



SNC•LAVALIN
Environment



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October 18, 2010

Halifax Regional Municipality
Sustainable Environment Management Office

PO Box 1749
Halifax, Nova Scotia
B3J 3A5

Attention: Mr. Cameron Deacoff

Dear Mr. Deacoff,

RE: Final Report: Water Quality Monitoring within Bedford West, Sub Areas 3 & 4, Bedford, Nova Scotia – August 2010 Sampling Event

1. INTRODUCTION

SNC-Lavalin Inc., Environment Division (SLE) was retained by the Halifax Regional Municipality (HRM) to conduct water quality monitoring within Bedford West Sub-Areas 3 & 4. Water samples were collected from nine (9) specified locations during the August 2010 sampling event. The purpose of the program is to determine water quality for watersheds impacted by the proposed development in Bedford West. The Paper Mill Lake watershed is the primary watershed in the area. Testing shall take place prior to construction and shall detect any impacts on and 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 and Paper Mill Lake, collected on August 24, 2010. The water quality test locations are presented on Figure 1.

2. METHODOLOGY

The August 2010 monitoring event consisted of the sampling and analysis of RCAP, Total Phosphorous, Total Suspended Solids, Fecal Coliform Bacteria and Chlorophyll-a from nine (9) specified sampling locations. Standard field measurements (pH, temperature, dissolved oxygen and conductivity) were measured at all nine specified sampling locations for the August 2010 monitoring event. The field measurements were taken using Hach IntelliCAL



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probes for pH, conductivity and dissolved oxygen (Product Numbers pH30101, CDC40101 and LDO10101, respectively). The samples and field parameter readings were collected from a 1.0 metre depth.

The field parameters and site conditions for each sampling location were recorded on a field report. The field reports are attached 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 from the nine sampling locations, were submitted to Maxxam Analytics Inc., located in Bedford, Nova Scotia.

Secchi depth measurements were taken from the shady side of the boat. 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 CCME guidelines for water are broken down based on water use including Freshwater Aquatic Life, Marine Water Aquatic Life, Irrigation, Livestock Watering, Recreation and Aesthetics and Drinking Water. The surface water quality results were compared to the CCME Freshwater Aquatic Life 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 Canadian Council of Ministers of the Environment (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. Or the concentration should not increase more than 10% of background levels when background is greater than 250 mg/L.



The CCME Guidelines for Canadian Recreational Water Quality (revised 2004) were used as reference guidelines. The guidelines indicate that the clarity of the water should be sufficiently clear 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 E. coli guideline is presented as 400/100mL, since there are not five E. Coli samples taken within a 30 day period.

4. RESULTS OF THE INVESTIGATION

4.1. FIELD MEASUREMENTS

Field Parameters were measured at all nine (9) specified sampling locations during the August 2010 monitoring event. Field measurements of dissolved oxygen, pH, conductivity and temperature are presented in Table 1. Dissolved oxygen readings were recorded at four (4) sample locations that were outside the CCME guideline range of 5.5 -9.5 mg/L: KL2 (4.66 mg/L), HWY102-1 (4.25 mg/L), HWY102-2 (2.45 mg/L), and LSD (5.41 mg/L). All other dissolved oxygen readings for the remaining five sample locations were within the applied CCME guideline range.

4.2. LABORATORY ANALYTICAL RESULTS

4.2.1. GENERAL CHEMISTRY

The analytical results reported pH levels outside the CCME guideline range in two (2) samples: HWY102-1 (pH = 6.24) and HWY 102-2 (pH = 6.32). The pH levels at HWY102-1 and HWY102-2 were also outside the CCME guideline range during the June, August and October 2009 and June 2010 sampling rounds.

Turbidity concentrations at all sample locations were reported to be within the referenced CCME Recreational Water Quality guideline of 50 NTU.

Analytical results reported TSS concentrations ranging from less than 2 mg/L for samples KL3, KL4, PML1 and PML2, to 110 mg/L in sample LSD. TSS for sample LSD increased from 6 mg/L in June 2010 to 110 mg/L in August 2010, which is more than the maximum



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acceptable increase of 25 mg/L from background levels at any time when background levels are between 25 and 250 mg/L.

General Chemistry results have been provided in Table 1. Laboratory certificates have been provided in Attachment 3.

4.2.2. METALS

Analytical results reported Total Aluminum concentrations of above the CCME Freshwater Aquatic Life Guideline of 5-100 µg/L at KL2, HWY102-1, HWY102-2, and LSD (Total Aluminum: 151 µg/L, 192 µg/L, 368 µg/L, and 189 µg/L, respectively). Total Iron concentrations were reported above the CCME FWAL guideline at KL2, HWY102-1, HWY102-2, and LSD (403 µg/L, 637 µg/L, 3850 µg/L, and 965 µg/L, respectively). All other metals parameters were reported to be within the applied 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 an E. Coli concentration (>250 CFU/100 ml) that potentially exceeds the applicable guideline of 400 CFU/100 ml for sample PML1. All other E. Coli and Fecal Coliform laboratory analytical results were reported to be within the applied guidelines.

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



5. CONCLUSIONS

Water quality monitoring within the Bedford West Sub-Areas 3 & 4 was conducted on August 24, 2010 and included the collection of field parameters (pH, temperature, dissolved oxygen and specific conductivity) and the collection and analysis of RCap, Total Phosphorous, Total Suspended Solids and Total Coliform and Chlorophyll-a.

Dissolved oxygen readings were recorded at four (4) sample locations that were outside the CCME guideline range of 5.5 -9.5 mg/L: KL2 (4.66 mg/L), HWY102-1 (4.25 mg/L), HWY102-2 (2.45 mg/L), and LSD (5.41 mg/L).

The analytical results reported pH levels outside the CCME guideline range in two (2) samples: HWY102-1 (pH = 6.24) and HWY 102-2 (pH = 6.32). The pH levels at HWY102-1 and HWY102-2 were also outside the CCME guideline range during the June, August and October 2009 and June 2010 sampling rounds.

Turbidity concentrations at all sample locations were reported to be within the referenced CCME Recreational Water Quality guideline of 50 NTU.

Analytical results reported Total Aluminum concentrations of above the CCME Freshwater Aquatic Life Guideline of 5-100 µg/L at KL2, HWY102-1, HWY102-2, and LSD (Total Aluminum: 151 µg/L, 192 µg/L, 368 µg/L, and 189 µg/L, respectively). Total Iron concentrations were reported above the CCME FWAL guideline at KL2, HWY102-1, HWY102-2, and LSD (403 µg/L, 637 µg/L, 3850 µg/L, and 965 µg/L, respectively). All other metals parameters were reported to be within the applied guidelines.

The laboratory analytical results reported an E. Coli concentration (>250 CFU/100 ml) that potentially exceeds the applicable guideline of 400 CFU/100 ml for sample PML1. All other E. Coli and Fecal Coliform laboratory analytical results were reported to be within the applied guidelines.



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

Yours truly,

SNC ♦ LAVALIN ENVIRONMENT

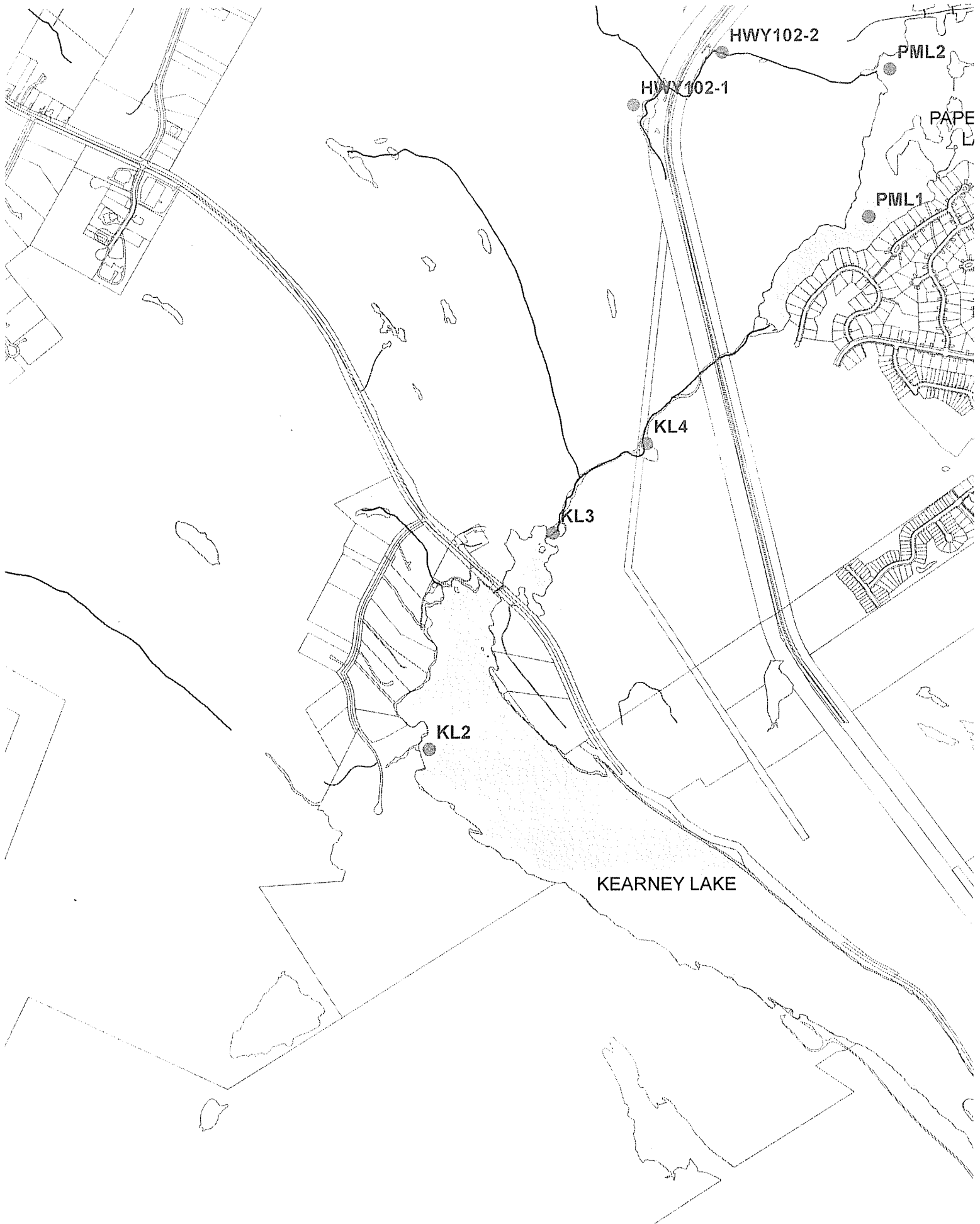
A handwritten signature in black ink, appearing to read 'Derek Heath', written in a cursive style.

