kearney Lake Run	**Site ID: KL4**	
Watercourse: Kearney Lake Run	**Location:** Kearney Lake Road	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0444463E, 4950571N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Overcast
Air Temperature:	20.9°C
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Accessible	Via walking path off Kearney Lake Road

Field Parameter Data

	Remarks
Date (d.m.y):	14/08/2014
Time (hh:mm):	11:35
Sample Depth (m):	1.0
pH:	7.25
Dissolved Oxygen (mg/L):	5.92
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	21.8
Conductivity (µs/cm):	251

Additional Comments / Notes

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FIELD REPORT – AUGUST 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 9
Client:	Halifax Regional Municipality	
Site: Kearney Lake		**Site ID: KL5**
Watercourse: Kearney Lake		**Location:** Kearney Lake Road
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 4949142E, 445280N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Cloudy
Air Temperature:	24°C
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Accessible	Yes (along Kearney Lake Road)

Field Parameter Data

	Remarks
Date (d.m.y):	14/08/2014
Time (hh:mm):	13:55
Sample Depth (m):	1.0
pH:	7.86
Dissolved Oxygen (mg/L):	7.64
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	22.9
Conductivity (µs/cm):	251

Additional Comments / Notes

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FIELD REPORT – AUGUST 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Highway 102	**Site ID: HWY 102-1**	
Watercourse: Marsh area	**Location:** Highway 102, south of exit 3	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0444708E, 4951644N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Overcast
Air Temperature:	20°C
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Accessible	Off Highway 102

Field Parameter Data

	Remarks
Date (d.m.y):	14/08/2014
Time (hh:mm):	10:10
Sample Depth (m):	1.0
pH:	6.63
Dissolved Oxygen (mg/L):	2.09
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	19.6
Conductivity (µs/cm):	337

Additional Comments / Notes

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FIELD REPORT – AUGUST 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Highway 102	**Site ID: HWY 102-2**	
Watercourse: Marsh area	**Location:** HWY 102, south of exit 3	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0444829E, 4951778N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Cloudy
Air Temperature:	25°C
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Accessible	Off Highway 102

Field Parameter Data

	Remarks
Date (d.m.y):	14/08/2014
Time (hh:mm):	14:25
Sample Depth (m):	N/A
pH:	N/A
Dissolved Oxygen (mg/L):	N/A
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	N/A
Conductivity (µs/cm):	N/A

Additional Comments / Notes

Field parameters data or water samples were not collected from this location due to low water levels and health and safety concerns.

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FIELD REPORT – AUGUST 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Lake Shore Drive	**Site ID: LSD**	
Watercourse: Marsh @ Lakeshore Dr.	**Location:** Kingswood Subdivision	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0442583E, 4950431N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Sunny with Clouds
Air Temperature:	21.7°C
Cloud Cover:	Partial
Wildlife Sightings:	No
Site Accessibility:	Via Lakeshore Drive in Kingswood Subdivision

Field Parameter Data

	Remarks
Date (d.m.y):	14/08/2014
Time (hh:mm):	12:45
Sample Depth (m):	N/A
pH:	N/A
Dissolved Oxygen (mg/L):	N/A
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	N/A
Conductivity (µs/cm):	N/A

Additional Comments / Notes

Field parameters data and water samples were not collected from this location due low water levels at this location and health and safety concerns.

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FIELD REPORT – AUGUST 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 9
Client:	Halifax Regional Municipality	
Site: Larry Uteck Blvd.	**Site ID: LU**	
Watercourse: Pond	**Location:** Larry Uteck off-ramp	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 4949816E, 445042N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Overcast
Air Temperature:	20.2°C
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Accessible	From Larry Uteck Blvd. off-ramp, Halifax-bound

Field Parameter Data

	Remarks
Date (d.m.y):	14/08/2014
Time (hh:mm):	10:45
Sample Depth (m):	1.0
pH:	7.23
Dissolved Oxygen (mg/L):	8.08
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	22.8
Conductivity (µs/cm):	611

Additional Comments / Notes

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FIELD REPORT – AUGUST 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Paper Mill Lake	**Site ID: PML1**	
Watercourse: Paper Mill Lake	**Location:** Moirs Mill Subdivision	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0445129E, 4951154N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Sunny
Air Temperature:	25°C
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Accessible	Via French Mast Lane in Moirs Mill Subdivision

Field Parameter Data

	Remarks
Date (d.m.y):	14/08/2014
Time (hh:mm):	14:45
Sample Depth (m):	1.0
pH:	7.42
Dissolved Oxygen (mg/L):	7.49
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	23.6
Conductivity (µs/cm):	263

Additional Comments / Notes

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FIELD REPORT – AUGUST 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Paper Mill Lake	**Site ID: PML2**	
Watercourse: Paper Mill Lake	**Location:** Moirs Mill Subdivision	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0445363E, 4951740N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Overcast
Air Temperature:	19.3°C
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Accessible	Via Lake Dr., off Hammonds Plains Rd.

Field Parameter Data

	Remarks
Date (d.m.y):	14/08/2014
Time (hh:mm):	9:20
Sample Depth (m):	0.1
pH:	7.22
Dissolved Oxygen (mg/L):	6.95
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	21.1
Conductivity (µs/cm):	266

Additional Comments / Notes

A secchi disk measurement was not collected at this sample location due to the low water level at this area.

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ATTACHMENT 2

Site Photographs

Photo 1: KL1, Kearney Lake sample location

Photo 2: KL2, Kearney Lake sample location

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Photo 3: KL3, Kearney Lake sample location

Photo 4: KL4, Kearney Lake sample location

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Photo 5: KL5, Kearney Lake sample location.

Photo 6: HWY102-1 sample location

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Photo 7: HWY102-2 sample location
(Note: no water samples were collected from this location).

Photo 8: LSD, Lake Shore Drive sample location.
(Note: no water samples were collected from this location).

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Photo 9: LU, Larry Uteck off-ramp sample location

Photo 10: PML1, Paper Mill Lake sample location

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Photo 11: PML2, Paper Mill Lake sample location

Photo 12: PML2, Paper Mill Lake water level.

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ATTACHMENT 3

Laboratory Certificates of Analysis

AGAT Laboratories

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Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

CLIENT NAME: SNC-LAVALIN
5657 SPRING GARDEN RD, SUITE 200
HALIFAX , NS B3J3R4
(902) 492-4544

ATTENTION TO: Derek Heath

PROJECT: 510192-0001 Bedford West

AGAT WORK ORDER: 14X876015

WATER ANALYSIS REVIEWED BY: Jason Coughtrey, Inorganics Supervisor

DATE REPORTED: Aug 25, 2014

PAGES (INCLUDING COVER): 11

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

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Results relate only to the items tested and to all the items tested

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 14X876015

PROJECT: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

SAMPLING SITE:

SAMPLED BY:

SNC-Lavalin Bedford West Custom Inorganics Package

DATE RECEIVED: 2014-08-14

DATE REPORTED: 2014-08-25

SAMPLE DESCRIPTION:				KL-1	KL-2	KL-3	KL-4	KL-5	Hwy-102-1	PML-1	PML-2
SAMPLE TYPE:				Water	Water	Water	Water	Water	Water	Water	Water
DATE SAMPLED:				8/14/2014	8/14/2014	8/14/2014	8/14/2014	8/14/2014	8/14/2014	8/14/2014	8/14/2014
Parameter	Unit	G / S	RDL	5691293	5691346	5691356	5691363	5691371	5691390	5691397	5691492
Alkalinity	mg/L		5	14	7	5	5	<5	28	7	10
Chloride	mg/L		1	76	17	46	47	47	57	50	50
True Color	TCU		5	8	44	13	11	11	31	10	7
Nitrate + Nitrite as N	mg/L		0.05	0.11	<0.05	0.13	0.17	0.10	<0.05	0.24	0.18
Nitrate as N	mg/L		0.05	0.11	<0.05	0.13	0.17	0.10	<0.05	0.24	0.18
Nitrite as N	mg/L		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ammonia as N	mg/L		0.03	<0.03	0.04	<0.03	<0.03	<0.03	0.04	<0.03	0.03
Total Organic Carbon	mg/L		0.5	2.4	6.6	2.8	2.1	2.7	7.7	2.0	2.4
Ortho-Phosphate as P	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH				7.06	6.87	6.87	6.91	6.84	7.49	7.00	7.04
Total Calcium	mg/L		0.1	11.0	4.0	7.9	7.9	7.6	23.3	9.1	8.8
Total Magnesium	mg/L		0.1	1.6	1.0	1.2	1.2	1.2	3.2	1.4	1.4
Total Phosphorus	mg/L		0.006	0.026	0.039	0.023	0.031	0.026	0.038	0.030	0.026
Total Potassium	mg/L		0.1	1.6	0.9	1.1	1.1	1.1	2.5	1.3	1.2
Total Sodium	mg/L		0.1	54.2	14.0	39.0	38.6	40.3	38.7	41.6	42.6
Reactive Silica as SiO2	mg/L		0.5	1.5	3.3	1.9	2.1	2.1	7.1	2.3	2.3
Total Suspended Solids	mg/L		5	<5	<5	<5	<5	<5	<5	<5	<5
Sulphate	mg/L		2	11	2	7	8	8	7	8	7
Turbidity	NTU		0.1	0.7	0.8	0.3	0.6	0.4	1.6	0.9	0.7
Electrical Conductivity	umho/cm		1	339	94	243	241	246	338	261	273
Anion Sum	me/L			2.66	0.66	1.55	1.60	1.50	2.31	1.73	1.77
Bicarb. Alkalinity (as CaCO3)	mg/L		5	14	7	5	5	<5	28	7	10
Calculated TDS	mg/L		1	165	44	106	108	106	150	117	118
Carb. Alkalinity (as CaCO3)	mg/L		10	<10	<10	<10	<10	<10	<10	<10	<10
Cation sum	me/L			3.09	0.97	2.23	2.21	2.27	3.22	2.45	2.47
Hardness	mg/L			34.1	14.1	24.7	24.7	23.9	71.4	28.5	27.7
% Difference/ Ion Balance (NS)	%			7.5	19.1	17.9	15.8	20.3	16.4	17.0	16.5
Langelier Index (@20C)	NA			-2.36	-3.23	-3.12	-3.08	-3.17	-1.30	-2.79	-2.61
Langelier Index (@ 4C)	NA			-2.68	-3.55	-3.44	-3.40	-3.49	-1.62	-3.11	-2.93
Saturation pH (@ 20C)	NA			9.42	10.1	9.99	9.99	10.0	8.79	9.79	9.65

Original Signed

Certified By:

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 14X876015

PROJECT: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

SAMPLING SITE:

SAMPLED BY:

SNC-Lavalin Bedford West Custom Inorganics Package

DATE RECEIVED: 2014-08-14

DATE REPORTED: 2014-08-25

		SAMPLE DESCRIPTION:		KL-1	KL-2	KL-3	KL-4	KL-5	Hwy-102-1	PML-1	PML-2
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		8/14/2014	8/14/2014	8/14/2014	8/14/2014	8/14/2014	8/14/2014	8/14/2014	8/14/2014
Parameter	Unit	G / S	RDL	5691293	5691346	5691356	5691363	5691371	5691390	5691397	5691492
Saturation pH (@ 4C)	NA			9.74	10.4	10.3	10.3	10.3	9.11	10.1	9.97
Total Aluminum	ug/L		5	42	236	52	46	53	83	129	52
Total Antimony	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Arsenic	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Barium	ug/L		5	20	18	17	19	17	142	23	27
Total Beryllium	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Bismuth	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Boron	ug/L		5	22	12	10	11	6	14	13	13
Total Cadmium	ug/L		0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	0.020	0.019
Total Chromium	ug/L		1	<1	<1	<1	<1	<1	<1	<1	<1
Total Cobalt	ug/L		1	<1	<1	<1	<1	<1	<1	<1	<1
Total Copper	ug/L		1	<1	<1	<1	<1	<1	<1	<1	<1
Total Iron	ug/L		50	124	723	96	55	<50	820	296	316
Total Lead	ug/L		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Manganese	ug/L		2	115	146	45	29	18	122	260	278
Total Molybdenum	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Nickel	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Selenium	ug/L		1	<1	<1	<1	<1	<1	<1	<1	<1
Total Silver	ug/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium	ug/L		5	45	17	32	31	30	103	37	37
Total Thallium	ug/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Titanium	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Uranium	ug/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Vanadium	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Zinc	ug/L		5	<5	<5	<5	<5	<5	<5	<5	<5
Total Coliforms (MPN)	MPN/100 mL		1	1550	>2420	1730	1550	629	>2420	2420	517
E. Coli (MPN)	MPN/100 mL		1	15	18	<1	1	1	179	10	3
Chlorophyll A - Acidification Method	ug/L		0.05	0.41	0.83	0.59	0.50	0.61	1.10	0.64	0.48

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Certificate of Analysis

AGAT WORK ORDER: 14X876015

PROJECT: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

SAMPLING SITE:

SAMPLED BY:

SNC-Lavalin Bedford West Custom Inorganics Package

DATE RECEIVED: 2014-08-14

DATE REPORTED: 2014-08-25

		SAMPLE DESCRIPTION:		KL-1	KL-2	KL-3	KL-4	KL-5	Hwy-102-1	PML-1	PML-2
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		8/14/2014	8/14/2014	8/14/2014	8/14/2014	8/14/2014	8/14/2014	8/14/2014	8/14/2014
Parameter	Unit	G / S	RDL	5691293	5691346	5691356	5691363	5691371	5691390	5691397	5691492
Chlorophyll A - Welschmeyer Method	ug/L		0.05	0.36	0.86	0.51	0.57	0.54	1.11	0.65	0.44
Total Kjeldahl Nitrogen as N	mg/L		0.4	<0.4	0.4	0.4	<0.4	0.5	0.6	0.4	0.4

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AGAT WORK ORDER: 14X876015

PROJECT: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

SAMPLING SITE:

SAMPLED BY:

SNC-Lavalin Bedford West Custom Inorganics Package

DATE RECEIVED: 2014-08-14

DATE REPORTED: 2014-08-25

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION: LU SAMPLE TYPE: Water DATE SAMPLED: 8/14/2014 5691514
Alkalinity	mg/L		5	21
Chloride	mg/L		1	104
True Color	TCU		5	8
Nitrate + Nitrite as N	mg/L		0.05	0.47
Nitrate as N	mg/L		0.05	0.47
Nitrite as N	mg/L		0.05	<0.05
Ammonia as N	mg/L		0.03	<0.03
Total Organic Carbon	mg/L		0.5	4.7
Ortho-Phosphate as P	mg/L		0.01	<0.01
pH				7.42
Total Calcium	mg/L		0.1	27.6
Total Magnesium	mg/L		0.1	3.8
Total Phosphorus	mg/L		0.006	0.028
Total Potassium	mg/L		0.1	3.7
Total Sodium	mg/L		0.1	88.1
Reactive Silica as SiO2	mg/L		0.5	2.5
Total Suspended Solids	mg/L		5	<5
Sulphate	mg/L		2	20
Turbidity	NTU		0.1	10.1
Electrical Conductivity	umho/cm		1	605
Anion Sum	me/L			3.80
Bicarb. Alkalinity (as CaCO3)	mg/L		5	21
Calculated TDS	mg/L		1	262
Carb. Alkalinity (as CaCO3)	mg/L		10	<10
Cation sum	me/L			5.64
Hardness	mg/L			84.6
% Difference/ Ion Balance (NS)	%			19.4
Langelier Index (@20C)	NA			-1.45
Langelier Index (@ 4C)	NA			-1.77
Saturation pH (@ 20C)	NA			8.87

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PROJECT: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

SAMPLING SITE:

SAMPLED BY:

SNC-Lavalin Bedford West Custom Inorganics Package

DATE RECEIVED: 2014-08-14

DATE REPORTED: 2014-08-25

Parameter	Unit	SAMPLE DESCRIPTION:	G / S	RDL	LU
		SAMPLE TYPE:			Water
		DATE SAMPLED:			8/14/2014
					5691514
Saturation pH (@ 4C)	NA				9.19
Total Aluminum	ug/L			5	46
Total Antimony	ug/L			2	<2
Total Arsenic	ug/L			2	<2
Total Barium	ug/L			5	157
Total Beryllium	ug/L			2	<2
Total Bismuth	ug/L			2	<2
Total Boron	ug/L			5	20
Total Cadmium	ug/L			0.017	0.031
Total Chromium	ug/L			1	<1
Total Cobalt	ug/L			1	<1
Total Copper	ug/L			1	<1
Total Iron	ug/L			50	207
Total Lead	ug/L			0.5	<0.5
Total Manganese	ug/L			2	182
Total Molybdenum	ug/L			2	<2
Total Nickel	ug/L			2	<2
Total Selenium	ug/L			1	<1
Total Silver	ug/L			0.1	<0.1
Total Strontium	ug/L			5	111
Total Thallium	ug/L			0.1	<0.1
Total Tin	ug/L			2	<2
Total Titanium	ug/L			2	<2
Total Uranium	ug/L			0.1	<0.1
Total Vanadium	ug/L			2	<2
Total Zinc	ug/L			5	8
Total Coliforms (MPN)	MPN/100 mL			1	961
E. Coli (MPN)	MPN/100 mL			1	7
Chlorophyll A - Acidification Method	ug/L			0.05	2.54

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Certificate of Analysis

AGAT WORK ORDER: 14X876015

PROJECT: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Derek Heath

SAMPLING SITE:

SAMPLED BY:

SNC-Lavalin Bedford West Custom Inorganics Package

DATE RECEIVED: 2014-08-14

DATE REPORTED: 2014-08-25

		SAMPLE DESCRIPTION:		LU
		SAMPLE TYPE:		Water
		DATE SAMPLED:		8/14/2014
Parameter	Unit	G / S	RDL	5691514
Chlorophyll A - Welschmeyer Method	ug/L		0.05	2.51
Total Kjeldahl Nitrogen as N	mg/L		0.4	1.7

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5691346-5691514 Ion Balance is biased high, contributing parameters have been re-checked.

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Quality Assurance

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 14X876015

PROJECT: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Aug 25, 2014

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL				METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits		
								Lower	Upper		Lower	Upper		Lower	Upper	
SNC-Lavalin Bedford West Custom Inorganics Package																
Alkalinity	5691293	5691293	14	10	0.0%	< 5	86%	80%	120%	NA	80%	120%	NA	80%	120%	
Chloride	5691774		5	6	11.8%	< 1	89%	80%	120%	NA	80%	120%	92%	80%	120%	
True Color	1	1796	5	5	0.0%	< 5	90%	80%	120%		80%	120%		80%	120%	
Nitrate as N	5691774		<0.05	<0.05	0.0%	< 0.05	90%	80%	120%	NA	80%	120%	93%	80%	120%	
Nitrite as N	5691774		<0.05	<0.05	0.0%	< 0.05	94%	80%	120%	NA	80%	120%	90%	80%	120%	
Ammonia as N	1	5691293	<0.03	<0.03	0.0%	< 0.03	113%	80%	120%		80%	120%	97%	80%	120%	
Total Organic Carbon	1		0.7	0.6	15.4%	< 0.5	83%	80%	120%		80%	120%	86%	80%	120%	
Ortho-Phosphate as P	1	5691796	0.15	0.15	0.0%	< 0.01	98%	80%	120%		80%	120%	102%	80%	120%	
pH	5691293	5691293	7.06	7.08	0.3%	<	101%	80%	120%	NA	80%	120%	NA	80%	120%	
Total Calcium	8152014		30.5	32.6	6.7%	< 0.1	120%	80%	120%	120%	80%	120%	NA	70%	130%	
Total Magnesium	8152014		3.0	3.2	6.5%	< 0.1	113%	80%	120%	109%	80%	120%	89%	80%	120%	
Total Phosphorus	5691293	5691293	0.026	0.027	0.0%	< 0.006	93%	90%	110%	100%	90%	110%	96%	80%	120%	
Total Potassium	8152014		4.7	5.0	6.2%	< 0.1	120%	80%	120%	119%	80%	120%	85%	70%	130%	
Total Sodium	8152014		12.3	13.1	6.3%	< 0.1	111%	80%	120%	111%	80%	120%	NA	70%	130%	
Reactive Silica as SiO2	1	5691363	2.1	2.1	0.0%	< 0.5	101%	80%	120%		80%	120%	94%	80%	120%	
Total Suspended Solids	1	5691554	<5	<5	0.0%	< 5	98%	80%	120%		120%	120%	102%	80%	120%	
Sulphate	5691774		20	22	9.2%	< 2	103%	80%	120%	NA	80%	120%	NA	80%	120%	
Turbidity	1	1796	0.3	0.3	0.0%	< 0.1	88%	80%	120%		80%	120%		80%	120%	
Electrical Conductivity	5691293	5691293	339	337	0.6%	< 1	101%	80%	120%	NA	80%	120%	NA	80%	120%	
Bicarb. Alkalinity (as CaCO3)	5691293	5691293	14	10	0.0%	< 5	NA	80%	120%	NA	80%	120%	NA	80%	120%	
Carb. Alkalinity (as CaCO3)	5691293	5691293	<10	<10	0.0%	< 10	NA	80%	120%	NA	80%	120%	NA	80%	120%	
Total Aluminum	8152014		173	184	6.2%	< 5	120%	80%	120%	120%	80%	120%	NA	70%	130%	
Total Antimony	8152014		< 0.002	< 0.002	0.0%	< 2	91%	80%	120%	98%	80%	120%	92%	70%	130%	
Total Arsenic	8152014		3	3	0.0%	< 2	97%	80%	120%	97%	80%	120%	90%	70%	130%	
Total Barium	8152014		50	52	3.9%	< 5	107%	80%	120%	105%	80%	120%	93%	70%	130%	
Total Beryllium	8152014		< 0.002	< 0.002	0.0%	< 2	104%	80%	120%	102%	80%	120%	91%	70%	130%	
Total Bismuth	8152014		< 0.002	< 0.002	0.0%	< 2	118%	80%	120%	118%	80%	120%	101%	70%	130%	
Total Boron	8152014		< 0.005	< 0.005	0.0%	< 5	112%	80%	120%	113%	80%	120%	97%	70%	130%	
Total Cadmium	8152014		< 0.000017	< 0.000017	0.0%	< 0.017	100%	80%	120%	101%	80%	120%	93%	70%	130%	
Total Chromium	8152014		< 0.001	< 0.001	0.0%	< 1	96%	80%	120%	92%	80%	120%	94%	70%	130%	
Total Cobalt	8152014		< 0.001	< 0.001	0.0%	< 1	94%	80%	120%	91%	80%	120%	94%	70%	130%	
Total Copper	8152014		< 0.002	< 0.002	0.0%	< 1	88%	80%	120%	87%	80%	120%	90%	70%	130%	
Total Iron	8152014		2830	2860	1.1%	< 50	99%	80%	120%	96%	80%	120%	99%	70%	130%	
Total Lead	8152014		< 0.0005	< 0.0005	0.0%	< 0.5	117%	80%	120%	115%	80%	120%	101%	70%	130%	
Total Manganese	8152014		1140	1210	6.0%	< 2	114%	80%	120%	108%	80%	120%	NA	70%	130%	
Total Molybdenum	8152014		< 0.002	< 0.002	0.0%	< 2	82%	80%	120%	84%	80%	120%	79%	70%	130%	
Total Nickel	8152014		< 0.002	< 0.002	0.0%	< 2	93%	80%	120%	93%	80%	120%	90%	70%	130%	
Total Selenium	8152014		< 0.001	< 0.001	0.0%	< 1	98%	80%	120%	106%	80%	120%	76%	70%	130%	
Total Silver	8152014		< 0.0001	< 0.0001	0.0%	< 0.1	95%	80%	120%	85%	80%	120%	NA	70%	130%	

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Quality Assurance

CLIENT NAME: SNC-LAVALIN
AGAT WORK ORDER: 14X876015
PROJECT: 510192-0001 Bedford West
ATTENTION TO: Derek Heath
SAMPLING SITE:
SAMPLED BY:

Water Analysis (Continued)

RPT Date: Aug 25, 2014			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Strontium	8152014		112	118	5.2%	< 5	81%	80%	120%	83%	80%	120%	88%	70%	130%
Total Thallium	8152014		< 0.0001	< 0.0001	0.0%	< 0.1	115%	80%	120%	112%	80%	120%	101%	70%	130%
Total Tin	8152014		< 0.002	< 0.002	0.0%	< 2	98%	80%	120%	100%	80%	120%	100%	70%	130%
Total Titanium	8152014		< 0.002	< 0.002	0.0%	< 2	108%	80%	120%	118%	80%	120%	130%	70%	130%
Total Uranium	8152014		0.2	0.2	0.0%	< 0.1	109%	80%	120%	108%	80%	120%	100%	70%	130%
Total Vanadium	8152014		2	2	0.0%	< 2	96%	80%	120%	89%	80%	120%	95%	70%	130%
Total Zinc	8152014		5	5	0.0%	< 5	94%	80%	120%	90%	80%	120%	80%	70%	130%
Total Kjeldahl Nitrogen as N	1	5689722	0.7	0.8	13.3%	< 0.4	96%	80%	120%		80%	120%	120%	80%	120%

Original Signed

Certified By:

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation.

