Stantec Consulting Ltd.
40 Highfield Park Drive, Suite 102
Dartmouth NS B3A 0A3
Tel (902) 468-7777
Fax (902) 468-9009

Stantec

April 30, 2010
File: 121510291

Clayton Development Limited
255 Lacewood Drive, Suite 100C
Halifax, NS B3M 4G2

Attention: Mike Hanusiak, Sr. Vice President, General Manager

Dear Mr. Hanusiak:

Reference: Water Quality Monitoring Results for Russell Lake – March 2010 Sampling Event

To monitor the effects of development, water quality monitoring has been undertaken on a seasonal basis since April of 2005 at four stations in Russell Lake (Figure 1). Monitoring events include one spring, two summers and one fall sampling event each year. Water samples are not collected in winter. Sampling results have been provided in previous letter reports to you, with a summary of the sampling up to October 29, 2009 presented in the report dated December 11, 2009. The present report builds on the results to date while focusing on the monitoring results for the March 18, 2010 spring sampling event.

The weather was overcast and warm at the time of sampling and clear to partly cloudy with no rain for the two days prior to the sampling event. Winds blew generally from the west and were below 30 km/hr for the two days leading up to and on the day of sample collection.

Sampling was conducted between 11:00 and 13:00 on March 18, 2010. At the time of sample collection in the North Inlet station, the water was clear although the water level appeared lower than usual. The grating within the culvert was obstructed by garbage and decaying vegetation. Water flowing from the South Inlet was clear and water levels at this station also appeared lower than usual. Within Russell Lake there was ice approximately 2-3 cm thick at the southern end and a silt boom remained attached to the western bank approximately midway along the length of the lake. There were no additional conditions of note although a couple of ducks were observed within the boat launch area. At the Outlet station of Russell Lake the water level again appeared low while running clear. The substrate was covered in a layer of dark organic detritus, most likely the remnants from in-stream and shoreline vegetation. Shoreline vegetation encroached within the channel and slowed flow along the banks and where algae were observed within the slow moving areas.

Tables 1 - 4 present water quality data for the period from April 2005 to March 2010 at the four Russell Lake monitoring stations: In-Lake, Outlet, South Inlet and North Inlet sampling stations. The trends for some of the key parameters (TSS, pH, conductivity, sodium and chloride, total phosphorus (TP), chlorophyll *a* and faecal coliforms) are presented graphically in Figures 2 to 8.

Total Suspended Solids

TSS concentrations (Figure 2) were very low with the maximum concentration of 2 mg/L measured within the South Inlet. TSS concentrations at the remaining three sites were below detection limits. These results were generally lower than previous spring results for the North Inlet and generally consistent with previous spring results for the remaining three sites.

pH

Measurements of pH collected since April 2005 (Figure 3) indicate that the waters of Russell Lake are generally neutral. The pH readings in March 2010 were neutral and are consistent with results from previous fall sampling events. Field measurements of pH for the March 2010 sampling event ranged from 7.5 at the Outlet station to 8.1 at the North Inlet stations. Historically, spring pH values have ranged from 6.5 to 7.8 for the In-Lake station with those at the Outlet station within a comparable range from 6.5 to 7.5. At the South Inlet station pH values in the spring have ranged from 6.4 to 7.8 and from 7.0 to 8.1 for the North Inlet station.

Salt Concentrations

Russell Lake has higher levels of salt concentrations due to the level of development within the watershed. This is typical of any urban lake when compared to a similar lake in a less developed watershed. Conductivity increases with salt concentrations and elevated levels are typically exhibited during spring melt conditions. Concentrations tend to be higher at the North Inlet station where the road network and associated drainage is concentrated and lower at the South Inlet station which is less developed.

As shown in Tables 1-4 and on Figure 4, the March 2010 conductivity measurements at the In-Lake and Outlet stations (620 µS/cm and 630 µS/cm respectively) were within the range observed over the duration of monitoring and similar to the measurements taken in the spring of 2007 and 2008. The conductivity at the South Inlet (270 µS/cm) was above previous spring measurements with the exception of 2008 when conductivity measured 330 µS/cm. The conductivity measurement at the North Inlet station was elevated at 2200 µS/cm; the second highest measurement observed at all stations in all seasons since 2005.

Sodium (Na) concentrations in March 2010 at the In-Lake, Outlet and South Inlet stations (95 mg/L, 98 mg/L, 35 mg/L respectively) were within the range observed over the duration of monitoring and the In-Lake and Outlet showed similar concentrations to those measured in the spring of 2007 and 2008. Concentrations at the North Inlet station were elevated at 350 mg/L.

Chloride ions at the In-Lake, Outlet and South Inlet stations (170 mg/L, 170 mg/L, 62 mg/L respectively) were within the range observed over the duration of monitoring and the In-Lake and Outlet showed similar concentrations to those from the spring of 2007 and 2008. Concentrations at the North Inlet station were elevated at 640 mg/L and were the second highest measurements observed in all seasons since 2005. (Tables 1-4; Figure 5).

The spring values for the In-Lake sampling station for 2005 to 2009 ranged from 350 to 1000 µS/cm for conductivity, from 58mg/L to 180 mg/L for sodium and from 91 to 270 mg/L for chloride. In March 2010 the values at this station were within that range with conductivity measured at 620 µS/cm, sodium at 95 mg/L and chloride at 170 mg/L. Similar values are typically observed between the Outlet station and the In-Lake station, as supported by the range of spring values at the Outlet station for conductivity (360 to 1000 µS/cm), sodium (61 to 160 mg/L) and chloride (93 to 270 mg/L) for the spring 2005 to 2009 sampling events. In March

2010 at the Outlet station, the results were within this range with conductivity measured at 630 µS/cm, sodium at 98 mg/L and chloride at 170 mg/L.

The spring 2005 to 2009 values for the South Inlet station ranged from 130 to 330 µS/cm for conductivity with results for sodium ranging from 15 to 47 mg/L and chloride ranging from 23 to 76 mg/L. The March 2010 values at this station were within the historic range at 140 µS/cm for conductivity, 16 mg/L for sodium and 23 mg/L for chloride.

The spring 2005 to 2009 values for the North Inlet Station ranged from 490 to 5,100 µS/cm for conductivity, from 75 to 990 mg/L for sodium, and from 110 to 1,500 mg/L for chloride. In March 2010, the concentrations measured at the North Inlet station for conductivity, sodium and chloride were 2,200 µS/cm, 350 mg/L and 640 mg/L, respectively. These results are generally higher than the values for fall from 2005 to 2009 with the exception of 2008 when concentrations were higher for all three parameters.

Nutrient Enrichment

The chlorophyll a (Chl a) concentration (based on the acidification technique) at the In-Lake site for March 2010 was 1.99 µg/L. This concentration is generally lower than results for the previous spring events with the exception of 2008. The spring results for the previous sampling years ranged from 1.44 µg/L in 2008 to 9.69 µg/L in 2007 (Figure 7). Total phosphorus (TP) concentrations at the In-Lake site have fluctuated over the spring sampling periods, ranging from a low of <5 µg/L in 2005 to a high of 15 µg/L in 2006 (Figure 6). The March 2010 result was 5 µg/L, and the second lowest value compared to previous sampling events and below the HRM threshold value of 15 µg/L for Russell Lake. It is noted that the threshold value is intended for comparison to sample results at the In-Lake Station only.

The Chl a concentration at the Outlet station in March 2010 measured 2.92 µg/L. The spring 2010 result is the second lowest spring value recorded between 2007 when Chl a was first measured and 2010 where the values ranged from 1.54 to 7.85. The spring 2010 TP concentration at the Outlet station measured 6 µg/L, which is below all previous spring results (Table 2) which ranged from a low of 7 µg/L in 2005 to a high of 17 µg/L in 2009.

The Chl a concentration for the March 2010 sampling event at the South Inlet Station was 1.37 µg/L. This result is within the range of previous spring values which were between 0.69 µg/L in 2009 to 2.22 µg/L in 2007. The TP concentration at the South Inlet Station in March 2010 measured 45 µg/L and is the highest TP concentration measured in the spring at the South Inlet Station. The previous TP concentrations ranged from 18 µg/L in 2008 to 42 µg/L in 2005.

The Chl a concentration for the March 2010 sampling event at the North Inlet Station was 0.83 µg/L. This result is within the range of previous spring values which were between 0.31 µg/L in 2008 to 1.08 µg/L in 2007. The TP concentration at the North Inlet station in March 2010 measured 7 µg/L and is the second lowest TP concentration measured in the spring at the North Inlet station. The previous TP concentrations ranged from >5 µg/L to 180 µg/L.