Derek Heath, P.Ge.
Project Manager

DH/ap

020331-0002-T-EN-REP-0005.doc Rev B02

	KL1			KL2			KL3			KL4					
	2009-06-29 08:00	2009-08-13 11:45	2009-10-01 06:30	2010-05-31 11:00	2010-08-24 13:10	2009-06-29 11:00	2009-08-13 10:30	2009-10-01 10:45	2010-05-31 10:15	2010-08-24 12:25	2009-06-29 09:00	2009-08-13 11:00	2009-10-01 09:30	2010-05-31 11:30	2010-08-24 14:12
-	4.1	4.2	5.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5.5-5.5	14.0	22.2	16.7	12.9	23.3	16.8	18.2	15.4	13.5	20.4	14.0	17.3	17.3	23.1	21.9
-	6.20	6.26	7.00	9.13	7.86	8.50	6.35	5.70	6.28	4.66	8.00	8.00	8.10	6.30	6.27
-	263	299	261	248	242	46	106	89	199	104	95	246	246	228	224
-	18	18	16	16	8	99	74	110	61	63	22	20	20	12	11
30	310	200	250	240	240	76	100	74	80	100	250	240	230	230	230
-	81	74	64	62	60	17	73	16	31	35	46	60	60	60	56
-	13	13	12	<2	<2	<2	<2	<2	3	<2	11	10	11	11	10
13000	0.18	-	-	0.21	0.16	0.06	-	-	0.10	0.07	0.14	0.24	0.24	0.15	0.19
60	<0.01	-	-	<0.01	<0.01	<0.01	0.11	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
19	0.18	0.09	0.12	0.21	0.16	0.06	0.06	0.16	0.10	0.07	0.12	0.14	0.14	0.12	0.12
-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
6.5-9	6.94	6.65	6.66	6.91	7.00	6.58	6.61	6.61	6.59	6.78	6.57	6.82	6.82	6.99	6.83
-	2.6	2.2	2.3	2.9	2.7	3.3	4.5	4.4	4.2	4.2	2.7	2.6	2.6	2.6	2.9
-	6	8	7	8	8	5	8	5	5	4	5	7	6	7	6
300	9.2	8.5	7.2	7.72	8.66	7.8	4.2	2.9	3.44	4.08	6.7	7.1	6.8	7.9	8.00
-	1.5	1.4	1.2	1.42	1.36	0.7	1.2	0.92	0.92	0.98	1.2	1.11	1.22	1.2	1.24
-	2.4	2.9	4.7	3.3	7.2	4.8	7.2	9.9	6.6	3.1	2.6	3.3	2.5	2.6	2.6
-	<0.02	0.009	<0.002	0.007	0.04	<0.02	0.04	0.034	0.009	0.009	<0.02	0.005	0.005	<0.02	<0.02
-	1.1	0.9	1.3	0.876	0.888	0.6	1.1	0.7	0.716	0.634	0.9	0.791	0.9	1	0.807
-	51	46	37	31.8	35.2	11	15	9.9	10.7	14.7	38	35	31	37	38.3
-	1	1	<1	6	7	2	2	5	6	1	<1	1	2	<1	<2
-	0.7	0.8	1.0	1.3	0.6	0.3	7.6	1.0	1.7	1.0	0.7	0.6	0.3	0.3	0.2
-	2.72	2.52	2.23	2.12	2.08	0.82	0.45	0.45	0.77	0.85	2.11	2.08	1.90	2.22	2.09
-	8	8	8	8	8	<1	8	<1	<1	8	<1	7	6	7	7
-	166	151	131	123	125	36	55	35	46	55	128	123	110	132	135
-	2.85	2.57	2.12	1.92	2.10	0.71	0.99	0.67	0.74	0.95	2.12	1.99	1.69	2.16	2.32
-	29	27	23	25	27	10	15	10	12	22	22	22	22	22	22
-	2.33	0.98	2.53	0.48	18.30	9.39	19.60	19.60	1.99	5.56	0.24	2.21	5.85	1.03	0.48
-	-2.68	-2.87	-2.94	-2.51	-3.44	NC	-3.20	NC	-3.44	NC	NC	-2.89	-2.92	-2.89	-2.84
-	-2.93	-3.12	-3.19	-2.97	-2.76	NC	-3.45	NC	-3.70	-3.30	NC	-3.14	-3.17	-3.14	-2.89
-	9.62	9.52	9.63	9.51	9.62	NC	9.63	9.63	10.00	9.83	9.82	9.71	9.74	9.64	9.75
-	9.87	9.77	9.87	9.88	9.76	NC	10.00	NC	10.30	10.10	NC	9.92	9.99	9.92	10.00
5-100	-	-	-	47.8	-	-	-	-	151	-	-	-	-	-	29.2
5	<2	<2	<2	<2	<2	<2	<2	<2	<10	<10	<2	<10	<10	<10	<10
-	16	16	16	15.9	15.9	9	16	16	11.7	14.3	16	16	15.7	16.6	17.8
-	<2	<2	<2	<2	<2	<2	<2	<2	<20	<20	<2	<20	<20	<20	<20
0.017	<0.3	-	-	11.4	9.1	8	-	-	14.7	12.7	6	6	7.8	8.6	9.1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2.0-4.0	-	-	-	<10	<10	<10	<10	<10	<10	<10	<2	<10	<10	<10	<10
3.00	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
1.0-7.0	<0.5	-	-	62	62	250	62	62	227	403	94	73	73	86	82
73	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
25-150	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
1	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
0.1	<0.5	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
0.8	<0.1	-	-	39.1	37.7	14	-	-	17.8	19.5	34	34	33.5	35.1	36.7
-	<2	<2	<2	<2	<2	<2	<2	<2	<20	<20	<20	<20	<20	<20	<20
-	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
30	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
-	99	24	24	24	24	8	100	24	2	6	1	17	2	<1	<1
-	200	170	170	170	170	1800	63	170	>250	11	120	24	190	16	16
-	0.53	0.79	1.11	1.73	1.47	0.82	6.05	1.97	0.73	0.55	1.04	1.18	1.30	1.14	1.06
-	0.48	0.69	1.17	1.61	1.42	0.87	5.97	1.95	0.66	0.54	0.94	1.21	1.09	1.11	0.97



ATTACHMENT 1

Field Reports

SLE FIELD REPORT

Project:	Water Quality Monitoring-Bedford West Sub-Areas 3 & 4		
Client:	Halifax Regional Municipality		
Site: Lakeshore Drive	Location: Kingswood Subdivision	Site ID: LSD	
Monitoring Well <input type="checkbox"/> Pumping Well <input type="checkbox"/> Surface Water <input checked="" type="checkbox"/> Spring/Seep <input type="checkbox"/> Discharge Pipe <input type="checkbox"/> Other: <input type="checkbox"/>			
SLEI Personnel On-Site:	Meghann Kerr		

Site Conditions

Weather:	Partly cloudy, 22.4°C
Site Accessibility: Accessible	Off Lakeshore Drive

Field Parameter Data

	Remarks
Date (d.m.y)	24.08.10
Sample Depth (m)	1.0 m
pH	6.64
Dissolved Oxygen	5.41 mg/L
Secchi Depth (m)	N/A
Temperature (degrees Celcius)	21.3°C
Conductivity (µs/cm)	203.2
Photo Taken?	Yes

Additional Comments / Notes

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Report Completed by: Meghann Kerr	Date: September 10, 2010
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SLE FIELD REPORT

Project:	Water Quality Monitoring-Bedford West Sub-Areas 3 & 4		
Client:	Halifax Regional Municipality		
Site: Kearney Lake	Location: Kearney Lake Road	Site ID: KL1	
Monitoring Well <input type="checkbox"/> Pumping Well <input type="checkbox"/> Surface Water <input checked="" type="checkbox"/> Spring/Seep <input type="checkbox"/> Discharge Pipe <input type="checkbox"/> Other: <input type="checkbox"/>			
SLEI Personnel On-Site:	Meghann Kerr		

Site Conditions

Weather:	Partly cloudy, 23.4°C
Site Accessibility: Accessible	Off Kearney Lake Road