Results relate only to the items tested and to all the items tested

AGAT Laboratories

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

Method Summary

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 14X876015

PROJECT: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Alkalinity	INORG-121-6001	SM 2320 B	PC-TITRATE
Chloride	INORG-121-6005	SM 4110 B	IC
True Color	INORG-121-6014	EPA 110.2	NEPHELOMETER
Nitrate + Nitrite as N	INORG-121-6005	SM 4110 B	CALCULATION
Nitrate as N	INORG-121-6005	SM 4110 B	IC
Nitrite as N	INORG-121-6005	SM 4110 B	IC
Ammonia as N	INORG-121-6003	SM 4500-NH3 G	COLORIMETER
Total Organic Carbon	INORG-121-6026	SM 5310 B	TOC ANALYZER
Ortho-Phosphate as P	INORG-121-6005	SM 4110 B	COLORIMETER
pH	INOR-121-6001	SM 4500 H+B	PC-TITRATE
Total Calcium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Magnesium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Phosphorus	INOR-93-1022	SM 4500-P B & E	SPECTROPHOTOMETER
Total Potassium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Sodium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Reactive Silica as SiO2	INORG-121-6028	SM 4110 B	COLORIMETER
Total Suspended Solids	INOR-121-6024, 6025	SM 2540C, D	GRAVIMETRIC
Sulphate	INORG-121-6005	SM 4110 B	IC
Turbidity	INORG-121-6022	SM 2130 B	NEPHELOMETER
Electrical Conductivity	INOR-121-6001	SM 2510 B	PC-TITRATE
Anion Sum	CALCULATION	SM 1030E	CALCULATION
Bicarb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Calculated TDS		SM 1030E	CALCULATION
Carb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Cation sum	CALCULATION	SM 1030E	CALCULATION
Hardness	CALCULATION	SM 2340B	CALCULATION
% Difference/ Ion Balance (NS)	CALCULATION	SM 1030E	CALCULATION
Langelier Index (@20C)	CALCULATION	CALCULATION	CALCULATION
Langelier Index (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 20C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Total Aluminum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Antimony	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Arsenic	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Barium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Beryllium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Bismuth	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Boron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cadmium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS

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Method Summary

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 14X876015

PROJECT: 510192-0001 Bedford West

ATTENTION TO: Derek Heath

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Chromium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cobalt	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Copper	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Iron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Lead	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Manganese	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Molybdenum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Nickel	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Selenium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Silver	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Strontium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Thallium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Tin	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Titanium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Uranium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Vanadium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Zinc	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Coliforms (MPN)	MIC-121-7000	Based on SM 9223B	INCUBATOR
E. Coli (MPN)	MIC-121-7000	Based on SM 9223B	INCUBATOR
Chlorophyll A - Acidification Method	Subcontracted	Subcontracted	
Chlorophyll A - Welschmeyer Method	Subcontracted	Subcontracted	ICP-MS
Total Kjeldahl Nitrogen as N	INOR-121-6020	SM 4500 NORG D	COLORIMETER

Results relate only to the items tested and to all the items tested

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Dartmouth, Nova Scotia
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Chain of Custody Record

Turnaround Time Required (TAT)

Regular TAT 5 to 7 working days ☑
Rush TAT 24 to 48 hours ☐
48 to 72 hours ☐
Date Required: 14X876015

Laboratory Use Only

Arrival Condition: ☑ Good ☐ Poor (see notes)
Arrival Temperature: 18°
AGAT Job Number:
Notes: Just taken

Report To

Company: SNC Lavalin
Contact: Derek Heath
Address: 5657 Spring Garden Road, Suite 200
Phone: +1 (902) 492-4544 Fax:
PO#:
AGAT Quotation: 12-761
Client Project Name/#: 510192-0001 Bedford West

Invoice To Same Yes ☑ / No ☐

Company:
Contact:
Address:
Phone: Fax:
PO#/Credit Card #:

Report Information

1. Name:
   Email:
2. Name: Derek Heath
   Email: derek.heath@snclavalin.com

Report Format

☐ Single Sample per page
☑ Multiple Samples per page
☑ Excel Format Included

Regulatory Requirements (Check):

☐ List Guidelines on Report ☐ Do not List Guidelines on Report
☐ PIRI
☐ Tier 1 ☐ Res ☐ Pot ☐ Coarse
☐ Tier 2 ☐ Com ☐ N/Pot ☐ Fine
☐ Gas ☐ Gas ☐ Lube
☐ CCME
☐ Industrial ☐ CDWQ ☐ Other
☐ Commercial ☐ NSDFOSP
☐ Res/Park ☐ HRM 101
☐ Agricultural ☐ Storm Water
☐ FWAL ☐ Waste Water
☐ Sediment

Sample Identification	Sample Matrix	Date/Time Sampled	Comments – Site/Sample Info. Sample Containment	Microtox	CCME PHC BTEX/F1-F4	Metals	AB Class II Landfill	Detailed Salinity	Routine Potability	Standard Water + Metals	Low Level Total Phosphorus	TSS & TKN	E.Coli (MPN)	Chlorophyll A	Number of Containers	Preserved (Y/N)	Hazardous (Y/N)	Lab Sample #
KL-1	WATER	14:15 on 14/08/14								✓	✓	✓	✓	✓				
KL-2	WATER	14/08/14 @ 13:35								✓	✓	✓	✓	✓				
KL-3	WATER	" @ 11:50								✓	✓	✓	✓	✓				
KL-4	WATER	" @ 11:35								✓	✓	✓	✓	✓				
KL-5	WATER	14/08/14 @ 13:55								✓	✓	✓	✓	✓				
LSD	WATER	" @ 12:45								✓	✓	✓	✓	✓				
HWY-102-1	WATER	" @ 10:10								✓	✓	✓	✓	✓				
HWY-102-2	WATER									✓	✓	✓	✓	✓				
PML-1	WATER	" @ 1445								✓	✓	✓	✓	✓				
PML-2	WATER	" @ 9:20								✓	✓	✓	✓	✓				
LU	WATER	" @ 10:45								✓	✓	✓	✓	✓				
	WATER									✓	✓	✓	✓	✓				

Samples Relinquished by (print name & sign):	Date	Samples Received by (Print name & sign):	Date	Special Instructions	Page ___ of ___
Christian P. Pol	14/08/14	Chris Deam	Aug 14/14		
Samples Relinquished by (print name & sign):	Date	Samples Received by (Print name & sign): Original Signed	Date 15:30		NO:
Samples Relinquished by (print name & sign):	Date	Samples Received by (Print name & sign):	Date		

Attachment F. October 2014 Water Monitoring Report

SNC·LAVALIN

SNC-LAVALIN INC.
Suite 200
Park Lane Terraces
5657 Spring Garden Road
Halifax, Nova Scotia
Canada, B3J 3R4

Telephone: 902-492-4544
Fax: 902-492-4540

November 21, 2014

Halifax Regional Municipality
Energy and Environment
PO Box 1749
Halifax, Nova Scotia
B3J 3A5

Attention: Mr. Cameron Deacoff

Dear Mr. Deacoff:

RE: Final Report: Water Quality Monitoring Program within Bedford West, Bedford, Nova Scotia – October 2014 Sampling Event

SNC-Lavalin Inc. (SLI) is pleased to submit one (1) electronic copy of the Final Letter Report for the October 2014 Sampling Event of the Bedford West Water Quality Monitoring Program, Bedford, Nova Scotia.

Should you have any questions or require anything further, please contact the undersigned at (902) 468-6230.

Yours truly,

SNC♦LAVALIN INC.

Original Signed

Christa Rafuse, P. Eng
Project Manager

CR/mg

510192-0001-T-EN-REP-0009_C02.docx

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1. INTRODUCTION

SNC-Lavalin Inc. (SLI) was retained by the Halifax Regional Municipality (HRM) to conduct a Water Quality Monitoring Program (the program) within Bedford West area.

The purpose of the program is to determine water quality for watersheds impacted by the development in the Bedford West area. The Paper Mill Lake watershed is the primary watershed within the subject area.

The program consists of collecting surface water samples from eleven (11) specified test locations as follows (See Figure 1 - Sample Locations):

- Kearney Lake (KL1, KL2, KL5);
- Kearney Lake Run (KL3, KL4);
- Highway 102 (HWY 102-1);
- Highway 102 (Location: HWY 102-2)
- Lake Shore Drive (Location: LSD);
- Larry Uteck Boulevard (LU);
- Paper Mill Lake (PML1); and
- Paper Mill Lake (PLM2).

The overall purpose of the program is to conduct water quality sampling and testing prior to construction activities to establish baseline conditions, in order to detect any impacts on and/or changes to water quality during and after construction of the development project.

As part of the October 2014 sampling event, this report presents water quality data of the eleven (11) specified test locations.

2. METHODOLOGY

The October 2014 program methodology consisted of one surface water sampling event and laboratory analyses of general chemistry (RCAp), total metals, total phosphorous, total

suspended solids, E. coli bacteria, TKN and chlorophyll-a from the specified test locations. Additionally, standard field parameters (pH, water temperature, dissolved oxygen, conductivity, secchi depth, air temperature, cloud cover, and wildlife sightings) were to be measured at specified sampling locations.

The water samples and field parameter readings were collected from a 1.0 metre depth whenever possible. Site conditions (weather, air temperature, cloud cover, and site accessibility) and field parameters for each sampling location were recorded on a field report.

A new pair of latex gloves was used at each sample location. Surface water samples were collected and placed in clean laboratory-supplied jars and stored in a chilled container together with a chain of custody record for transport to the laboratory. All surface water samples collected were submitted to AGAT Laboratories, located in Dartmouth, NS.

Secchi depth measurements were taken from the shady side of the boat at two sample locations. The secchi disk was lowered in the water until no longer visible. The depth was measured to the nearest tenth of a metre. The disk was raised until visible in the water and the depth was measured. The secchi depth is the midpoint between the two measured depths.

During the October 2014 water sampling event, the Waterra AM100 Aqua Meter and AP800 Aqua Probe were used for collecting water field parameters, such as pH, dissolved oxygen, conductivity and temperature.

With respect to historical field parameter data collection, the following monitors have been used:

a) For the August 2014 water sampling event, the Waterra AM/OO Aqua Meter and AP800 aqua probe were used to collect water field parameters (pH, dissolved oxygen, conductivity and temperature).
b) For the May 2014 water sampling event, the Horiba U-22 parameter monitor was used to collect water field parameters (pH, dissolved oxygen, conductivity and temperature).

c) For 2013-2012 sampling events: Waterra AM100 Aqua Meter and AP800 Aqua Probe were used for collecting water field parameters (pH, dissolved oxygen, conductivity and temperature).
d) For 2011-2010 sampling events: Hach intelliCAL probes were used for collecting for pH, temperature, conductivity and dissolved oxygen (Product Numbers pHC30101, CDC40101 and LDO10101, respectively); and
e) For 2009 sampling events: Oakton Portable Waterproof Meters were used for collecting water field parameters (dissolved oxygen meter 35601 Series; pH and conductivity 35630-00 and 35630-02, respectively).

3. ASSESSMENT OF STANDARDS

The Canadian Council of Ministers of the Environment (CCME) guidelines for water are broken down based on water use including Freshwater Aquatic Life, Marine Water Aquatic Life, Irrigation, Livestock Watering and Aesthetics and Drinking Water. The surface water quality results were compared to the CCME Freshwater Aquatic Life (FWAL) guidelines since the specified sampling locations are located at and/or near adjacent freshwater bodies.

Analytical data for total suspended solids (TSS) and turbidity are compared to the CCME for the Protection of Aquatic Life (CCME Narrative Total Particulate Matter – Table 1 Suspended Sediments and Turbidity, High Flow Conditions, 1999, updated 2002).

For TSS, the guideline value is equal to a maximum increase of 25 mg/L from background levels at any time when background levels are between 25 and 250 mg/L. When background is greater than 250 mg/L, the concentration should not increase more than 10% of background levels.

The Health Canada guidelines for Canadian Recreational Water Quality (2012, Third Edition) are presented as reference guidelines. The Canadian Recreational Water Quality guidelines indicate that the clarity of the water should be sufficiently clear such that a Secchi disk is visible at a minimum of 1.2 metres. For turbidity, a limit of 50 Nephelometric

Turbidity Units (NTU) is suggested.

The Nova Scotia Environment Environmental Quality Standards for Surface Water (Notification of Contamination Protocol (PRO-100) July 6, 2013) are presented as reference guidelines (http://www.novascotia.ca/nse/contaminatedsites/protocols.asp).

4. WATER QUALITY RESULTS - OCTOBER 2014

The field parameters data and analytical results such as inorganic, calculated parameters, metals and microbiological are presented in Table 1 – Bedford West Sampling Program Results.

In addition, the field reports are provided in Attachment 1; photographs of each water sampling location are attached in Attachment 2, and laboratory certificates of analysis are enclosed in Attachment 3.

4.1. FIELD OBSERVATIONS

Site conditions were observed at eleven (11) sampling locations. Information was recorded on a Field Data Sheet per station, which included the following information: weather, air temperature, cloud cover, wildlife sightings and site accessibility. Field notes and associated photograph are included in **Attachment 1**, Field Report and **Attachment 2**, Photo-log, respectively.

It should be noted that at station KL1 (Kearney Lake) a potential concern was observed on October 28th, 2014 and immediately reported to the client. However based on the number of dead fish observed (approx.28) by SNC field personnel, it was concluded that a simple dumping of fish was the most likely cause of this issue. As the likelihood of potential water quality sample contamination from these fish was considered low, the monitoring event proceeded as planned.

4.2. FIELD MEASUREMENTS

Standard field parameters were measured at eleven (11) sampling locations. Information was recorded on a Field Data Sheet per station, which included the following information: date, time, sample depth, pH, dissolved Oxygen, secchi depth, water temperature and conductivity. Collected data is included in **Attachment 1**, Field Report.

The dissolved oxygen reading of 4.54 mg/L at HWY 102-1 (dated 2014/10/27) was outside of the applicable CCME FWAL guideline range of 5.5 - 9.5 mg/L.

4.3. LABORATORY ANALYTICAL RESULTS

4.3.1. GENERAL CHEMISTRY

Reported pH below minimum CCME FWAL guideline of 6.5-9pHs as shown in table below:

Reported pH above CCME FWAL guideline of 6.5-9 pH
▪ 6.35 pH at KL1 ▪ 6.06 pH at PLM2 ▪ 5.90 pH at HWY102-1 ▪ 6.40 pH at HYW 102-2 ▪ 6.41 pH at LU

4.3.2. METALS

Analytical results reported three (3) total metals (aluminum, cadmium and iron) concentrations which exceeded the applicable CCME FWAL guidelines as shown in table below. All other metals parameters were reported to be well within the applied CCME FWAL guidelines.

Aluminum concentration above CCME FWAL guideline of 5-100 µg/L	Cadmium concentrations above CCME FWAL guideline of 0.017 µg/L	Iron concentrations above the CCME FWAL guideline of 300 µg/L
▪ 155 µg/L at KL1 ▪ 340 µg/L at KL2 ▪ 105 µg/L at KL3 ▪ 108 µg/L at KL5 ▪ 310 µg/L at HWY102-1 ▪ 216 µg/L at HWY102-2 ▪ 141 µg/L at LSD ▪ 109 µg/L at LU ▪ 141 µg/L at PML-1 ▪ 122 µg/L at PML-2	▪ 0.025 µg/L at KL1 ▪ 0.018 µg/L at KL2 ▪ 0.024 µg/L at KL5 ▪ 0.022 µg/L at HWY102-1 ▪ 0.019 µg/LHWY102-2 ▪ 0.079 µg/L LU ▪ 0.018 µg/L PML-2	▪ 485 µg/L at HWY102-2 ▪ 363 µg/L at LSD

4.3.3. MICROBIOLOGICAL

The E. Coli concentrations were reported to be well within the referenced Health Canada Recreational Water Quality guideline at ten (10) of the eleven (11) water locations. At the LU station, E. Coli concentration was reported above (1730 MPN/100mL) the Health Canada guideline of 400 MPN/100mL.

5. CONCLUSIONS

The October 2014 Bedford West water quality monitoring program was conducted at the eleven (11) water test locations.

It should be noted that the surface water sampling event and laboratory analyses of general chemistry was conducted on Oct 27th, 2014; however due to cloudy conditions a standard field parameter (i.e. secchi depth) was measured on Oct 28th at KL1 location. (See Attachment A – Field Report)

The October 2014 program event included the collection of surface water samples for the analysis of general chemistry, total metals, total phosphorous, total suspended solids, E. Coli, total coliforms and chlorophyll-a, as well as, the collection of standard field parameter data such as pH, water temperature, dissolved oxygen, conductivity, secchi depth, air temperature, cloud cover, and wildlife sightings.

Based on the October 2014 monitoring results (field measurements and laboratory analytical data), and their comparisons with the applicable guidelines the following findings are concluded:

- **Dissolved Oxygen** reading of 4.54 mg/L at HWY 102-1 was outside of the applicable CCME FWAL guideline range of 5.5 - 9.5 mg/L.

- **General Chemistry** concentrations were in general well within the CCME FWAL applicable guidelines for the eleven (11) sampled locations. However, **pH** reported concentrations below CCME FWAL guideline of 6.5-9 pH at five (5) stations as follows: 6.35 pH at KL1; 6.06 pH at PLM2; 5.90 pH at HWY102-1; 6.40 pH at HYW 102-2; and 6.41 pH at LU.

- **Total Aluminum** concentrations exceeding the CCME FWAL guideline of 5-100 µg/L at ten (10) sampling stations as follows: 155 µg/L at KL1; 340 µg/L at KL2; 105 µg/L at KL3; 108 µg/L at KL5; 310 µg/L at HWY102-1; 216 µg/L at HWY102-2; 141 µg/L at LSD; 109 µg/L at LU; 141 µg/L at MPL-1; and 122 µg/L at PML-2.

- **Total Cadmium** concentrations were reported above the CCME FWAL guideline of 0.017 µg/L at seven (7) sampling stations as follows: 0.025 µg/L at KL1; 0.018 µg/L at KL2; 0.024 µg/L at KL5; 0.022 µg/L at HWY102-1; 0.019 µg/LHWY102-2; 0.079 µg/L LU; and 0.018 µg/L PML-2.

- **Total Iron** concentrations were reported above the CCME FWAL guideline of 300 µg/L at two (2) sampling stations as follows: 485 µg/L at HWY102-2 and 363 µg/L at LSD.

- E. Coli concentration at one (1) sampling station was reported above the Health Canada Recreational Water Quality guideline of 400 MPN/100mL. E. Coli concentration at LU reported of 1730 MPN/100mL.

6. LIMITATIONS

The findings of this report are limited to the conditions found at the time of the water sampling event. No assurance can be made that change in conditions may not occur subsequent to this monitoring and assessment of laboratory results, which may have an impact on the parameters surveyed.

This letter report contains professional opinions and findings relating to the data collected in relation to applicable guidelines and not legal opinion. Any use of the water monitoring findings constitutes acceptance of SNC-Lavalin's liability limitations.

N

HWY102-2

PML2

HWY102-1

PAPER MILL LAKE

PML1

KL4

LSD

KL3

KL2

LU

KEARNEY LAKE

KL5

KL1

Legend

- Water Quality Monitoring Test Locations/Sample Identification

0 200 400 800 1,200 1,600

Meters

SNC•LAVALIN

SNC•LAVALIN Inc.
Halifax, Nova Scotia, Canada
Telephone: (902) 492-4544
Fax: (902) 492-4540
Member of the SNC•LAVALIN Group

Certified ISO 9001

HALIFAX REGIONAL MUNICIPALITY

PROJECT: WATER QUALITY MONITORING WITHIN BEDFORD WEST

TITLE: WATER QUALITY MONITORING TEST LOCATIONS

DESIGNED:	CH
DRAWN:	CH
CHECKED:	DH
SCALE:	AS SHOWN
DATE:	10-09-2012
PROJECT #:	510192-0001
DRAWING #:	1

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

October 2014	Units	RDL	NSE ESQs for Surface Water (Reference)	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Kearney Lake															
Sample Sites						KL1															
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/14	2012/10/10	2013/05/15	2013/08/16	2013/10/16	2014/05/14	2014/08/14	2014/10/27
Sampling Time	hh:mm	--				08:00	11:45	08:30	11:00	13:10	12:00	11:00	14:30	14:00	8:30	11:20	9:50	10:20	11:10	13:30	10:30	14:15	14:55
FIELD DATA																							
Secchi Depth	Meters	--	--	1.2	--	4.1	4.2	5.0	N/A	5.0	4.9	2.4	3.2	2.4	2.35	5.36	N/A	2.50	2.03	2.90	2.36	2.70	2.54
Water Temp	Celsius	0.1	--	--	--	14.0	22.2	16.7	12.9	23.3	8.8	11.5	25.6	15.9	8.9	23.3	15.4	13.2	22.2	14.1	12.7	23.2	12.2
Dissolved Oxygen	mg/L	0.01	--	--	5.5-9.5	**10.77**	8.20	7.00	9.13	7.86	**10.48**	**10.69**	8.22	9.22	8.98	7.93	8.72	**9.76**	8.57	8.30	**15.29**	7.22	8.12
pH	pH	N/A	--	--	--	6.20	6.76	6.67	7.23	7.32	6.61	6.60	6.16	6.04	8.67	6.91	6.32	6.32	8.24	6.35	6.74	7.46	6.44
Specific Conductance	uS/cm	1	--	--	--	263	299	261	248	242	219	288	179	146	277	279	198.1	243	216.5	217.9	547.0	341.0	223.0
INORGANICS																							
Total Alkalinity (as CaCO3)	mg/L	5	--	--	--	6	8	8	7	8	6	<5	9	7	24	7	<5	<5	<5	8	30	14	<5
Dissolved Chloride (Cl)	mg/L	1	--	--	120	81	74	64	62	60	55	73	45	33	66	70	50	66	59	48	80	76	46
Colour	TCU	30	--	--	--	18	18	16	26	8	21	28	40	45	50	11	20	11	37	20	13	8	23
Nitrite + Nitrate	mg/L	0.05	--	--	--	0.18	0.09	0.12	0.21	0.16	0.23	0.2	0.11	0.13	0.20	0.09	0.10	0.18	0.14	0.19	0.11	0.11	0.08
Nitrate (N)	mg/L	0.05	--	--	13000	0.18	--	--	0.21	0.16	--	0.2	--	--	0.20	0.09	0.10	0.18	0.14	0.19	0.11	0.11	0.08
Nitrite (N)	mg/L	0.05	--	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	--	--	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.04	0.03	<0.03	0.03	0.03	<0.03	<0.03	<0.03	<0.03
Total Organic Carbon	mg/L	0.5	--	--	--	2.4	2.9	4.7	3.3	3.2	3.1	3.4	5.9	5.5	5.4	2.9	5.2	4.4	4.1	4.3	4.6	2.4	4.4
Orthophosphate (as P)	mg/L	0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (Lab)	pH	N/A	--	5.0-9.0	6.5-9	6.94	6.65	6.68	6.91	7.00	6.79	6.52	6.51	6.52	6.7	7.2	6.9	6.78	6.93	6.85	6.72	7.06	**6.35**
Total Calcium (Ca)	mg/L	0.1	--	--	--	9.2	8.5	7.2	7.72	8.66	8.30	7.65	4.82	5.31	6.8	8.4	6.3	7.5	6.6	6.5	8.1	11	6.0
Total Magnesium (Mg)	mg/L	0.1	--	--	--	1.5	1.4	1.2	1.42	1.36	1.30	1.29	0.86	1.06	1.1	1.5	1.5	1.1	1.2	1.2	1.6	1.6	0.9
Total Phosphorus (1M depth)	mg/L	0.006	--	--	--	<0.02	<0.02	<0.002	0.009	0.007	0.005	0.008	0.012	0.009	0.037	0.043	0.007	0.007	0.011	0.008	0.011	0.026	0.01
Total Potassium (K)	mg/L	0.1	--	--	--	1.1	0.9	1.3	0.876	0.888	0.901	0.788	0.773	0.871	0.7	0.9	0.9	0.8	0.7	1.1	0.9	1.6	0.7
Total Sodium (Na)	mg/L	0.1	--	--	--	51	46	37	31.8	35.2	33.8	43.7	22.8	19.8	40.1	42.0	29.8	35.8	26.2	31.6	50.2	54.2	37.6
Reactive Silica (SiO2)	mg/L	0.5	--	--	--	2.6	2.2	2.3	2.9	2.7	2.9	2.8	1.9	2.3	2.4	1.3	2.2	2.5	1.8	2.2	2.0	1.5	1.8
Total Suspended Solids	mg/L	5	--	--	--	1	1	<1	4	17	3	2	2	3	<5	<5	<5	<5	<5	5	<5	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	--	--	--	14	13	12	11	11	11	12	10	8	8	9	9	11	9	9	12	11	7
Turbidity (NTU)	NTU	0.1	--	50	--	0.7	0.8	1.0	1.3	0.6	1	1	1	0.9	2.4	0.8	1.3	1.6	3.3	0.5	2.9	0.7	1.9
Conductivity (uS/cm)	µS/cm	1	--	--	--	310	290	250	240	240	230	290	180	140	246	274	196	259	241	212	290	339	235
Calculated Parameters																							
Anion Sum	me/L	N/A	--	--	--	2.72	2.52	2.23	2.12	2.08	1.91	2.33	1.66	1.27	2.52	2.31	1.60	2.10	1.86	1.71	3.11	2.66	1.45
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5	--	--	--	6	8	8	7	8	6	<1	9	7	24	7	<5	<5	<5	8	30	14.00	<5
Calculated TDS	mg/L	1	--	--	--	166	151	131	123	125	118	143	92	77	139	137	98	124	104	103	172	165.00	99
Carb. Alkalinity (calc. as CaCO3)	mg/L	10	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	--	--	--	2.85	2.57	2.12	1.92	2.10	2.02	2.42	1.33	1.25	2.24	2.41	1.79	2.08	1.61	1.84	2.77	3.09	2.05
Hardness (CaCO3)	mg/L	1	--	--	--	29	27	23	25	27	26	24	16	18	21.5	27.2	21.9	23.3	21.4	21.2	26.8	34.10	18.7
Ion Balance (% Difference)	%	N/A	--	--	--	2.33	0.98	2.53	4.95	0.48	2.80	1.89	11.00	0.79	5.9	2.1	5.3	0.7	7.3	3.4	5.8	7.50	17.2
Langelier Index (@ 20C)	N/A	N/A	--	--	--	-2.68	-2.87	-2.94	-2.72	-2.51	-2.87	NC	-3.18	-3.21	-2.69	-2.63	-3.19	-3.24	-3.14	-3.02	-2.51	-2.36	-3.76
Langelier Index (@ 4C)	N/A	N/A	--	--	--	-2.93	-3.12	-3.19	-2.97	-2.76	-3.12	NC	-3.43	-3.46	-3.01	-2.95	-3.51	-3.56	-3.46	-3.34	-2.83	-2.68	-4.08
Saturation pH (@ 20C)	N/A	N/A	--	--	--	9.62	9.52	9.62	9.63	9.51	9.66	NC	9.69	9.73	9.39	9.83	10.10	10.0	10.1	9.87	9.23	9.42	10.1
Saturation pH (@ 4C)	N/A	N/A	--	--	--	9.87	9.77	9.87	9.88	9.76	9.91	NC	9.94	9.98	9.71	10.2	10.4	10.3	10.4	10.2	9.55	9.74	10.4
Metals (ICP-MS)																							
Total Aluminum (Al)	µg/L	5	5	--	5-100	**230**	--	--	**289**	47.8	--	**338**	--	--	**321**	43	**168**	**191**	**120**	56	**229**	42	**155**
Total Antimony (Sb)	µg/L	2	20	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	2	5.0	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	5	1000	--	--	16	--	--	18.5	15.9	--	13	--	--	12	15	9	12	7	16	14	20	9
Total Beryllium (Be)	µg/L	2	5.3	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	1200	--	1500	8	--	--	11.4	9.1	--	<50	--	--	<5	11	33	6	10	9	7	22	10
Total Cadmium (Cd)	µg/L	0.017	0.01	--	0.017	<0.3	--	--	**0.053**	<0.017	--	**0.056**	--	--	**0.032**	**0.027**	**0.021**	**0.020**	<0.017	0.017	**0.037**	<0.017	**0.025**
Total Chromium (Cr)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	**6**	<1	<1
Total Cobalt (Co)	µg/L	1	10	--	--	1	--	--	0.54	<0.40	--	0.79	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	1	2	--	2.0-4.0	<2	--	--	**5.8**	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<1	1	1	<1	1
Total Iron (Fe)	µg/L	50	300	--	300	130	--	--	**313**	62	125	177	162	**384**	229	137	195	207	132	92	147	124	168
Total Lead (Pb)	µg/L	0.5	1	--	1.0-7.0	<0.5	--	--	**10.3**	<0.50	--	<0.50	--	--	<0.5	<0.5	1.9	<0.5	<0.5	<0.5	5.1	<0.5	<0.5
Total Manganese (Mn)	µg/L	2	820	--	--	100	--	--	79.2	57.1	59	78.4	52.3	55.8	48	65	68	73	48	24	48	115	42
Total Molybdenum (Mo)	µg/L	2	73	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	25	--	25-150	5	--	--	3.2	<2.0	--	3.2	--	--	<2	<2	2	2	<2	<2	3	<2	3
Total Selenium (Se)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	5	21000	--	--	46	--	--	39.1	37.7	--	36	--	--	32	41	32	37	33	30	40	45	26
Total Thallium (Tl)	µg/L	0.1	0.8	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	--	--	--	11	--	--	6.4	<2.0	--	5.4	--	--	8	<2	3	4	2	<2	2	<2	5
Total Uranium (U)	µg/L	0.1	300	--	15	0.1	--	--	0.11	<0.10	--	0.12	--	--	0.1	<0.1	0.1	0.1	0.1	<0.1	0.1	<0.1	<0.1
Total Vanadium (V)	µg/L	2	6	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	30	--	30	27	--	--	14.4	7.5	11.1	12.1	13.3	9.7	5	<5	11	11	6	5	14	<5	9
MICROBIOLOGICAL																							
Total Coliform	MPN/100mL	1	--	--	--	200	65	--	>250	63	>250	91	>250	--	2420	>2420	1120	1200	866	488	525	1550	>2420
E. coli	MPN/100mL	1	--	400	--	39	24	--	9	15	37	8	**>250**	<100	41	11	17	48	2	7	<1	15	28
Fecal Coliform	MPN/ml	--	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	0.05	--	--	--	0.53	0.79	1.11	1.73	1.47	0.99	0.76	1.44	1.36	0.62	2.3	1.54	1.22	1.40	1.19	0.40	0.41	0.84
Chlorophyll A - Welschmeyer method	µg/L	0.05	--	--	--	0.48	0.69	1.17	1.61	1.42	0.81	0.69	1.15	1.14	0.63	2.3	2.16	1.40	1.40	1.19	1.32	0.36	0.8
Total Kjeldahl Nitrogen as N	mg/L	0.4	--	--	--	--	--	--	--	--	--	--	--	--	0.9	3.1	0.4	--	0.7	<0.4	1.1	<0.4	0.4