Bacterial Contamination

Bacterial contamination in Russell Lake is measured by sampling and testing for the presence of faecal coliforms in the water. In addition to faecal coliform analysis conducted by the lab, a request for analysis of *Escherichia coli* (*E. coli*) was added for this event. *E coli* are a type of faecal coliform but may be considered a

more specific indicator of bacteria found in the intestines of warm blooded animals and humans and a strong indication of recent sewage or animal waste contamination, whereas some faecal bacteria may originate from non-faecal sources. *E coli* counts were 1 CFU/100 mL for the In-Lake and 3 CFU/100 mL at the Outlet stations, 2 CFU/100 mL for the South Inlet and 45 CFU/100 mL for the North Inlet. Samples analyzed for faecal coliforms at the four stations during the March 2010 sampling event were all below detection limits of 1 MPN/100 mL. The geometric mean of the results for faecal coliform analysis indicate that levels were below CCME Recreational Guideline for freshwater at the time of sample collection.

Conclusion

The results of the March 2010 sampling event indicate that total phosphorus levels at the In-Lake station are below the HRM threshold value of 15 µg/L. Chl a concentrations were generally lower than the 2007-2008 spring results. TP concentrations were within the low end of the range of previous spring results, with the exception of the South Inlet which the spring 2010 sample was above all previous concentrations.

The March 2010 conductivity, sodium (Na) and chloride (Cl) concentrations were within the range of previous sampling events for all sites and were characteristic of spring values. TSS measurements were very low and pH measurements indicate that the lake water is neutral. All faecal coliform and *E coli* results were below the CCME Recreational guidelines.

Sincerely,

STANTEC CONSULTING LTD

Shannan Murphy, B.Sc
Project Manager
Tel: (902) 468-7777
shannan.murphy@stantec.com

cc: Cameron Deacoff, Halifax Regional Municipality

Attachment: Figures 1-8 and Tables 1-4

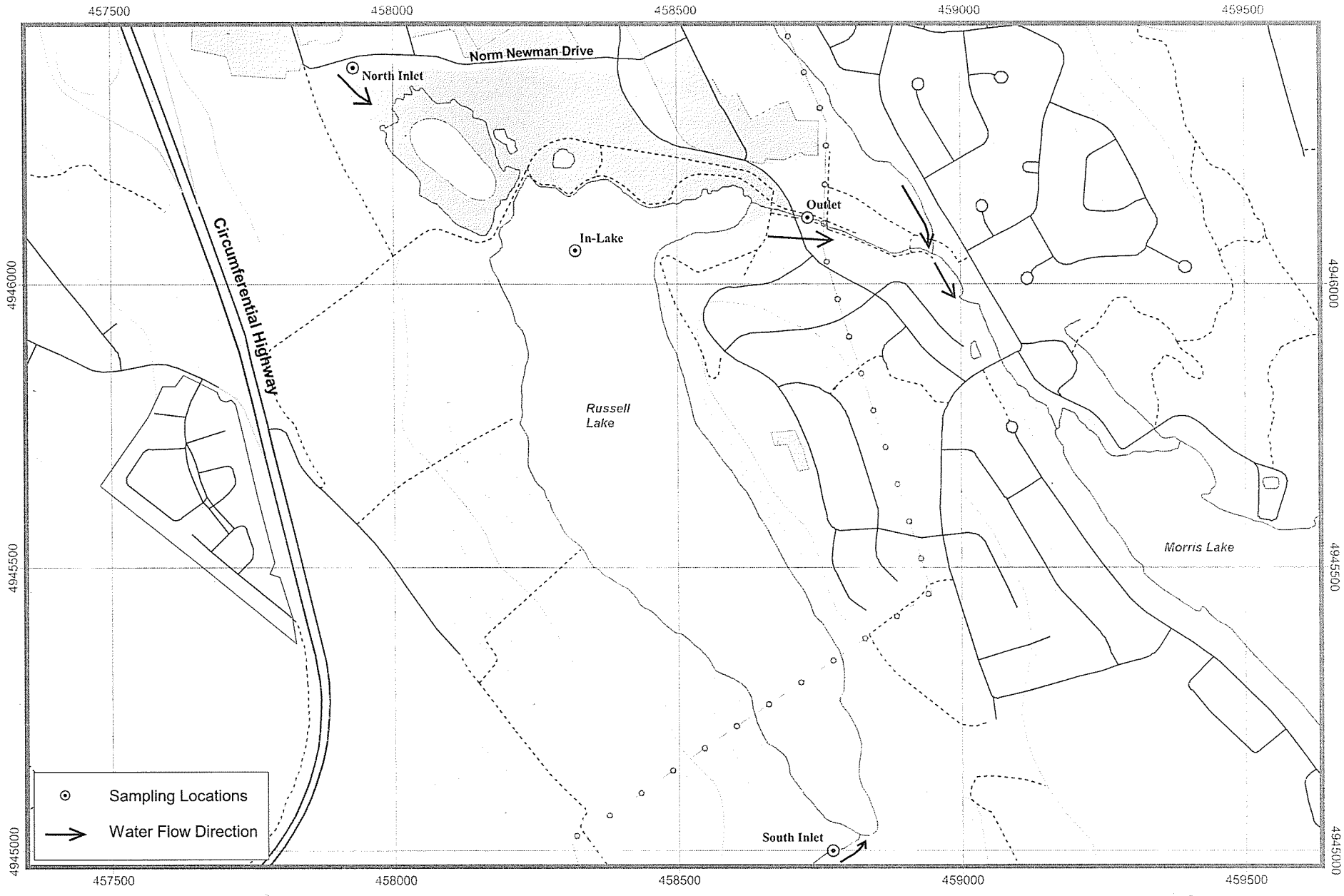


Figure 1

Russell Lake Sampling Locations

0 250 500

Metres

Map Parameters
Projection: UTM-NAD83-Z20
Scale 1:9,000
Date: May 11, 2007
Project No.. NSD19184