Field Parameter Data

	Remarks
Date (d.m.y)	24.08.10
Sample Depth (m)	1.0 m
pH	7.32
Dissolved Oxygen	7.86 mg/L
Secchi Depth (m)	5.0
Temperature (degrees Celcius)	23.3°C
Conductivity (µs/cm)	242
Photo Taken?	No (June 2010 photo provided in report)

Additional Comments / Notes

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Report Completed by: Meghann Kerr	Date: September 10, 2010
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SLE FIELD REPORT

Project:	Water Quality Monitoring-Bedford West Sub-Areas 3 & 4		
Client:	Halifax Regional Municipality		
Site: Kearney Lake	Location: Collins Road	Site ID: KL2	
Monitoring Well <input type="checkbox"/> Pumping Well <input type="checkbox"/> Surface Water <input checked="" type="checkbox"/> Spring/Seep <input type="checkbox"/> Discharge Pipe <input type="checkbox"/> Other:			
SLEI Personnel On-Site:	Meghann Kerr		

Site Conditions

Weather:	Partly cloudy, 21.8°C
Site Accessibility: Accessible	Off Collins Road, through wooded area

Field Parameter Data

	Remarks
Date (d.m.y)	24.08.10
Sample Depth (m)	1.0 m
pH	6.96
Dissolved Oxygen	4.66 mg/L
Secchi Depth (m)	N/A
Temperature (degrees Celcius)	20.4°C
Conductivity (µs/cm)	104.4
Photo Taken?	Yes

Additional Comments / Notes

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Report Completed by: Meghann Kerr	Date: September 10, 2010
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SLE FIELD REPORT

Project:	Water Quality Monitoring-Bedford West Sub-Areas 3 & 4		
Client:	Halifax Regional Municipality		
Site: Kearney Lake Run	Location: Kearney Lake Road	Site ID: KL3	
Monitoring Well <input type="checkbox"/> Pumping Well <input type="checkbox"/> Surface Water <input checked="" type="checkbox"/> Spring/Seep <input type="checkbox"/> Discharge Pipe <input type="checkbox"/> Other: <input type="checkbox"/>			
SLEI Personnel On-Site:	Meghann Kerr		

Site Conditions

Weather:	Partly cloudy, 22.3°C
Site Accessibility: Accessible	Off Kearney Lake Road, through woods just past dam

Field Parameter Data

	Remarks
Date (d.m.y)	24.08.10
Sample Depth (m)	1.0 m
pH	7.33
Dissolved Oxygen	7.83 mg/L
Secchi Depth (m)	N/A
Temperature (degrees Celcius)	23.1°C
Conductivity (µs/cm)	228
Photo Taken?	Yes

Additional Comments / Notes

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Report Completed by: Meghann Kerr	Date: September 10, 2010
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SLE FIELD REPORT

Project:	Water Quality Monitoring-Bedford West Sub-Areas 3 & 4		
Client:	Halifax Regional Municipality		
Site: Kearney Lake Run	Location: Kearney Lake Road	Site ID: KL4	
Monitoring Well <input type="checkbox"/> Pumping Well <input type="checkbox"/> Surface Water <input checked="" type="checkbox"/> Spring/Seep <input type="checkbox"/> Discharge Pipe <input type="checkbox"/> Other: <input type="checkbox"/>			
SLEI Personnel On-Site:	Meghann Kerr		

Site Conditions

Weather:	Partly cloudy, 21.9°C
Site Accessibility: Accessible	Off Kearney Lake Road, through woods along walking path, beyond dam

Field Parameter Data

	Remarks
Date (d.m.y)	24.08.10
Sample Depth (m)	1.0 m
pH	6.98
Dissolved Oxygen	6.27 mg/L
Secchi Depth (m)	N/A
Temperature (degrees Celcius)	21.9°C
Conductivity (µs/cm)	226
Photo Taken?	Yes

Additional Comments / Notes

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Report Completed by: Meghann Kerr	Date: September 10, 2010
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SLE FIELD REPORT

Project:	Water Quality Monitoring-Bedford West Sub-Areas 3 & 4		
Client:	Halifax Regional Municipality		
Site: Highway 102	Location: Highway 102, south of Exit 3	Site ID: HWY102-1	
Monitoring Well <input type="checkbox"/> Pumping Well <input type="checkbox"/> Surface Water <input checked="" type="checkbox"/> Spring/Seep <input type="checkbox"/> Discharge Pipe <input type="checkbox"/> Other: <input type="checkbox"/>			
SLEI Personnel On-Site:	Meghann Kerr		

Site Conditions

Weather:	Cloudy, light drizzle for <5 minutes, 20.5°C
Site Accessibility: Accessible	Off Highway 102, southbound

Field Parameter Data

	Remarks
Date (d.m.y)	24.08.10
Sample Depth (m)	1.0 m
pH	5.26
Dissolved Oxygen	4.25 mg/L
Secchi Depth (m)	N/A
Temperature (degrees Celcius)	19.6°C
Conductivity (µs/cm)	105.7
Photo Taken?	Yes

Additional Comments / Notes

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Report Completed by: Meghann Kerr	Date: September 10, 2010
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SLE FIELD REPORT

Project:	Water Quality Monitoring-Bedford West Sub-Areas 3 & 4		
Client:	Halifax Regional Municipality		
Site: Highway 102	Location: Highway 102, south of Exit 3	Site ID: HWY102-2	
Monitoring Well <input type="checkbox"/> Pumping Well <input type="checkbox"/> Surface Water <input checked="" type="checkbox"/> Spring/Seep <input type="checkbox"/> Discharge Pipe <input type="checkbox"/> Other: <input type="checkbox"/>			
SLEI Personnel On-Site:	Meghann Kerr		

Site Conditions

Weather:	Mostly cloudy, 19.4°C
Site Accessibility: Accessible	Off Highway 102, Northbound

Field Parameter Data

	Remarks
Date (d.m.y)	24.08.10
Sample Depth (m)	1.0 m
pH	5.86
Dissolved Oxygen	2.45 mg/L
Secchi Depth (m)	N/A
Temperature (degrees Celcius)	17.0°C
Conductivity (µs/cm)	167
Photo Taken?	Yes

Additional Comments / Notes

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Report Completed by: Meghann Kerr	Date: September 10, 2010
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SLE FIELD REPORT

Project:	Water Quality Monitoring-Bedford West Sub-Areas 3 & 4		
Client:	Halifax Regional Municipality		
Site: Paper Mill Lake	Location: Off Lake Dr.	Site ID: PML1	
Monitoring Well <input type="checkbox"/> Pumping Well <input type="checkbox"/> Surface Water <input checked="" type="checkbox"/> Spring/Seep <input type="checkbox"/> Discharge Pipe <input type="checkbox"/> Other: <input type="checkbox"/>			
SLEI Personnel On-Site:	Meghann Kerr		

Site Conditions

Weather:	Mostly clear, 23.0°C
Site Accessibility: Accessible	Site accessible through wooded area off Lake Dr.

Field Parameter Data

	Remarks
Date (d.m.y)	24.08.10
Sample Depth (m)	1.0 m
pH	7.35
Dissolved Oxygen	7.83 mg/L
Secchi Depth (m)	N/A
Temperature (degrees Celcius)	22.7°C
Conductivity (µs/cm)	234
Photo Taken?	Yes

Additional Comments / Notes

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Report Completed by: Meghann Kerr	Date: September 10, 2010
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SLE FIELD REPORT

Project:	Water Quality Monitoring-Bedford West Sub-Areas 3 & 4		
Client:	Halifax Regional Municipality		
Site: Paper Mill Lake	Location: Off Ahmadi Cr.	Site ID: PML2	
Monitoring Well <input type="checkbox"/> Pumping Well <input type="checkbox"/> Surface Water <input checked="" type="checkbox"/> Spring/Seep <input type="checkbox"/> Discharge Pipe <input type="checkbox"/> Other: <input type="checkbox"/>			
SLEI Personnel On-Site:	Meghann Kerr		

Site Conditions

Weather:	Mostly clear, 23.6°C
Site Accessibility: Accessible	Site accessible from Ahmadi Crescent, off Moirs Mill Road

Field Parameter Data

	Remarks
Date (d.m.y)	24.08.10
Sample Depth (m)	1.0 m
pH	7.39
Dissolved Oxygen	8.09 mg/L
Secchi Depth (m)	3.0
Temperature (degrees Celcius)	25.3°C
Conductivity (µs/cm)	234
Photo Taken?	Yes

Additional Comments / Notes

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Report Completed by: Meghann Kerr	Date: September 10, 2010
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ATTACHMENT 2

Site Photographs



Photo 1: View of KL1



Photo 2: View of sample location KL2.



Photo 3: View of sample location KL3.



Photo 4: View of sample location KL4, looking downstream.



Photo 5: View of sample location HWY102-1.



Photo 6: View from sample location HWY102-1.



Photo 7: View from sample location HWY102-2.

