



Stantec

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

September 30, 2013
File: 121511151

Clayton Developments 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 – August 2013 Sampling Event

To monitor the effects of development, water quality monitoring has been undertaken on a seasonal basis since April 2005 at four stations in Russell Lake (Figure 1 in Attachment). Monitoring is conducted four times each year with sampling events carried out once during the spring, twice during the summer, and once during the fall. Water samples are not collected during the winter months. Sampling results have been provided in previous letter reports, with a summary of the sampling up to June 26, 2013 presented in the report dated August 9, 2013. The present report builds on the results to date while focusing on the most current (August 26, 2013) late summer sampling event, with special attention provided to previous late summer sampling events.

The weather during the sampling period on August 26, 2013 was clear with an air temperature of 20 - 24°C. Only a small amount of rain (0.5 mm) was recorded for the six days preceding the sampling day. Hourly mean wind speeds less than 44 km/h blew primarily from the southwest for 48 hours leading up to the date of sample collection with mean hourly wind speeds between 4 and 26 km/h on the sampling date.

Sampling was conducted between 10:00 and 13:00 on August 26, 2013. The following conditions were observed at the four Russell Lake monitoring stations (i.e., In-Lake, Outlet, South Inlet, and North Inlet sampling stations):

- Within Russell Lake, at the In-Lake station, the water appeared clear to slightly brownish green. No ducks were observed in the vicinity of the boat slipway.
- At the Outlet station of Russell Lake, the water appeared clear. Algae were observed in the low-flow areas and in-stream vegetation was present along the banks.
- Water flowing in the South Inlet station appeared clear to slightly tea stained. Fine silt and organics were observed on the substrate. No in-stream vegetation was observed.
- The water at the North Inlet station was clear and the stream substrate could be observed. The grating within the culvert at this station contained garbage. Vegetation was present in the water at this site.

Tables 1 to 6 below present statistical summaries of analytical results from April 2005 to August 2013 for key water quality parameters (total suspended solids (TSS), turbidity, pH, conductivity, sodium and chloride, total phosphorus (TP), Chlorophyll a (Chl a), and fecal coliforms) at each of the monitoring stations. The seasonal trends for some of the key water quality parameters are presented graphically in Figures 2 to 8 below. Where applicable, the water quality data were compared to the Canadian Council for the Ministers of the Environment Guidelines for the Protection of Freshwater Aquatic Life (CCME FAL).

September 30, 2013

Mike Hanusiak, Sr. Vice President, General Manager

Page 2 of 6

Reference: Water Quality Monitoring Results for Russell Lake – August 2013 Sampling Event

Water Clarity

TSS concentrations on August 26, 2013 (Figure 2 in Attachment and Table 1) were below the late summer mean and consistent with or below the median values at all stations.

Table 1 Russell Lake - TSS Statistics

Station	August 26, 2013 Results (mg/L)	Late Summer Min (mg/L)	Late Summer Max (mg/L)	Late Summer Median (mg/L)	Late Summer Mean (mg/L)
In-Lake	1	ND	3	2	2
Outlet	ND	ND	50	1	8
South Inlet	2	ND	91	2	14
North Inlet	1	ND	3	1	2

Turbidity levels at all stations were within the range of historical measurements. The South Inlet had a turbidity concentration of 5.6 NTU, which was within the historical range but higher than the median value (3.5 NTU) for late summer results (Table 2).

Table 2 Russell Lake - Turbidity Statistics

Station	August 26, 2013 Results (NTU)	Late Summer Min (NTU)	Late Summer Max (NTU)	Late Summer Median (NTU)	Late Summer Mean (NTU)
In-Lake	1.2	0.8	2.2	1.0	1.2
Outlet	0.3	0.2	1.3	0.6	0.6
South Inlet	5.6	0.5	7.5	2.9	3.5
North Inlet	1.1	0.7	4.3	1.6	2.0

pH

Measurements of pH collected since April 2005 (Figure 3 in Attachment and Table 3 below) indicate that the water of Russell Lake in late summer is historically slightly basic with a median value of 7.4. The pH readings in August 2013 ranged from neutral, with a pH of 6.99 at the Outlet station, to slightly basic, with a pH of 7.84 for the Inlake station. These pH results are consistent with results from previous late summer sampling events and are within the CCME FAL guideline for pH of 6.5 to 9.0.

Table 3 Russell Lake - pH Statistics

Station	August 26, 2013 Results (Units)	Late Summer Min (Units)	Late Summer Max (Units)	Late Summer Median (Units)	Late Summer Mean (Units)
In-Lake	7.84	6.80	8.24	7.43	7.42
Outlet	6.99	6.81	7.81	7.57	7.44
South Inlet	7.34	6.70	8.00	7.39	7.32
North Inlet	7.26	7.23	7.92	7.77	7.67

Reference: Water Quality Monitoring Results for Russell Lake – August 2013 Sampling Event

Salt Concentrations

As is typical of urban lakes in watersheds subject to development, Russell Lake has relatively higher salt concentrations than would be expected for a similar lake in a less developed watershed. Conductivity increases with salt concentrations and elevated levels are typically exhibited during spring melt conditions which decrease during the summer monitoring periods. 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 Table 4 and on Figure 4 (Attachment), the August 2013 conductivity measurements at the In-Lake, Outlet and North Inlet stations were within the range observed since March 2005. The August 2013 conductivity measurements were all slightly elevated over the late summer mean and median values.