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September 2009)
NSE ESQs for Surface Water = Nova Scotia Environment Environmental Quality Standards for Surface Water (July 2013)
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

October 2014	Units	RDL	NSE ESQs for Surface Water (Reference)	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Kearney Lake															
Sample Sites						KL2															
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/14	2012/10/10	2013/05/15	2013/08/15	2013/10/16	2014/05/14	2014/08/14	2014/10/27
Sampling Time	hh:mm	--				11:00	10:30	10:45	10:15	12:25	10:50	09:30	14:00	13:15	9:50	10:30	10:20	09:10	16:10	14:30	10:45	9:20	14:04
FIELD DATA																							
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	--	--	--	16.8	18.2	15.4	13.5	20.4	8.0	9.9	19.1	14.1	7.6	21.8	12.3	10.1	22.9	9.7	11.7	21.1	10.8
Dissolved Oxygen	mg/L	0.01	--	--	5.5-9.5	**10.16**	8.50	5.70	6.28	**4.66**	**9.58**	**9.66**	7.06	8.43	6.47	5.82	7.63	9.37	6.38	7.40	**14.90**	6.95	7.7
pH	pH	N/A	--	--	--	6.33	6.35	6.19	6.61	6.96	6.25	6.77	5.90	5.62	7.72	6.41	6.29	5.75	7.47	5.57	6.60	7.22	5.79
Specific Conductance	uS/cm	1	--	--	--	46	106	89	199	104	75	80	67	54	58	96.6	61.1	77.9	65.3	64.5	188.0	266.0	63.0
INORGANICS																							
Total Alkalinity (as CaCO3)	mg/L	5	--	--	--	8	8	8	8	7	<5	<5	7	<5	20	<5	8	<5	<5	<5	29	7	28
Dissolved Chloride (Cl)	mg/L	1	--	--	120	48	48	48	48	25	17	19	14	10	16	20	12	19	21	14	20	17	12
Colour	TCU	30	--	--	--	20	20	20	20	63	95	80	110	120	52	60	94	37	90	71	25	44	168
Nitrite + Nitrate	mg/L	0.05	--	--	--	0.19	0.19	0.19	0.19	0.07	0.06	0.12	0.07	<0.05	0.11	0.08	<0.05	0.12	<0.05	<0.05	0.08	<0.05	<0.05
Nitrate (N)	mg/L	0.05	--	--	13000	0.19	0.19	0.19	0.19	0.07	--	0.12	--	--	0.11	0.08	<0.05	0.12	<0.05	<0.05	0.08	<0.05	<0.05
Nitrite (N)	mg/L	0.05	--	--	60	<0.05	<0.05	<0.05	<0.05	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	--	--	19	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03	<0.03	<0.03	0.04	<0.03	<0.03	0.04	<0.03
Total Organic Carbon	mg/L	0.5	--	--	--	4.3	4.3	4.3	4.3	6.6	9.7	6.5	10	12	8.1	7.1	10.9	7.5	11.1	10.9	6.2	6.6	12.9
Orthophosphate (as P)	mg/L	0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.09	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (Lab)	pH	N/A	--	5.0-9.0	6.5-9	6.85	6.85	6.85	6.85	6.78	**6.11**	**6.27**	**6.4**	**6.05**	6.5	6.7	6.5	**6.37**	6.62	**6.34**	6.53	6.87	**6.06**
Total Calcium (Ca)	mg/L	0.1	--	--	--	6.5	6.5	6.5	6.5	4.08	3.55	2.51	2.48	2.21	2.4	3.6	2.9	2.7	2.5	2.4	3.4	4.0	2.4
Total Magnesium (Mg)	mg/L	0.1	--	--	--	1.2	1.2	1.2	1.2	0.98	0.84	0.63	0.64	0.36	0.7	1.0	1.0	0.7	0.5	0.8	1.1	1.0	0.6
Total Phosphorus (1M depth)	mg/L	0.006	--	--	--	0.02	0.02	0.02	0.02	0.009	0.009	0.009	0.008	0.013	0.021	0.059	0.013	0.010	0.020	0.029	0.013	0.039	0.03
Total Potassium (K)	mg/L	0.1	--	--	--	1.1	1.1	1.1	1.1	0.634	0.826	0.534	0.497	0.734	0.5	0.7	0.8	0.5	0.5	0.7	0.7	0.9	0.7
Total Sodium (Na)	mg/L	0.1	--	--	--	31.6	31.6	31.6	31.6	14.7	10.6	11.1	7.8	6.9	9.8	14.2	9.5	8.9	7.0	7.9	17.5	14.0	7.6
Reactive Silica (SiO2)	mg/L	0.5	--	--	--	2.2	2.2	2.2	2.2	4.2	4.7	2.7	4.3	4	2.6	4.0	4.9	2.8	4.4	4.9	2.4	3.3	4.6
Total Suspended Solids	mg/L	5	--	--	--	103	103	103	103	7	<1	<1	<2	<1	<5	<5	<5	<5	135	<5	<5	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	--	--	--	9	9	9	9	<2	<2	<2	<2	<2	3	3	2	4	5	4	4	2	3
Turbidity (NTU)	NTU	0.1	--	50	--	0.5	0.5	0.5	0.5	1.0	1.0	0.4	0.7	0.6	0.5	1.1	1.0	1.9	2.2	1.0	0.9	0.8	1.2
Conductivity (uS/cm)	µS/cm	1	--	--	--	212	212	212	212	100	97	79	66	54	71	91	61	83	69	62	87	94	66
Calculated Parameters																							
Anion Sum	me/L	N/A	--	--	--	0.49	0.82	0.45	0.77	0.85	0.49	0.53	0.53	0.28	0.92	0.63	0.54	0.63	0.70	0.48	1.23	0.66	0.96
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5	--	--	--	<1	8	<1	5	7	<1	<1	7	<1	20	<5	8	<5	<5	<5	29	7	28
Calculated TDS	mg/L	1	--	--	--	36	55	35	46	55	38	37	34	25	45	44	34	37	37	31	65	44	44
Carb. Alkalinity (calc. as CaCO3)	mg/L	10	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	--	--	--	0.71	0.99	0.67	0.74	0.95	0.74	0.68	0.55	0.49	0.65	0.94	0.73	0.63	0.54	0.60	1.07	0.97	0.57
Hardness (CaCO3)	mg/L	1	--	--	--	10	15	10	12	14	12	9	9	8	8.9	13.1	11.4	9.6	8.3	9.3	13.0	14.1	8.5
Ion Balance (% Difference)	%	N/A	--	--	--	18.30	9.39	19.60	1.99	5.56	20.30	12.40	1.85	27.30	17.6	19.7	15.1	0.3	12.9	11.0	7.1	19.1	25.7
Langelier Index (@ 20C)	N/A	N/A	--	--	--	NC	-3.20	NC	-3.44	-3.05	NC	NC	-3.66	NC	-3.37	-3.60	-3.68	-4.05	-3.83	-4.12	-3.04	-3.23	-3.66
Langelier Index (@ 4C)	N/A	N/A	--	--	--	NC	-3.45	NC	-3.70	-3.30	NC	NC	-3.91	NC	-3.69	-3.92	-4.00	-4.37	-4.15	-4.44	-3.36	-3.55	-3.98
Saturation pH (@ 20C)	N/A	N/A	--	--	--	NC	9.78	NC	10.00	9.83	NC	NC	10.10	NC	9.87	10.3	10.2	10.4	10.5	10.5	9.57	10.1	9.72
Saturation pH (@ 4C)	N/A	N/A	--	--	--	NC	10.00	NC	10.30	10.10	NC	NC	10.30	NC	10.2	10.6	10.5	10.7	10.8	10.8	9.89	10.4	10.0
Metals (ICP-MS)																							
Total Aluminum (Al)	µg/L	5	5	--	5-100	**290**	--	--	**175**	**151**	--	**271**	--	--	**209**	**205**	**338**	**256**	**270**	**259**	**205**	**236**	**340**
Total Antimony (Sb)	µg/L	2	20	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	2	5.0	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	5	1000	--	--	9	--	--	11.7	14.3	--	9.5	--	--	9	11	10	8	<5	13	13	18	9
Total Beryllium (Be)	µg/L	2	5.3	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	1200	--	1500	8	--	--	14.7	12.7	--	<50	--	--	6	14	22	6	11	9	11	12	12
Total Cadmium (Cd)	µg/L	0.017	0.01	--	0.017	<0.3	--	--	**0.018**	<0.017	--	<0.017	--	--	<0.017	<0.017	<0.017	<0.017	<0.017	**0.019**	<0.017	<0.017	**0.018**
Total Chromium (Cr)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	**9**	<1	<1
Total Cobalt (Co)	µg/L	1	10	--	--	<1	--	--	<0.40	<0.40	--	<0.40	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	1	2	--	2.0-4.0	<2	--	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<1	2	<1	<1	4
Total Iron (Fe)	µg/L	50	300	--	300	250	--	--	227	**403**	238	202	**418**	**358**	154	**541**	**813**	269	**528**	**523**	174	**723**	305
Total Lead (Pb)	µg/L	0.5	1	--	1.0-7.0	<0.5	--	--	1.01	<0.50	--	<0.50	--	--	<0.5	<0.5	1.1	<0.5	0.5	<0.5	5.8	<0.5	0.5
Total Manganese (Mn)	µg/L	2	820	--	--	26	--	--	43.2	83.3	34.7	12.1	68.4	22.6	17	90	114	24	67	53	33	146	25
Total Molybdenum (Mo)	µg/L	2	73	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	25	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Selenium (Se)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	1	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	**0.42**	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	5	21000	--	--	14	--	--	17.8	19.5	--	11.9	--	--	10	18	15	12	9	12	16	17	12
Total Thallium (Tl)	µg/L	0.1	0.8	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	3	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	--	--	--	2	--	--	<2.0	<2.0	--	2.8	--	--	<2	2	3	4	<2	2	2	<2	3
Total Uranium (U)	µg/L	0.1	300	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Vanadium (V)	µg/L	2	6	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	30	--	30	8	--	--	5.4	5.3	6.5	<5.0	<5.0	<5.0	<5	<5	7	<5	<5	<5	<5	<5	<5
MICROBIOLOGICAL																							
Total Coliform	MPN/100mL	1	--	--	--	1800	170	--	>250	11	>250	59	>250	--	>2420	1986	>2420	>2420	>2420	>2420	525	>2420	>2420
E. coli	MPN/100mL	1	--	400	--	**1500**	100	--	**>250**	6	6	2	**>250**	<100	3	7	3	12	6	2	<1	18	11
Fecal Coliform	MPN/ml	--	--	400	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	0.05	--	--	--	0.82	6.05	1.97	0.73	0.55	0.22	0.44	0.89	0.97	0.53	2.2	0.07	0.62	1.00	0.73	0.13	0.83	0.41
Chlorophyll A - Welschmeyer method	µg/L	0.05	--	--	--	0.87	5.97	1.95	0.66	0.54	0.21	0.42	0.73	0.82	0.56	2.2	0.12	0.72	1.00	0.74	0.14	0.86	0.41
Total Kjeldahl Nitrogen as N	mg/L	0.4	--	--	--	--	--	--	--	--	--	--	--	--	<0.4	2.2	0.7	--	1.1	<0.4	<0.4	0.4	<0.4

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)
NSE ESQs for Surface Water = Nova Scotia Environment Environmental Quality Standards for Surface Water (July 2013)
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

October 2014	Units	RDL	NSE ESQs for Surface Water (Reference)	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Kearney Lake															
Sample Sites						KL3															
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/14	2012/10/10	2013/05/15	2013/08/16	2013/10/16	2014/05/14	2014/08/14	2014/10/27
Sampling Time	hh:mm	--				09:00	11:00	09:30	11:30	14:12	11:40	10:30	12:20	12:00	10:26	12:20	11:20	9:50	10:00	14:00	11:00	11:50	14:25
FIELD DATA																							
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	--	--	--	14.0	21.6	17.3	14.7	23.1	9.9	10.3	21.1	15.5	9	24.5	15.6	11.7	21.5	13.6	11.0	22.7	12.8
Dissolved Oxygen	mg/L	0.01	--	--	5.5-9.5	**10.79**	8.00	8.00	9.26	7.83	**10.35**	**11.06**	8.42	**9.60**	8.89	8.17	7.72	**10.20**	9.20	8.90	5.90	7.87	8.12
pH	pH	N/A	--	--	--	7.27	6.74	6.97	7.27	7.33	6.76	6.83	6.96	6.30	7.68	6.85	6.51	5.86	7.25	6.49	6.55	7.37	6.67
Specific Conductance	uS/cm	1	--	--	--	95	282	246	220	228	199	220	175	161	204	225	177.2	207.3	194.4	210.6	405.0	252.0	208.0
INORGANICS																							
Total Alkalinity (as CaCO3)	mg/L	5	--	--	--	<5	7	7	6	7	7	6	7	7	23	6	5	<5	5	7	15	5	6
Dissolved Chloride (Cl)	mg/L	1	--	--	120	66	63	60	55	55	53	56	43	37	50	57	46	54	40	46	58	46	45
Colour	TCU	30	--	--	--	22	20	20	28	12	20	31	38	40	57	15	31	19	23	20	16	13	20
Nitrite + Nitrate	mg/L	0.05	--	--	--	0.14	0.12	0.14	0.24	0.15	0.22	0.24	0.15	0.16	0.19	0.09	0.09	0.21	0.11	<0.05	0.17	0.13	0.13
Nitrate (N)	mg/L	0.05	--	--	13000	0.14	--	--	0.24	0.15	--	0.24	--	--	0.19	0.09	0.09	0.21	0.11	<0.05	0.17	0.13	0.13
Nitrite (N)	mg/L	0.05	--	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	--	--	19	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Total Organic Carbon	mg/L	0.5	--	--	--	2.6	3.9	4.3	3.6	3.1	3.3	3.8	5.1	5	5.9	3.4	4.9	4.3	4.4	4.6	4.6	2.8	4.5
Orthophosphate (as P)	mg/L	0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (Lab)	pH	N/A	--	5.0-9.0	6.5-9	**6.38**	6.67	6.82	6.82	6.99	6.87	6.52	6.5	**6.38**	6.7	7.1	6.9	6.68	6.96	6.86	6.68	6.87	6.59
Total Calcium (Ca)	mg/L	0.1	--	--	--	6.7	7.1	6.8	6.81	7.98	8.29	7.09	4.73	5.63	5.7	6.9	6.0	7.0	5.3	6.8	6.4	7.9	6.8
Total Magnesium (Mg)	mg/L	0.1	--	--	--	1.2	1.2	1.11	1.22	1.28	1.27	1.21	0.83	1.01	1.0	1.2	1.3	1.0	0.9	1.3	1.4	1.2	1.0
Total Phosphorus (1M depth)	mg/L	0.006	--	--	--	<0.02	<0.02	0.005	0.005	<0.002	0.003	0.008	0.003	0.012	0.019	0.045	0.007	0.006	0.006	0.012	0.009	0.023	0.15
Total Potassium (K)	mg/L	0.1	--	--	--	0.9	1.1	0.9	0.791	0.837	0.990	0.879	0.681	0.921	0.7	0.9	0.9	0.8	0.6	1.2	0.8	1.1	0.9
Total Sodium (Na)	mg/L	0.1	--	--	--	38	38	35	28.3	33.1	33.0	33.0	20.8	21.3	31.2	34.5	26.37	35.1	20.1	32.1	36.4	39.0	35.3
Reactive Silica (SiO2)	mg/L	0.5	--	--	--	2.7	2.6	2.6	3.2	2.9	3.2	2.9	2.5	2.6	2.7	2.0	2.6	2.9	2.6	2.7	2.6	1.9	2.4
Total Suspended Solids	mg/L	5	--	--	--	<1	1	1	2	<2	<1	<1	<1	<1	<5	<5	<5	<5	<5	<5	<5	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	--	--	--	11	12	12	10	10	10	9	10	8	7	8	7	7	7	8	9	7	7
Turbidity (NTU)	NTU	0.1	--	50	--	0.7	1.4	0.6	0.3	0.5	0.6	0.6	0.6	0.4	0.8	0.7	1	0.7	2.4	0.4	0.4	0.3	0.9
Conductivity (uS/cm)	µS/cm	1	--	--	--	250	250	240	220	220	220	220	170	160	197	222	182	219	216	204	218	243	216
Calculated Parameters																							
Anion Sum	me/L	N/A	--	--	--	2.11	2.17	2.08	1.90	1.93	1.87	1.90	1.58	1.36	2.03	1.90	1.55	1.68	1.38	1.60	2.14	1.55	1.54
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5	--	--	--	<1	7	7	6	7	7	6	7	7	23	6	5	<5	5	7	15	5	6
Calculated TDS	mg/L	1	--	--	--	128	130	123	110	117	116	115	88	82	111	113	91	106	78	100	122	106	100
Carb. Alkalinity (calc. as CaCO3)	mg/L	10	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	--	--	--	2.12	2.16	1.99	1.69	1.97	1.98	1.92	1.23	1.32	1.77	1.98	1.60	2.00	1.24	1.89	2.07	2.23	2.00
Hardness (CaCO3)	mg/L	1	--	--	--	22	23	22	22	25	26	23	15	18	18.4	22.2	20.3	21.6	16.9	22.3	21.7	24.7	21.1
Ion Balance (% Difference)	%	N/A	--	--	--	0.24	0.23	2.21	5.85	1.03	2.86	0.52	12.50	1.49	6.8	2.1	1.6	8.6	5.5	8.3	1.5	17.9	12.8
Langelier Index (@ 20C)	N/A	N/A	--	--	--	NC	-3.00	-2.89	-2.92	-2.60	-2.73	-3.23	-3.33	-3.35	-2.77	-2.88	-3.21	-3.37	-3.19	-3.05	-2.93	-3.12	-3.39
Langelier Index (@ 4C)	N/A	N/A	--	--	--	NC	-3.25	-3.14	-3.17	-2.85	-2.99	-3.49	-3.58	-3.60	-3.09	-3.20	-3.53	-3.69	-3.51	-3.37	-3.25	-3.44	-3.71
Saturation pH (@ 20C)	N/A	N/A	--	--	--	NC	9.67	9.71	9.74	9.59	9.60	9.75	9.83	9.73	9.47	9.98	10.10	10.0	10.2	9.91	9.61	9.99	9.98
Saturation pH (@ 4C)	N/A	N/A	--	--	--	NC	9.92	9.96	9.99	9.84	9.86	10.00	10.10	9.98	9.79	10.3	10.4	10.4	10.5	10.2	9.93	10.3	10.3
Metals (ICP-MS)																							
Total Aluminum (Al)	µg/L	5	5	--	5-100	259	259	--	**124**	53.5	--	**266**	--	--	**199**	54	**153**	**140**	65	100	**260**	52	**105**
Total Antimony (Sb)	µg/L	2	20	--	--	<2	<2	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	2	5.0	--	5	<2	<2	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	5	1000	--	--	13	13	--	15.7	13.2	--	19.1	--	--	18	17	15	19	9	18	17	17	16
Total Beryllium (Be)	µg/L	2	5.3	--	--	<2	<2	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	--	--	--	<2	<2	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	1200	--	1500	9	9	--	7.8	8.7	--	<50	--	--	5	9	17	7	7	10	8	10	12
Total Cadmium (Cd)	µg/L	0.017	0.01	--	0.017	0.019	0.019	--	**0.030**	<0.017	--	**0.046**	--	--	**0.019**	**0.021**	**0.027**	**0.028**	<0.017	<0.017	**0.038**	<0.017	0.017
Total Chromium (Cr)	µg/L	1	1.0	--	1	<1	<1	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	**7**	<1	<1
Total Cobalt (Co)	µg/L	1	10	--	--	<1	<1	--	<0.40	<0.40	--	<0.40	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	1	2	--	2.0-4.0	2	2	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<1	1	1	<1	2
Total Iron (Fe)	µg/L	50	300	--	300	523	523	--	73	133	58	136	104	154	137	136	119	131	71	172	137	96	118
Total Lead (Pb)	µg/L	0.5	1	--	1.0-7.0	<0.5	<0.5	--	0.60	<0.50	--	<0.50	--	--	<0.5	<0.5	0.7	<0.5	<0.5	0.9	3.6	<0.5	<0.5
Total Manganese (Mn)	µg/L	2	820	--	--	53	53	--	36.8	67.1	32.1	41.5	33.1	32.5	25	47	46	37	20	92	41	45	27
Total Molybdenum (Mo)	µg/L	2	73	--	73	<2	<2	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	25	--	25-150	<2	<2	--	2.0	<2.0	--	2.3	--	--	<2	<2	<2	<2	<2	<2	2	<2	<2
Total Selenium (Se)	µg/L	1	1.0	--	1	<1	<1	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.1	<0.1	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	5	21000	--	--	12	12	--	33.5	35.9	--	33.2	--	--	25	33	29	33	18	32	31	32	29
Total Thallium (Tl)	µg/L	0.1	0.8	--	0.8	<0.1	<0.1	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	--	--	--	<2	<2	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	--	--	--	2	2	--	<2.0	<2.0	--	4.9	--	--	<2	<2	<2	<2	<2	2	3	<2	2
Total Uranium (U)	µg/L	0.1	300	--	15	<0.1	<0.1	--	<0.10	<0.10	--	0.11	--	--	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Vanadium (V)	µg/L	2	6	--	--	<2	<2	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	30	--	30	<5	<5	--	9.7	6.9	6.4	9.3	6.6	9.2	<5	<5	8	10	5	7	10	<5	6
MICROBIOLOGICAL																							
Total Coliform	MPN/100mL	1	--	--	--	120	24	--	190	16	58	72	110	--	291	1553	178	345	2420	1300	86	1730	>2420
E. coli	MPN/100mL	1	--	400	--	1	17	--	2	<1	8	5	37	<100	2	<1	3	8	21	<1	<1	<1	13
Fecal Coliform	MPN/ml	--	--	400	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	0.05	--	--	--	1.04	1.11	1.18	1.30	1.14	0.51	0.78	1.26	1.24	0.52	1.3	0.81	1.44	2.00	0.65	0.76	0.59	1.23
Chlorophyll A - Welschmeyer method	µg/L	0.05	--	--	--	0.94	0.97	1.21	1.09	1.19	0.42	0.67	0.98	1.01	0.55	1.2	1.14	1.62	2.30	0.61	0.69	0.51	1.12
Total Kjeldahl Nitrogen as N	mg/L	0.4	--	--	--	--	--	--	--	--	--	--	--	--	<0.4	2.8	<0.4	--	1.3	<0.4	0.6	0.4	0.4