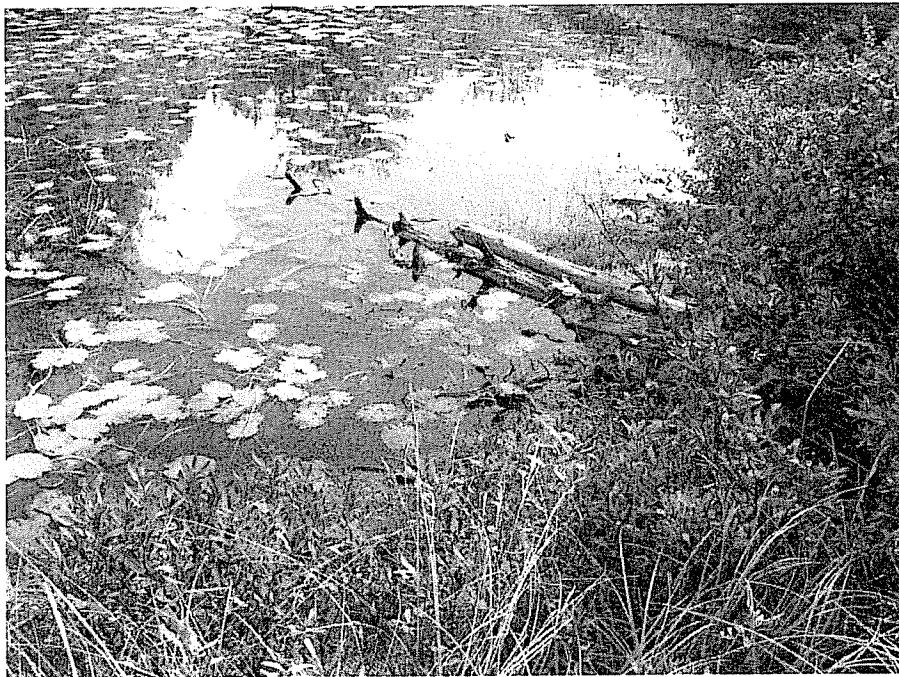


Photo 8: View from sample location LSD.



Photo 9: View of sample location PML1 off of Ahmadi Crescent in Bedford.

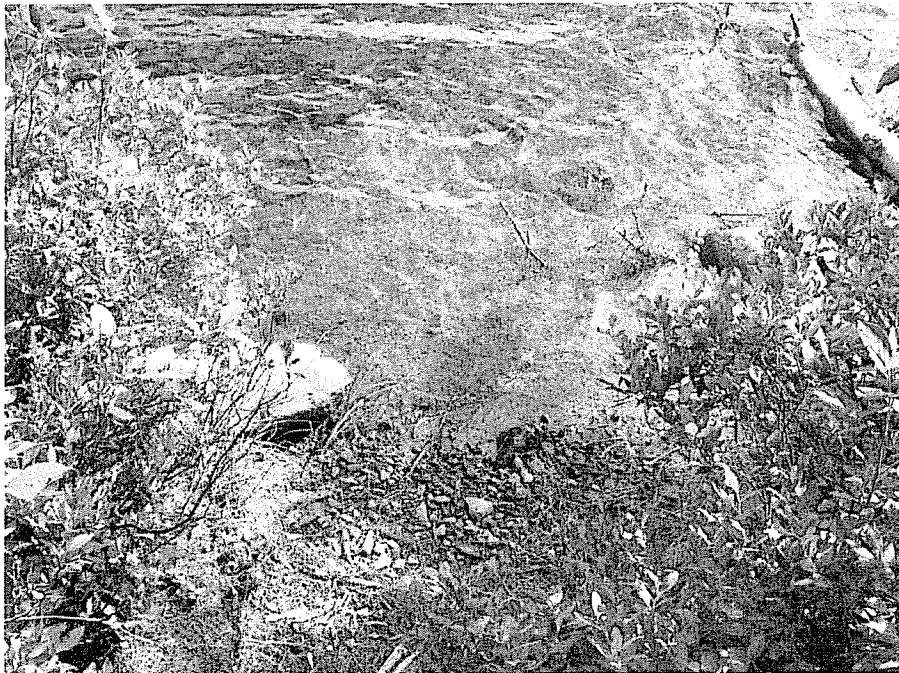


Photo 10: View of sample location PML2.

ATTACHMENT 3

Laboratory Certificates of Analysis

Your Project #: 020331-0002
 Site: BEDFORD WEST
 Your C.O.C. #: B 101589

Attention: Derek Heath
 SNC Lavalin Inc, Environment Division
 5657 Spring Garden Rd
 Suite 200
 Halifax, NS
 B3J 3R4

Report Date: 2010/09/02

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B0B5853
Received: 2010/08/25, 9:04

Sample Matrix: Water
 # Samples Received: 9

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide	1	N/A	2010/08/31		
Carbonate, Bicarbonate and Hydroxide	8	N/A	2010/09/01		
Alkalinity	9	N/A	2010/09/01	ATL SOP 00013 R4	Based on EPA310.2
Chloride	9	N/A	2010/08/31	ATL SOP 00014 R6	Based on SM4500-Cl-
Total coliform and Ecoli water	9	N/A	2010/08/25	ATL SOP 00096 R3	Based on MOE3407, SM21
Colour	9	N/A	2010/09/01	ATL SOP 00020 R3	Based on SM2120C
Conductance - water	9	N/A	2010/08/31	ATL SOP 00004 R5/00006 R4	Based on SM2510B
Hardness (calculated as CaCO3)	9	N/A	2010/09/02	ATL SOP 00048	Based on SM2340B
Metals Water Total Collision Cell MS	9	2010/08/26	2010/08/27	ATL SOP 00058 R2	Based on EPA6020A
Ion Balance (% Difference)	9	N/A	2010/09/02		
Anion and Cation Sum	9	N/A	2010/09/02		
Nitrogen Ammonia - water	9	N/A	2010/09/01	ATL SOP 00015 R5	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite	9	N/A	2010/08/31	ATL SOP 00016 R4	Based on USGS - Enz
Nitrogen - Nitrite	9	N/A	2010/09/01	ATL SOP 00017 R4	Based on SM4500-NO2B
Nitrogen - Nitrate (as N)	9	N/A	2010/09/01	ATL SOP 00018 R3	Based on ASTM D3867
pH	9	N/A	2010/08/31	ATL SOP 00003 R5/00005 R7	Based on SM4500H+
Phosphorus - ortho	9	N/A	2010/08/31	ATL SOP 00021 R3	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C)	9	N/A	2010/09/02		
Sat. pH and Langelier Index (@ 4C)	9	N/A	2010/09/02		
Reactive Silica	9	N/A	2010/09/01	ATL SOP 00022 R3	Based on EPA 366.0
Sulphate	9	N/A	2010/09/01	ATL SOP 00023 R3	Based on EPA 375.4
Chlorophyll A (Sub from Bedford) ¶	9	2010/08/25	2010/09/01		
Total Dissolved Solids (TDS calc)	9	N/A	2010/09/02		
Organic carbon - Total (TOC)	9	N/A	2010/08/31	ATL SOP 00037 R4	Based on SM5310C
Total Phosphorus (Colourimetric) ¶	9	2010/09/01	2010/09/02	CAM SOP-00407	APHA 4500 P,B,F
Total Suspended Solids	5	N/A	2010/08/25	ATL SOP 00007 R3	based on EPA 160.2
Total Suspended Solids	4	N/A	2010/08/26	ATL SOP 00007 R3	based on EPA 160.2
Turbidity	9	N/A	2010/09/01	ATL SOP 00011 R4	based on EPA 180.1

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

- (1) This test was performed by Dalhousie Department of Oceanography
- (2) This test was performed by Maxxam Analytics Mississauga

Your Project #: 020331-0002
Site: BEDFORD WEST
Your C.O.C. #: B 101589

Attention: Derek Heath
SNC Lavalin Inc, Environment Division
5657 Spring Garden Rd
Suite 200
Halifax, NS
B3J 3R4

Report Date: 2010/09/02

CERTIFICATE OF ANALYSIS

-2-

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

MICHELLE HILL, Project Manager
Email: Michelle.Hill@maxxamanalytics.com
Phone# (902) 420-0203

=====
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 2

Page 2 of 14

This document is in electronic format, hard copy is available on request

Maxxam Job #: B0B5853
 Report Date: 2010/09/02

 SNC Lavalin Inc, Environment Division
 Client Project #: 020331-0002
 Project name: BEDFORD WEST

RESULTS OF ANALYSES OF WATER

Maxxam ID		GX8752	GX8752			GX8759		
Sampling Date		2010/08/24 10:20	2010/08/24 10:20			2010/08/24 09:30		
COC Number		B 101589	B 101589			B 101589		
	Units	HWY102-1	HWY102-1 Lab-Dup	RDL	QC Batch	HWY102-2	RDL	QC Batch