Table 4 Russell Lake - Conductivity Statistics

Station	August 26, 2013 Results (µS/cm)	Late Summer Min (µS/cm)	Late Summer Max (µS/cm)	Late Summer Median (µS/cm)	Late Summer Mean (µS/cm)
In-Lake	590	330	810	585	581
Outlet	600	320	810	585	583
South Inlet	270	45	430	160	189
North Inlet	830	520	1100	775	799

Sodium and chloride are indicators of road salt concentrations in urban lakes and are discussed in that context below. Given that CCME FAL recommends a chloride concentration of less than 120 mg/L for the long-term health of aquatic organisms (guideline of 640 mg/L for short-term exposure), the discussion of salt concentrations below will revolve predominantly around chloride with a brief description of sodium concentrations within Russell Lake.

Sodium (Na) concentrations in August 2013 at the In-Lake and Outlet sampling stations (both 94 mg/L; Tables 8 and 9 in the Attachment) were within their respective ranges observed over the duration of monitoring, though both stations were approximately 8 mg/L above their respective median values. The sodium concentration at the South Inlet (26 mg/L) and North Inlet (113 mg/L) stations were both within the range of sodium concentrations previously measured during the late summer sampling events and were 3 and 5 mg/L, respectively, above their respective median late summer values.

Chloride ion concentrations at the In-Lake, Outlet, South Inlet, and North Inlet stations (150 mg/L, 150 mg/L, 40 mg/L and 190 mg/L, respectively) were within the range observed over the duration of monitoring (refer to Table 5 below and Figure 5 in Attachment). The In-Lake, Outlet and North Inlet stations on the long term have generally exceeded the CCME FAL long-term guideline concentration of 120 mg/L for chloride. The North Inlet station was the most frequent station to exceed the CCME long-term chloride guideline value, with 8 out of 9 late-summer samples exceeding the guideline concentration (See Figure 5).

September 30, 2013

Mike Hanusiak, Sr. Vice President, General Manager

Page 4 of 6

Reference: Water Quality Monitoring Results for Russell Lake – August 2013 Sampling Event**Table 5 Russell Lake - Chloride Statistics**

Station	August 26, 2013 Results (mg/L)	Late Summer Min (mg/L)	Late Summer Max (mg/L)	Late Summer Median (mg/L)	Late Summer Mean (mg/L)
In-Lake	150	77	220	145	152
Outlet	150	79	220	150	153
South Inlet	40	9	84	29	35
North Inlet	190	110	270	175	186

The late-summer conductivity values for the In-Lake sampling station from 2005 to 2013 ranged from 330 to 810 $\mu\text{S}/\text{cm}$, and from 77 to 220 mg/L for chloride. In August 2013, the values at this station were similar to spring concentrations in 2010, 2011 and 2012, and lower than late summer concentrations in 2008 and 2009 (refer to Figure 4 and Figure 5 in Attachment, respectively).

Similar values are typically observed between the Outlet station and the In-Lake station, as supported by the range of late summer values at the Outlet station for conductivity (320 to 810 $\mu\text{S}/\text{cm}$) and chloride (79 to 220 mg/L) for the late summer 2005 - 2013 sampling events. In August 2013 at the Outlet station, the values were similar to late summer concentrations in 2010, 2011 and 2012, and lower than late summer concentrations in 2008 and 2009 (Figure 4 and Figure 5, respectively).

The late summer 2005-2013 values for the South Inlet station ranged from 45 to 430 $\mu\text{S}/\text{cm}$ for conductivity, and chloride ranged from 9 to 84 mg/L. The August 2013 values at this station were within the historic range for conductivity and chloride. Conductivity and chloride results were most similar to data from 2010 and lower than data from 2012 (refer to Figure 4 and Figure 5 in Attachment, respectively).

The historical late-summer values for the North Inlet station ranged from 520 to 1,100 $\mu\text{S}/\text{cm}$ for conductivity and from 110 to 270 mg/L for chloride. In August 2013, the concentrations measured at the North Inlet station for conductivity and chloride were 830 $\mu\text{S}/\text{cm}$ and 190 mg/L, respectively. These August 2013 results are slightly higher than the August 2005 and 2006 concentrations, but lower than the concentrations reported in August from 2008 to 2010.

Nutrient Enrichment

The Chlorophyll a (Chl a) concentration of 4.20 $\mu\text{g}/\text{L}$ (based on the acidification technique) at the In-Lake site for August 2013 is within the range reported during the monitoring program (Table 6 below and Figure 6 in Attachment). The In-lake Chl a result for August 2013 is slightly above the late summer median value (Table 6).