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)
NSE ESQs for Surface Water = Nova Scotia Environment Environmental Quality Standards for Surface Water (July 2013)
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

October 2014	Units	RDL	NSE ESQs for Surface Water (Reference)	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Kearney Lake																Kearney Lake									
Sample Sites						KL4																KL5									
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/14	2012/10/10	2013/05/15	2013/08/16	2013/10/16	2014/05/14	2014/08/14	2014/10/27	2011/10/17	2012/05/01	2012/08/14	2012/10/10	2013/05/15	2013/08/16	2013/10/16	2014/05/14	2014/08/14	2014/10/27
Sampling Time	hh:mm	--				10:00	11:30	10:00	11:20	13:50	11:15	10:10	11:40	11:40	10:16	12:00	11:40	9:41	10:30	14:20	11:15	11:35	14:35	9:40	10:52	13:10	12:10	10:03	10:50	13:45	11:30	13:55	10:45
FIELD DATA																															
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	--	--	--	13.4	21.9	17.3	14.5	21.9	9.8	10.1	21.2	15.3	9.0	24.4	15.7	11.7	20.4	13.5	11.0	21.8	12.5	14.7	10.5	26.1	16.6	13.3	22.7	14.7	13.7	22.9	12.8
Dissolved Oxygen	mg/L	0.01	--	--	5.5-9.5	**10.87**	8.10	8.30	9.01	6.27	**10.89**	**10.99**	**8.55**	**9.65**	8.70	7.32	8.87	**10.09**	8.89	**9.60**	**14.50**	5.92	7.52	9.38	7.88	7.90	8.16	**9.67**	8.89	8.60	**15.83**	7.64	7.91
pH	pH	N/A	--	--	--	8.00	6.71	6.94	7.19	6.98	6.07	6.49	6.43	6.02	9.0	6.71	6.77	5.72	7.08	6.41	6.30	7.25	6.55	6.52	7.76	6.69	6.72	6.20	8.57	6.51	6.79	7.86	6.60
Specific Conductance	uS/cm	1	--	--	--	771	262	247	224	226	215	218	172	126	206	225	185.9	207.1	196.2	209.0	273.0	251.0	208.0	112	230	229	189.0	219.5	202.1	212.9	472.0	251.0	211.0
INORGANICS																															
Total Alkalinity (as CaCO3)	mg/L	5	--	--	--	5	7	7	6	8	7	5	8	7	22	8	<5	<5	<5	<5	30	5	29	9	21	8	<5	<5	6	5	32	<5	<5
Dissolved Chloride (Cl)	mg/L	1	--	--	120	67	65	60	56	56	53	56	44	37	51	57	46	54	41	47	59	47	48	37	55	57	48	58	44	46	61	47	47
Colour	TCU	30	--	--	--	22	18	20	27	11	20	32	38	43	48	11	20	17	21	20	13	11	28	35	43	10	27	10	22	18	14	11	22
Nitrite + Nitrate	mg/L	0.05	--	--	--	0.15	0.12	0.14	0.23	0.19	0.21	0.23	0.15	0.17	0.19	0.11	0.09	0.20	0.11	0.17	0.25	0.17	0.16	0.17	0.19	0.15	0.83	0.21	0.21	0.25	0.16	0.10	0.16
Nitrate (N)	mg/L	0.05	--	--	13000	0.15	--	--	0.23	0.19	--	0.23	--	--	0.19	0.11	0.09	0.20	0.11	0.17	0.25	0.17	0.16	--	0.19	0.15	0.83	0.21	0.21	0.20	0.16	0.10	0.16
Nitrite (N)	mg/L	0.05	--	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	--	--	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	0.05	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.03	0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.06
Total Organic Carbon	mg/L	0.5	--	--	--	2.5	2.6	4.0	3.3	2.6	3.1	3.7	6	5.4	7.5	3.2	4.8	4.2	4.5	4.3	4.4	2.1	4.4	4.8	5.8	3.4	4.7	4.0	4.6	7.0	4.3	2.7	4.5
Orthophosphate (as P)	mg/L	0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (Lab)	pH	N/A	--	5.0-9.0	6.5-9	6.61	6.75	6.83	6.83	6.93	6.83	6.57	6.57	**6.46**	6.7	7.0	6.9	6.69	6.96	6.85	6.69	6.91	6.85	6.57	6.7	7.1	6.5	6.71	6.93	6.89	6.64	6.84	6.63
Total Calcium (Ca)	mg/L	0.1	--	--	--	6.8	7.7	7.0	6.81	8.00	8.45	6.84	4.93	5.24	5.7	6.8	5.8	6.8	5.1	6.8	6.4	7.9	6.8	5.79	6.1	6.6	5.9	7.1	5.7	6.4	6.5	7.6	7.0
Total Magnesium (Mg)	mg/L	0.1	--	--	--	1.2	1.3	1.2	1.22	1.24	1.31	1.19	0.86	0.99	1.0	1.2	1.2	1.0	0.8	1.2	1.3	1.2	1.0	1.05	1.0	1.1	1.2	1.0	1.0	1.1	1.4	1.2	1.0
Total Phosphorus (1M depth)	mg/L	0.006	--	--	--	<0.02	<0.02	<0.002	0.004	<0.002	<0.002	0.007	0.003	0.026	0.022	0.043	0.007	0.006	2.39	0.016	0.022	0.031	0.015	0.009	0.018	0.040	0.006	0.005	0.013	0.010	0.010	0.026	0.14
Total Potassium (K)	mg/L	0.1	--	--	--	1	1	1	0.807	0.905	0.968	0.826	0.733	1.130	0.7	1.0	0.9	0.8	0.6	1.2	0.8	1.1	0.9	0.858	0.7	0.9	0.8	0.8	0.7	1.1	0.8	1.1	0.9
Total Sodium (Na)	mg/L	0.1	--	--	--	39	41	37	28.5	34.3	33.9	32.1	21.5	21.1	31.5	34.5	25.2	31.6	20.1	30.7	35.9	38.6	34.1	22.0	34.6	32.0	27.7	33.6	19.2	31.3	37.5	40.3	38.3
Reactive Silica (SiO2)	mg/L	0.5	--	--	--	2.7	2.6	2.6	3.1	2.9	3.1	2.9	2.5	2.7	2.7	2.2	2.6	3.0	2.6	2.5	2.6	2.1	2.5	2.5	2.7	2.0	2.4	2.7	2.5	2.5	2.7	2.1	2.5
Total Suspended Solids	mg/L	5	--	--	--	<1	1	<1	<2	<2	<1	2	<1	<2	<5	<5	<5	<5	<5	<5	<5	<5	<5	1	<5	<5	<5	<5	<5	<5	<5	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	--	--	--	11	12	11	10	10	10	9	10	8	7	8	7	7	7	9	9	8	8	9	7	8	8	8	7	8	9	8	8
Turbidity (NTU)	NTU	0.1	--	50	--	0.5	1.0	0.3	0.3	0.2	0.8	0.7	0.7	0.4	0.7	0.4	0.8	0.7	2.6	2.1	1.1	0.6	0.8	0.9	1.1	0.7	0.9	0.7	0.8	0.4	1.1	0.4	0.8
Conductivity (uS/cm)	µS/cm	1	--	--	--	260	250	230	220	230	250	210	170	160	200	224	183	218	218	204	219	241	218	160	215	226	189	232	223	204	228	246	225
Calculated Parameters																															
Anion Sum	me/L	N/A	--	--	--	2.23	2.22	2.09	1.91	1.94	1.85	1.88	1.62	1.36	2.04	1.94	1.45	1.68	1.31	1.53	2.47	1.60	2.11	1.42	2.13	1.95	1.58	1.82	1.52	1.58	2.56	1.50	1.50
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5	--	--	--	5	7	7	6	8	7	5	8	7	22	8	<5	<5	<5	<5	30	5	29	9	21	8	<5	<5	6	5	32	<5	<5
Calculated TDS	mg/L	1	--	--	--	132	135	125	111	118	116	113	90	81	111	114	87	103	75	97	132	108	117	84	118	111	96	110	82	98	136	106	103
Carb. Alkalinity (calc. as CaCO3)	mg/L	10	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10	<10	<10	<1	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	--	--	--	2.16	2.32	2.07	1.70	2.02	2.03	1.86	1.28	1.3	1.78	1.97	1.53	1.84	1.23	1.84	2.04	2.21	1.94	1.36	1.94	1.85	1.64	1.94	1.23	1.81	2.12	2.27	2.14
Hardness (CaCO3)	mg/L	1	--	--	--	22	25	22	22	25	27	22	16	17	18.4	21.9	19.4	21.1	16.0	21.9	21.3	24.7	21.1	19	19.3	21.0	19.7	21.8	18.4	20.5	22.0	23.9	21.6
Ion Balance (% Difference)	%	N/A	--	--	--	1.59	2.20	0.48	5.82	2.02	4.64	0.53	11.70	2.26	6.6	0.8	2.8	4.5	3.2	9.2	9.5	15.8	4.2	2.16	4.7	2.6	2.0	3.2	10.6	6.7	9.4	20.3	17.5
Langelier Index (@ 20C)	N/A	N/A	--	--	--	-3.21	-2.89	-2.84	-2.92	-2.64	-2.75	-3.22	-3.18	-3.31	-2.79	-2.86	-3.22	-3.37	-3.21	-3.21	-2.63	-3.08	-2.45	-3.06	-2.79	-2.77	-3.62	-3.33	-3.11	-3.19	-2.64	-3.17	-3.42
Langelier Index (@ 4C)	N/A	N/A	--	--	--	-3.46	-3.14	-3.09	-3.17	-2.89	-3.00	-3.47	-3.43	-3.56	-3.11	-3.18	-3.54	-3.69	-3.53	-3.53	-2.95	-3.40	-2.77	-3.31	-3.11	-3.09	-3.94	-3.65	-3.43	-3.51	-2.96	-3.49	-3.74
Saturation pH (@ 20C)	N/A	N/A	--	--	--	9.82	9.64	9.67	9.75	9.57	9.58	9.79	9.75	9.77	9.49	9.86	10.10	10.1	10.2	10.1	9.32	9.99	9.30	9.63	9.49	9.87	10.1	10.0	10.0	10.1	9.28	10.0	10.0
Saturation pH (@ 4C)	N/A	N/A	--	--	--	10.1	9.9	9.9	10.0	9.8	9.8	10.0	10.0	10.0	9.8	10.2	10.4	10.4	10.5	10.4	9.64	10.3	9.62	9.88	9.81	10.2	10.4	10.4	10.4	10.4	9.60	10.3	10.4
Metals (ICP-MS)																															
Total Aluminum (Al)	µg/L	5	5	--	5-100	**150**	--	--	**125**	29.2	--	**231**	--	--	**188**	48	**149**	**141**	**106**	**159**	**236**	46	93	--	**222**	52	**154**	**136**	58	61	**224**	53	**108**
Total Antimony (Sb)	µg/L	2	20	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	2	5.0	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	5	1000	--	--	16	--	--	16.6	17.8	--	18.2	--	--	18	17	16	18	10	19	17	19	16	--	18	16	15	19	9	16	16	17	17
Total Beryllium (Be)	µg/L	2	5.3	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	1200	--	1500	6	--	--	8.6	9.1	--	<50	--	--	6	9	16	7	6	9	8	11	11	--	6	9	15	7	7	9	7	6	10
Total Cadmium (Cd)	µg/L	0.017	0.01	--	0.017	<0.3	--	--	**0.031**	<0.017	--	**0.035**	--	--	**0.021**	<0.017	**0.027**	**0.027**	0.017	**0.050**	**0.027**	<0.017	<0.017	--	**0.022**	**0.027**	**0.029**	**0.024**	<0.017	**0.034**	**0.036**	<0.017	**0.024**
Total Chromium (Cr)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	6	<1	<1	<1	**6**	<1	<1	--	<1	<1	5	<1	<1	<1	**6**	<1	<1
Total Cobalt (Co)	µg/L	1	10	--	--	<1	--	--	<0.40	<0.40	--	<0.40	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	1	2	--	2.0-4.0	<2	--	--	<2.0	2.4	<2.0	2.3	<2.0	<2.0	<2	<2	4	**9**	<1	1	<1	<1	2	<2.0	<2	<2	<2	<2	<2	<1	1	<1	<1	5
Total Iron (Fe)	µg/L	50	300	--	300	86	--	--	82	51	55	119	109	138	129	118	133	213	144	248	129	55	104	175	160	78	120	111	70	79	111	<50	119
Total Lead (Pb)	µg/L	0.5	1	--	1.0-7.0	<0.5	--	--	3.23	<0.50	--	<0.50	--	--	<0.5	<0.5	0.8	0.9	<0.5	<0.5	2.6	<0.5	<0.5	--	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	1.9	<0.5	0.5
Total Manganese (Mn)	µg/L	2	820	--	--	51	--	--	34.5	63.5	29.4	38.5	27.2	29.7	23	34	38	34	77	130	34	29	24	35.9	30	14	37	35	13	12	40	18	25
Total Molybdenum (Mo)	µg/L	2	73	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	25	--	25-150	3	--	--	2.0	<2.0	--	<2.0	--	--	<2	<2	5	<2	<2	<2	<2	<2	<2	--	<2	<2	5	<2	<2	<2	2	<2	<2
Total Selenium (Se)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<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
Total Strontium (Sr)	µg/L	5	21000	--	--	34	--	--	33.1	36.7	--	32.7	--	--	25	32	28	32	17	31	31	31	29	--	27	31	29	31	18	31	31	30	30
Total Thallium (Tl)	µg/L	0.1	0.8	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<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
Total Tin (Sn)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	5	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	4.2	--	--	<2	<2	<2	<2	<2	3	2	<2	<2	--	3	<2	<2	<2	<2	<2	<2	<2	2
Total Uranium (U)	µg/L	0.1	300	--	15	<0.1	--	--	<0.10	<0.10	--	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
Total Vanadium (V)	µg/L	2	6	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	30	--	30	14	--	--	10.4	6.9	7	11.3	7.4	7	<5	<5	**68**	21	<5	9	9	<5	<5	9.3	5	<5	**64**	11	7	5	10	<5	10
MICROBIOLOGICAL																															
Total Coliform	MPN/100mL	1	--	--	--	28	58	--	100	16	75	83	95	--	345	>2420	921	548	>2420	770	308	1550	>2420	--	461	613	93	461	308	461	42	629	>2470
E. coli	MPN/100mL	1	--	400	--	4	33	--	1	<1	2	5	39	<100	4	<1	4	6	38	<1	<1	1	8	100	14	2	6	6	6	4	<1	1	17
Fecal Coliform	MPN/ml	--	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	0.05	--	--	--	0.78	1.11	1.06	0.92	0.07	0.50	0.60	1.04	1.31	0.52	0.7	0.55	1.34	1.50	0.40	0.44	0.50	1.03	0.91	0.30	1.2	1.09	1.44	2.20	0.64	0.20	0.61	0.9
Chlorophyll A - Welschmeyer method	µg/L	0.05	--	--	--	0.69	0.96	1.11	0.77	0.07	0.41	0.55	0.82	1.07	0.55	0.7	0.74	1.48	1.70	0.39	0.40	0.57	0.95	0.85	0.33	1.0	1.41	1.59	2.40	0.62	0.20	0.54	0.84
Total Kjeldahl Nitrogen as N	mg/L	0.4	--	--	--	--	--	--	--	--	--	--	--	--	0.5	<0.4	0.7	--	1.8	1.1	<0.4	<0.4	<0.4	--	<0.4	2.3	1.0	--	0.6	1.1	<0.4	0.5	1.1

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)
NSE ESQs for Surface Water = Nova Scotia Environment Environmental Quality Standards for Surface Water (July 2013)
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

October 2014	Units	RDL	NSE ESQs for Surface Water (Reference)	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Highway 102																	
Sample Sites						HWY102-1																	
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/15	2012/10/11	2013/05/15	2013/08/15	2013/10/16	2014/05/14	2014/08/14	2014/10/27
Sampling Time	hh:mm	--				07:00	12:45	08:00	13:00	10:20	09:00	13:40	11:00	11:00	14:50	11:00	9:50	14:15	12:22	12:30	12:00	10:10	9:30
FIELD DATA																							
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	--	--	--	11.8	18.8	15.7	14.9	19.6	7.4	11.4	17.8	14.6	10.7	21.8	13.6	11.7	19.5	8.9	12.1	19.6	10.2
Dissolved Oxygen	mg/L	0.01	--	--	5.5-9.5	**11.44**	5.80	**4.34**	8.18	**4.25**	6.05	8.15	**3.88**	**5.34**	5.65	**1.03**	**3.83**	7.55	**3.32**	**3.10**	**12.03**	**2.09**	**4.54**
pH	pH	N/A	--	--	--	7.98	5.35	5.25	6.31	5.26	5.62	5.75	5.77	5.99	8.76	5.73	6.38	6.19	7.10	6.79	6.02	6.63	5.12
Specific Conductance	uS/cm	1	--	--	--	194	153	104	135	106	109	114	108	89	288	225	155.5	226	173.2	234.0	880.0	337	109
INORGANICS																							
Total Alkalinity (as CaCO3)	mg/L	5	--	--	--	<5	<5	<5	<5	<5	<5	5	11	8	22	25	15	9	23	20	31	28	30
Dissolved Chloride (Cl)	mg/L	1	--	--	120	24	38	24	32	25	22	24	19	12	58	48	28	53	31	40	65	57	19
Colour	TCU	30	--	--	--	67	68	57	37	89	53	39	65	79	24	65	40	9	65	25	11	31	93
Nitrite + Nitrate	mg/L	0.05	--	--	--	<0.05	<0.05	<0.05	0.69	<0.05	1.2	0.69	0.25	1.2	2.61	0.06	0.43	0.51	<0.05	<0.05	<0.05	<0.05	0.53
Nitrate (N)	mg/L	0.05	--	--	13000	<0.05	--	--	0.69	<0.05	--	0.69	--	--	2.61	0.06	0.43	0.51	<0.05	<0.05	<0.05	<0.05	0.53
Nitrite (N)	mg/L	0.05	--	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	--	--	19	<0.05	0.29	<0.05	<0.05	<0.05	<0.05	0.05	0.1	0.07	0.31	0.19	0.04	<0.03	0.05	0.06	<0.03	0.04	0.03
Total Organic Carbon	mg/L	0.5	--	--	--	6.5	10	7.7	4.7	11	6.3	4.5	7.2	7.4	5.5	10.0	7.0	5.1	10.1	17.7	4.1	7.7	9.0
Orthophosphate (as P)	mg/L	0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (units)	pH	N/A	--	5.0-9.0	6.5-9	**4.54**	**5.24**	**5.40**	**5.48**	**6.24**	**5.31**	**6.42**	6.55	**6.28**	**6.4**	6.9	6.8	6.86	6.87	6.73	6.56	7.49	**5.90**
Total Calcium (Ca)	mg/L	0.1	--	--	--	1.7	1.8	1.6	4.93	3.34	5.09	4.9	5.21	5.55	12.5	11.7	7.5	11.1	10.5	13.9	7.2	23.3	2.2
Total Magnesium (Mg)	mg/L	0.1	--	--	--	0.3	0.5	0.5	1.08	0.79	1.09	0.91	0.92	1.19	1.7	2.0	1.4	1.4	1.5	2.3	1.6	3.2	0.6
Total Phosphorus (1M depth)	mg/L	0.006	--	--	--	0.07	0.14	0.020	0.006	0.007	0.011	0.009	0.012	0.010	0.019	0.039	0.02	0.006	0.021	0.022	0.013	0.038	0.03
Total Potassium (K)	mg/L	0.1	--	--	--	0.5	1.2	0.7	1.140	1.630	1.310	1.100	1.500	1.880	1.6	2.5	1.5	1.3	1.7	2.4	1.2	2.5	0.7
Total Sodium (Na)	mg/L	0.1	--	--	--	15	25	13	15.9	14.5	14.6	14.8	10.2	8.26	36.3	27.7	14.6	30.8	15.0	20.5	39.1	38.7	18.6
Reactive Silica (SiO2)	mg/L	0.5	--	--	--	2.5	2.2	2.0	1.1	3.8	5.1	2.8	5.2	4.6	4.1	6.1	5.1	3.1	5.1	5.8	1.7	7.1	4.7
Total Suspended Solids	mg/L	5	--	--	--	7	80	2	<2	11	<2	<1	1	<1	9	6	<5	<5	<5	<5	6	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	--	--	--	5	3	3	8	<2	8	10	8	10	14	8	9	12	8	12	10	7	6
Turbidity (NTU)	NTU	0.1	--	50	--	14.0	35	0.9	1.4	1.2	0.6	0.4	0.6	1.1	0.9	1.9	0.9	0.5	1.6	0.5	0.7	1.6	0.9
Conductivity (uS/cm)	µS/cm	1	--	--	--	100	140	92	130	100	110	110	100	88	263	231	143	243	188	218	252	338	112
Calculated Parameters																							
Anion Sum	me/L	N/A	--	--	--	0.77	1.12	0.73	1.11	0.71	0.88	1.03	0.95	0.80	2.55	2.02	1.31	1.96	1.50	1.78	2.66	2.31	1.30
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5	--	--	--	<1	<1	<1	<1	<1	<1	5	11	8	22	25	15	9	23	20	31	28	30
Calculated TDS	mg/L	1	--	--	--	50	73	45	67	50	63	65	58	54	150	117	73	117	83	104	143	150	68
Carb. Alkalinity (calc. as CaCO3)	mg/L	10	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	--	--	--	0.84	1.32	0.74	1.06	0.93	1.02	1.00	0.83	0.80	2.43	6.04	1.19	2.06	1.40	1.87	2.25	3.22	1.04
Hardness (CaCO3)	mg/L	1	--	--	--	6	6	6	17	12	17	16	17	19	38.2	37.5	24.5	33.5	32.4	44.2	24.6	71.4	8.0
Ion Balance (% Difference)	%	N/A	--	--	--	4.35	8.20	0.68	2.30	13.40	7.37	1.48	6.74	0.00	2.6	1.9	4.6	2.4	3.5	2.6	8.4	16.4	11.2
Langelier Index (@ 20C)	N/A	N/A	--	--	--	NC	NC	NC	NC	NC	NC	-3.50	-2.99	-3.36	-2.77	-2.23	-2.72	-2.73	-2.33	-2.41	-2.69	-1.30	-3.85
Langelier Index (@ 4C)	N/A	N/A	--	--	--	NC	NC	NC	NC	NC	NC	-3.75	-3.25	-3.61	-3.09	-2.55	-3.04	-3.05	-2.65	-2.73	-3.01	-1.62	-4.17
Saturation pH (@ 20C)	N/A	N/A	--	--	--	NC	NC	NC	NC	NC	NC	9.92	9.54	9.64	9.17	9.13	9.52	9.59	9.20	9.14	9.25	8.79	9.75
Saturation pH (@ 4C)	N/A	N/A	--	--	--	NC	NC	NC	NC	NC	NC	10.20	9.80	9.89	9.49	9.45	9.84	9.91	9.52	9.46	9.57	9.11	10.1
Metals (ICP-MS)																							
Total Aluminum (Al)	µg/L	5	5	--	5-100	**510**	--	--	**169**	**192**	--	**205**	--	--	**134**	**183**	**146**	86	**145**	**150**	**187**	83	310
Total Antimony (Sb)	µg/L	2	20	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	2	5.0	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	5	1000	--	--	22	--	--	52.9	36.9	--	37.3	--	--	58	284	42	57	57	80	46	142	17
Total Beryllium (Be)	µg/L	2	5.3	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	1200	--	1500	<5	--	--	11.4	10.9	--	<50	--	--	12	18	13	10	10	11	9	14	11
Total Cadmium (Cd)	µg/L	0.017	0.01	--	0.017	<0.3	--	--	**0.043**	<0.017	--	**0.023**	--	--	**0.034**	**0.021**	<0.017	<0.017	<0.017	**0.040**	**0.022**	<0.017	**0.022**
Total Chromium (Cr)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	**8**	<1	<1
Total Cobalt (Co)	µg/L	1	10	--	--	<1	--	--	0.50	0.46	--	<0.40	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	1	2	--	2.0-4.0	2	--	--	3.4	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	3	<2	<1	2	<1	<1	2
Total Iron (Fe)	µg/L	50	300	--	300	**720**	--	--	146	**637**	150	107	209	219	102	**1380**	255	111	**938**	**446**	147	**820**	290
Total Lead (Pb)	µg/L	0.5	1	--	1.0-7.0	1.6	--	--	2.37	0.56	--	<0.50	--	--	<0.5	0.7	<0.5	<0.5	<0.5	0.6	2.6	<0.5	0.6
Total Manganese (Mn)	µg/L	2	820	--	--	40	--	--	55.3	39.0	67.0	28.1	21.0	31.3	34	79	28	23	45	31	56	122	61
Total Molybdenum (Mo)	µg/L	2	73	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	25	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Selenium (Se)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	5	21000	--	--	11	--	--	29.1	19.7	--	24.3	--	--	48	58	36	52	47	62	38	103	13
Total Thallium (Tl)	µg/L	0.1	0.8	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	--	--	--	6	--	--	<2.0	<2.0	--	3.5	--	--	<2	3	<2	<2	<2	4	2	<2	<2
Total Uranium (U)	µg/L	0.1	300	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Vanadium (V)	µg/L	2	6	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	30	--	30	21	--	--	16.4	6.9	6.9	<5.0	<5.0	6.9	<5	6	<5	<5	<5	10	10	<5	7
MICROBIOLOGICAL																							
Total Coliform	MPN/100mL	1	--	--	--	84	>250	--	>250	>250	180	120	180	--	687	>2420	>2420	1550	>2420	1553	120	>2420	>2420
E. coli	MPN/100mL	1	--	400	--	54	**>250**	--	12	17	5	1	78	<100	3	68	145	4	9	5	3	179	3
Fecal Coliform	MPN/ml	--	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	0.05	--	--	--	15.40	19.29	0.70	18.12	1.61	8.45	0.93	0.58	0.69	0.53	2.59	0.81	1.27	14.70	1.99	0.25	1.10	1.22
Chlorophyll A - Welschmeyer method	µg/L	0.05	--	--	--	17.50	19.60	0.84	17.62	1.68	7.52	0.84	0.56	0.65	0.59	2.89	1.05	1.45	15.80	2.20	0.82	1.11	1.38
Total Kjeldahl Nitrogen as N	mg/L	0.4	--	--	--	--	--	--	--	--	--	--	--	--	1.1	1.3	0.6	--	0.6	0.6	0.7	0.6	<0.4