Calculated Parameters								
Anion Sum	me/L	0.710		N/A	2245008	1.27	N/A	2245008
Bicarb Alkalinity (calc. as CaCO3)	mg/L	<1		1	2245005	5	1	2245005
Calculated TDS	mg/L	50		1	2245011	93	1	2245011
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1		1	2245005	<1	1	2245005
Cation Sum	me/L	0.930		N/A	2245008	1.81	N/A	2245008
Hardness (CaCO3)	mg/L	12		1	2245006	12	1	2245006
Ion Balance (% Difference)	%	13.4		N/A	2245007	17.5	N/A	2245007
Langelier Index (@ 20C)	N/A	NC			2245009	-3.70		2245009
Langelier Index (@ 4C)	N/A	NC			2245010	-3.95		2245010
Nitrate (N)	mg/L	<0.05		0.05	2244962	<0.05	0.05	2244962
Saturation pH (@ 20C)	N/A	NC			2245009	10.0		2245009
Saturation pH (@ 4C)	N/A	NC			2245010	10.3		2245010
Inorganics								
Total Alkalinity (Total as CaCO3)	mg/L	<5		5	2250534	5	5	2250534
Dissolved Chloride (Cl)	mg/L	25		1	2250906	41	1	2250906
Colour	TCU	89		30	2250912	160	30	2250912
Nitrate + Nitrite	mg/L	<0.05		0.05	2250916	<0.05	0.05	2250916
Nitrite (N)	mg/L	<0.01		0.01	2250918	<0.01	0.01	2250918
Nitrogen (Ammonia Nitrogen)	mg/L	<0.05	<0.05	0.05	2252969	0.20	0.05	2252969
Total Organic Carbon (C)	mg/L	11		0.5	2251730	14	0.5	2251730
Orthophosphate (P)	mg/L	<0.01		0.01	2250914	0.01	0.01	2250914
pH	pH	6.24		N/A	2251966	6.32	N/A	2252253
Total Phosphorus	mg/L	0.007		0.002	2252524	0.028	0.002	2252524
Reactive Silica (SiO2)	mg/L	3.8		0.5	2250910	6.4	0.5	2250910
Total Suspended Solids	mg/L	11		2	2245322	27	5	2245322
Dissolved Sulphate (SO4)	mg/L	<2		2	2250908	<2	2	2250908
Turbidity	NTU	1.2		0.1	2252624	3.1	0.1	2252624
Conductivity	uS/cm	100		1	2251973	160	1	2252258
Subcontracted Analysis								
Subcontract Parameter	N/A	ATTACHED		N/A	2245937	ATTACHED	N/A	2245937
RDL = Reportable Detection Limit QC Batch = Quality Control Batch								

Maxxam Job #: BOB5853
 Report Date: 2010/09/02

SNC Lavalin Inc, Environment Division
 Client Project #: 020331-0002
 Project name: BEDFORD WEST

RESULTS OF ANALYSES OF WATER

Maxxam ID		GX8760	GX8760		GX8761		
Sampling Date		2010/08/24 11:28	2010/08/24 11:28		2010/08/24 12:25		
COC Number		B 101589	B 101589		B 101589		
	Units	LSD	LSD Lab-Dup	RDL	KL2	RDL	QC Batch

Calculated Parameters							
Anion Sum	me/L	1.77		N/A	0.850	N/A	2245008
Bicarb Alkalinity (calc as CaCO3)	mg/L	21		1	7	1	2245005
Calculated TDS	mg/L	107		1	55	1	2245011
Carb Alkalinity (calc as CaCO3)	mg/L	<1		1	<1	1	2245005
Cation Sum	me/L	1.94		N/A	0.950	N/A	2245008
Hardness (CaCO3)	mg/L	35		1	14	1	2245006
Ion Balance (% Difference)	%	4.58		N/A	5.56	N/A	2245007
Langelier Index (@ 20C)	N/A	-1.71			-3.05		2245009
Langelier Index (@ 4C)	N/A	-1.96			-3.30		2245010
Nitrate (N)	mg/L	0.10		0.05	0.07	0.05	2244962
Saturation pH (@ 20C)	N/A	9.01			9.83		2245009
Saturation pH (@ 4C)	N/A	9.26			10.1		2245010
Inorganics							
Total Alkalinity (Total as CaCO3)	mg/L	21		5	7	5	2250534
Dissolved Chloride (Cl)	mg/L	45		1	25	1	2250906
Colour	TCU	26		5	63	30	2250912
Nitrate + Nitrite	mg/L	0.10		0.05	0.07	0.05	2250916
Nitrite (N)	mg/L	<0.01		0.01	<0.01	0.01	2250918
Nitrogen (Ammonia Nitrogen)	mg/L	<0.05		0.05	<0.05	0.05	2252969
Total Organic Carbon (C)	mg/L	6.0		0.5	6.6	0.5	2251730
Orthophosphate (P)	mg/L	<0.01		0.01	<0.01	0.01	2250914
pH	pH	7.30		N/A	6.78	N/A	2252253
Total Phosphorus	mg/L	0.10		0.002	0.009	0.002	2252524
Reactive Silica (SiO2)	mg/L	3.4		0.5	4.2	0.5	2250910
Total Suspended Solids	mg/L	110	110	10	7	2	2245322
Dissolved Sulphate (SO4)	mg/L	3		2	<2	2	2250908
Turbidity	NTU	6.2		0.1	1.0	0.1	2252624
Conductivity	uS/cm	200		1	100	1	2252258
Subcontracted Analysis							
Subcontract Parameter	N/A	ATTACHED		N/A	ATTACHED	N/A	2245937

RDL = Reportable Detection Limit
 Lab-Dup = Laboratory Initiated Duplicate
 QC Batch = Quality Control Batch

Maxxam Job #: B0B5853
 Report Date: 2010/09/02

SNC Lavalin Inc, Environment Division
 Client Project #: 020331-0002
 Project name: BEDFORD WEST

RESULTS OF ANALYSES OF WATER

Maxxam ID		GX8762		GX8763	GX8764		
Sampling Date		2010/08/24		2010/08/24	2010/08/24		
		13:10		13:50	14:12		
COC Number		B 101589		B 101589	B 101589		
	Units	KL1	QC Batch	KL4	KL3	RDL	QC Batch

Calculated Parameters							
Anion Sum	me/L	2.08	2245008	1.94	1.93	N/A	2245008
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	8	2245005	8	7	1	2245005
Calculated TDS	mg/L	125	2245011	118	117	1	2245011
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1	2245005	<1	<1	1	2245005
Cation Sum	me/L	2.10	2245008	2.02	1.97	N/A	2245008
Hardness (CaCO3)	mg/L	27	2245006	25	25	1	2245006
Ion Balance (% Difference)	%	0.480	2245007	2.02	1.03	N/A	2245007
Langelier Index (@ 20C)	N/A	-2.51	2245009	-2.64	-2.60		2245009
Langelier Index (@ 4C)	N/A	-2.76	2245010	-2.89	-2.85		2245010
Nitrate (N)	mg/L	0.16	2244962	0.19	0.15	0.05	2244962
Saturation pH (@ 20C)	N/A	9.51	2245009	9.57	9.59		2245009
Saturation pH (@ 4C)	N/A	9.76	2245010	9.82	9.84		2245010
Inorganics							
Total Alkalinity (Total as CaCO3)	mg/L	8	2250534	8	7	5	2250534
Dissolved Chloride (Cl)	mg/L	60	2250906	56	55	1	2250906
Colour	TCU	13	2250912	11	12	5	2250912
Nitrate + Nitrite	mg/L	0.16	2250916	0.19	0.15	0.05	2250916
Nitrite (N)	mg/L	<0.01	2250918	<0.01	<0.01	0.01	2250918
Nitrogen (Ammonia Nitrogen)	mg/L	<0.05	2252969	<0.05	<0.05	0.05	2252969
Total Organic Carbon (C)	mg/L	3.2	2251730	2.6	3.1	0.5	2251730
Orthophosphate (P)	mg/L	<0.01	2250914	<0.01	<0.01	0.01	2250914
pH	pH	7.00	2252253	6.93	6.99	N/A	2252253
Total Phosphorus	mg/L	0.007	2252524	<0.002	<0.002	0.002	2252524
Reactive Silica (SiO2)	mg/L	2.7	2250910	2.9	2.9	0.5	2250910
Total Suspended Solids	mg/L	17	2245322	<2	<2	2	2246290
Dissolved Sulphate (SO4)	mg/L	11	2250908	10	10	2	2250908
Turbidity	NTU	0.6	2252624	0.2	0.5	0.1	2252624
Conductivity	uS/cm	240	2252258	230	220	1	2252258
Subcontracted Analysis							
Subcontract Parameter	N/A	ATTACHED	2245937	ATTACHED	ATTACHED	N/A	2245937

RDL = Reportable Detection Limit
 QC Batch = Quality Control Batch

Maxxam Job #: B0B5853
 Report Date: 2010/09/02

 SNC Lavalin Inc, Environment Division
 Client Project #: 020331-0002
 Project name: BEDFORD WEST

RESULTS OF ANALYSES OF WATER

Maxxam ID		GX8765	GX8765	GX8766	GX8766		
Sampling Date		2010/08/24	2010/08/24	2010/08/24	2010/08/24		
		15.15	15.15	16.20	16.20		
COC Number		B 101589	B 101589	B 101589	B 101589		
	Units	PML1	PML1 Lab-Dup	PML2	PML2 Lab-Dup	RDL	QC Batch