Stantec

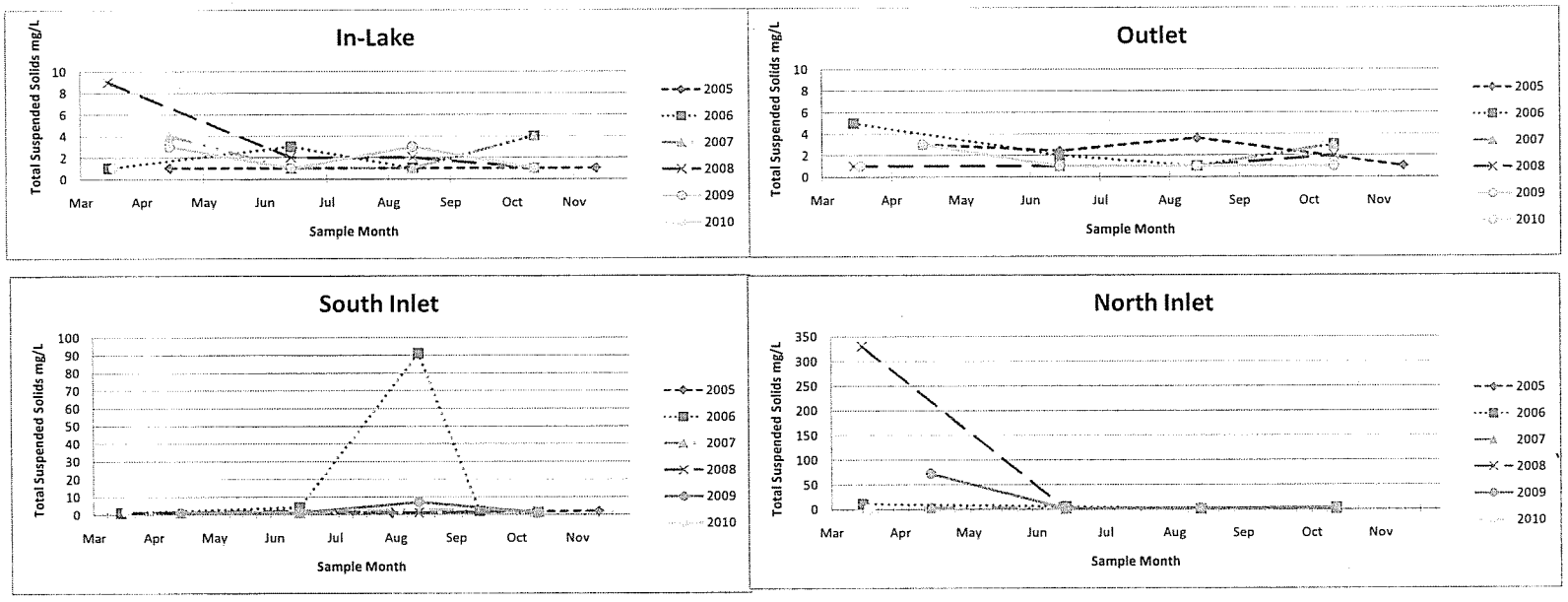
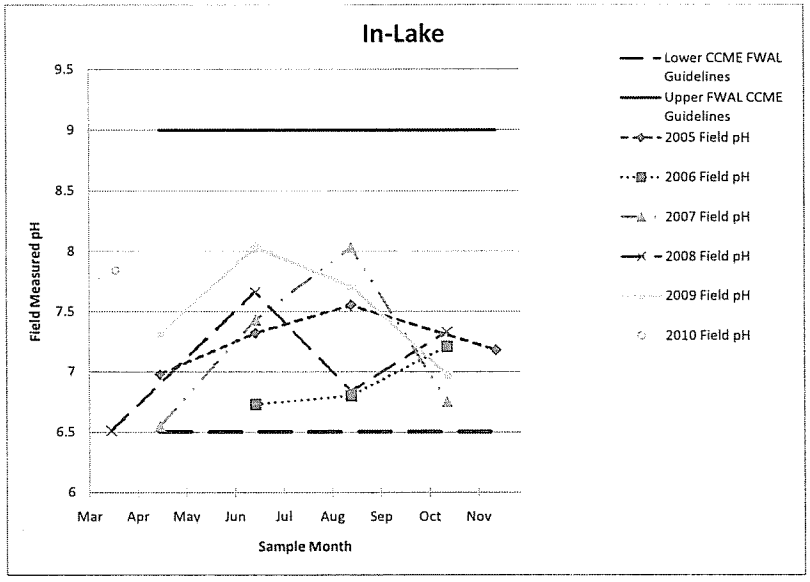
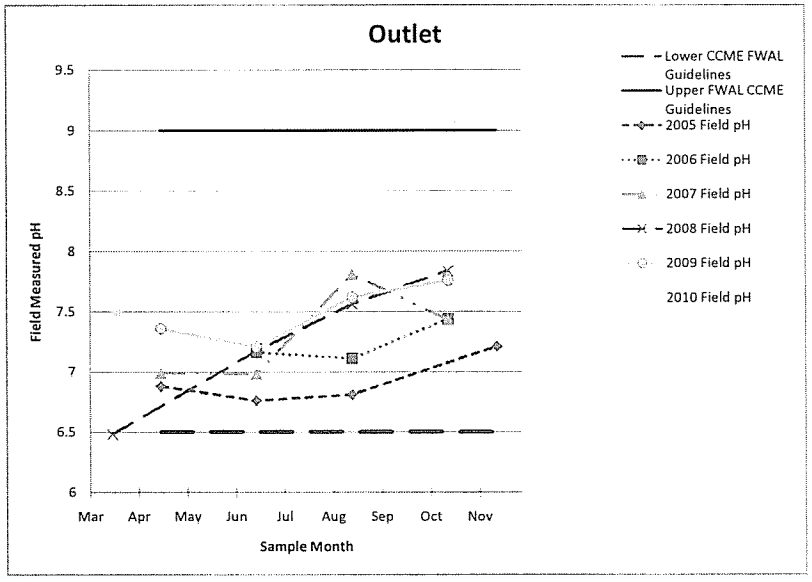
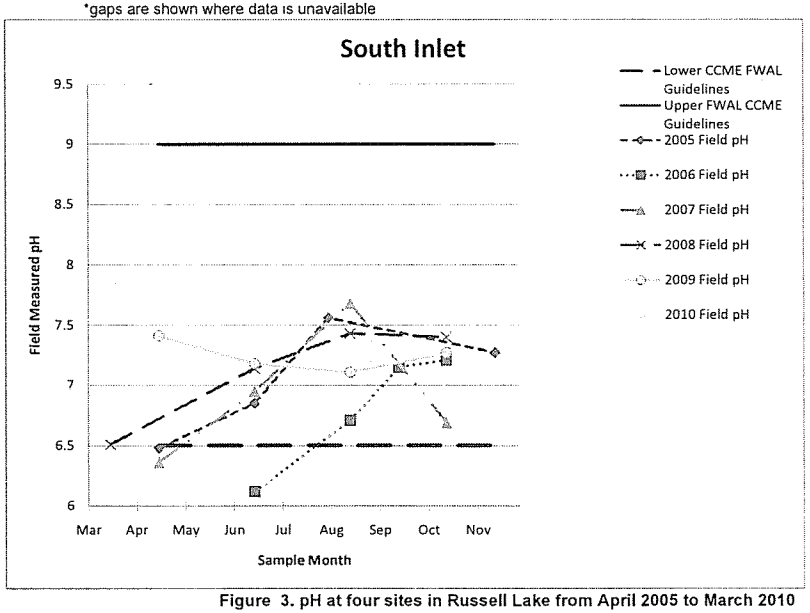


Figure 2. Total Suspended Solids at four sites in Russell Lake from April 2005 to March 2010





*gaps are shown where data is unavailable



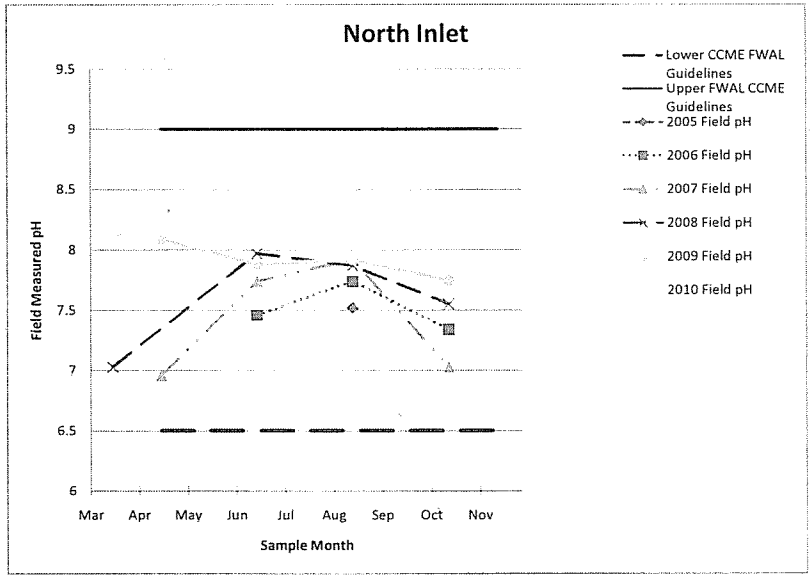
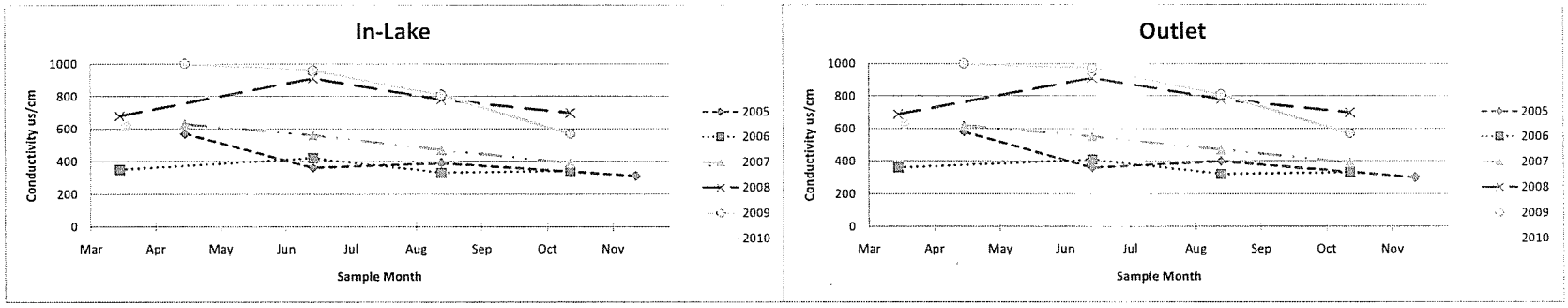