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September 2009)
NSE ESQs for Surface Water = Nova Scotia Environment Environmental Quality Standards for Surface Water (July 2013)
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

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TABLE 1: BEDFORD WEST SAMPLING PROGRAM

October 2014	Units	RDL	NSE ESQs for Surface Water (Reference)	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Highway 102																	
Sample Sites						HWY102-2																	
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/15	2012/10/11	2013/05/15	2013/08/15	2013/10/16	2014/05/14	2014/08/14	2014/10/27
Sampling Time	hh:mm	--				12:30	12:15	12:30	12:40	09:30	12:30	11:20	15:00	15:30	11:20	12:20	10:35	10:40	10:00	10:22	12:15	14:25	10:07
FIELD DATA																							
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--	N/A
Water Temp	Celsius	0.1	--	--	--	16.7	19.2	16.4	17.2	17.0	8.7	10.8	24.2	15.1	7.8	23.7	14.3	11.5	22.0	10.7	11.4	--	10.4
Dissolved Oxygen	mg/L	0.01	--	--	5.5-9.5	**10.01**	5.90	**4.80**	**4.91**	**2.45**	**2.99**	6.92	7.03	**5.09**	**3.73**	**13.1**	**3.28**	6.30	**1.57**	**4.20**	**10.50**	--	9.25
pH	pH	N/A	--	--	--	6.57	5.71	5.40	6.33	5.86	5.64	6.22	5.89	5.29	7.3	6.37	6.72	6.01	6.92	5.40	5.40	--	5.85
Specific Conductance	uS/cm	1	--	--	--	37	457	162	415	167	101.2	92.2	123.1	96	225	226	159.1	288	188.5	204.4	204.4	--	174
INORGANICS																							
Total Alkalinity (as CaCO3)	mg/L	5	--	--	--	<5	<5	7	6	5	<5	<5	5	<5	17	7	<5	6	14	7	30	--	8
Dissolved Chloride (Cl)	mg/L	1	--	--	120	21	82	83	**170**	41	18	21	21	17	63	109	45	71	50	52	113	--	34
Colour	TCU	30	--	--	--	120	190	91	96	160	68	65	98	77	32	100	70	11	61	36	13	--	85
Nitrite + Nitrate	mg/L	0.05	--	--	--	<0.05	<0.05	<0.05	0.10	<0.05	0.62	0.26	1.8	3.2	1.54	<0.05	0.14	0.17	<0.05	<0.05	<0.05	--	0.12
Nitrate (N)	mg/L	0.05	--	--	13000	<0.05	--	--	0.10	<0.05	--	0.26	--	--	1.54	<0.05	0.14	0.17	<0.05	<0.05	<0.05	--	0.12
Nitrite (N)	mg/L	0.05	--	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	--	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	--	--	19	<0.05	0.06	<0.05	<0.05	0.20	<0.05	<0.05	0.30	0.08	0.09	<0.03	<0.03	<0.03	0.17	0.09	<0.03	--	<0.03
Total Organic Carbon	mg/L	0.5	--	--	--	8.5	13	13	7.2	14	7.4	5.7	9.2	8.4	7.0	15.8	11.2	6.1	10.6	5.1	17.4	--	8.0
Orthophosphate (as P)	mg/L	0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01
pH (units)	pH	N/A	--	5.0-9.0	6.5-9	**5.43**	**5.96**	**6.30**	**6.05**	**6.32**	**5.47**	**5.93**	**6.18**	**5.92**	**5.9**	6.7	6.8	6.61	6.59	**6.34**	7.20	--	**6.40**
Total Calcium (Ca)	mg/L	0.1	--	--	--	1.6	4.0	4.8	7.44	3.84	4.01	3.07	2.22	3.80	7.0	8.4	5.6	7.6	8.5	8.2	14.1	--	9.5
Total Magnesium (Mg)	mg/L	0.1	--	--	--	0.4	0.7	0.9	0.96	0.59	1.00	0.68	0.68	1.38	1.2	1.4	1.2	1.2	1.3	2.2	3.1	--	1.8
Total Phosphorus (1M depth)	mg/L	0.006	--	--	--	<0.02	0.04	0.034	0.010	0.028	0.003	0.009	0.019	0.041	0.021	0.054	0.03	0.014	0.028	0.199	0.028	--	0.20
Total Potassium (K)	mg/L	0.1	--	--	--	0.5	0.8	1.1	0.984	0.956	1.390	0.844	1.310	1.880	1.2	1.7	1.6	1.3	1.5	2.5	2.9	--	1.7
Total Sodium (Na)	mg/L	0.1	--	--	--	15	51	55	83.7	32.0	12.1	13.3	13.1	13.3	41.5	63.6	20.4	39.0	19.1	34.5	69.6	--	24.0
Reactive Silica (SiO2)	mg/L	0.5	--	--	--	2.2	4.4	4.0	3.0	6.4	5.4	2.5	6.5	6.7	4.1	6.9	5.8	1.6	6.2	6.6	1.6	--	5.9
Total Suspended Solids	mg/L	5	--	--	--	<2	58	62	34	27	3	<1	10	14	<5	39	<5	<5	<5	194	34	--	<5
Dissolved Sulphate (SO4)	mg/L	2	--	--	--	<2	3	8	11	<2	7	5	5	8	12	6	10	10	9	10	12	--	8
Turbidity (NTU)	NTU	0.1	--	50	--	0.7	3.8	4.2	2.6	3.1	0.5	0.4	1.2 (1)	3.9	0.6	10.8	2	1.5	3.3	144	1.1	--	1.1
Conductivity (uS/cm)	µS/cm	1	--	--	--	85	290	310	590	160	94	91	100	110	263	403	179	295	203	223	433	--	194
Calculated Parameters																							
Anion Sum	me/L	N/A	--	--	--	0.60	2.37	2.62	5.13	1.27	0.70	0.73	0.91	0.86	2.48	3.34	1.49	2.34	1.88	1.81	4.04	--	1.29
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5	--	--	--	<1	<1	7	6	5	<1	<1	5	<1	17	7	<5	6	14	7	30	--	8
Calculated TDS	mg/L	1	--	--	--	42	150	165	282	93	52	48	62	67	143	200	86	135	100	145	235	--	85
Carb. Alkalinity (calc. as CaCO3)	mg/L	10	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10	--	<10
Cation Sum	me/L	N/A	--	--	--	0.81	2.65	2.89	4.17	1.81	0.86	0.82	0.83	0.97	2.32	2.10	1.40	2.24	1.50	3.50	4.17	--	1.76
Hardness (CaCO3)	mg/L	1	--	--	--	6	13	16	23	12	14	11	8	15	22.4	26.7	18.9	23.9	26.6	29.5	48.0	--	31.1
Ion Balance (% Difference)	%	N/A	--	--	--	14.90	5.58	4.90	10.30	17.50	10.30	5.81	4.60	6.01	3.3	3.6	3.1	2.3	11.3	31.7	1.6	--	15.1
Langelier Index (@ 20C)	N/A	N/A	--	--	--	NC	NC	-3.57	-3.72	-3.70	NC	NC	-4.07	NC	-3.63	-3.15	-3.34	-3.33	-2.92	-3.50	-1.80	--	-3.30
Langelier Index (@ 4C)	N/A	N/A	--	--	--	NC	NC	-3.82	-3.97	-3.95	NC	NC	-4.32	NC	-3.95	-3.47	-3.66	-3.65	-3.24	-3.82	-2.12	--	-3.62
Saturation pH (@ 20C)	N/A	N/A	--	--	--	NC	NC	9.87	9.77	10.00	NC	NC	10.30	NC	9.53	9.85	10.10	9.94	9.51	9.84	9.00	--	9.70
Saturation pH (@ 4C)	N/A	N/A	--	--	--	NC	NC	10.10	10.00	10.30	NC	NC	10.50	NC	9.85	10.2	10.5	10.3	9.83	10.2	9.32	--	10.0
Metals (ICP-MS)																							
Total Aluminum (Al)	µg/L	5	5	--	5-100	270	--	--	189	368	--	260	--	--	145	**466**	**259**	**130**	**138**	**2760**	**400**	--	**216**
Total Antimony (Sb)	µg/L	2	20	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	<2
Total Arsenic (As)	µg/L	2	5.0	--	5	<2	--	--	<1.0	2.1	--	<1.0	--	--	<2	<2	<2	<2	<2	6	<2	--	<2
Total Barium (Ba)	µg/L	5	1000	--	--	20	--	--	53.1	27.7	--	26.6	--	--	49	74	33	44	43	213	381	--	63
Total Beryllium (Be)	µg/L	2	5.3	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	<2
Total Bismuth (Bi)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	<2
Total Boron (B)	µg/L	5	1200	--	1500	<5	--	--	7.9	7.8	--	<50	--	--	10	17	15	9	10	13	11	--	12
Total Cadmium (Cd)	µg/L	0.017	0.01	--	0.017	<0.3	--	--	0.051	<0.017	--	<0.017	--	--	0.037	**0.031**	**0.032**	**0.019**	<0.017	**0.096**	**0.051**	--	**0.019**
Total Chromium (Cr)	µg/L	1	1.0	--	1	<2	--	--	<1.0	1.0	--	<1.0	--	--	<1	<1	<1	<1	1	**9**	**2**	--	<1
Total Cobalt (Co)	µg/L	1	10	--	--	<1	--	--	0.66	0.77	--	<0.40	--	--	<1	1	1	<1	1	3	1	--	<1
Total Copper (Cu)	µg/L	1	2	--	2.0-4.0	2	--	--	2.0	<2.0	<2.0	<2.0	2.5	2.8	<2	3	3	<2	1	**12**	4	--	2
Total Iron (Fe)	µg/L	50	300	--	300	**880**	--	--	**1380**	**3850**	**303**	229	**897**	**1110**	214	**5210**	**1550**	**383**	**1720**	**28400**	**1660**	--	**485**
Total Lead (Pb)	µg/L	0.5	1	--	1.0-7.0	1.9	--	--	1.61	2.70	--	0.59	--	--	<0.5	5.2	2.1	0.6	0.7	19.4	3.5	--	1.0
Total Manganese (Mn)	µg/L	2	820	--	--	110	--	--	387	135	52.9	40.5	106	176	78	219	207	83	173	327	212	--	93
Total Molybdenum (Mo)	µg/L	2	73	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	<2
Total Nickel (Ni)	µg/L	2	25	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	4	2	--	<2
Total Selenium (Se)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	<1	<1	<1	<1	<1	<1	--	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1
Total Strontium (Sr)	µg/L	5	21000	--	--	11	--	--	37.4	21.1	--	16.9	--	--	33	45	31	39	40	45	75	--	43
Total Thallium (Tl)	µg/L	0.1	0.8	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1
Total Tin (Sn)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	<2
Total Titanium (Ti)	µg/L	2	--	--	--	4	--	--	<2.0	6.4	--	4.9	--	--	<2	10	4	4	<2	60	9	--	6
Total Uranium (U)	µg/L	0.1	300	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	--	<0.1
Total Vanadium (V)	µg/L	2	6	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	2	<2	<2	<2	11	<2	--	<2
Total Zinc (Zn)	µg/L	5	30	--	30	12	--	--	13.6	12.3	9.3	5.5	9	12.5	<5	7	12	12	<5	**46**	**36**	--	17
MICROBIOLOGICAL																							
Total Coliform	MPN/100mL	1	--	--	--	28	>250	--	>250	75	41	110	>250	--	1553	>2420	>2420	2420	1990	>2420	687	--	>2420
E. coli	MPN/100mL	1	--	400	--	4	230	--	9	5	<1	7	**>250**	<100	<1	16	50	111	9	4	<1	--	<1
Fecal Coliform	MPN/ml	--	--	400	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	0.05	--	--	--	0.90	82.63	48.17	0.85	16.36	0.25	0.97	4.91	1.9	2.07	21.03	0.33	2.41	1.10	21.62	10.34	--	0.46
Chlorophyll A - Welschmeyer method	µg/L	0.05	--	--	--	0.91	81.20	52.50	0.85	17.35	0.23	0.87	4.49	2.15	2.27	17.26	0.50	3.02	1.30	27.02	11.09	--	0.55
Total Kjeldahl Nitrogen as N	mg/L	0.4	--	--	--	--	--	--	--	--	--	--	--	--	0.6	1.1	0.5	--	0.7	2.0	15.3	--	<0.4

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
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TABLE 1: BEDFORD WEST SAMPLING PROGRAM

October 2014	Units	RDL	NSE ESQs for Surface Water (Reference)	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Lake Shore Drive																Larry Uteck Blvd									
Sample Sites						LSD																LU									
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/17	2012/05/01	2012/08/15	2012/10/11	2013/05/15	2013/08/15	2013/10/16	2014/05/15	2014/08/14	2014/10/27	2011/10/17	2012/05/01	2012/08/15	2012/10/11	2013/05/15	2013/08/15	2013/10/16	2014/05/15	2014/08/14	2014/10/27
Sampling Time	hh:mm	--				12:00	09:30	11:45	09:00	11:28	10:00	08:45	13:20	9:00	9:15	13:00	9:10	08:40	15:30	11:55	9:30	12:45	13:30	10:30	15:20	11:30	10:10	14:30	14:30	13:00	11:45	10:45	9:54
FIELD DATA																															
Secchi Depth	Meters	--	--	1.2	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	--	--	--	13.1	16.7	15.3	13.4	21.3	7.3	10.2	21.0	12.0	5.7	25.7	13.4	7.7	20.2	8.8	8.9	--	10.48	11.3	12.8	27.3	14.6	13.9	18.3	10.9	15.0	22.8	10.2
Dissolved Oxygen	mg/L	0.01	--	--	5.5-9.5	**10.84**	5.70	5.50	8.60	**5.41**	8.47	9.44	7.87	8.16	**4.06**	**2.69**	7.58	8.77	7.26	7.60	**14.78**	--	7.22	**4.24**	6.17	8.2	9.04	**10.15**	8.29	**4.50**	**11.96**	8.08	7.55
pH	pH	N/A	--	--	--	7.88	6.74	6.34	6.42	6.64	6.17	7.09	6.88	6.63	8.22	7.16	6.92	5.19	7.28	6.23	7.02	--	6.31	6.07	7.82	6.65	6.78	6.39	7.49	5.45	6.50	7.23	6.17
Specific Conductance	uS/cm	1	--	--	--	723	210	168	218	203	110	146	126	112	62	177.5	116.7	123.6	132.5	147.8	180.0	--	111	203	955	480	262	670	320	845.0	999.0	611.0	371.0
INORGANICS																															
Total Alkalinity (as CaCO3)	mg/L	5	--	--	--	13	16	12	13	21	9	9	15	12	21	14	11	8	20	11	35	--	10	12	14	14	14	6	22	7	30	21	<5
Dissolved Chloride (Cl)	mg/L	1	--	--	120	41	34	31	49	45	25	38	27	22	22	33	23	39	32	23	29	--	23	34	**224**	116	52	**190**	99	**258**	**243**	104	70
Colour	TCU	30	--	--	--	32	27	37	20	26	33	32	41	49	13	20	40	10	21	25	9	--	31	94	18	14	18	7	7	19	6	8	18
Nitrite + Nitrate	mg/L	0.05	--	--	--	0.14	0.14	0.06	0.23	0.10	0.12	0.25	0.17	0.09	0.13	0.80	<0.05	0.18	0.20	<0.05	0.09	--	0.11	0.61	1.00	0.64	1.89	1.11	2.57	0.34	1.22	0.47	1.97
Nitrate (N)	mg/L	0.05	--	--	13000	0.14	--	--	0.23	0.10	--	0.25	--	--	0.13	0.80	<0.05	0.18	0.20	<0.05	0.09	--	0.11	--	1.00	0.64	1.89	1.11	2.57	0.34	1.22	0.47	1.97
Nitrite (N)	mg/L	0.05	--	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	--	<0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	--	--	19	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	0.06	0.03	<0.03	<0.03	<0.03	0.03	0.03	0.04	--	<0.03	0.06	0.04	0.16	<0.03	<0.03	0.04	0.04	0.05	<0.03	<0.03
Total Organic Carbon	mg/L	0.5	--	--	--	5.0	3.8	6.8	3.7	6.0	5.3	4.7	7.1	7.5	3.1	8.0	7.7	4.7	6.3	6.9	5.2	--	8.1	11.0	3.7	22.8	4.8	3.1	4.5	2.9	6.9	4.7	4.7
Orthophosphate (as P)	mg/L	0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (units)	pH	N/A	--	5.0-9.0	6.5-9	6.69	6.69	6.93	7.10	7.30	6.67	6.72	6.79	6.49	6.2	6.9	6.9	6.94	6.95	**6.49**	**6.47**	--	6.72	**6.43**	6.7	7.2	7.2	6.92	7.11	**6.49**	**6.42**	7.42	**6.41**
Total Calcium (Ca)	mg/L	0.1	--	--	--	6.5	6.9	5.4	7.99	10.5	5.29	5.9	5.14	5.04	2.6	18.1	5.1	6.4	6.0	5.6	5.4	--	5.1	7.63	30.7	22.1	14.5	22.0	17.6	21.8	23.9	27.6	12.6
Total Magnesium (Mg)	mg/L	0.1	--	--	--	1.4	1.6	1.3	1.99	2.14	1.15	1.25	1.19	1.23	0.7	3.3	1.4	1.2	1.4	1.6	1.5	--	1.1	2.34	4.2	3.6	2.2	2.8	2.7	4.0	4.2	3.8	2.2
Total Phosphorus (1M depth)	mg/L	0.006	--	--	--	and 400	0.03	0.009	0.018	0.100	0.009	0.018	0.028	0.014	0.022	0.063	0.003	0.007	0.015	0.078	0.100	--	0.03	0.034	0.043	0.036	0.030	0.006	0.027	0.046	0.260	0.028	0.04
Total Potassium (K)	mg/L	0.1	--	--	--	1.2	1.1	1.3	1.180	1.210	1.030	1.070	0.960	1.240	0.6	1.9	1.3	1.2	1.1	1.4	1.1	--	1.1	2.110	3.2	3.6	2.5	2.6	2.8	2.9	3.1	3.7	3.0
Total Sodium (Na)	mg/L	0.1	--	--	--	24	21	18	24.8	26.9	15.2	23.2	14.3	13.8	11.3	18.6	15.2	21.9	26.6	14.6	23.4	--	18.1	22.7	124	62.2	32.3	95.1	51.7	170	147	88.1	62.7
Reactive Silica (SiO2)	mg/L	0.5	--	--	--	3.1	4.2	4.0	3.2	3.4	4.3	2.6	3.9	3.8	3.1	2.9	4.9	2.6	3.9	5.0	2.9	--	4.2	6.9	4.9	0.7	6.3	5.1	8.6	7.0	2.1	2.5	6.9
Total Suspended Solids	mg/L	5	--	--	--	16	98	5	6	110	7	4	77	5	<5	16	19	<5	17	9	51	--	8	13	5	165	<5	<5	<5	<5	626	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	--	--	--	6	4	5	7	3	4	6	4	4	5	5	5	6	7	5	5	--	4	21	26	25	23	26	29	33	29	20	27
Turbidity (NTU)	NTU	0.1	--	50	--	0.6	12	2.5	12	6.2	1	0.6	2.5	1.7	6.7	**283**	2.1	1.1	31.6	**82.6**	6.6	--	1.4	3.3	4.1	23.0	2.3	1.8	1.6	0.7	42.7	10.1	1.6
Conductivity (uS/cm)	µS/cm	1	--	--	--	170	150	140	200	200	110	150	130	110	96	161	110	168	136	105	122	--	125	190	813	482	255	732	433	840	819	605	394
Calculated Parameters																															
Anion Sum	me/L	N/A	--	--	--	1.56	0.82	1.22	1.80	1.77	0.97	1.39	1.14	0.96	1.15	1.37	0.97	1.40	1.46	0.97	1.63	--	0.94	1.69	7.21	4.12	2.36	6.10	4.02	8.13	8.15	3.80	2.68
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5	--	--	--	13	8	12	13	21	9	9	15	12	21	14	11	8	20	11	35	--	10	12	14	14	14	6	22	7	30	21	<5
Calculated TDS	mg/L	1	--	--	--	92	55	74	104	107	62	84	66	60	56	163	58	82	87	66	88	--	59	109	426	246	144	347	229	496	477	262	187
Carb. Alkalinity (calc. as CaCO3)	mg/L	10	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10	--	<10	<1	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	--	--	--	1.53	0.99	1.20	1.69	1.94	1.05	1.44	1.02	1.00	0.76	3.59	1.10	1.43	1.62	1.62	1.52	--	1.19	1.70	7.40	4.30	2.43	5.55	3.51	8.90	8.24	5.64	3.64
Hardness (CaCO3)	mg/L	1	--	--	--	22	15	19	28	35	18	20	18	18	9.4	58.8	18.5	20.9	20.7	20.6	19.7	--	17.3	29	94.0	70.0	45.3	66.5	55.1	70.9	77.0	84.6	40.5
Ion Balance (% Difference)	%	N/A	--	--	--	0.97	9.39	0.83	3.15	4.58	3.96	1.77	5.56	2.04	20.7	63.0	6.1	1.0	5.2	25.0	3.4	--	11.8	0.29	1.3	2.2	1.4	4.7	6.8	4.5	0.6	19.4	15.2
Langelier Index (@ 20C)	N/A	N/A	--	--	--	-2.74	-3.20	-2.60	-2.22	-1.71	-2.99	-2.88	-2.64	-3.05	-3.62	-2.30	-2.91	-2.93	-2.55	-3.29	-2.84	--	-3.14	-2.95	-2.32	-1.94	-2.10	-2.60	-1.93	-2.98	-2.38	-1.45	-3.41
Langelier Index (@ 4C)	N/A	N/A	--	--	--	-2.99	-3.45	-2.85	-2.47	-1.96	-3.24	-3.13	-2.89	-3.31	-3.94	-2.62	-3.23	-3.25	-2.87	-3.61	-3.16	--	-3.46	-3.20	-2.64	-2.26	-2.42	-2.92	-2.25	-3.30	-2.70	-1.77	-3.73
Saturation pH (@ 20C)	N/A	N/A	--	--	--	9.43	9.78	9.53	9.32	9.01	9.66	9.60	9.43	9.54	9.82	9.20	9.81	9.87	9.50	9.78	9.31	--	9.86	9.38	9.02	9.14	9.30	9.52	9.04	9.47	8.80	8.87	9.82
Saturation pH (@ 4C)	N/A	N/A	--	--	--	9.68	10.00	9.78	9.57	9.26	9.91	9.85	9.68	9.80	10.10	9.52	10.10	10.20	9.82	10.1	9.63	--	10.2	9.63	9.34	9.46	9.62	9.84	9.36	9.79	9.12	9.19	10.1
Metals (ICP-MS)																															
Total Aluminum (Al)	µg/L	5	5	--	5-100	99	--	--	349	189	--	217	--	--	490	**19200**	**186**	**131**	93	**3420**	**487**	--	141	--	218	**227**	**252**	**107**	**447**	31	**1400**	46	109
Total Antimony (Sb)	µg/L	2	20	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	<2	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	2	5.0	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	**8**	<2	<2	<2	<2	<2	--	<2	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Barium (Ba)	µg/L	5	1000	--	--	14	--	--	15.3	19.2	--	13.9	--	--	11	86	12	12	7	24	15	--	11	--	225	201	116	133	134	119	185	157	80
Total Beryllium (Be)	µg/L	2	5.3	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	2	<2	<2	<2	<2	<2	--	<2	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	<2	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	1200	--	1500	13	--	--	41.4	21.6	--	<50	--	--	6	24	16	10	15	15	14	--	16	--	11	17	22	10	22	18	22	20	21
Total Cadmium (Cd)	µg/L	0.017	0.01	--	0.017	<0.3	--	--	0.018	<0.017	--	<0.017	--	--	0.029	**1.050**	**0.023**	<0.017	<0.017	**0.073**	**0.032**	--	<0.017	--	0.538	**0.171**	**0.168**	**0.300**	**0.236**	**0.148**	**0.171**	**0.031**	0.079
Total Chromium (Cr)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	**11**	<1	<1	<1	**2**	<1	--	<1	--	<1	<1	<1	<1	1	<1	<1	<1	<1
Total Cobalt (Co)	µg/L	1	10	--	--	<1	--	--	<0.40	0.88	--	<0.40	--	--	<1	34	<1	<1	<1	1	<1	--	<1	--	<1	1	<1	<1	<1	<1	<1	<1	<1
Total Copper (Cu)	µg/L	1	2	--	2.0-4.0	<2	--	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	**22**	2	<2	1	**12**	2	--	3	2.9	<2	3	16	2	6	2	2	<1	4
Total Iron (Fe)	µg/L	50	300	--	300	180	--	--	**554**	**965**	120	211	**388**	**384**	161	**38900**	**312**	236	254	**4200**	**593**	--	363	**2150**	**347**	**1320**	**500**	194	**890**	157	**2000**	207	229
Total Lead (Pb)	µg/L	0.5	1	--	1.0-7.0	<0.5	--	--	3.02	0.54	--	<0.50	--	--	0.6	**82.4**	<0.5	<0.5	<0.5	5.2	0.5	--	<0.5	--	0.8	0.7	1.0	<0.5	1.4	<0.5	1.8	<0.5	<0.5
Total Manganese (Mn)	µg/L	2	820	--	--	51	--	--	113	632	22.8	30.2	53.4	38.5	26	13200	67	71	81	124	140	--	60	129	182	485	120	87	89	26	71	182	36
Total Molybdenum (Mo)	µg/L	2	73	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	<2	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	25	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	13	<2	<2	<2	2	<2	--	<2	--	<2	<2	<2	<2	<2	<2	3	<2	<2
Total Selenium (Se)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	**2**	<1	<1	<1	<1	<1	--	<1	--	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<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
Total Strontium (Sr)	µg/L	5	21000	--	--	30	--	--	36.3	42.1	--	24.4	--	--	12	82	22	24	24	25	26	--	19	--	112	94	60	93	90	96	116	111	54
Total Thallium (Tl)	µg/L	0.1	0.8	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	0.2	<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
Total Tin (Sn)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	<2	<2	<2	<2	<2	<2	--	<2	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	--	--	--	<2	--	--	7.2	4.1	--	5.3	--	--	3	405	4	<2	2	36	6	--	3	--	4	3	7	3	11	2	22	<2	3
Total Uranium (U)	µg/L	0.1	300	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	1.6	<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
Total Vanadium (V)	µg/L	2	6	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	30	<2	<2	<2	2	<2	--	<2	--	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	30	--	30	7	--	--	7.2	6.7	<5.0	<5.0	<5.0	5	<5	**110**	7	6	<5	15	<5	--	<5	9	**79**	**92**	**39**	**57**	**49**	26	17	8	23
MICROBIOLOGICAL																															
Total Coliform	MPN/100mL	1	--	--	--	53	>250	--	>250	>250	280	85	>250	--	1414	>2420	>2420	1990	>2420	>2420	1203	--	8	--	>2420	>2420	2420	866	>2420	866	>2420	961	>2420
E. coli	MPN/100mL	1	--	400	--	22	24	--	4	45	6	10	**>250**	<100	2	26	10	10	20	2	<1	--	>2420	<100	<1	2	19	3	86	<1	<1	7	**1730**
Fecal Coliform	MPN/ml	--	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	0.05	--	--	--	1.46	10.70	4.68	1.21	6.64	0.21	1.19	1.93	1.41	1.88	6.62	0.13	<0.50	1.6	2.02	1.91	--	0.32	1.99	2.44	32.52	1.80	1.54	2.30	0.12	99.13	2.54	0.96
Chlorophyll A - Welschmeyer method	µg/L	0.05	--	--	--	1.85	11.10	5.62	1.32	7.71	0.19	1.07	1.73	1.18	2.28	7.58	0.22	<0.50	2	2.98	1.91	--	0.33	2.08	2.71	31.31	2.15	1.77	2.50	0.11	98.00	2.51	0.96
Total Kjeldahl Nitrogen as N	mg/L	0.4	--	--	--	--	--	--	--	--	--	--	--	--	0.5	3.5	0.5	--	0.7	3.0	1.0	--	<0.4	--	0.4	4.2	0.7	--	0.5	<0.4	1.2	1.7	<0.4