Calculated Parameters							
Anion Sum	me/L	2.15		2.01		N/A	2245008
Bicarb. Alkalinity (calc. as CaCO ₃)	mg/L	9		8		1	2245005
Calculated TDS	mg/L	134		120		1	2245011
Carb. Alkalinity (calc. as CaCO ₃)	mg/L	<1		<1		1	2245005
Cation Sum	me/L	2.33		2.03		N/A	2245008
Hardness (CaCO ₃)	mg/L	28		24		1	2245006
Ion Balance (% Difference)	%	4.02		0.500		N/A	2245007
Langelier Index (@ 20C)	N/A	-2.43		-2.55			2245009
Langelier Index (@ 4C)	N/A	-2.68		-2.80			2245010
Nitrate (N)	mg/L	0.27		0.11		0.05	2244962
Saturation pH (@ 20C)	N/A	9.47		9.57			2245009
Saturation pH (@ 4C)	N/A	9.72		9.82			2245010
Inorganics							
Total Alkalinity (Total as CaCO ₃)	mg/L	9		8	8	5	2250534
Dissolved Chloride (Cl)	mg/L	61		58	59	1	2250906
Colour	TCU	12		13	13	5	2250912
Nitrate + Nitrite	mg/L	0.27		0.11	0.10	0.05	2250916
Nitrite (N)	mg/L	<0.01		<0.01	<0.01	0.01	2250918
Nitrogen (Ammonia Nitrogen)	mg/L	<0.05		<0.05		0.05	2252969
Total Organic Carbon (C)	mg/L	3.3		3.4		0.5	2251730
Orthophosphate (P)	mg/L	<0.01		<0.01	<0.01	0.01	2250914
pH	pH	7.04		7.02		N/A	2252253
Total Phosphorus	mg/L	0.002	<0.002	0.002		0.002	2252524
Reactive Silica (SiO ₂)	mg/L	3.4		2.3	2.3	0.5	2250910
Total Suspended Solids	mg/L	<2		<2		2	2246290
Dissolved Sulphate (SO ₄)	mg/L	12		10	10	2	2250908
Turbidity	NTU	0.9		0.8		0.1	2252624
Conductivity	uS/cm	250		230		1	2252258
Subcontracted Analysis							
Subcontract Parameter	N/A	ATTACHED		ATTACHED		N/A	2245937

RDL = Reportable Detection Limit
 Lab-Dup = Laboratory Initiated Duplicate
 QC Batch = Quality Control Batch

Maxxam Job #: B0B5853
 Report Date: 2010/09/02

SNC Lavalin Inc, Environment Division
 Client Project # 020331-0002
 Project name: BEDFORD WEST

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		GX8752	GX8759	GX8760	GX8761	GX8762		
Sampling Date		2010/08/24 10.20	2010/08/24 09.30	2010/08/24 11.28	2010/08/24 12.25	2010/08/24 13.10		
COC Number		B 101589	B 101589	B 101589	B 101589	B 101589		
	Units	HWY102-1	HWY102-2	LSD	KL2	KL1	RDL	QC Batch

Metals								
Total Aluminum (Al)	ug/L	192	368	189	151	47.8	5.0	2247891
Total Antimony (Sb)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2247891
Total Arsenic (As)	ug/L	<1.0	2.1	<1.0	<1.0	<1.0	1.0	2247891
Total Barium (Ba)	ug/L	36.9	27.7	19.2	14.3	15.9	1.0	2247891
Total Beryllium (Be)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2247891
Total Bismuth (Bi)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	2247891
Total Boron (B)	ug/L	10.9	7.8	21.6	12.7	9.1	5.0	2247891
Total Cadmium (Cd)	ug/L	<0.017	<0.017	<0.017	<0.017	<0.017	0.017	2247891
Total Calcium (Ca)	ug/L	3340	3840	10500	4080	8660	100	2247891
Total Chromium (Cr)	ug/L	<1.0	1.0	<1.0	<1.0	<1.0	1.0	2247891
Total Cobalt (Co)	ug/L	0.46	0.77	0.88	<0.40	<0.40	0.40	2247891
Total Copper (Cu)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	2247891
Total Iron (Fe)	ug/L	637	3850	965	403	62	50	2247891
Total Lead (Pb)	ug/L	0.56	2.70	0.54	<0.50	<0.50	0.50	2247891
Total Magnesium (Mg)	ug/L	791	593	2140	983	1360	100	2247891
Total Manganese (Mn)	ug/L	39.0	135	632	83.3	57.1	2.0	2247891
Total Molybdenum (Mo)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	2247891
Total Nickel (Ni)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	2247891
Total Phosphorus (P)	ug/L	<100	<100	<100	<100	<100	100	2247891
Total Potassium (K)	ug/L	1630	956	1210	634	888	100	2247891
Total Selenium (Se)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2247891
Total Silver (Ag)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	2247891
Total Sodium (Na)	ug/L	14500	32000	26900	14700	35200	100	2247891
Total Strontium (Sr)	ug/L	19.7	21.1	42.1	19.5	37.7	2.0	2247891
Total Thallium (Tl)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	2247891
Total Tin (Sn)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	2247891
Total Titanium (Ti)	ug/L	<2.0	6.4	4.1	<2.0	<2.0	2.0	2247891
Total Uranium (U)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	2247891
Total Vanadium (V)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	2247891
Total Zinc (Zn)	ug/L	6.9	12.3	6.7	5.3	7.5	5.0	2247891

RDL = Reportable Detection Limit
 QC Batch = Quality Control Batch

Maxxam Job #: B0B5853
 Report Date: 2010/09/02

SNC Lavalin Inc, Environment Division
 Client Project # 020331-0002
 Project name: BEDFORD WEST

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		GX8763	GX8763	GX8764	GX8765	GX8766		
Sampling Date		2010/08/24 13:50	2010/08/24 13:50	2010/08/24 14:12	2010/08/24 15:15	2010/08/24 16:20		
COC Number		B 101589	B 101589	B 101589	B 101589	B 101589		
	Units	KL4	KL4 Lab-Dup	KL3	PML1	PML2	RDL	QC Batch

Metals								
Total Aluminum (Al)	ug/L	29.2	30.5	53.5	45.9	55.8	5.0	2247891
Total Antimony (Sb)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2247891
Total Arsenic (As)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2247891
Total Barium (Ba)	ug/L	17.8	17.4	13.2	24.4	12.2	1.0	2247891
Total Beryllium (Be)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2247891
Total Bismuth (Bi)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	2247891
Total Boron (B)	ug/L	9.1	9.6	8.7	8.6	8.8	5.0	2247891
Total Cadmium (Cd)	ug/L	<0.017	<0.017	<0.017	<0.017	<0.017	0.017	2247891
Total Calcium (Ca)	ug/L	8000	8200	7980	9020	7690	100	2247891
Total Chromium (Cr)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2247891
Total Cobalt (Co)	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	2247891
Total Copper (Cu)	ug/L	2.4	3.1	<2.0	<2.0	<2.0	2.0	2247891
Total Iron (Fe)	ug/L	51	70	133	89	151	50	2247891
Total Lead (Pb)	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	2247891
Total Magnesium (Mg)	ug/L	1240	1330	1280	1220	1170	100	2247891
Total Manganese (Mn)	ug/L	63.5	67.0	67.1	68.9	81.0	2.0	2247891
Total Molybdenum (Mo)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	2247891
Total Nickel (Ni)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	2247891
Total Phosphorus (P)	ug/L	<100	<100	<100	<100	<100	100	2247891
Total Potassium (K)	ug/L	905	889	837	1060	900	100	2247891
Total Selenium (Se)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2247891
Total Silver (Ag)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	2247891
Total Sodium (Na)	ug/L	34300	34800	33100	40200	35100	100	2247891
Total Strontium (Sr)	ug/L	36.7	36.9	35.9	37.1	32.8	2.0	2247891
Total Thallium (Tl)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	2247891
Total Tin (Sn)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	2247891
Total Titanium (Ti)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	2247891
Total Uranium (U)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	2247891
Total Vanadium (V)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	2247891
Total Zinc (Zn)	ug/L	6.9	7.9	6.9	5.4	<5.0	5.0	2247891

RDL = Reportable Detection Limit
 Lab-Dup = Laboratory Initiated Duplicate
 QC Batch = Quality Control Batch

Maxxam Job #: B0B5853
 Report Date: 2010/09/02

SNC Lavalin Inc, Environment Division
 Client Project #: 020331-0002
 Project name: BEDFORD WEST

MICROBIOLOGY (WATER)

Maxxam ID		GX8752	GX8759	GX8760	GX8761	GX8762		
Sampling Date		2010/08/24 10:20	2010/08/24 09:30	2010/08/24 11:28	2010/08/24 12:25	2010/08/24 13:10		
COC Number		B 101589	B 101589	B 101589	B 101589	B 101589		
	Units	HWY102-1	HWY102-2	LSD	KL2	KL1	RDL	QC Batch

Microbiological								
Escherichia coli	CFU/100mL	17	5	45	6	15	1	2245254
Total Coliforms	CFU/100mL	>250	75	>250	11	63	1	2245254

RDL = Reportable Detection Limit
 QC Batch = Quality Control Batch

Maxxam ID		GX8763	GX8764	GX8765	GX8766		
Sampling Date		2010/08/24 13:50	2010/08/24 14:12	2010/08/24 15:15	2010/08/24 16:20		
COC Number		B 101589	B 101589	B 101589	B 101589		
	Units	KL4	KL3	PML1	PML2	RDL	QC Batch

Microbiological							
Escherichia coli	CFU/100mL	<1	<1	>250	<1	1	2245254
Total Coliforms	CFU/100mL	16	16	>250	46	1	2245254

RDL = Reportable Detection Limit
 QC Batch = Quality Control Batch

Maxxam Job #: B0B5853
Report Date: 2010/09/02

SNC Lavalin Inc, Environment Division
Client Project #: 020331-0002
Project name: BEDFORD WEST

GENERAL COMMENTS

Sample GX8752-01: Results for calcium, sodium, phosphorous and potassium were reported for the ICP-OES.

RCAp Ion Balance acceptable. Low ionic strength sample

Sample GX8759-01: Results for sodium, phosphorous and potassium were reported for the ICP-OES

Poor RCAp Ion Balance due to sample matrix. Excess cations due to presence of turbidity

Sample GX8760-01: Results for sodium, phosphorous and potassium were reported for the ICP-OES

Sample GX8761-01: Results for sodium, phosphorous and potassium were reported for the ICP-OES. RCAp Ion Balance acceptable
Anion/cation agreement within 0.2 meq/L.