Figure 3. pH at four sites in Russell Lake from April 2005 to March 2010



*gaps are shown where data is unavailable

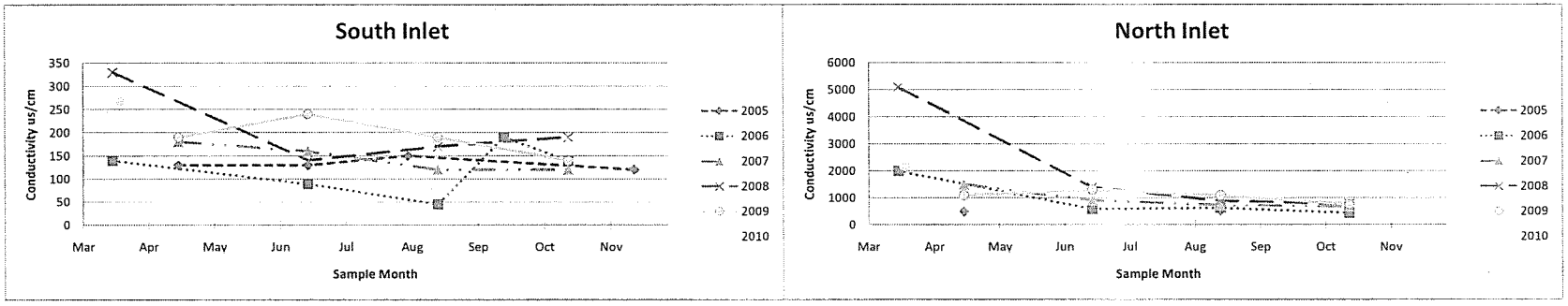
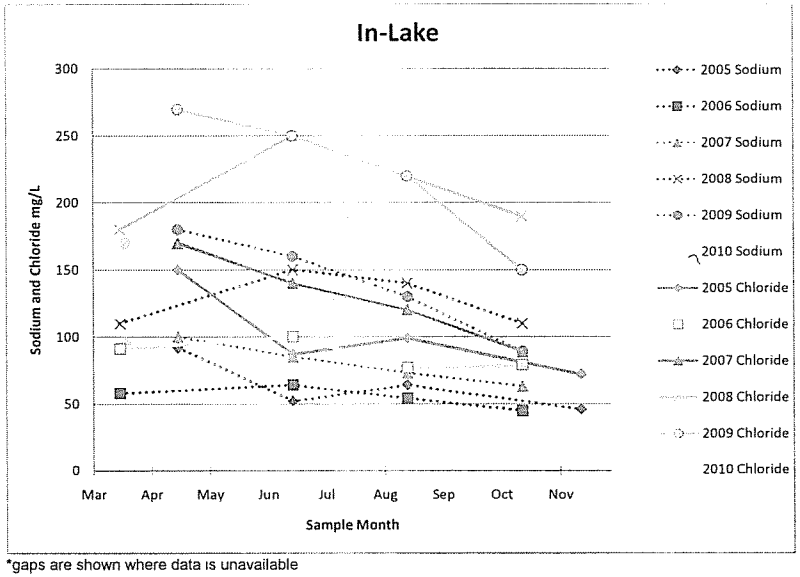
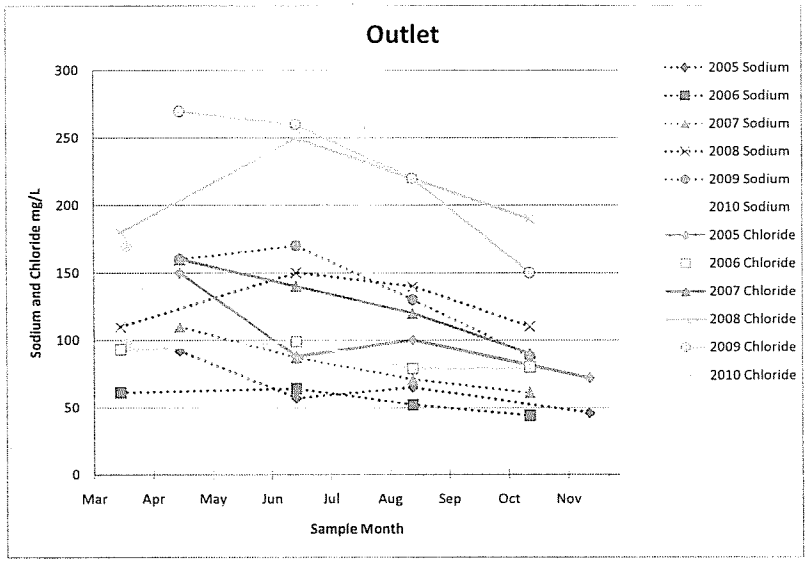
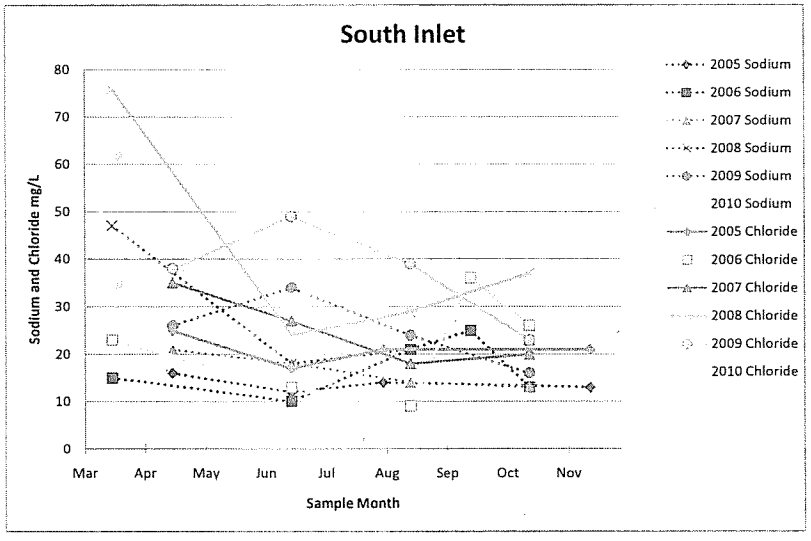


Figure 4. Conductivity at four sites in Russell Lake from April 2005 to March 2010





*gaps are shown where data is unavailable



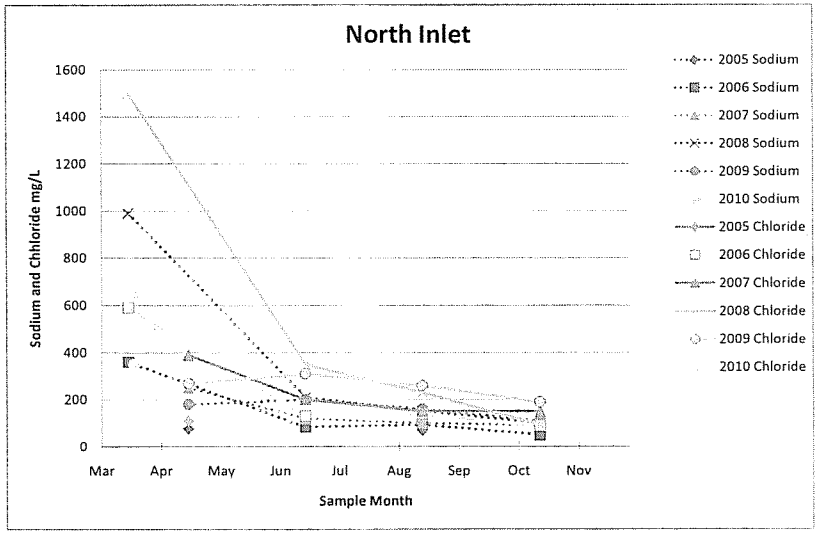
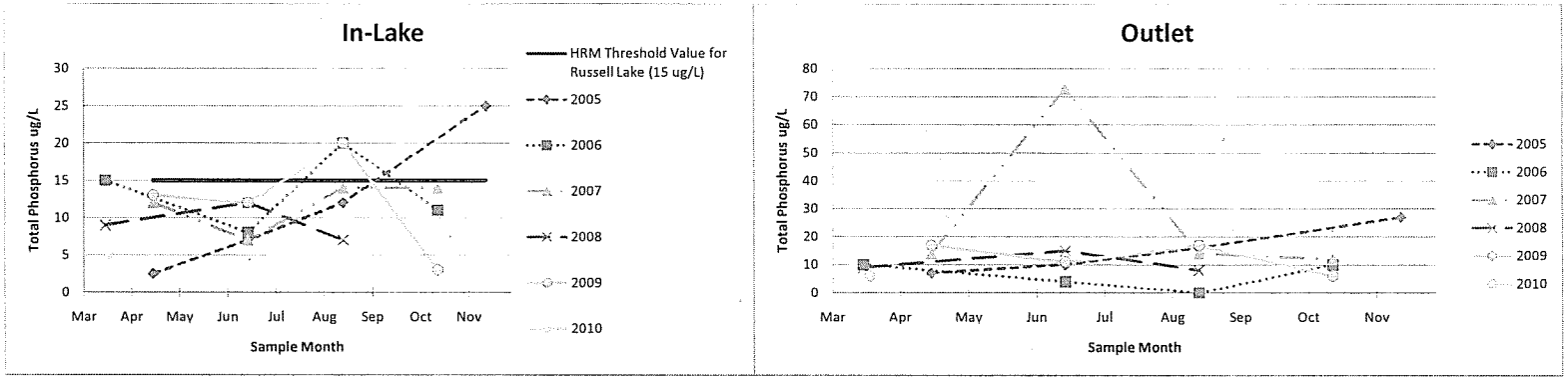