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)

" -- " = no guideline available / Not Tested.

CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)

CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.

Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)

NSE ESQs for Surface Water = Nova Scotia Environment Environmental Quality Standards for Surface Water (July 2013)

Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.

Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

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TABLE 1: BEDFORD WEST SAMPLING PROGRAM

October 2014	Units	RDL	NSE ESQs for Surface Water (Reference)	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Paper Mill Lake																
Sample Sites						PML1																
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/15	2012/10/11	2013/05/15	2013/08/15	2013/10/16	2014/05/15	2014/08/14	2014/10/27
Sampling Time	hh:mm	--				13:45	13:00	13:00	13:35	15:15	13:00	13:00	16:50	17:00	12:50	--	10:55	10:51	11:35	10:45	10:30	14:45	12:35
FIELD DATA																						
Secchi Depth	Meters	--	--	1.2	--	3.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Temp	Celsius	0.1	--	--	--	15.7	17.1	16.2	13.2	22.7	9.1	10.3	22.1	13.6	8.3	--	14.9	11.6	22.5	12.3	12.1	23.6	12.4
Dissolved Oxygen	mg/L	0.01	--	--	5.5-9.5	**10.56**	8.10	6.90	8.76	7.83	**10.43**	**10.39**	8.17	**9.54**	8.41	--	8.60	**9.98**	7.65	**9.90**	**12.08**	7.49	8.06
pH	pH	N/A	--	--	--	7.39	6.57	6.64	7.06	7.35	5.89	6.28	6.20	6.11	7.58	--	6.63	6.39	7.20	6.32	6.60	7.42	6.60
Specific Conductance	uS/cm	1	--	--	--	561	279	223	265	234	125	177	174	106	366	--	186.4	215.1	199.0	250.5	431.0	263.0	210.0
INORGANICS																						
Total Alkalinity (as CaCO3)	mg/L	5	--	--	--	6	7	7	7	9	5	6	7	7	20	--	<5	<5	6	7	31	7	7
Dissolved Chloride (Cl)	mg/L	1	--	--	120	39	64	58	67	61	24	44	43	18	55	--	45	57	57	48	63	50	46
Colour	TCU	30	--	--	--	54	15	21	19	12	57	32	38	65	38	--	29	8	15	11	17	10	30
Nitrite + Nitrate	mg/L	0.05	--	--	--	0.49	0.10	0.17	0.42	0.27	0.66	0.55	0.15	0.62	0.22	--	0.14	0.21	0.18	0.18	0.22	0.24	0.18
Nitrate (N)	mg/L	0.05	--	--	13000	0.49	--	--	0.42	0.27	--	0.55	--	--	0.22	--	0.14	0.21	0.18	0.18	0.22	0.24	0.18
Nitrite (N)	mg/L	0.05	--	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	--	--	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	0.06	--	<0.03	<0.03	0.04	<0.03	0.04	<0.03	<0.03
Total Organic Carbon	mg/L	0.5	--	--	--	6.5	3.6	4.7	0.7	3.3	6.7	4.6	5	8.3	5.7	--	5.3	4.2	4.1	5.1	4.0	2.0	4.4
Orthophosphate (as P)	mg/L	0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH (units)	pH	N/A	--	5.0-9.0	6.5-9	**6.36**	6.75	6.79	6.63	7.04	6.58	6.54	6.83	6.67	6.6	--	6.8	6.71	6.92	6.88	6.66	7.00	6.64
Total Calcium (Ca)	mg/L	0.1	--	--	--	4.5	6.9	6.4	8.37	9.02	5.90	6.02	4.99	4.64	6.0	--	6.0	6.8	6.6	6.9	6.9	9.1	7.0
Total Magnesium (Mg)	mg/L	0.1	--	--	--	0.6	1.1	1.0	1.25	1.22	0.82	0.98	0.89	0.85	1.0	--	1.1	1.0	0.9	1.5	1.3	1.4	1.0
Total Phosphorus (1M depth)	mg/L	0.006	--	--	--	<0.02	<0.02	0.002	0.018	0.002	<0.002	0.014	0.011	0.030	0.019	--	0.03	0.006	0.007	0.047	0.012	0.030	0.02
Total Potassium (K)	mg/L	0.1	--	--	--	0.9	0.9	0.9	1.160	1.060	1.340	1.230	0.771	1.430	0.8	--	1.0	0.8	1.0	1.5	0.9	1.3	0.9
Total Sodium (Na)	mg/L	0.1	--	--	--	25	38	34	35.2	40.2	18.4	26.8	22.8	13.7	33.6	--	29.8	35.3	28.5	32.2	38.1	41.6	33.7
Reactive Silica (SiO2)	mg/L	0.5	--	--	--	4.5	2.6	2.8	3.8	3.4	5.9	3.7	2.6	5.4	2.9	--	3.2	2.8	2.6	2.6	2.5	2.3	2.7
Total Suspended Solids	mg/L	5	--	--	--	<2	3	9	7	<2	<1	1	<2	5	9	--	6	<5	<5	23	6	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	--	--	--	13	11	11	13	12	12	12	10	12	7	--	10	8	10	10	10	8	8
Turbidity (NTU)	NTU	0.1	--	50	--	0.4	0.5	0.6	8.2	0.9	0.5	0.6	1	1.2	0.7	--	1	0.7	1.1	19.2	1.4	0.9	1.5
Conductivity (uS/cm)	µS/cm	1	--	--	--	170	250	230	260	250	130	180	170	100	214	--	179	227	218	209	230	261	224
Calculated Parameters																						
Anion Sum	me/L	N/A	--	--	--	1.51	2.18	1.99	2.34	2.15	1.09	1.62	1.56	0.92	2.11	--	1.49	1.79	1.95	1.71	2.62	1.73	1.62
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5	--	--	--	6	7	7	7	9	5	6	7	7	20	--	<5	<5	6	7	31	7	7
Calculated TDS	mg/L	1	--	--	--	93	129	118	137	134	75	100	90	63	117	--	95	110	109	115	140	117	102
Carb. Alkalinity (calc. as CaCO3)	mg/L	10	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	--	<10	<10	<10	<10	<10	<10	<10
Cation Sum	me/L	N/A	--	--	--	1.40	2.11	1.89	2.11	2.33	1.20	1.58	1.35	0.95	1.89	--	1.78	2.00	1.69	2.56	2.18	2.45	1.94
Hardness (CaCO3)	mg/L	1	--	--	--	14	22	20	26	28	18	19	16	15	19.1	--	19.5	21.1	20.2	23.4	22.6	28.5	21.6
Ion Balance (% Difference)	%	N/A	--	--	--	3.78	1.63	2.58	5.17	4.02	4.80	1.25	7.22	1.60	5.5	--	9.0	5.5	7.0	19.8	9.2	17.0	9.2
Langelier Index (@ 20C)	N/A	N/A	--	--	--	-3.57	-2.90	-2.94	-2.96	-2.43	-3.25	-3.27	-2.94	-3.13	-2.91	--	-3.31	-3.35	-3.07	-3.03	-2.61	-2.79	-3.26
Langelier Index (@ 4C)	N/A	N/A	--	--	--	-3.82	-3.15	-3.19	-3.21	-2.68	-3.50	-3.53	-3.19	-3.38	-3.23	--	-3.63	-3.67	-3.39	-3.35	-2.93	-3.11	-3.58
Saturation pH (@ 20C)	N/A	N/A	--	--	--	9.93	9.65	9.73	9.59	9.47	9.83	9.81	9.77	9.80	9.51	--	10.10	10.1	9.99	9.91	9.27	9.79	9.90
Saturation pH (@ 4C)	N/A	N/A	--	--	--	10.20	9.90	9.98	9.84	9.72	10.10	10.10	10.00	10.10	9.83	--	10.40	10.4	10.3	10.2	9.59	10.1	10.2
Metals (ICP-MS)																						
Total Aluminum (Al)	µg/L	5	5	--	5-100	**260**	--	--	**665**	45.9	--	**233**	--	--	**177**	--	**306**	**141**	**103**	**3920**	**305**	**129**	**142**
Total Antimony (Sb)	µg/L	2	20	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	<2	<2	<2	<2	<2	<2	<2
Total Arsenic (As)	µg/L	2	5.0	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	<2	<2	<2	2	<2	<2	<2
Total Barium (Ba)	µg/L	5	1000	--	--	23	--	--	35.3	24.4	--	26.6	--	--	22	--	19	20	12	40	23	23	18
Total Beryllium (Be)	µg/L	2	5.3	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	<2	<2	<2	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	<2	<2	<2	<2
Total Boron (B)	µg/L	5	1200	--	1500	8	--	--	11.3	8.6	--	<50	--	--	6	--	9	6	8	9	8	13	11
Total Cadmium (Cd)	µg/L	0.017	0.01	--	0.017	<0.3	--	--	**0.032**	<0.017	--	<0.017	--	--	<0.017	--	**0.066**	**0.021**	**0.018**	**0.430**	<0.017	**0.020**	<0.017
Total Chromium (Cr)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	<1	<1	<1	**3**	<1	<1	<1
Total Cobalt (Co)	µg/L	1	10	--	--	<1	--	--	0.96	<0.40	--	<0.40	--	--	<1	--	2	<1	<1	9	<1	<1	<1
Total Copper (Cu)	µg/L	1	2	--	2.0-4.0	<2	--	--	2.0	<2.0	<2.0	4.0	<2.0	2.3	<2	--	<2	<2	1	**6**	1	<1	2
Total Iron (Fe)	µg/L	50	300	--	300	140	--	--	**837**	89	161	141	**315**	**528**	137	--	**742**	130	205	**5300**	239	296	182
Total Lead (Pb)	µg/L	0.5	1	--	1.0-7.0	<0.5	--	--	1.73	<0.50	--	<0.50	--	--	<0.5	--	0.9	<0.5	<0.5	**13.5**	0.9	<0.5	<0.5
Total Manganese (Mn)	µg/L	2	820	--	--	17	--	--	142	68.9	41.3	14.4	128	62.4	48	--	214	33	58	693	54	260	49
Total Molybdenum (Mo)	µg/L	2	73	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	25	--	25-150	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	2	<2	<2	9	<2	<2	<2
Total Selenium (Se)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	<1	<1	<1	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	5	21000	--	--	18	--	--	36.3	37.1	--	25	--	--	26	--	30	31	25	34	35	37	30
Total Thallium (Tl)	µg/L	0.1	0.8	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	<2	<2	<2	<2
Total Titanium (Ti)	µg/L	2	--	--	--	<2	--	--	7.8	<2.0	--	3.9	--	--	<2	--	4	<2	<2	65	4	<2	3
Total Uranium (U)	µg/L	0.1	300	--	15	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	0.1	--	<0.1	<0.1	<0.1	0.6	<0.1	<0.1	<0.1
Total Vanadium (V)	µg/L	2	6	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	<2	<2	<2	10	<2	<2	<2
Total Zinc (Zn)	µg/L	5	30	--	30	8	--	--	10.0	5.4	5.7	6.3	6.2	5.4	<5	--	13	8	<5	**62**	<5	<5	6
MICROBIOLOGICAL																						
Total Coliform	MPN/100mL	1	--	--	--	200	73	--	>250	>250	>250	85	>250	--	411	--	2420	866	1730	1011	613	2420	>2420
E. coli	MPN/100mL	1	--	400	--	33	45	--	19	**>250**	2	2	34	<100	2	--	20	12	4	6	6	10	10
Fecal Coliform	MPN/ml	--	--	400	--	--	--	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	0.05	--	--	--	0.62	2.31	0.57	0.82	1.12	0.07	2.85	0.86	0.15	1.03	--	0.69	1.17	1.10	5.07	0.67	0.64	0.91
Chlorophyll A - Welschmeyer method	µg/L	0.05	--	--	--	0.64	2.21	0.64	0.74	1.04	0.06	2.75	0.76	0.15	1.10	--	0.91	1.37	1.10	6.39	0.65	0.65	0.87
Total Kjeldahl Nitrogen as N	mg/L	0.4	--	--	--	--	--	--	--	--	--	--	--	--	<0.4	--	0.4	--	0.4	0.8	0.4	0.4	<5

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)
NSE ESQs for Surface Water = Nova Scotia Environment Environmental Quality Standards for Surface Water (July 2013)
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

TABLE 1: BEDFORD WEST SAMPLING PROGRAM

October 2014	Units	RDL	NSE ESQs for Surface Water (Reference)	Health Canada Guideline for Recreational Water Quality (Reference)	CCME Guideline FWAL (Applied)	Paper Mill Lake																	
Sample Sites						PML2																	
Sampling Date	yyyy-mm-dd	--				2009/06/29	2009/08/13	2009/10/01	2010/05/31	2010/08/24	2010/11/01	2011/05/13	2011/08/14	2011/10/16	2012/05/01	2012/08/15	2012/10/11	2013/05/15	2013/08/15	2013/10/16	2014/05/15	2014/08/14	2014/10/27
Sampling Time	hh:mm	--				13:15	13:40	13:45	14:30	16:20	13:00	12:40	16:20	16:15	13:16	--	--	13:40	10:45	11:20	11:00	9:20	8:30
FIELD DATA																							
Secchi Depth	Meters	--	--	1.2	--	2.8	2.2	2.3	N/A	3.0	2.0	2.2	2.3	2.2	2.35	--	--	3.20	--	N/A	N/A	N/A	3.1
Water Temp	Celsius	0.1	--	--	--	14.8	24.2	19.7	17.8	25.3	10.1	10.9	23.1	15.2	11.6	--	--	14.8	--	12.6	14.4	21.1	12.1
Dissolved Oxygen	mg/L	0.01	--	--	5.5-9.5	**10.20**	8.30	8.40	8.78	8.09	**10.58**	**9.88**	8.7	8.94	7.75	--	--	9.26	--	8.90	**12.44**	6.95	7.92
pH	pH	N/A	--	--	--	6.36	6.82	6.84	7.09	7.39	6.53	6.31	6.67	6.13	8.61	--	--	6.49	--	6.13	6.50	7.22	5.92
Specific Conductance	uS/cm	1	--	--	--	267	264	241	237	234	201	159	173	156	231	--	--	234	--	250.5	966.0	266.0	215.0
INORGANICS																							
Total Alkalinity (as CaCO3)	mg/L	5	--	--	--	5	7	7	6	8	7	<5	8	7	21	--	--	<5	--	8	32	10	26
Dissolved Chloride (Cl)	mg/L	1	--	--	120	63	63	58	62	58	50	44	43	34	55	--	--	63	--	64	**245**	50	42
Colour	TCU	30	--	--	--	22	17	19	20	13	23	35	38	48	39	--	--	18	--	8	6	7	31
Nitrite + Nitrate	mg/L	0.05	--	--	--	0.14	0.07	0.09	0.19	0.11	0.23	0.33	0.14	0.22	0.24	--	--	0.22	--	<0.05	0.13	0.18	0.18
Nitrate (N)	mg/L	0.05	--	--	13000	0.14	--	--	0.19	0.11	--	0.33	--	--	0.24	--	--	0.22	--	<0.05	0.13	0.18	0.18
Nitrite (N)	mg/L	0.05	--	--	60	<0.01	--	--	<0.01	<0.01	--	<0.01	--	--	<0.05	--	--	<0.05	--	<0.05	<0.05	<0.05	<0.05
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	--	--	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	--	--	0.03	--	0.23	0.05	0.03	<0.03
Total Organic Carbon	mg/L	0.5	--	--	--	3.6	2.6	4.5	3.2	3.4	3.6	4	6	5.6	5.9	--	--	4.4	--	4.0	2.7	2.4	5.8
Orthophosphate (as P)	mg/L	0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	--	<0.01	--	<0.01	<0.01	<0.01	<0.01
pH (units)	pH	N/A	--	5.0-9.0	6.5-9	6.50	6.81	6.82	6.66	7.02	6.83	**6.37**	6.60	6.60	6.6	--	--	6.68	--	6.73	7.13	7.04	6.77
Total Calcium (Ca)	mg/L	0.1	--	--	--	6.1	7.1	6.1	7.17	7.69	7.96	5.30	4.76	5.04	6.1	--	--	6.7	--	7.7	19.2	8.8	6.9
Total Magnesium (Mg)	mg/L	0.1	--	--	--	1.1	1.1	1.1	1.25	1.17	1.20	0.93	0.86	0.90	1.0	--	--	1.0	--	1.4	1.7	1.4	1.0
Total Phosphorus (1M depth)	mg/L	0.006	--	--	--	<0.02	<0.02	0.002	0.010	0.002	<0.002	0.009	0.009	0.007	0.025	--	--	0.006	--	0.026	0.011	0.026	0.02
Total Potassium (K)	mg/L	0.1	--	--	--	0.9	1.0	0.9	0.984	0.900	1.020	0.861	0.801	0.968	0.8	--	--	0.8	--	1.3	1.4	1.2	1.1
Total Sodium (Na)	mg/L	0.1	--	--	--	35	40	34	31.1	35.1	30.8	25.7	21.3	20.9	34.6	--	--	37.5	--	42.0	133	42.6	33.9
Reactive Silica (SiO2)	mg/L	0.5	--	--	--	2.6	2.5	2.3	2.6	2.3	3.3	2.9	2.5	3	2.8	--	--	2.7	--	4.2	2.4	2.3	2.9
Total Suspended Solids	mg/L	5	--	--	--	2	3	<1	15	<2	11	<1	8	<1	<5	--	--	<5	--	<5	16	<5	<5
Dissolved Sulphate (SO4)	mg/L	2	--	--	--	11	11	11	10	10	10	9	10	9	7	--	--	9	--	11	27	7	7
Turbidity (NTU)	NTU	0.1	--	50	--	0.8	0.7	0.6	1.0	0.8	0.4	0.4	3.4	0.5	0.7	--	--	1	--	3.3	2.6	0.7	1
Conductivity (uS/cm)	µS/cm	1	--	--	--	240	250	230	230	230	210	170	170	150	213	--	--	254	--	277	777	273	212
Calculated Parameters																							
Anion Sum	me/L	N/A	--	--	--	2.11	2.17	1.99	2.07	2.01	1.77	1.46	1.58	1.30	2.13	--	--	1.98	--	2.19	8.12	1.77	1.86
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5	--	--	--	5	7	7	6	8	7	<1	8	7	21	--	--	<5	--	8	32	10	26
Calculated TDS	mg/L	1	--	--	--	123	131	117	120	120	110	91	89	79	119	--	--	119	--	137	448	118	109
Carb. Alkalinity (calc. as CaCO3)	mg/L	10	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	--	--	<10	--	<10	<10	<10	<10
Cation Sum	me/L	N/A	--	--	--	1.94	2.23	1.88	1.88	2.03	1.86	1.48	1.28	1.27	1.94	--	--	2.09	--	2.55	6.96	2.47	1.95
Hardness (CaCO3)	mg/L	1	--	--	--	20	22	20	23	24	25	17	15	16	19.3	--	--	20.8	--	25.0	54.9	27.7	21.3
Ion Balance (% Difference)	%	N/A	--	--	--	4.20	1.36	2.84	4.81	0.50	2.48	0.68	10.50	1.17	4.8	--	--	2.8	--	7.5	7.7	16.5	2.2
Langelier Index (@ 20C)	N/A	N/A	--	--	--	-3.33	-2.83	-2.93	-3.06	-2.55	-2.80	NC	-3.18	-3.17	-2.89	--	--	-3.39	--	-3.08	-1.73	-2.61	-2.57
Langelier Index (@ 4C)	N/A	N/A	--	--	--	-3.59	-3.08	-3.18	-3.31	-2.80	-3.05	NC	-3.43	-3.42	-3.21	--	--	-3.71	--	-3.40	-2.05	-2.93	-2.89
Saturation pH (@ 20C)	N/A	N/A	--	--	--	9.83	9.64	9.75	9.72	9.57	9.63	NC	9.78	9.77	9.49	--	--	10.1	--	9.81	8.86	9.65	9.34
Saturation pH (@ 4C)	N/A	N/A	--	--	--	10.10	9.89	10.00	9.97	9.82	9.88	NC	10.00	10.00	9.81	--	--	10.4	--	10.1	9.18	9.97	9.66
Metals (ICP-MS)																							
Total Aluminum (Al)	µg/L	5	5	--	5-100	**130**	--	--	**1030**	55.8	--	**202**	--	--	**189**	--	--	**131**	--	**107**	**181**	52	**122**
Total Antimony (Sb)	µg/L	2	20	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	--	<2	--	<2	<2	<2	<2
Total Arsenic (As)	µg/L	2	5.0	--	5	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	--	<2	--	<2	<2	<2	<2
Total Barium (Ba)	µg/L	5	1000	--	--	16	--	--	23.0	12.2	--	23	--	--	22	--	--	22	--	37	50	27	19
Total Beryllium (Be)	µg/L	2	5.3	--	--	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<2	--	--	<2	--	<2	<2	<2	<2
Total Bismuth (Bi)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--	<2	<2	<2	<2
Total Boron (B)	µg/L	5	1200	--	1500	5	--	--	8.2	8.8	--	<50	--	--	6	--	--	6	--	9	7	13	11
Total Cadmium (Cd)	µg/L	0.017	0.01	--	0.017	<0.3	--	--	**0.037**	<0.017	--	**0.028**	--	--	**0.023**	--	--	**0.039**	--	**0.060**	**0.062**	**0.019**	**0.018**
Total Chromium (Cr)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	--	<1	--	<1	<1	<1	<1
Total Cobalt (Co)	µg/L	1	10	--	--	<1	--	--	0.65	<0.40	--	<0.40	--	--	<1	--	--	<1	--	2	<1	<1	<1
Total Copper (Cu)	µg/L	1	2	--	2.0-4.0	<2	--	--	3.3	<2.0	<2.0	<2.0	<2.0	<2.0	<2	--	--	<2	--	**1380**	1	<1	2
Total Iron (Fe)	µg/L	50	300	--	300	100	--	--	**1090**	151	76	143	**699**	181	178	--	--	181	--	**1760**	264	**316**	134
Total Lead (Pb)	µg/L	0.5	1	--	1.0-7.0	<0.5	--	--	2.39	<0.50	--	<0.50	--	--	<0.5	--	--	<0.5	--	**49.7**	0.7	<0.5	<0.5
Total Manganese (Mn)	µg/L	2	820	--	--	58	--	--	159	81.0	28.0	33.8	88.6	30.6	22	--	--	87	--	866	206	278	24
Total Molybdenum (Mo)	µg/L	2	73	--	73	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--	<2	<2	<2	<2
Total Nickel (Ni)	µg/L	2	25	--	25-150	2	--	--	2.2	<2.0	--	<2.0	--	--	<2	--	--	<2	--	3	<2	<2	<2
Total Selenium (Se)	µg/L	1	1.0	--	1	<2	--	--	<1.0	<1.0	--	<1.0	--	--	<1	--	--	<1	--	<1	<1	<1	<1
Total Silver (Ag)	µg/L	0.1	0.1	--	0.1	<0.5	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	--	<0.1	--	0.1	<0.1	<0.1	<0.1
Total Strontium (Sr)	µg/L	5	21000	--	--	30	--	--	34.7	32.8	--	25.7	--	--	27	--	--	31	--	35	68	37	29
Total Thallium (Tl)	µg/L	0.1	0.8	--	0.8	<0.1	--	--	<0.10	<0.10	--	<0.10	--	--	<0.1	--	--	<0.1	--	<0.1	<0.1	<0.1	<0.1
Total Tin (Sn)	µg/L	2	--	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--	3	<2	<2	<2
Total Titanium (Ti)	µg/L	2	--	--	--	<2	--	--	21.3	<2.0	--	3.6	--	--	<2	--	--	<2	--	2	3	<2	<2
Total Uranium (U)	µg/L	0.1	300	--	15	<0.1	--	--	0.10	<0.10	--	<0.10	--	--	0.1	--	--	<0.1	--	<0.1	<0.1	<0.1	<0.1
Total Vanadium (V)	µg/L	2	6	--	--	<2	--	--	<2.0	<2.0	--	<2.0	--	--	<2	--	--	<2	--	<2	<2	<2	<2
Total Zinc (Zn)	µg/L	5	30	--	30	12	--	--	18.3	<5.0	5.8	6.6	7.5	10	8	--	--	11	--	**762**	<5	<5	5
MICROBIOLOGICAL																							
Total Coliform	MPN/100mL	1	--	--	--	49	40	--	>250	46	97	64	>250	--	261	--	--	1410	--	411	291	517	>2420
E. coli	MPN/100mL	1	--	400	--	10	31	--	69	<1	6	17	**>250**	<100	1	--	--	12	--	2	<1	3	16
Fecal Coliform	MPN/ml	--	--	400	--	--	--	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyll A - Acidification method	µg/L	0.05	--	--	--	1.15	1.36	0.59	3.50	1.54	0.53	0.55	2.48	1.33	0.76	--	--	1.18	--	0.25	0.99	0.48	0.72
Chlorophyll A - Welschmeyer method	µg/L	0.05	--	--	--	1.22	1.33	0.66	3.39	1.51	0.42	0.51	2.26	1.13	0.76	--	--	1.34	--	0.27	1.13	0.44	0.7
Total Kjeldahl Nitrogen as N	mg/L	0.4	--	--	--	--	--	--	--	--	--	--	--	--	<0.4	--	--	--	--	1.7	<0.4	0.4	<5