Sample GX8762-01: Results for sodium, phosphorous and potassium were reported for the ICP-OES

Sample GX8763-01: Results for sodium, phosphorous and potassium were reported for the ICP-OES

Sample GX8764-01: Results for sodium, phosphorous and potassium were reported for the ICP-OES

Sample GX8765-01: Results for sodium, phosphorous and potassium were reported for the ICP-OES

Sample GX8766-01: Results for sodium, phosphorous and potassium were reported for the ICP-OES

Results relate only to the items tested.

SNC Lavalin Inc, Environment Division
 Attention: Derek Heath
 Client Project #: 020331-0002
 P. O. #:
 Project name: BEDFORD WEST

Quality Assurance Report
 Maxxam Job Number: DB0B5853

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
2245254 ODE	Method Blank	Escherichia coli	2010/08/25	<1		CFU/100mL	
		Total Coliforms	2010/08/25	<1		CFU/100mL	
2245322 JDW	QC Standard	Total Suspended Solids	2010/08/25		101	%	80 - 120
	Method Blank	Total Suspended Solids	2010/08/25	<1		mg/L	
	RPD [GX8760-01]	Total Suspended Solids	2010/08/25	0		%	25
2246290 JDW	QC Standard	Total Suspended Solids	2010/08/26		96	%	80 - 120
	Method Blank	Total Suspended Solids	2010/08/26	<1		mg/L	
	RPD	Total Suspended Solids	2010/08/26	NC		%	25
2247891 MLB	Matrix Spike [GX8766-01]	Total Aluminum (Al)	2010/08/27		98	%	80 - 120
		Total Antimony (Sb)	2010/08/27		114	%	80 - 120
		Total Arsenic (As)	2010/08/27		96	%	80 - 120
		Total Barium (Ba)	2010/08/27		NC	%	80 - 120
		Total Beryllium (Be)	2010/08/27		111	%	80 - 120
		Total Bismuth (Bi)	2010/08/27		89	%	80 - 120
		Total Boron (B)	2010/08/27		101	%	80 - 120
		Total Cadmium (Cd)	2010/08/27		97	%	80 - 120
		Total Calcium (Ca)	2010/08/27		103	%	80 - 120
		Total Chromium (Cr)	2010/08/27		102	%	80 - 120
		Total Cobalt (Co)	2010/08/27		98	%	80 - 120
		Total Copper (Cu)	2010/08/27		94	%	80 - 120
		Total Iron (Fe)	2010/08/27		100	%	80 - 120
		Total Lead (Pb)	2010/08/27		94	%	80 - 120
		Total Magnesium (Mg)	2010/08/27		98	%	80 - 120
		Total Manganese (Mn)	2010/08/27		NC	%	80 - 120
		Total Molybdenum (Mo)	2010/08/27		106	%	80 - 120
		Total Nickel (Ni)	2010/08/27		97	%	80 - 120
		Total Phosphorus (P)	2010/08/27		95	%	80 - 120
		Total Potassium (K)	2010/08/27		94	%	80 - 120
		Total Selenium (Se)	2010/08/27		95	%	80 - 120
		Total Silver (Ag)	2010/08/27		93	%	80 - 120
		Total Sodium (Na)	2010/08/27		NC	%	80 - 120
		Total Strontium (Sr)	2010/08/27		NC	%	80 - 120
		Total Thallium (Tl)	2010/08/27		95	%	80 - 120
		Total Tin (Sn)	2010/08/27		104	%	80 - 120
		Total Titanium (Ti)	2010/08/27		102	%	80 - 120
		Total Uranium (U)	2010/08/27		101	%	80 - 120
		Total Vanadium (V)	2010/08/27		106	%	80 - 120
		Total Zinc (Zn)	2010/08/27		96	%	80 - 120
	Spiked Blank	Total Aluminum (Al)	2010/08/27		96	%	80 - 120
		Total Antimony (Sb)	2010/08/27		115	%	80 - 120
		Total Arsenic (As)	2010/08/27		95	%	80 - 120
		Total Barium (Ba)	2010/08/27		99	%	80 - 120
		Total Beryllium (Be)	2010/08/27		106	%	80 - 120
		Total Bismuth (Bi)	2010/08/27		98	%	80 - 120
		Total Boron (B)	2010/08/27		95	%	80 - 120
		Total Cadmium (Cd)	2010/08/27		95	%	80 - 120
		Total Calcium (Ca)	2010/08/27		104	%	80 - 120
		Total Chromium (Cr)	2010/08/27		109	%	80 - 120
		Total Cobalt (Co)	2010/08/27		104	%	80 - 120
		Total Copper (Cu)	2010/08/27		101	%	80 - 120
		Total Iron (Fe)	2010/08/27		102	%	80 - 120
		Total Lead (Pb)	2010/08/27		102	%	80 - 120
		Total Magnesium (Mg)	2010/08/27		96	%	80 - 120
		Total Manganese (Mn)	2010/08/27		97	%	80 - 120

SNC Lavalin Inc, Environment Division
 Attention: Derek Heath
 Client Project #: 020331-0002
 P.O. #:
 Project name: BEDFORD WEST

Quality Assurance Report (Continued)

Maxxam Job Number: DB0B5853

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits		
2247891	MLB	Spiked Blank	Total Molybdenum (Mo)	2010/08/27		107	% 80 - 120		
			Total Nickel (Ni)	2010/08/27		101	% 80 - 120		
			Total Phosphorus (P)	2010/08/27		94	% 80 - 120		
			Total Potassium (K)	2010/08/27		93	% 80 - 120		
			Total Selenium (Se)	2010/08/27		100	% 80 - 120		
			Total Silver (Ag)	2010/08/27		93	% 80 - 120		
			Total Sodium (Na)	2010/08/27		96	% 80 - 120		
			Total Strontium (Sr)	2010/08/27		103	% 80 - 120		
			Total Thallium (Tl)	2010/08/27		105	% 80 - 120		
			Total Tin (Sn)	2010/08/27		109	% 80 - 120		
			Total Titanium (Ti)	2010/08/27		112	% 80 - 120		
			Total Uranium (U)	2010/08/27		107	% 80 - 120		
			Total Vanadium (V)	2010/08/27		112	% 80 - 120		
			Total Zinc (Zn)	2010/08/27		98	% 80 - 120		
			Method Blank	Total Aluminum (Al)	2010/08/27	<5.0		ug/L	
				Total Antimony (Sb)	2010/08/27	<1.0		ug/L	
				Total Arsenic (As)	2010/08/27	<1.0		ug/L	
				Total Barium (Ba)	2010/08/27	<1.0		ug/L	
				Total Beryllium (Be)	2010/08/27	<1.0		ug/L	
Total Bismuth (Bi)	2010/08/27	<2.0			ug/L				
Total Boron (B)	2010/08/27	<5.0			ug/L				
Total Cadmium (Cd)	2010/08/27	<0.017			ug/L				
Total Calcium (Ca)	2010/08/27	<100			ug/L				
Total Chromium (Cr)	2010/08/27	<1.0			ug/L				
Total Cobalt (Co)	2010/08/27	<0.40			ug/L				
Total Copper (Cu)	2010/08/27	<2.0			ug/L				
Total Iron (Fe)	2010/08/27	<50			ug/L				
Total Lead (Pb)	2010/08/27	<0.50			ug/L				
Total Magnesium (Mg)	2010/08/27	<100			ug/L				
Total Manganese (Mn)	2010/08/27	<2.0			ug/L				
Total Molybdenum (Mo)	2010/08/27	<2.0			ug/L				
Total Nickel (Ni)	2010/08/27	<2.0			ug/L				
Total Phosphorus (P)	2010/08/27	<100			ug/L				
Total Potassium (K)	2010/08/27	<100			ug/L				
Total Selenium (Se)	2010/08/27	<1.0			ug/L				
Total Silver (Ag)	2010/08/27	<0.10			ug/L				
Total Sodium (Na)	2010/08/27	<100			ug/L				
Total Strontium (Sr)	2010/08/27	<2.0			ug/L				
Total Thallium (Tl)	2010/08/27	<0.10			ug/L				
Total Tin (Sn)	2010/08/27	<2.0			ug/L				
Total Titanium (Ti)	2010/08/27	<2.0			ug/L				
Total Uranium (U)	2010/08/27	<0.10			ug/L				
Total Vanadium (V)	2010/08/27	<2.0			ug/L				
Total Zinc (Zn)	2010/08/27	<5.0			ug/L				
RPD [GX8763-01]	Total Aluminum (Al)	2010/08/27		4.5		%	25		
	Total Antimony (Sb)	2010/08/27		NC		%	25		
	Total Arsenic (As)	2010/08/27		NC		%	25		
	Total Barium (Ba)	2010/08/27	2.0		%	25			
	Total Beryllium (Be)	2010/08/27	NC		%	25			
	Total Bismuth (Bi)	2010/08/27	NC		%	25			
	Total Boron (B)	2010/08/27	NC		%	25			
	Total Cadmium (Cd)	2010/08/27	NC		%	25			
	Total Calcium (Ca)	2010/08/27	2.5		%	25			
	Total Chromium (Cr)	2010/08/27	NC		%	25			
Total Cobalt (Co)	2010/08/27	NC		%	25				

SNC Lavalin Inc, Environment Division
 Attention: Derek Heath
 Client Project #: 020331-0002
 P.O. #
 Project name: BEDFORD WEST