Figure 5. Sodium and chloride concentrations at four sites in Russell Lake from April 2005 to March 2010



*gaps are shown where data is unavailable

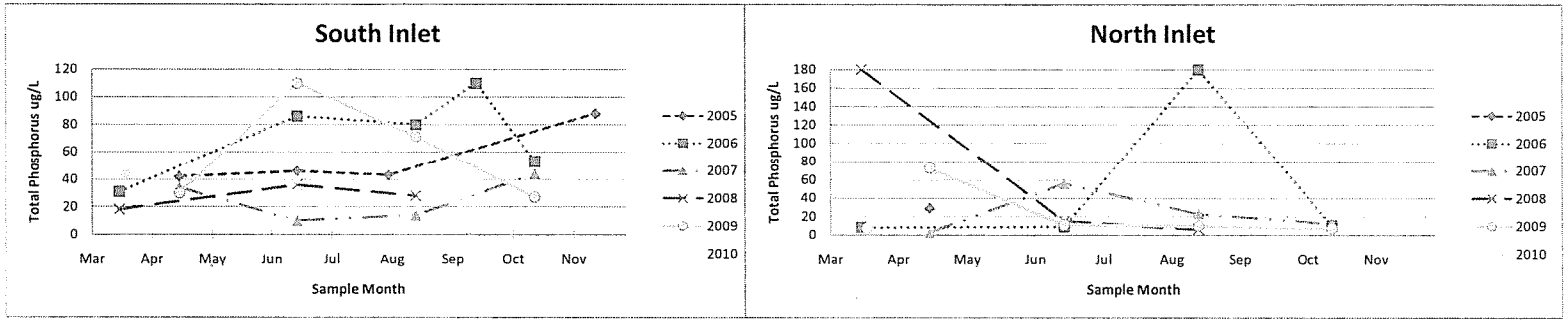
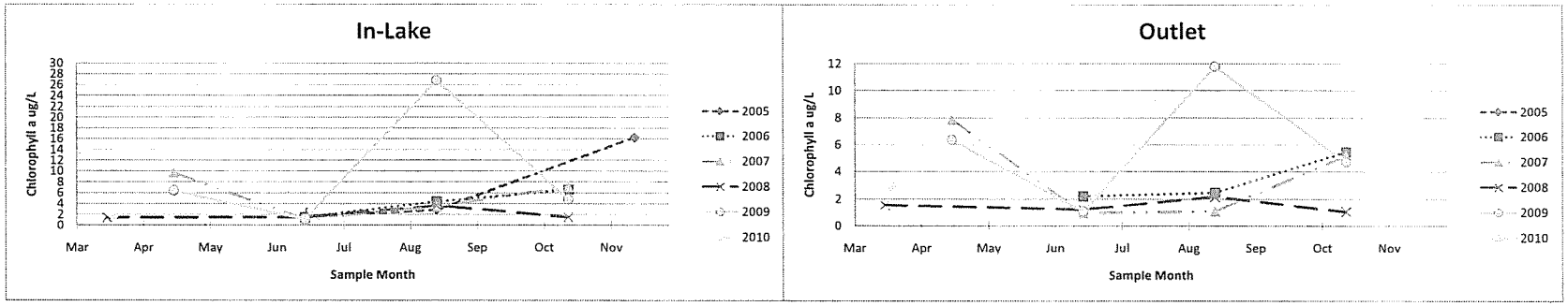
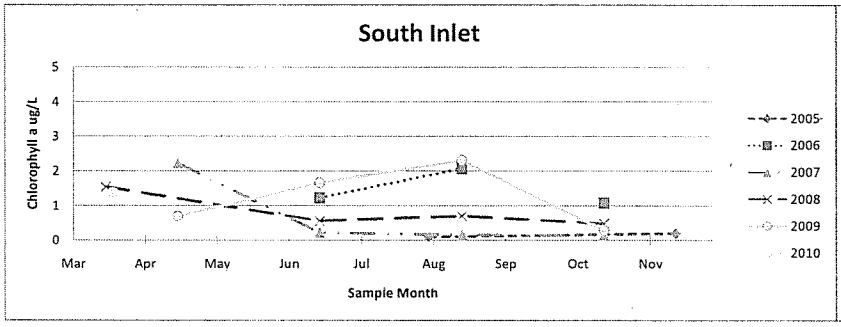


Figure 6.Total phosphorus concentrations at four sites in Russell Lake from April 2005 to March 2010



*gaps are shown where data is unavailable



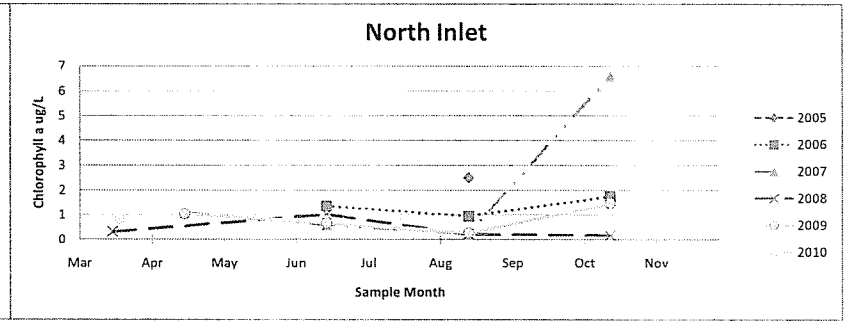


Figure 7. Chlorophyll *a* at four sites in Russell Lake from April 2005 to March 2010