Notes:

RDL = Recordable Detection Limit (represents most recent sampling event RDL)
" -- " = no guideline available / Not Tested.
CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life Guideline for the protection of the environment and ecological receptors (last updated 2011)
CCME FWAL Guidelines for Aluminum, Lead, Copper and Nickel vary based on reported pH and water hardness (CCME FWAL calculation equations). The largest guideline value for each respective element range was always used.
Health Canada Guideline for Recreational Water Quality = Health Canada Guidelines for Canadian Recreational Water Quality - Draft (September, 2009)
NSE ESQs for Surface Water = Nova Scotia Environment Environmental Quality Standards for Surface Water (July 2013)
Bold = Parameter concentration exceeds CCME FWAL Guideline - Present Result.
Bold = Parameter concentration exceeds CCME FWAL Guideline - Previous Result.

SNC·LAVALIN

ATTACHMENT 1
Field Reports

FIELD REPORT – OCTOBER 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5	
Client:	Halifax Regional Municipality		
Site: Kearney Lake		**Site ID: KL1**	
Watercourse: Kearney Lake		**Location:** Kearney Lake Road	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:			
GPS Coordinates:	20T 0445718E, 4948496N (UTM, NAD83)		
SNC Field Personnel:	Ghislain Pitre		

Site Conditions

Weather:	Cloudy
Air Temperature:	10°C
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Yes, Accessible	Off Kearney Lake Road

Field Parameter Data

	Remarks
Date (d.m.y):	**27/10/2014**
Time (hh:mm):	14:55
Sample Depth (m):	1.0
pH:	6.44
Dissolved Oxygen (mg/L):	8.12
Secchi Depth (m):	2.54 **(Date: 28/10/2014)**
Water Temperature (degrees Celsius):	12.24
Conductivity (µs/cm):	223

Additional Comments / Notes

Field parameters data and water samples were collected from this location on Oct 27th, 2014. Due to cloudy weather, secchi disk measurement was collected at this sample location on Oct 28th, 2014.

A potential concern was observed; however it was concluded that probable someone dumped the death fish at this location. Based on the number of fish observed (approx.28) by SNC field personnel, it was concluded that a simple dumping of death fish was the most likely cause of this issue. As the likelihood of potential water quality sample contamination from these fish was considered low, the monitoring event proceeded as planned. The observation and associated photograph are included in the report.

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FIELD REPORT – OCTOBER 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Kearney Lake	**Site ID: KL2**	
Watercourse: Kearney Lake	**Location:** Kearney Lake Road	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0443942E, 4949803N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Cloudy
Air Temperature:	9
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Yes, Accessible	Via Lake Dr. off Hammonds Plains Rd

Field Parameter Data

	Remarks
Date (d.m.y):	27/10/2014
Time (hh:mm):	14:04
Sample Depth (m):	1.0
pH:	5.79
Dissolved Oxygen (mg/L):	7.70
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	10.77
Conductivity (µs/cm):	63

Additional Comments / Notes

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FIELD REPORT – OCTOBER 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Kearney Lake Run	**Site ID: KL3**	
Watercourse: Kearney Lake Run	**Location:** Kearney Lake Road	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0444390E, 4950406N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Cloudy
Air Temperature:	10°C
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Yes, Accessible	Walking through the woods off Kearney Lake Road

Field Parameter Data

	Remarks
Date (d.m.y):	27/10/2014
Time (hh:mm):	14:25
Sample Depth (m):	0.5
pH:	6.67
Dissolved Oxygen (mg/L):	8.12
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	12.83
Conductivity (µs/cm):	208

Additional Comments / Notes

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FIELD REPORT – OCTOBER 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Kearney Lake Run	**Site ID: KL4**	
Watercourse: Kearney Lake Run	**Location:** Kearney Lake Road	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0444463E, 4950571N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Cloudy
Air Temperature:	10°C
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Yes, Accessible	Via walking path off Kearney Lake Road

Field Parameter Data

	Remarks
Date (d.m.y):	27/10/2014
Time (hh:mm):	14:35
Sample Depth (m):	0.5
pH:	6.55
Dissolved Oxygen (mg/L):	7.52
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	12.52
Conductivity (µs/cm):	208

Additional Comments / Notes

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FIELD REPORT – OCTOBER 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 9
Client:	Halifax Regional Municipality	
Site: Kearney Lake	**Site ID: KL5**	
Watercourse: Kearney Lake	**Location:** Kearney Lake Road	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 4949142E, 445280N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Sunny
Air Temperature:	11°C
Cloud Cover:	Partially
Wildlife Sightings:	No
Site Accessibility: Yes, Accessible	Along Kearney Lake Road

Field Parameter Data

	Remarks
Date (d.m.y):	27/10/2014
Time (hh:mm):	10:45
Sample Depth (m):	1.0
pH:	6.60
Dissolved Oxygen (mg/L):	7.91
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	12.84
Conductivity (µs/cm):	211

Additional Comments / Notes

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FIELD REPORT – OCTOBER 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Highway 102	**Site ID: HWY 102-1**	
Watercourse: Marsh area	**Location:** Highway 102, south of exit 3	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0444708E, 4951644N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Sunny
Air Temperature:	9°C
Cloud Cover:	No
Wildlife Sightings:	No
Site Accessibility: Yes, Accessible	Off Highway 102

Field Parameter Data

	Remarks
Date (d.m.y):	27/10/2014
Time (hh:mm):	9:30
Sample Depth (m):	1.0
pH:	5.11
Dissolved Oxygen (mg/L):	4.54
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	10.20
Conductivity (µs/cm):	109

Additional Comments / Notes

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FIELD REPORT – OCTOBER 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Highway 102	**Site ID: HWY 102-2**	
Watercourse: Marsh area	**Location:** HWY 102, south of exit 3	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0444829E, 4951778N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Sunny
Air Temperature:	11°C
Cloud Cover:	No
Wildlife Sightings:	No
Site Accessibility: Yes, Accessible	Off Highway 102

Field Parameter Data

	Remarks
Date (d.m.y):	27/10/2014
Time (hh:mm):	10:07
Sample Depth (m):	0.5
pH:	5.85
Dissolved Oxygen (mg/L):	9.25
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	10.35
Conductivity (µs/cm):	174

Additional Comments / Notes

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FIELD REPORT – OCTOBER 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Lake Shore Drive	**Site ID: LSD**	
Watercourse: Marsh @ Lakeshore Dr.	**Location:** Kingswood Subdivision	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0442583E, 4950431N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Sunny
Air Temperature:	10°C
Cloud Cover:	Partially
Wildlife Sightings:	Yes (Deer)
Site Accessibility: Yes, Accessible	Via Lakeshore Drive in Kingswood Subdivision

Field Parameter Data

	Remarks
Date (d.m.y):	27/10/2014
Time (hh:mm):	13:30
Sample Depth (m):	0.5
pH:	6.31
Dissolved Oxygen (mg/L):	7.22
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	10.48
Conductivity (µs/cm):	111

Additional Comments / Notes

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FIELD REPORT – OCTOBER 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 9
Client:	Halifax Regional Municipality	
Site: Larry Uteck Blvd.	**Site ID: LU**	
Watercourse: Pond	**Location:** Larry Uteck off-ramp	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 4949816E, 445042N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Sunny
Air Temperature:	12°C
Cloud Cover:	No
Wildlife Sightings:	No
Site Accessibility: Yes, Accessible	From Larry Uteck Blvd. off-ramp, Halifax-bound

Field Parameter Data

	Remarks
Date (d.m.y):	27/10/2014
Time (hh:mm):	9:54
Sample Depth (m):	1.0
pH:	6.17
Dissolved Oxygen (mg/L):	7.55
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	10.18
Conductivity (µs/cm):	371

Additional Comments / Notes

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FIELD REPORT – OCTOBER 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Paper Mill Lake	**Site ID: PML1**	
Watercourse: Paper Mill Lake	**Location:** Moirs Mill Subdivision	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0445129E, 4951154N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Sunny
Air Temperature:	11°C
Cloud Cover:	Yes (some)
Wildlife Sightings:	No
Site Accessibility: Yes, Accessible	Via French Mast Lane in Moirs Mill Subdivision

Field Parameter Data

	Remarks
Date (d.m.y):	27/10/2014
Time (hh:mm):	12:35
Sample Depth (m):	1.0
pH:	6.60
Dissolved Oxygen (mg/L):	8.06
Secchi Depth (m):	N/A
Water Temperature (degrees Celsius):	12.37
Conductivity (µs/cm):	210

Additional Comments / Notes

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FIELD REPORT – OCTOBER 2014

Project:	Water Quality Monitoring - Bedford West	**Sub-Area(s):** 2, 3, 4, 5
Client:	Halifax Regional Municipality	
Site: Paper Mill Lake	**Site ID: PML2**	
Watercourse: Paper Mill Lake	**Location:** Moirs Mill Subdivision	
Monitoring Well ☐Pumping Well ☒ Surface Water ☐Spring/Seep ☐Discharge Pipe ☐Other:		
GPS Coordinates:	20T 0445363E, 4951740N (UTM, NAD83)	
SNC Field Personnel:	Ghislain Pitre	

Site Conditions

Weather:	Overcast
Air Temperature:	8°C
Cloud Cover:	Yes
Wildlife Sightings:	No
Site Accessibility: Yes, Accessible	Via Lake Dr., off Hammonds Plains Rd.

Field Parameter Data

	Remarks
Date (d.m.y):	27/10/2014
Time (hh:mm):	8:30
Sample Depth (m):	1
pH:	5.92
Dissolved Oxygen (mg/L):	7.92
Secchi Depth (m):	3.08
Water Temperature (degrees Celsius):	12.10
Conductivity (µs/cm):	215

Additional Comments / Notes

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ATTACHMENT 2

Site Photographs

Photo 1a: KL1, Kearney Lake sample location

Photo 1b: KL1, Kearney Lake (potential concern)

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Photo 2: KL2, Kearney Lake sample location

Photo 3: KL3, Kearney Lake sample location

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Photo 4: KL4, Kearney Lake sample location

Photo 5: KL5, Kearney Lake sample location.

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Photo 6: HWY102-1 sample location

Photo 7: HWY102-2 sample location

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Photo 8: LSD, Lake Shore Drive sample location.

Photo 9: LU, Larry Uteck off-ramp sample location

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Photo 10: PML1, Paper Mill Lake sample location

Photo 11: PML2, Paper Mill Lake sample location

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ATTACHMENT 3

Laboratory Certificates of Analysis

AGAT Laboratories

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

CLIENT NAME: SNC-LAVALIN
5657 SPRING GARDEN RD, SUITE 200
HALIFAX , NS B3J3R4
(902) 492-4544

ATTENTION TO: Christa Rafuse

PROJECT: 510192-0001 Bedford West

AGAT WORK ORDER: 14X907730

MICROBIOLOGY ANALYSIS REVIEWED BY: Laura Baker, Inorganics Data Reporter

WATER ANALYSIS REVIEWED BY: Jason Coughtrey, Inorganics Supervisor

DATE REPORTED: Nov 06, 2014

PAGES (INCLUDING COVER): 13

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

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Results relate only to the items tested and to all the items tested

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Certificate of Analysis

AGAT WORK ORDER: 14X907730

PROJECT: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Christa Rafuse

SAMPLING SITE:

SAMPLED BY:

Total Coliforms and E.coli (MPN)

DATE RECEIVED: 2014-10-27

DATE REPORTED: 2014-11-06

		SAMPLE DESCRIPTION:		KL-1	KL-2	KL-3	KL-4	KL-5	LSD	HWY-102-1	HWY-102-2
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014
Parameter	Unit	G / S	RDL	5999298	5999327	5999348	5999355	5999365	5999375	5999388	5999398
E. Coli (MPN)	MPN/100 mL		1	28	11	13	8	17	8	3	<1
Total Coliforms (MPN)	MPN/100 mL		1	>2420	>2420	>2420	>2420	>2420	>2420	>2420	>2420

		SAMPLE DESCRIPTION:		PML-1	PML-2	LU
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		10/27/2014	10/27/2014	10/27/2014
Parameter	Unit	G / S	RDL	5999415	5999422	5999430
E. Coli (MPN)	MPN/100 mL		1	10	16	1730
Total Coliforms (MPN)	MPN/100 mL		1	>2420	>2420	>2420

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

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Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 14X907730

PROJECT: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Christa Rafuse

SAMPLING SITE:

SAMPLED BY:

Standard Water Analysis + Metals (Total)

DATE RECEIVED: 2014-10-27

DATE REPORTED: 2014-11-06

Parameter	Unit	G / S	RDL	KL-1 Water 10/27/2014 5999298	KL-2 Water 10/27/2014 5999327	KL-3 Water 10/27/2014 5999348	KL-4 Water 10/27/2014 5999355	KL-5 Water 10/27/2014 5999365	LSD Water 10/27/2014 5999375	HWY-102-1 Water 10/27/2014 5999388	HWY-102-2 Water 10/27/2014 5999398
SAMPLE DESCRIPTION:				KL-1	KL-2	KL-3	KL-4	KL-5	LSD	HWY-102-1	HWY-102-2
SAMPLE TYPE:				Water	Water	Water	Water	Water	Water	Water	Water
DATE SAMPLED:				10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014
pH				6.35	6.06	6.59	6.85	6.63	6.72	5.90	6.40
Reactive Silica as SiO2	mg/L		0.5	1.8	4.6	2.4	2.5	2.5	4.2	4.7	5.9
Chloride	mg/L		1	46	12	45	48	47	23	19	34
Fluoride	mg/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sulphate	mg/L		2	7	3	7	8	8	4	6	8
Alkalinity	mg/L		5	<5	28	6	29	<5	10	30	8
True Color	TCU		5	23	168	20	28	22	31	93	85
Turbidity	NTU		0.1	1.9	1.2	0.9	0.8	0.8	1.4	0.9	1.1
Electrical Conductivity	umho/cm		1	235	66	216	218	225	125	112	194
Nitrate + Nitrite as N	mg/L		0.05	0.08	<0.05	0.13	0.16	0.16	0.11	0.53	0.12
Nitrate as N	mg/L		0.05	0.08	<0.05	0.13	0.16	0.16	0.11	0.53	0.12
Nitrite as N	mg/L		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ammonia as N	mg/L		0.03	<0.03	<0.03	<0.03	<0.03	0.06	<0.03	0.03	<0.03
Total Organic Carbon	mg/L		0.5	4.4	12.9	4.5	4.4	4.5	8.1	9.0	8.0
Ortho-Phosphate as P	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Sodium	mg/L		0.1	37.6	7.6	35.3	34.1	38.3	18.1	18.6	24.0
Total Potassium	mg/L		0.1	0.7	0.7	0.9	0.9	0.9	1.1	0.7	1.7
Total Calcium	mg/L		0.1	6.0	2.4	6.8	6.8	7.0	5.1	2.2	9.5
Total Magnesium	mg/L		0.1	0.9	0.6	1.0	1.0	1.0	1.1	0.6	1.8
Total Phosphorous	mg/L		0.02	0.02	0.02	0.02	<0.02	0.02	0.03	0.03	0.03
Bicarb. Alkalinity (as CaCO3)	mg/L		5	<5	28	6	29	<5	10	30	8
Carb. Alkalinity (as CaCO3)	mg/L		10	<10	<10	<10	<10	<10	<10	<10	<10
Hydroxide	mg/L		5	<5	<5	<5	<5	<5	<5	<5	<5
Calculated TDS	mg/L		1	99	44	100	117	103	59	68	85
Hardness	mg/L			18.7	8.5	21.1	21.1	21.6	17.3	8.0	31.1
Langelier Index (@20C)	NA			-3.76	-3.66	-3.39	-2.45	-3.42	-3.14	-3.85	-3.30
Langelier Index (@ 4C)	NA			-4.08	-3.98	-3.71	-2.77	-3.74	-3.46	-4.17	-3.62
Saturation pH (@ 20C)	NA			10.1	9.72	9.98	9.30	10.0	9.86	9.75	9.70
Saturation pH (@ 4C)	NA			10.4	10.0	10.3	9.62	10.4	10.2	10.1	10.0
Anion Sum	me/L			1.45	0.96	1.54	2.11	1.50	0.94	1.30	1.29

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Certificate of Analysis

AGAT WORK ORDER: 14X907730

PROJECT: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Christa Rafuse

SAMPLING SITE:

SAMPLED BY:

Standard Water Analysis + Metals (Total)

DATE RECEIVED: 2014-10-27

DATE REPORTED: 2014-11-06

Parameter	Unit	G / S	RDL	KL-1 Water 10/27/2014 5999298	KL-2 Water 10/27/2014 5999327	KL-3 Water 10/27/2014 5999348	KL-4 Water 10/27/2014 5999355	KL-5 Water 10/27/2014 5999365	LSD Water 10/27/2014 5999375	HWY-102-1 Water 10/27/2014 5999388	HWY-102-2 Water 10/27/2014 5999398
SAMPLE DESCRIPTION:				KL-1	KL-2	KL-3	KL-4	KL-5	LSD	HWY-102-1	HWY-102-2
SAMPLE TYPE:				Water	Water	Water	Water	Water	Water	Water	Water
DATE SAMPLED:				10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014
Cation sum	me/L			2.05	0.57	2.00	1.94	2.14	1.19	1.04	1.76
% Difference/ Ion Balance (NS)	%			17.2	25.7	12.8	4.2	17.5	11.8	11.2	15.1
Total Aluminum	ug/L		5	155	340	105	93	108	141	310	216
Total Antimony	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Arsenic	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Barium	ug/L		5	9	9	16	16	17	11	17	63
Total Beryllium	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Bismuth	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Boron	ug/L		5	10	12	12	11	10	16	11	12
Total Cadmium	ug/L		0.017	0.025	0.018	0.017	<0.017	0.024	<0.017	0.022	0.019
Total Chromium	ug/L		1	<1	<1	<1	<1	<1	<1	<1	<1
Total Cobalt	ug/L		1	<1	<1	<1	<1	<1	<1	<1	<1
Total Copper	ug/L		1	1	4	2	2	5	3	2	2
Total Iron	ug/L		50	168	305	118	104	119	363	290	485
Total Lead	ug/L		0.5	<0.5	0.5	<0.5	<0.5	0.5	<0.5	0.6	1.0
Total Manganese	ug/L		2	42	25	27	24	25	60	61	93
Total Molybdenum	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Nickel	ug/L		2	3	<2	<2	<2	<2	<2	<2	<2
Total Selenium	ug/L		1	<1	<1	<1	<1	<1	<1	<1	<1
Total Silver	ug/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium	ug/L		5	26	12	29	29	30	19	13	43
Total Thallium	ug/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Tin	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Titanium	ug/L		2	5	3	2	<2	2	3	<2	6
Total Uranium	ug/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Vanadium	ug/L		2	<2	<2	<2	<2	<2	<2	<2	<2
Total Zinc	ug/L		5	9	<5	6	<5	10	<5	7	17