Quality Assurance Report (Continued)

Maxxam Job Number: DB0B5853

QA/QC Batch	Date Analyzed	Parameter	Value	Recovery	Units	QC Limits
Num Init QC Type	yyyy/mm/dd					
2247891 MLB RPD [GX8763-01]	2010/08/27	Total Copper (Cu)	NC		%	25
	2010/08/27	Total Iron (Fe)	NC		%	25
	2010/08/27	Total Lead (Pb)	NC		%	25
	2010/08/27	Total Magnesium (Mg)	6.8		%	25
	2010/08/27	Total Manganese (Mn)	5.4		%	25
	2010/08/27	Total Molybdenum (Mo)	NC		%	25
	2010/08/27	Total Nickel (Ni)	NC		%	25
	2010/08/27	Total Phosphorus (P)	NC		%	25
	2010/08/27	Total Potassium (K)	1.8		%	25
	2010/08/27	Total Selenium (Se)	NC		%	25
	2010/08/27	Total Silver (Ag)	NC		%	25
	2010/08/27	Total Sodium (Na)	1.6		%	25
	2010/08/27	Total Strontium (Sr)	0.5		%	25
	2010/08/27	Total Thallium (Tl)	NC		%	25
	2010/08/27	Total Tin (Sn)	NC		%	25
	2010/08/27	Total Titanium (Ti)	NC		%	25
	2010/08/27	Total Uranium (U)	NC		%	25
	2010/08/27	Total Vanadium (V)	NC		%	25
	2010/08/27	Total Zinc (Zn)	NC		%	25
2250534 JOA Matrix Spike [GX8766-01]		Total Alkalinity (Total as CaCO3)		95	%	80 - 120
QC Standard	2010/09/01	Total Alkalinity (Total as CaCO3)		107	%	80 - 120
Spiked Blank	2010/09/01	Total Alkalinity (Total as CaCO3)		104	%	80 - 120
Method Blank	2010/09/01	Total Alkalinity (Total as CaCO3)	<5		mg/L	
RPD [GX8766-01]	2010/09/01	Total Alkalinity (Total as CaCO3)	NC		%	25
2250906 JOA Matrix Spike [GX8766-01]		Dissolved Chloride (Cl)		NC	%	80 - 120
QC Standard	2010/08/31	Dissolved Chloride (Cl)		101	%	80 - 120
Spiked Blank	2010/08/31	Dissolved Chloride (Cl)		100	%	80 - 120
Method Blank	2010/08/31	Dissolved Chloride (Cl)	<1		mg/L	
RPD [GX8766-01]	2010/08/31	Dissolved Chloride (Cl)	1.5		%	25
2250908 SMT Matrix Spike [GX8766-01]		Dissolved Sulphate (SO4)		110	%	80 - 120
QC Standard	2010/09/01	Dissolved Sulphate (SO4)		107	%	80 - 120
Spiked Blank	2010/09/01	Dissolved Sulphate (SO4)		110	%	80 - 120
Method Blank	2010/09/01	Dissolved Sulphate (SO4)	<2		mg/L	
RPD [GX8766-01]	2010/09/01	Dissolved Sulphate (SO4)	NC		%	25
2250910 DLB Matrix Spike [GX8766-01]		Reactive Silica (SiO2)		98	%	80 - 120
QC Standard	2010/09/01	Reactive Silica (SiO2)		98	%	75 - 125
Spiked Blank	2010/09/01	Reactive Silica (SiO2)		100	%	80 - 120
Method Blank	2010/09/01	Reactive Silica (SiO2)	<0.5		mg/L	
RPD [GX8766-01]	2010/09/01	Reactive Silica (SiO2)	NC		%	25
2250912 SMT QC Standard	2010/09/01	Colour		107	%	80 - 120
Method Blank	2010/09/01	Colour	<5		TCU	
RPD [GX8766-01]	2010/09/01	Colour	NC		%	25
2250914 SMT Matrix Spike [GX8766-01]		Orthophosphate (P)		91	%	80 - 120
QC Standard	2010/08/31	Orthophosphate (P)		99	%	80 - 120
Spiked Blank	2010/08/31	Orthophosphate (P)		100	%	80 - 120
Method Blank	2010/08/31	Orthophosphate (P)	<0.01		mg/L	
RPD [GX8766-01]	2010/08/31	Orthophosphate (P)	NC		%	25
2250916 DLB Matrix Spike [GX8766-01]		Nitrate + Nitrite		102	%	80 - 120
QC Standard	2010/08/31	Nitrate + Nitrite		101	%	80 - 120

SNC Lavalin Inc, Environment Division
 Attention: Derek Heath
 Client Project #: 020331-0002
 P O. #:
 Project name: BEDFORD WEST

Quality Assurance Report (Continued)

Maxxam Job Number: DB0B5853

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
2250916 DLB	Spiked Blank	Nitrate + Nitrite	2010/08/31		103	%	80 - 120
	Method Blank	Nitrate + Nitrite	2010/08/31	<0.05		mg/L	
	RPD [GX8766-01]	Nitrate + Nitrite	2010/08/31	NC		%	25
2250918 SMT	Matrix Spike [GX8766-01]	Nitrite (N)	2010/09/01		99	%	80 - 120
	QC Standard	Nitrite (N)	2010/09/01		104	%	80 - 120
	Spiked Blank	Nitrite (N)	2010/09/01		104	%	80 - 120
	Method Blank	Nitrite (N)	2010/09/01	<0.01		mg/L	
	RPD [GX8766-01]	Nitrite (N)	2010/09/01	NC		%	25
2251730 CRA	Matrix Spike	Total Organic Carbon (C)	2010/08/31		105	%	80 - 120
	QC Standard	Total Organic Carbon (C)	2010/08/31		104	%	80 - 120
	Spiked Blank	Total Organic Carbon (C)	2010/08/31		104	%	80 - 120
	Method Blank	Total Organic Carbon (C)	2010/08/31	<0.5		mg/L	
	RPD	Total Organic Carbon (C)	2010/08/31	NC		%	25
2251966 ARS	QC Standard	pH	2010/08/31		101	%	80 - 120
	Method Blank	pH	2010/08/31	5.83		pH	
	RPD	pH	2010/08/31	1.4		%	25
2251973 ARS	QC Standard	Conductivity	2010/08/31		100	%	80 - 120
	Method Blank	Conductivity	2010/08/31	<1		uS/cm	
	RPD	Conductivity	2010/08/31	2.2		%	25
2252253 ARS	QC Standard	pH	2010/08/31		100	%	80 - 120
	Method Blank	pH	2010/08/31	5.36		pH	
	RPD	pH	2010/08/31	0.6		%	25
2252258 ARS	QC Standard	Conductivity	2010/08/31		101	%	80 - 120
	Method Blank	Conductivity	2010/08/31	<1		uS/cm	
	RPD	Conductivity	2010/08/31	0.08		%	25
2252524 VRO	Matrix Spike [GX8765-02]	Total Phosphorus	2010/09/02		101	%	80 - 120
	QC Standard	Total Phosphorus	2010/09/02		110	%	85 - 115
	Spiked Blank	Total Phosphorus	2010/09/02		107	%	85 - 115
	Method Blank	Total Phosphorus	2010/09/02	<0.002		mg/L	
	RPD [GX8765-02]	Total Phosphorus	2010/09/02	NC		%	20
2252624 ARS	QC Standard	Turbidity	2010/09/01		100	%	80 - 120
	Method Blank	Turbidity	2010/09/01	<0.1		NTU	
	RPD	Turbidity	2010/09/01	22.9		%	25
2252969 DLB	Matrix Spike [GX8752-01]	Nitrogen (Ammonia Nitrogen)	2010/09/01		90	%	80 - 120
	QC Standard	Nitrogen (Ammonia Nitrogen)	2010/09/01		98	%	80 - 120
	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2010/09/01		91	%	80 - 120
	Method Blank	Nitrogen (Ammonia Nitrogen)	2010/09/01	<0.05		mg/L	
	RPD [GX8752-01]	Nitrogen (Ammonia Nitrogen)	2010/09/01	NC		%	25

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
 Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference
 QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
 Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
 Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
 NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
 NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.



Dalhousie University

Department of Oceanography
Halifax, N.S.
B3H 4J1

01-September-10
1G9

Maxxam Analytics Inc., 200 Bluewater Road, Bedford, NS, B4B

Attention: Michelle Hill
algae by fluorescence

Re: Determination of chlorophyll a in

Maxxam Project#: B0B5853

Acidification Technique:

Maxxam ID	Client ID	Chl a ($\mu\text{g/L}$)
GX8752-03R	HWY102-1	1.61
GX8759-03R	HWY102-2	16.36
GX8760-03R	LSD	6.64
GX8761-03R	KL2	0.55
GX8762-03R	KL1	1.47
GX8763-03R	KL4	0.07
GX8764-03R	KL3	1.14
GX8765-03R	PML1	1.12
GX8766-03R	PML2	1.54

Welschmeyer Technique:

Maxxam ID	Client ID	Chl a ($\mu\text{g/L}$)
GX8752-03R	HWY102-1	1.68
GX8759-03R	HWY102-2	17.35
GX8760-03R	LSD	7.71
GX8761-03R	KL2	0.54
GX8762-03R	KL1	1.42
GX8763-03R	KL4	0.07

GX8764-03R	KL3	1.19
GX8765-03R	PML1	1.04
GX8766-03R	PML2	1.51

- **CHI 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**

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