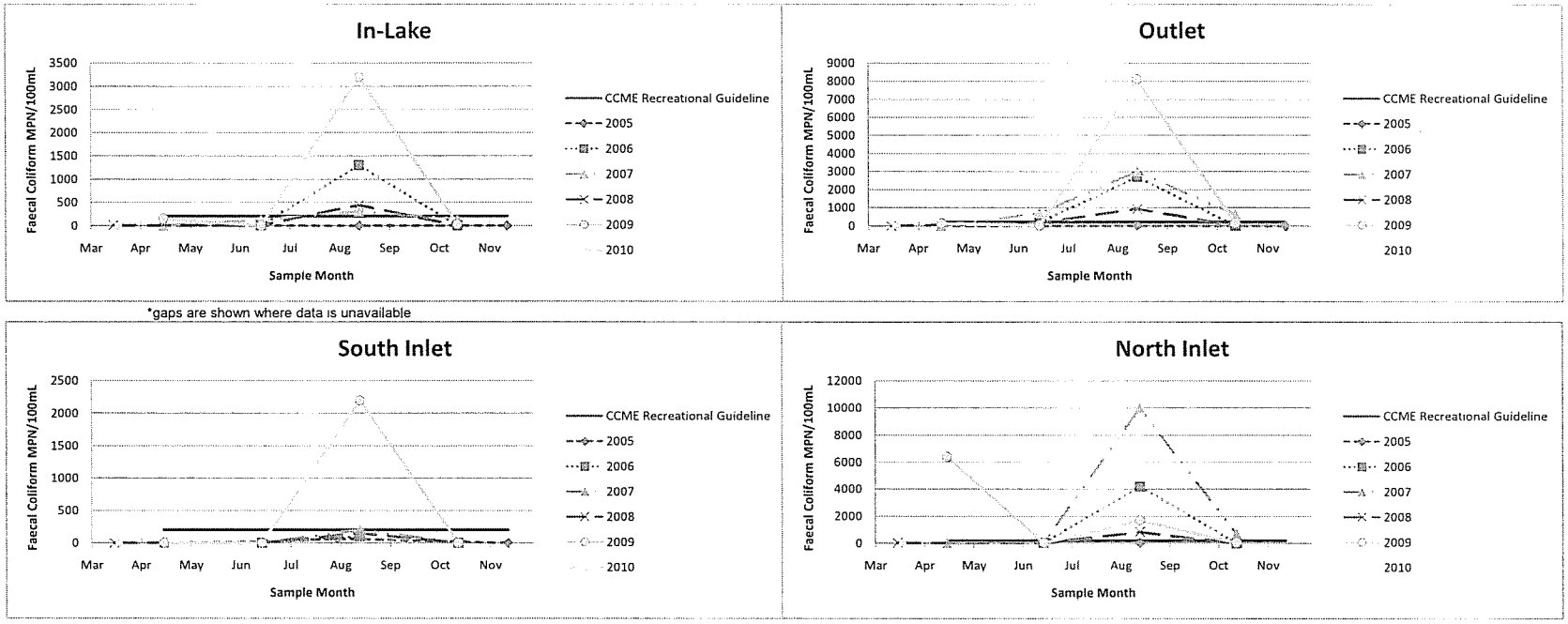


Figure 8. Faecal coliforms at four sites in Russell Lake from April 2005 to March 2010

TABLE 1 Surface Water Quality Data for Russell Lake, In-Lake (2005-2009)

Analyte	Units	CCME FWAL	In-Lake																				
			2005				2006				2007				2008				2009				2010
			Apr	Jun	Aug	Nov	Mar	Jun	Aug	Oct	Apr	Jun	Aug	Oct	Mar	Jun	Aug	Oct	Apr	Jun	Aug	Oct	Mar
General Chemistry																							
Total Alkalinity (as $CaCO_3$)	mg/L		20	17	21	17	15	20	25	26	22	29	27	30	19	22	28	34	27	30	36	35	30
Chloride	mg/L		150	87	99	72	91	100	77	79	170	140	120	89	180	250	220	190	270	250	220	150	170
Colour	TCU		12	12	8	18	12	14	13	11	9	9	8	12	10	11	15	9	16	9	14	20	14
Hardness (as $CaCO_3$)	mg/L		48	34	40	37		43	39	42	59	53	52	46	52	62	64	56	70	65	66	52	54
Nitrate + Nitrite (as N)	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.15	<0.05	<0.05	<0.05	0.2	<0.05	<0.05	<0.05	0.11
Nitrate (as N)	mg/L	13000	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-	-	-	-	-	-	<0.05	-
Nitrite (as N)	mg/L	60	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	<0.01	-
Ammonia (as N)	mg/L	19	<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	<0.05	<0.05	<0.05
Total Keljdahl Nitrogen	mg/L		-	-	0.4	0.4	0.3	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Organic Carbon	mg/L		1.9	3.6	3	4.4	<0.5	3.7	4.6	3.6	2.7	4	2.4	4.3	2	2.2	2.4	4.3	3.3	3.1	5	4.5	2.9
Ortho Phosphate (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
*Total Phosphorus	ug/L		2.5	7	12	25	15	8	20	11	12	7	14	14	9	12	7		13	12	20	3	5
Dissolved Phosphorus	mg/L		<0.005	-	<0.1	-	0.006	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-
pH	Units	6.5-9	7.0	7.0	7.1	7.3	7.0	6.8	7.4	7.5	7.4	7.5	7.6	7.5	7.5	7.6	7.4	7.4	7.1	7.4	7.5	7.5	7.3
Reactive Silica (as SiO_2)	mg/L		1.8	0.7	2.1	3.5	2.5	1.3	2.5	<0.5	0.9	0.7	2.3	0.8	1.8	0.8	2.6	3.6	2.2	0.6	2.2	3.4	2.8
Sulphate	mg/L		16	12	13	13	15	15	11	12	17	18	16	13	20	24	23	20	25	26	20	17	18
Turbidity	NTU		0.7	0.6	0.8	2	1.3	1.1	1	3.6	2.9	0.9	0.8	3.2	3.1	1	1.7	0.7	1.4	0.6	1	0.8	1.1
Conductivity	µS/cm		570	360	390	310	350	420	330	340	630	560	470	390	680	910	780	700	1000	960	810	570	620
TDS (calculated)	mg/L		289	176	206	159	192	212	176	170	326	285	245	204	345	462	434	368	518	485	418	300	327
Bicarbonate (as $CaCO_3$)	mg/L		20	17.1	21.3	17	15	20	25	26	22	29	27	30	19	22	27	34	27	30	36	35	30
Carbonate (as $CaCO_3$)	mg/L		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Calcium	mg/L		16	12	14	12	13	14	13	14	20	18	17	15	18	21	22	19	24	22	23	18	18
Magnesium	mg/L		1.8	1.4	1.7	1.6	1.7	1.8	1.8	1.8	2.5	2.1	2.1	1.8	1.8	2.2	2.2	2.1	2.4	2.2	2.3	2	1.9
Potassium	mg/L		1.5	1.2	1.5	1.5	1.5	1.4	1.6	1.7	2.2	2.3	2.1	2.3	2.1	2.3	2.4	2.4	2.6	2.5	2.5	2.3	2.0
Sodium	mg/L		92	52	64	46	58	64	54	45	100	85	73	63	110	150	140	110	180	160	130	89	95
**Total Suspended Solids	mg/L		1	1	1	1	1	3	1	4	4	1	1	4	9	2	2	1	3	1	3	1	1
Chlorophyll a	µg/L			1.60	2.80	16.20		1.42	4.35	6.58	9.69	1.07	3.45	7.11	1.44	1.47	3.64	1.48	6.43	1.17	26.80	4.78	1.99
Field Measurements																							
Secchi disc depth	m		-	3.4	2.8	3.0	-	2.8	-	1.5	-	4.8	2.5	1.5	-	-	1.75	4	1.3	6	1.4	3.75	3.5
Dissolved Oxygen	mg/L		10.5	8.9	7.3	13.2	-	10.6	5.6	12.3	14.5	9.8	11.0	10.2	16.9	9.5	8.0	10.8	9.7	11.3	8.8	10.9	13.4
pH	units		7.0	7.3	7.6	7.2		6.7	6.8	7.2	6.6	7.4	8.0	6.8	6.5	7.7	6.8	7.3	7.3	8.0	7.7	7.0	7.8
Conductivity	µS/cm		602	334	188	129		393	310	330	612	527	474	278	444	1701	1514	600	1031	278	831	-	601
Temperature (field)	°C		10.4	19.6	23.4	7.2	-	19.8	21.1	8.4	7.8	20.4	23.3	11.1	5.6	18.3	21.9	9.5	5.3	16.9	22.2	8.3	5.2
Bacteriological																							
E.Coli	CFU/100ml																						1
***Faecal Coliform	MPN/100 ml		1	1	1	1		5	1300	1	3	120	300	140	11	8	440	2	150	1	3200	32	1

FWAL - Freshwater Aquatic Life

*Results below detection limits (DL) shown as 2.5 (1/2 DL)

**Results below detection limits (DL) shown as 1

***Results below detection limits shown as 1

Cells left intentionally blank for graphs to indicate no sample collected

Cells with dash indicate no sample collected

TABLE 2 Surface Water Quality Data for Russell Lake, Outlet (2005-2009)