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Certificate of Analysis

AGAT WORK ORDER: 14X907730

PROJECT: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Christa Rafuse

SAMPLING SITE:

SAMPLED BY:

Standard Water Analysis + Metals (Total)

DATE RECEIVED: 2014-10-27

DATE REPORTED: 2014-11-06

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION: PML-1	PML-2	LU
				SAMPLE TYPE: Water	Water	Water
				DATE SAMPLED: 10/27/2014	10/27/2014	10/27/2014
				5999415	5999422	5999430
pH				6.64	6.77	6.41
Reactive Silica as SiO2	mg/L		0.5	2.7	2.9	6.9
Chloride	mg/L		1	46	42	70
Fluoride	mg/L		0.1	<0.1	<0.1	<0.1
Sulphate	mg/L		2	8	7	27
Alkalinity	mg/L		5	7	26	<5
True Color	TCU		5	30	31	18
Turbidity	NTU		0.1	1.5	1	1.6
Electrical Conductivity	umho/cm		1	224	212	394
Nitrate + Nitrite as N	mg/L		0.05	0.18	0.18	1.97
Nitrate as N	mg/L		0.05	0.18	0.18	1.97
Nitrite as N	mg/L		0.05	<0.05	<0.05	<0.05
Ammonia as N	mg/L		0.03	<0.03	<0.03	<0.03
Total Organic Carbon	mg/L		0.5	4.4	5.8	4.7
Ortho-Phosphate as P	mg/L		0.01	<0.01	<0.01	<0.01
Total Sodium	mg/L		0.1	33.7	33.9	62.7
Total Potassium	mg/L		0.1	0.9	1.1	3.0
Total Calcium	mg/L		0.1	7.0	6.9	12.6
Total Magnesium	mg/L		0.1	1.0	1.0	2.2
Total Phosphorous	mg/L		0.02	0.03	0.03	0.03
Bicarb. Alkalinity (as CaCO3)	mg/L		5	7	26	<5
Carb. Alkalinity (as CaCO3)	mg/L		10	<10	<10	<10
Hydroxide	mg/L		5	<5	<5	<5
Calculated TDS	mg/L		1	102	109	187
Hardness	mg/L			21.6	21.3	40.5
Langelier Index (@20C)	NA			-3.26	-2.57	-3.41
Langelier Index (@ 4C)	NA			-3.58	-2.89	-3.73
Saturation pH (@ 20C)	NA			9.90	9.34	9.82
Saturation pH (@ 4C)	NA			10.2	9.66	10.1
Anion Sum	me/L			1.62	1.86	2.68

Original Signed

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 14X907730

PROJECT: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Christa Rafuse

SAMPLING SITE:

SAMPLED BY:

Standard Water Analysis + Metals (Total)

DATE RECEIVED: 2014-10-27

DATE REPORTED: 2014-11-06

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION: PML-1 SAMPLE TYPE: Water DATE SAMPLED: 10/27/2014 5999415	PML-2 Water 10/27/2014 5999422	LU Water 10/27/2014 5999430
Cation sum	me/L			1.94	1.95	3.64
% Difference/ Ion Balance (NS)	%			9.2	2.2	15.2
Total Aluminum	ug/L		5	142	122	109
Total Antimony	ug/L		2	<2	<2	<2
Total Arsenic	ug/L		2	<2	<2	<2
Total Barium	ug/L		5	18	19	80
Total Beryllium	ug/L		2	<2	<2	<2
Total Bismuth	ug/L		2	<2	<2	<2
Total Boron	ug/L		5	11	11	21
Total Cadmium	ug/L		0.017	<0.017	0.018	0.079
Total Chromium	ug/L		1	<1	<1	<1
Total Cobalt	ug/L		1	<1	<1	<1
Total Copper	ug/L		1	2	2	4
Total Iron	ug/L		50	182	134	229
Total Lead	ug/L		0.5	<0.5	<0.5	<0.5
Total Manganese	ug/L		2	49	24	36
Total Molybdenum	ug/L		2	<2	<2	<2
Total Nickel	ug/L		2	<2	<2	<2
Total Selenium	ug/L		1	<1	<1	<1
Total Silver	ug/L		0.1	<0.1	<0.1	<0.1
Total Strontium	ug/L		5	30	29	54
Total Thallium	ug/L		0.1	<0.1	<0.1	<0.1
Total Tin	ug/L		2	<2	<2	<2
Total Titanium	ug/L		2	3	<2	3
Total Uranium	ug/L		0.1	<0.1	<0.1	<0.1
Total Vanadium	ug/L		2	<2	<2	<2
Total Zinc	ug/L		5	6	5	23

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Original Signed

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 14X907730

PROJECT: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Christa Rafuse

SAMPLING SITE:

SAMPLED BY:

TP (Water)

DATE RECEIVED: 2014-10-27

DATE REPORTED: 2014-11-06

		SAMPLE DESCRIPTION:		KL-1	KL-2	KL-3	KL-4	KL-5	LSD	HWY-102-1	HWY-102-2
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014
Parameter	Unit	G / S	RDL	5999298	5999327	5999348	5999355	5999365	5999375	5999388	5999398
Total Phosphorus	mg/L		0.006	0.013	0.025	0.148	0.015	0.135	0.031	0.031	0.201

		SAMPLE DESCRIPTION:		PML-1	PML-2	LU
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		10/27/2014	10/27/2014	10/27/2014
Parameter	Unit	G / S	RDL	5999415	5999422	5999430
Total Phosphorus	mg/L		0.006	0.021	0.018	0.039

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

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Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 14X907730

PROJECT: 510192-0001 Bedford West

CLIENT NAME: SNC-LAVALIN

ATTENTION TO: Christa Rafuse

SAMPLING SITE:

SAMPLED BY:

TSS, TKN

DATE RECEIVED: 2014-10-27

DATE REPORTED: 2014-11-06

		SAMPLE DESCRIPTION:		KL-1	KL-2	KL-3	KL-4	KL-5	LSD	HWY-102-1	HWY-102-2
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014	10/27/2014
Parameter	Unit	G / S	RDL	5999298	5999327	5999348	5999355	5999365	5999375	5999388	5999398
Total Kjeldahl Nitrogen as N	mg/L		0.4	0.4	<0.4	0.4	<0.4	1.1	<0.4	<0.4	<0.4
Total Suspended Solids	mg/L		5	<5	<5	<5	<5	<5	8	<5	<5

		SAMPLE DESCRIPTION:		PML-1	PML-2	LU
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		10/27/2014	10/27/2014	10/27/2014
Parameter	Unit	G / S	RDL	5999415	5999422	5999430
Total Kjeldahl Nitrogen as N	mg/L		0.4	0.8	<0.4	<0.4
Total Suspended Solids	mg/L		5	<5	<5	<5

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

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Quality Assurance

CLIENT NAME: SNC-LAVALIN
AGAT WORK ORDER: 14X907730
PROJECT: 510192-0001 Bedford West
ATTENTION TO: Christa Rafuse
SAMPLING SITE:
SAMPLED BY:

Water Analysis

RPT Date: Nov 06, 2014			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Standard Water Analysis + Metals (Total)															
pH	5998984		7.64	7.57	0.9%	<	101%	80%	120%	NA	80%	120%	NA	80%	120%
Reactive Silica as SiO2	1	5999348	2.4	2.4	0.0%	< 0.5	103%	80%	120%		80%	120%	94%	80%	120%
Chloride	6000358		13	14	5.4%	< 1	99%	80%	120%	NA	80%	120%	NA	80%	120%
Fluoride	6000358		0.3	0.3	0.0%	< 0.1	88%	80%	120%	NA	80%	120%	80%	80%	120%
Sulphate	6000358		4	5	0.0%	< 2	99%	80%	120%	NA	80%	120%	94%	80%	120%
Alkalinity	5998984		50	49	1.6%	< 5	83%	80%	120%	NA	80%	120%	NA	80%	120%
True Color	1	6000035	<5	<5	0.0%	< 5	105%	80%	120%		80%	120%		80%	120%
Turbidity	1	6001427	3.9	4	2.5%	< 0.1	85%	80%	120%		80%	120%		80%	120%
Electrical Conductivity	5998984		196	192	2.0%	< 1	87%	80%	120%	NA	80%	120%	NA	80%	120%
Nitrate as N	6000358		0.15	0.18	0.0%	< 0.05	90%	80%	120%	NA	80%	120%	87%	80%	120%
Nitrite as N	6000358		<0.05	<0.05	0.0%	< 0.05	98%	80%	120%	NA	80%	120%	89%	80%	120%
Ammonia as N	1	5999430	<0.03	<0.03	0.0%	< 0.03	97%	80%	120%		80%	120%	88%	80%	120%
Total Organic Carbon	1		15.0	15.2	1.3%	< 0.5	102%	80%	120%		80%	120%	94%	80%	120%
Ortho-Phosphate as P	1	5999348	<0.01	<0.01	0.0%	< 0.01	103%	80%	120%		80%	120%	103%	80%	120%
Total Sodium	1028201		29.8	29.4	1.4%	< 0.1	108%	80%	120%	107%	80%	120%	103%	70%	130%
Total Potassium	1028201		1.3	1.3	0.0%	< 0.1	110%	80%	120%	106%	80%	120%	96%	70%	130%
Total Calcium	1028201		17.7	18.0	1.7%	< 0.1	103%	80%	120%	98%	80%	120%	108%	70%	130%
Total Magnesium	1028201		1.95	1.92	1.6%	< 0.1	100%	80%	120%	98%	80%	120%	101%	80%	120%
Total Phosphorous	1028201		0.04	0.04	0.0%	< 0.02	113%	80%	120%	110%	80%	120%	96%	70%	130%
Bicarb. Alkalinity (as CaCO3)	5998984		50	49	1.6%	< 5	NA	80%	120%	NA	80%	120%	NA	80%	120%
Carb. Alkalinity (as CaCO3)	5998984		<10	<10	0.0%	< 10	NA	80%	120%	NA	80%	120%	NA	80%	120%
Hydroxide	5998984		<5	<5	0.0%	< 5	NA	80%	120%	NA	80%	120%	NA	80%	120%
Total Aluminum	1028201		< 5	< 5	0.0%	< 5	101%	80%	120%	102%	80%	120%	91%	70%	130%
Total Antimony	1028201		< 2	< 2	0.0%	< 2	93%	80%	120%	94%	80%	120%	98%	70%	130%
Total Arsenic	1028201		4	4	0.0%	< 2	98%	80%	120%	95%	80%	120%	90%	70%	130%
Total Barium	1028201		12	11	8.7%	< 5	97%	80%	120%	94%	80%	120%	104%	70%	130%
Total Beryllium	1028201		< 2	< 2	0.0%	< 2	109%	80%	120%	104%	80%	120%	104%	70%	130%
Total Bismuth	1028201		< 2	< 2	0.0%	< 2	106%	80%	120%	94%	80%	120%	101%	70%	130%
Total Boron	1028201		53	51	3.8%	< 5	110%	80%	120%	100%	80%	120%	100%	70%	130%
Total Cadmium	1028201		0.042	0.035	18.2%	< 0.017	99%	80%	120%	95%	80%	120%	98%	70%	130%
Total Chromium	1028201		< 1	< 1	0.0%	< 1	110%	80%	120%	111%	80%	120%	100%	70%	130%
Total Cobalt	1028201		< 1	< 1	0.0%	< 1	111%	80%	120%	109%	80%	120%	96%	70%	130%
Total Copper	1028201		1	4		< 1	113%	80%	120%	110%	80%	120%	94%	70%	130%
Total Iron	1028201		< 50	< 50	0.0%	< 50	103%	80%	120%	99%	80%	120%	95%	70%	130%
Total Lead	1028201		< 0.5	< 0.5	0.0%	< 0.5	103%	80%	120%	103%	80%	120%	104%	70%	130%
Total Manganese	1028201		90	90	0.0%	< 2	99%	80%	120%	99%	80%	120%	102%	70%	130%
Total Molybdenum	1028201		19	19	0.0%	< 2	97%	80%	120%	92%	80%	120%	106%	70%	130%
Total Nickel	1028201		< 2	< 2	0.0%	< 2	112%	80%	120%	110%	80%	120%	97%	70%	130%
Total Selenium	1028201		< 1	< 1	0.0%	< 1	104%	80%	120%	98%	80%	120%	92%	70%	130%

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation.

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http://www.agatlabs.com

Quality Assurance

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 14X907730

PROJECT: 510192-0001 Bedford West

ATTENTION TO: Christa Rafuse

SAMPLING SITE:

SAMPLED BY:

Water Analysis (Continued)

RPT Date: Nov 06, 2014			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Silver	1028201		< 0.1	< 0.1	0.0%	< 0.1	101%	80%	120%	97%	80%	120%	99%	70%	130%
Total Strontium	1028201		94	91	3.2%	< 5	100%	80%	120%	100%	80%	120%	100%	70%	130%
Total Thallium	1028201		< 0.1	< 0.1	0.0%	< 0.1	100%	80%	120%	103%	80%	120%	105%	70%	130%
Total Tin	1028201		< 2	< 2	0.0%	< 2	95%	80%	120%	96%	80%	120%	98%	70%	130%
Total Titanium	1028201		< 2	< 2	0.0%	< 2	108%	80%	120%	105%	80%	120%	100%	70%	130%
Total Uranium	1028201		3.52	3.62	2.8%	< 0.1	100%	80%	120%	98%	80%	120%	120%	70%	130%
Total Vanadium	1028201		< 2	< 2	0.0%	< 2	111%	80%	120%	111%	80%	120%	100%	70%	130%
Total Zinc	1028201		< 5	< 5	0.0%	< 5	111%	80%	120%	109%	80%	120%	87%	70%	130%
TSS, TKN															
Total Kjeldahl Nitrogen as N	1	5999298	0.4	0.5	22.2%	< 0.4	108%	80%	120%		80%	120%	97%	80%	120%
Total Suspended Solids	1	5999298	<5	<5	0.0%	< 5	99%	80%	120%		80%	120%	109%	80%	120%
TP (Water)															
Total Phosphorus	5999298	5999298	0.013	0.014	7.4%	< 0.006	93%	90%	110%	98%	90%	110%	109%	80%	120%

Original Signed

Certified By:

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Method Summary

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 14X907730

PROJECT: 510192-0001 Bedford West

ATTENTION TO: Christa Rafuse

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Microbiology Analysis			
E. Coli (MPN)	MIC-121-7000	Based on SM 9223B	INCUBATOR
Total Coliforms (MPN)	MIC-121-7000	Based on SM 9223B	INCUBATOR

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Method Summary

CLIENT NAME: SNC-LAVALIN
AGAT WORK ORDER: 14X907730
PROJECT: 510192-0001 Bedford West
ATTENTION TO: Christa Rafuse
SAMPLING SITE:
SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
pH	INOR-121-6001	SM 4500 H+B	PC-TITRATE
Reactive Silica as SiO2	INORG-121-6028	SM 4110 B	COLORIMETER
Chloride	INORG-121-6005	SM 4110 B	IC
Fluoride	INORG-121-6005	SM 4110 B	IC
Sulphate	INORG-121-6005	SM 4110 B	IC
Alkalinity	INORG-121-6001	SM 2320 B	PC-TITRATE
True Color	INORG-121-6014	EPA 110.2	NEPHELOMETER
Turbidity	INORG-121-6022	SM 2130 B	NEPHELOMETER
Electrical Conductivity	INOR-121-6001	SM 2510 B	PC-TITRATE
Nitrate + Nitrite as N	INORG-121-6005	SM 4110 B	CALCULATION
Nitrate as N	INORG-121-6005	SM 4110 B	IC
Nitrite as N	INORG-121-6005	SM 4110 B	IC
Ammonia as N	INORG-121-6003	SM 4500-NH3 G	COLORIMETER
Total Organic Carbon	INORG-121-6026	SM 5310 B	TOC ANALYZER
Ortho-Phosphate as P	INORG-121-6005	SM 4110 B	COLORIMETER
Total Sodium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Potassium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Calcium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Magnesium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Phosphorous	MET-121-6104 & MET-121-6105	SM 3125	ICP/MS
Bicarb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Carb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Hydroxide	INORG-121-6001	SM 2320 B	PC-TITRATE
Calculated TDS	CALCULATION	SM 1030E	CALCULATION
Hardness	CALCULATION	SM 2340B	CALCULATION
Langelier Index (@20C)	CALCULATION	CALCULATION	CALCULATION
Langelier Index (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 20C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Anion Sum	CALCULATION	SM 1030E	CALCULATION
Cation sum	CALCULATION	SM 1030E	CALCULATION
% Difference/ Ion Balance (NS)	CALCULATION	SM 1030E	CALCULATION
Total Aluminum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Antimony	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Arsenic	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Barium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Beryllium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Bismuth	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Boron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS

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Method Summary

CLIENT NAME: SNC-LAVALIN

AGAT WORK ORDER: 14X907730

PROJECT: 510192-0001 Bedford West

ATTENTION TO: Christa Rafuse

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Cadmium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Chromium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cobalt	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Copper	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Iron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Lead	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Manganese	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Molybdenum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Nickel	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Selenium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Silver	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Strontium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Thallium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Tin	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Titanium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Uranium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Vanadium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Zinc	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Phosphorus	INOR-93-6022	SM 4500-P B & E	SPECTROPHOTOMETER
Total Kjeldahl Nitrogen as N	INOR-121-6020	SM 4500 NORG D	COLORIMETER
Total Suspended Solids	INOR-121-6024, 6025	SM 2540C, D	GRAVIMETRIC

Results relate only to the items tested and to all the items tested

Dalhousie University
Department of Oceanography
Halifax, N.S.
B3H 4R2

30-Oct-14 AGAT Laboratories, 11 Morris Dr. Unit 122, Dartmouth, NS, B3B 1M2

Attention: Lisa Johnston
Re: Determination of chlorophyll a in algae by fluorescence

AGAT Job#: 14X907730
Req#: 96721

Acidification Technique:

Sample ID	Chl a (µg/L)
5999298	0.84
5999327	0.41
5999348	1.23
5999355	1.03
5999365	0.90
5999375	0.32
5999388	1.22
5999398	0.46
5999415	0.91
5999422	0.72
5999430	0.96

Welschmeyer Technique:

Sample ID	Chl a (µg/L)
5999298	0.80
5999327	0.41
5999348	1.12
5999355	0.95
5999365	0.84
5999375	0.33
5999388	1.38
5999398	0.55

phone: (902)494-6663 **fax: (902)494-2039**

5999415	0.87
5999422	0.70
5999430	0.96

- **CHl a = chlorophyll a**
- **An underestimation of chl a occurs by the fluorescence acidification technique in the presence of Chl b. Since chl b containing chlorophytes are often present in freshwater ecosystems another technique (welschmeyer) was also employed.**
- **Reference for Welschmeyer technique Limnol. Oceanogr., 39(8) 1994, 1985-1992**

Received: 28-Oct-14
Completed: 30-Oct-14

Original Signed

Jessica Miller

phone: (902)494-6663 **fax: (902)494-2039**

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Chain of Custody Record

Turnaround Time Required (TAT)

Regular TAT 5 to 7 working days ☑
Rush TAT 24 to 48 hours ☐
48 to 72 hours ☐
Date Required: _____

Report To

Company: SNC Lavalin
Contact: Christa Rafuse
Address: 40 Fielding Avenue, Dartmouth, NS, B3B1E4
Phone: +1 (902) 468-6230 Fax: +1 (902) 468-786
PO#:
AGAT Quotation: 12-761
Client Project Name/#: 510192-0001 Bedford West

Report Information

1. Name: Maria Gutierrez
Email: Maria.Gutierrez@snclavalin.com
2. Name: Christa Rafuse
Email: christa.rafuse@snclavalin.com

Report Format

☐ Single Sample per page
☑ Multiple Samples per page
☑ Excel Format Included

Laboratory Use Only

Arrival Condition: ☑ Good ☐ Poor (see notes)
Arrival Temperature: 9°
AGAT Job Number: 14X907730
Notes:

Invoice To Same Yes ☑ / No ☐

Company:
Contact:
Address:
Phone: Fax:
PO#/Credit Card #:

Regulatory Requirements (Check):

☐ List Guidelines on Report ☐ Do not List Guidelines on Report
☐ PIRI
☐ Tier 1 ☐ Res ☐ Pot ☐ Coarse
☐ Tier 2 ☐ Com ☐ N/Pot ☐ Fine
☐ Gas ☐ Gas ☐ Lube
☐ CCME
☐ Industrial ☐ CDWQ ☐ Other
☐ Commercial ☐ NSDFOSP
☐ Res/Park ☐ HRM 101
☐ Agricultural ☐ Storm Water
☐ FWAL ☐ Waste Water
☐ Sediment

Sample Identification	Sample Matrix	Date/Time Sampled	Comments – Site/Sample Info. Sample Containment	Microtox	CCME PHC BTEX/F1-F4	Metals	AB Class II Landfill	Detailed Salinity	Routine Potability	Standard Water + Metals	Low Level Total Phosphorus	TSS & TKN	E.Coli (MPN)	Chlorophyll A	Number of Containers	Preserved (Y/N)	Hazardous (Y/N)	Lab Sample #
KL-1	WATER	Oct 27, 2014								✓	✓	✓	✓	✓				
KL-2	WATER	"								✓	✓	✓	✓	✓				
KL-3	WATER	"								✓	✓	✓	✓	✓				
KL-4	WATER	"								✓	✓	✓	✓	✓				
KL-5	WATER	"								✓	✓	✓	✓	✓				
LSD	WATER	"								✓	✓	✓	✓	✓				
HWY-102-1	WATER	"								✓	✓	✓	✓	✓				
HWY-102-2	WATER	"								✓	✓	✓	✓	✓				
PML-1	WATER	"								✓	✓	✓	✓	✓				
PML-2	WATER	"								✓	✓	✓	✓	✓				
LU	WATER	"								✓	✓	✓	✓	✓				
	WATER									✓	✓	✓	✓	✓				

Samples Relinquished by (print name & sign):	Date	Samples Received by (Print name & sign):	Date	Special Instructions	Page ___ of ___
Ghislain Pitre	Oct 27, 2014	Chris Doome	Oct 27/14		
Samples Relinquished by (print name & sign):	Date	Original Signed	Date 15:20		NO:
Samples Relinquished by (print name & sign):	Date	Samples Received by (Print name & sign):	Date		

Attachment G. Summary, E. Coli and Total Phosphorus Measurements, 2013-2014

Table 1. Summary of E. Coli data and geometric means, 2013-2014

Year	Spring	Summer	Fall	Geometric Mean	Threshold Exceeded?	Notes
Site: KL1						
2013	48	2	7	8.76	No	
2014	1	15	28	7.49	No	
Site: KL2						
2013	12	6	2	5.24	No	
2014	1	18	11	5.83	No	
Site: KL3						
2013	8	21	1	5.52	No	
2014	1	1	13	2.35	No	
Site: KL4						
2013	6	38	1	6.11	No	
2014	1	1	8	2.00	No	
Site: KL5						
2013	6	6	4	5.24	No	
2014	1	1	17	2.57	No	
Site: HWY 102-1						
2013	4	9	5	5.65	No	
2014	3	179	3	11.72	No	
Site: HWY 102-2						
2013	111	9	4	15.87	No	
2014	1	--	1	1.00	No	No results in Aug 2014; geometric mean calculated on basis of Spring & Fall only
Site: LSD						
2013	10	20	2	7.37	No	

2014	1	--	2420	49.19	No	No results in Aug 2014; geometric mean calculated on basis of Spring & Fall only. Fall result presented as >2420, based on limits of testing methodology.
Year	**Spring**	**Summer**	**Fall**	**Geometric Mean**	**Threshold**	**Year**
Site: LU						
2013	3	86	1	6.37	No	
2014	1	7	1730	22.96	No	
Site: PML1						
2013	12	4	6	6.60	No	
2014	6	10	10	8.43	No	
Site: PML2						
2013	12	--	2	4.90	No	No results in Aug 2014; geometric mean calculated on basis of Spring & Fall only
2014	1	3	16	3.63	No	

Individual results shown in grey exceed the numerical threshold (400 CFU/100mL), but the threshold is applied to the geometric mean of individual results of one station for one calendar year, not single results.

Table 2. Summary of Total Phosphorus Results, Summer 2013 – Fall 2014

Sites	2013 Summer	2013 Fall	2014 Spring	2014 Summer	2014 Fall
KL1	11	8	11	26	13
KL2	20	29	13	39	25
KL3	6	12	9	23	148
KL4	2390	16	22	31	15
KL5	13	10	10	26	135
HWY102-1	21	22	13	38	31
HWY102-2	28	199	28	--	201
LSD	15	78	100	--	31
LU	27	46	260	28	39
PML1	7	47	12	30	21
PML2	--	26	11	26	18

Seasonal Summary: # Exceedences	8	9	9	9	11
Seasonal Summary: % total	80%	82%	82%	100%	100%

Notes

1. Cells marked in grey indicate that measured Total Phosphorus results exceeded 10mg/L during the corresponding monitoring event.

2. Cells marked '--' indicate that the corresponding site was not monitored during the season.

Legend

	oligotrophic (0-10 μg/100mL): lowest trophic status, below notification threshold
	mesotrophic (10-20 μg/100mL): trophic status immediately above threshold
	meso-eutrophic (20-35 μg/100mL): trophic status two steps above threshold
	eutrophic (35-100 μg/100mL): trophic status three steps above threshold
	hypereutrophic (≥100 μg/100mL): highest trophic status, four steps above threshold