Analyte	Units	CCME FWAL	Outlet																				
			2005				2006				2007				2008				2009				2010
			Apr	Jun	Aug	Nov	Mar	Jun	Aug	Oct	Apr	Jun	Aug	Oct	Mar	Jun	Aug	Oct	Apr	Jun	Aug	Oct	Mar
General Chemistry																							
Total Alkalinity (as $CaCO_3$)	mg/L		19	17	23	17	16	21	25	26	22	26	27	30	19	23	27	33	27	29	36	34	30
Chloride	mg/L		150	88	100	72	93	99	79	80	160	140	120	90	180	250	220	190	270	260	220	150	170
Colour	TCU		11	12	12	18	12	14	14	11	9	9	9	12	11	10	16	9	16	10	16	18	16
Hardness (as $CaCO_3$)	mg/L		49	6.94	42	37	-	43	41	41	59	54	50	44	53	63	65	59	65	68	66	51	56
Nitrate + Nitrite (as N)	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.14	<0.05	<0.05	<0.05	0.21	<0.05	<0.05	<0.05	0.07
Nitrate (as N)	mg/L	13000	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-	-	-	-	-	-	<0.05	-
Nitrite (as N)	mg/L	60	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	<0.01	-
Ammonia (as N)	mg/L	19	<0.05	<0.05	0.06	<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
Total Keljdahl Nitrogen	mg/L		-	0.5	0.4	0.3	0.1	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Organic Carbon	mg/L		2.1		3.6	4.3	3.6	3.3	5.4	2.9	2.9	3.7	3.2	4.3	2.3	3.3	3.2	3.8	2.7	3.1	3.7	3.5	2.8
Ortho Phosphate (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
Total Phosphorus	ug/L		7	10	16	27	10	4	<20	10	14	73	14	12	9	15	8		17	11	17	6	6
Dissolved Phosphorus	mg/L		0.005	-	<0.1	-	0.007	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-
pH	Units	6.5-9.0	6.7	6.9	7.1	7.3	6.9	6.7	7.4	7.5	7.2	7.4	7.6	7.5	7.5	7.4	7.3	7.3	7.1	7.5	7.3	7.8	7.3
Reactive Silica (as SiO_2)	mg/L		1.4	1	2.5	3.5	2	1.3	2.4	1.4	0.9	4.4	2.3	0.8	1.8	1.6	2.6	3.4	2.1	0.5	2.4	3.3	2.3
Sulphate	mg/L		16	12	12	16	14	14	11	12	17	18	16	13	19	24	23	20	25	24	20	17	17
Turbidity	NTU		1.4	2.4	0.2	1.8	1.2	1	0.3	2.8	2.9	0.7	0.6	2.5	2.8	0.8	1.2	0.3	1.4	0.6	0.5	0.7	1.2
Conductivity	µS/cm		580	360	400	300	360	410	320	330	620	550	470	390	690	910	780	700	1000	970	810	570	630
TDS (calculated)	mg/L		292	<1	214	162	197	209	178	171	323	286	243	201	342	469	435	372	506	499	417	296	328
Bicarbonate (as $CaCO_3$)	mg/L		19.5	36	23	17	16	21	25	26	22	26	27	30	19	23	27	33	27	29	36	34	30
Carbonate (as $CaCO_3$)	mg/L		<1	16.8	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Calcium	mg/L		17	12	14	12	14	14	14	14	20	18	17	15	18	22	22	19	22	23	23	17	19
Magnesium	mg/L		1.8	1.5	1.7	1.6	1.7	1.7	1.7	1.8	2.3	2.2	2.1	1.8	1.8	2.2	2.2	2.1	2.2	2.3	2.3	1.9	2.0
Potassium	mg/L		1.6	1.3	1.2	1.5	1.5	1.4	1.5	1.7	2.4	2.1	2	2.3	2.1	2.3	2.4	2.4	2.4	2.6	2.5	2.1	2.0
Sodium	mg/L		92	57	65	46	61	64	52	44	110	87	71	61	110	150	140	110	160	170	130	88	98
*Total Suspended Solids	mg/L		3	2.4	3.6	1	5	2	1	3	3	1	1	3	1	1	1	2	3	1	1	1	1
Chlorophyll a	µg/L					17.70		2.19	2.46	5.46	7.85	0.95	1.08	5.16	1.54	1.20	2.16	1.04	6.35	1.07	11.60	4.72	2.92
Field Measurements																							
Secchi disc depth	m		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L		10.2	7.4	5.5	10.8	-	11.3	8.9	11.9	14.8	8.4	11.3	10.1	19.3	8.4	7.4	10.9	9.6	6.9	8.1	10.6	11.1
pH	units		6.9	6.8	6.8	7.2		7.2	7.1	7.4	7.0	7.0	7.8	7.4	6.5	7.2	7.6	7.8	7.4	7.2	7.6	7.8	7.5
Conductivity	µS/cm		635	345	201	136		389	399	344	613	532	473	272	448	1703	1505	602	1023	278	834	-	592
Temperature (field)	°C		12.2	22.5	25.5	7.6	-	21.3	23.1	9.1	9.6	22.9	24.5	9.9	5.5	18.6	23.2	7.8	6.2	19.6	23.5	8.8	5.1
Bacteriological																							
E.Coli	CFU/100ml																						3
**Faecal Coliform	MPN/100 ml		1	8	10	1		170	2700	1	1	700	3000	640	9	160	930	4	140	24	8100	160	1

FWAL - Freshwater Aquatic Life

*Results below detection limits shown as 1

**Results below detection limits shown as 1

Cells left intentionally blank for graphs to indicate no sample collected

Cells with dash indicate no sample collected

TABLE 3 Surface Water Quality Data for Russell Lake, South Inlet (2005-2009)

Analyte	Units	CCME FWAL	South Inlet																				
			2005				2006					2007				2008				2009				2010
			Apr	Jun	Aug	Nov	Mar	Jun	Aug	Sep	Oct	Apr	Jun	Aug	Oct	Mar	Jun	Aug	Oct	Apr	Jun	Aug	Oct	Mar
General Chemistry										additional														
Total Alkalinity (as $CaCO_3$)	mg/L		11	31	33	7	21	13	<5	35	13	11	25	24	25	18	23	37	32	16	34	54	24	25
Chloride	mg/L		25	17	21	21	23	13	9	36	26	35	27	18	20	76	24	29	37	38	49	39	23	62
Colour	TCU		24	27	21	45	14	68	380	44	38	23	47	52	41	17	52	150	51	51	50	150	57	26
Hardness (as $CaCO_3$)	mg/L		24	40	45	23	-	21	46	48	29	30	33	33	28	43	29	41	37	27	40	53	32	42
Nitrate + Nitrite (as N)	mg/L		<0.05	<0.05	0.09	0.08	0.13	<0.05	<0.05	0.12	0.08	0.09	<0.05	0.07	0.05	0.1	<0.05	0.1	<0.05	0.15	<0.05	0.14	<0.05	0.11
Nitrate (as N)	mg/L	13000	<0.05	<0.05	0.09	0.08	0.13	<0.05	<0.05	-	0.07	0.09	-	-	-	-	-	-	-	-	-	-	<0.05	-
Nitrite (as N)	mg/L	60	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	<0.01	-
Ammonia (as N)	mg/L	19	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	0.08	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L		-	0.3	0.4	0.3	0.3	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Organic Carbon	mg/L		6.6	7.1	6.1	9	4.6	<0.5	45	11	7.2	5.6	11	11	9.2	3.3	8.5	17	11	6.3	8.9	13	7.8	5.5
Ortho Phosphate (as P)	mg/L		0.04	0.03	0.04	0.08	0.02	0.08	0.01	0.11	0.05	<0.01	0.05	0.07	0.03	<0.01	0.03	0.03	0.02	0.01	0.01	0.03	<0.01	0.01
Total Phosphorus	ug/L		42	46	43	88	31	86	80	110	53	34	10	14	44	18	36	28		30	110	71	27	45
Dissolved Phosphorus	mg/L		0.037	-	<0.1	-	0.021	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-
pH	Units	6.5-9.0	6.8	7.0	7.2	6.6	7.0	6.6	4.7	7.5	6.9	7.0	7.3	7.2	7.2	7.4	7.3	7.2	7.4	6.9	7.4	7.4	7.4	7.3
Reactive Silica (as SiO_2)	mg/L		4.1	7.2	9.9	5.7	7.4	3.8	5.9	10	5.8	3.5	0.7	6.1	6.5	3.8	4.8	6.5	8.8	3.2	3.5	7.1	5.5	5.6
Sulphate	mg/L		12	5.1	7.9	16	11	<2	<10	<2	13	12	<2	<2	<2	15	2	<2	<2	15	3	<2	12	12
Turbidity	NTU		0.3	0.2	<0.1	0.7	1.2	0.4	3.2	1.3	2.8	0.8	0.5	1.6	1.2	0.5	0.5	2.4	1.6	2.4	1.1	6.4	1.5	1.1
Conductivity	µS/cm		130	130	150	120	140	89	45	190	140	180	160	120	120	330	140	170	190	190	240	190	140	270
TDS (calculated)	mg/L		73	74.6	89.3	70	83	43	60	113	78	91	78	66	67	170	75	98	102	104	125	128	84	147
Bicarbonate (as $CaCO_3$)	mg/L		10.7	31.3	32.8	7	21	13	<1	35	13	11	25	24	25	18	23	37	32	16	34	54	24	25
Carbonate (as $CaCO_3$)	mg/L		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Calcium	mg/L		6.6	10	11	6.7	9.1	5.8	14	14	8.4	8.3	9.4	9.3	7.9	13	8.1	13	10	8.3	12	16	9.4	12
Magnesium	mg/L		1.9	3.4	4.1	1.6	3.2	1.5	3	3.4	2	2.1	0.01	2.3	2	2.3	2.2	2.4	2.7	1.5	2.3	3.3	2	2.8
Potassium	mg/L		1	0.9	0.9	1	1	0.5	2	2	2.1	1.4	0.9	1	1.5	1.6	1.1	1.9	2.4	1.4	1.3	1.4	1.1	1.3
Sodium	mg/L		16	12	14	13	15	10	21	25	13	21	18	14	13	47	18	21	21	26	34	24	16	35
*Total Suspended Solids	mg/L		1	1	1	2	1	4	91	2	1	1	1	3	1	1	2	1	2	1	1	7	1	2
Chlorophyll a	µg/L				0.10	0.20		1.23	2.07		1.08	2.22	0.22	0.16	0.15	1.54	0.56	0.70	0.48	0.69	1.67	2.32	0.29	1.37
Field Measurements																								
Secchi disc depth	m		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L		10.4	9.3	7.4	13.0	-	10.3	8.8	-	12.3	14.8	9.9	11.7	12.5	21.4	10.5	6.9	11.4	10.0	10.9	9.1	10.7	15.6
pH	units		6.5	6.9	7.6	7.3		6.1	6.7	7.2	7.2	6.4	7.0	7.7	6.7	6.5	7.1	7.4	7.4	7.4	7.2	7.1	7.3	7.8
Conductivity	µS/cm		124	105	185	78		94	161	-	142	174	145	121	74	187	260	331	164	191	69	232	-	268
Temperature (field)	°C		9.0	15.3	23.5	5.7	-	14.7	16.9	-	6.6	4.8	14.7	16.3	5.1	0.5	12.0	17.2	5.6	4.3	13.3	16.0	5.7	3.7
Bacteriological																								
E. Coli	CFU/100ml																							2
**Faecal Coliform	MPN/100 ml		1	14	66	1		1	100		1	1	2	200	6	2	2	150	3	3	1	2200	2	1

FWAL - Freshwater Aquatic Life

*Results below detection limits shown as 1

**Results below detection limits shown as 1

Cells left intentionally blank for graphs to indicate no sample collected

Cells with dash indicate no sample collected

TABLE 4 Surface Water Quality Data for Russell Lake, North Inlet (2005-2009)

Analyte	Units	CCME FWAL	North Inlet																				2010
			2005				2006				2007				2008				2009				
			Apr	Jun	Aug	Nov	Mar	Jun	Aug	Oct	Apr	Jun	Aug	Oct	Mar	Jun	Aug	Oct	Apr	Jun	Aug	Oct	Mar
General Chemistry																							
Total Alkalinity (asCaCO$_3$)	mg/L		28	-	56	-	71	63	70	41	56	81	88	83	40	<1	87	71	47	80	92	72	70
Chloride	mg/L		110		110		590	130	140	87	390	200	150	150	1500	350	230	91	270	310	260	190	640
Colour	TCU		28	-	17	-	7	21	13	20	12	13	15	12	7	16	49	13	30	24	25	27	11
Hardness (as CaCO$_3$)	mg/L		62	-	93	-	-	86	110	81	160	150	120	120	230	150	130	120	100	140	140	110	200
Nitrate + Nitrite (as N)	mg/L		0.65	-	0.22	-	0.4	<0.05	0.07	1.3	0.32	0.24	0.25	0.23	0.62	0.2	0.26	0.15	0.56	0.27	0.21	0.23	0.33
Nitrate (as N)	mg/L	13000		-		-	0.4	<0.05	0.07	1.27	0.32	-	-	-	-	-	-	-	-	-	-	0.23	
Nitrite (as N)	mg/L	60	<0.01	-		-	<0.01	<0.01	<0.01	0.03	<0.01	-	-	-	-	-	-	-	-	-	-	<0.01	
Ammonia (as N)	mg/L	19	<0.05	-	<0.05	-	0.14	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.12	<0.05	<0.05	<0.05	0.06	<0.05	0.06	<0.05	<0.05
Total Keljdahl Nitrogen	mg/L			-	0.3	-	0.6	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Organic Carbon	mg/L		6.5	-	3.3	-	2	4.6	5.8	4.9	4.2	3.9	3.7	4.3	5	3.8	6.2	3.3	5	4.7	4.8	5	3.4
Ortho Phosphate (as P)	mg/L		0.02	-	<0.01	-	<0.01	<0.01	0.11	<0.01	5.2	0.03	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
*Total Phosphorus	ug/L		29		22		8	9	180	10	2.5	56	23	12	180	15	6		73	11	10	7	7
Dissolved Phosphorus	mg/L		-	-	-	-	0.007	-	-	-	5.1	-	-	-	-	-	-	-	-	-	-	-	
pH	Units	6.5-9.0	7.3		7.6		7.7	7.3	7.8	7.6	7.3	7.9	7.9	7.9	7.6	8.0	7.8	7.7	7.4	7.7	7.9	7.9	7.8
Reactive Silica (as SiO$_2$)	mg/L		3.3	-	4	-	3.4	2.2	3.3	5.5	3.3	3.3	4.9	4.2	2.6	2.2	5.7	4.5	3.2	2.9	4.9	5.4	4.5
Sulphate	mg/L		26	-	21	-	40	17	12	26	46	50	30	23	97	22	32	20	38	28	14	23	<0.01
Turbidity	NTU		25	-	3.3	-	14	2.1	0.7	10	4.2	1.5	1.2	1.5	170	0.8	1.5	0.6	8.5	1	0.9	1.3	1.8
Conductivity	µS/cm		490		520		2000	580	620	430	1500	900	720	670	5100	1400	890	780	1100	1300	1100	760	2200
TDS (calculated)	mg/L		262	-	274	-	1110	310	339	234	804	488	392	364	2740	693	521	413	563	652	560	407	1170
Bicarbonate (as CaCO$_3$)	mg/L		28	-	56	-	71	63	70	41	56	80	88	83	40	83	87	70	47	80	91	71	70
Carbonate (as CaCO$_3$)	mg/L		<1	-	<1	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Calcium	mg/L		21	-	31	-	62	29	39	26	55	50	42	40	78	52	43	40	35	47	48	37	69
Magnesium	mg/L		2.3	-	3.7	-	6.3	3.2	4	3.7	5	5.2	4.4	4.3	8.4	5.8	4.4	4.8	3.8	5.1	5.6	4.3	7.7
Potassium	mg/L		2.3	-	2.4	-	3.4	2.1	2.5	5.2	5.9	4.4	4.1	4.8	6.8	2.6	3.4	3.3	3.4	2.9	3.0	2.6	4.0
Sodium	mg/L		75		68		360	83	91	49	250	120	98	90	990	210	150	100	180	200	160	110	350
**Total Suspended Solids	mg/L		4		3		11	5	1	3	3	3	1	1	330	1	1	1	72	1	2	3	1
Chlorophyll a	µg/L				2.50			1.35	0.94	1.74	1.08	0.59	0.23	6.60	0.31	1.00	0.21	0.17	1.03	0.67	0.27	1.44	0.83
Field Measurements				-		-																	
Secchi disc depth	m		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Dissolved Oxygen	mg/L		-	-	12.0	-	-	11.6	9.8	12.1	13.9	10.0	11.3	13.9	20.3	10.3	9.4	11.6	10.3	9.5	9.6	11.0	12.4
pH	units				7.5			7.5	7.7	7.3	7.0	7.7	7.9	7.0	7.0	8.0	7.9	7.6	8.1	7.9	7.9	7.8	8.1
Conductivity	µS/cm				170			542	754	437	1523	908	728	444	3036	2540	1750	681	1075	366	1069		2093
Temperature (field)	°C		-	-	7.2	-	-	18.9	21.8	8.2	8.9	19.0	18.7	9.0	1.9	14.4	18.3	8.7	6.4	14.8	18.3	7.5	4.1
Bacteriological																							
E.Coli	CFU/100ml																						45
***Faecal Coliform	MPN/100 ml				1			35	4200	1	6	34	10000	710	22	22	830	5	6400	20	1700	51	1

FWAL - Freshwater Aquatic Life

*Results below detection limits (DL = 5) shown as 2.5 ug/L (1/2 DL)

**Results below detection limits (DL) shown as 1

***Results below detection limits shown as 1

Cells left intentionally blank for graphs to indicate no sample collected

Cells with dash indicate no sample collected