Total phosphorus (TP) concentrations at the In-Lake station have fluctuated over the late summer sampling periods, ranging from a low of 7 $\mu\text{g}/\text{L}$ in 2008 to a high of 20 $\mu\text{g}/\text{L}$ in 2006 and 2009 (Figure 7 in Attachment). The total phosphorus concentration in August 2013 was 7 $\mu\text{g}/\text{L}$ (Table 7 below), which is the same as the lowest late summer value measured to date. The concentration of phosphorous at the In-Lake station is also below the HRM threshold value of 15 $\mu\text{g}/\text{L}$ for Russell Lake. It should be noted that the threshold value is intended for comparison to sample results at the In-Lake station only.

Reference: Water Quality Monitoring Results for Russell Lake – August 2013 Sampling Event

Table 6 Russell Lake - Chl a Statistics

Station	August 26, 2013 Results (µg/L)	Late Summer Min (µg/L)	Late Summer Max (µg/L)	Late Summer Median (µg/L)	Late Summer Mean (µg/L)
In-Lake	4.20	2.80	26.80	3.56	6.95
Outlet	0.42	1.08	11.80	2.16	3.88
South Inlet	0.51	0.10	2.32	0.94	1.11
North Inlet	0.62	0.21	2.50	0.43	0.73

From 2007 to 2013, the Chl a concentration at the Outlet station ranged from 1.08 (in 2012) to 11.80 µg/L (in 2009) (Figure 6). The August 2013 Chl a concentration was 0.42 µg/L (Table 6), which measured lower than historical values. The late summer 2013 TP concentration at the Outlet station measured 4 µg/L, which was also lower than the historical range of 7 µg/L (in 2010) to 17 µg/L (in 2009) (refer to Table 7 below and Figure 7 in Attachment).

The Chl a concentration for the August 2013 sampling event at the South Inlet station was 0.51 µg/L (Table 6). This result is within the range of previous late summer values, which were between 0.10 µg/L (in 2005) and 2.32 µg/L (in 2009). The TP concentration at the South Inlet station in August 2013 measured 30 µg/L (Table 7), which is below the late summer median of 45 µg/L. Prior TP concentrations ranged from 14 µg/L in 2007 to 80 µg/L in 2006.

The Chl a concentration for the August 2013 sampling event at the North Inlet station was 0.62 µg/L (Table 6). This result is within the range of all previous late summer values, which were between 0.21 µg/L (in 2008) and 2.50 µg/L (in 2005). As indicated in Table 7 (below), the TP concentration at the North Inlet station in August 2013 measured 9 µg/L and is within the range of previous late summer values for TP concentrations (2 µg/L to 180 µg/L), and lower than the historical median value (18 µg/L).

Table 7 Russell Lake - TP Statistics

Station	August 26, 2013 Results (µg/L)	Late Summer Min (µg/L)	Late Summer Max (µg/L)	Late Summer Median (µg/L)	Late Summer Mean (µg/L)
In-Lake	7	7	20	14	14
Outlet	4	7	17	14	12
South Inlet	30	14	80	45	49
North Inlet	9	2	180	18	38

Bacterial Contamination

Bacterial contamination in Russell Lake is measured by sampling and testing for the presence of fecal coliforms in the water. In addition to fecal coliform analysis conducted by the lab, analysis of *Escherichia coli* (*E. coli*) has also been carried out for sampling events beginning in 2010. *E. coli* are a type of fecal coliform that may be considered a more specific indicator for bacteria typically found in the intestines of warm-blooded animals. An elevated *E. coli* concentration is a stronger indication of recent sewage or animal waste contamination, whereas some fecal bacteria may originate from non-fecal sources. *E. coli* counts were 10 CFU/100 mL for the In-Lake station and 70 CFU/100ml at the Outlet, 100 CFU/100ml at the South Inlet and <1 CFU/100ml at the North Inlet stations. The concentration of fecal coliforms measured at the In-Lake station was 50 CFU/100 mL, 70 CFU/100ml at the Outlet, <1 CFU/100ml at the South Inlet and 200

September 30, 2013

Mike Hanusiak, Sr. Vice President, General Manager

Page 6 of 6

Reference: Water Quality Monitoring Results for Russell Lake – August 2013 Sampling Event

CFU/100ml at the North Inlet stations. These values are lower than previous median values when compared to station-specific results from past years (refer to Figure 8 in Attachment).

Conclusion

The August 2013 conductivity, sodium (Na) and chloride (Cl) concentrations were within the range of results from previous sampling events for all stations, though they were slightly above their respective median values of late summer samples collected from 2006 to 2013.

The concentration of total phosphorus (TP) for the In-Lake station was 7 µg /L for the August 2013 sampling event, which is well below the HRM threshold value of 15 µg/L. The lake Outlet station TP concentration was 4 µg/L, which is the lowest historical TP concentration at this station. The late summer TP results for the two inlet stations were higher than the concentration at the In-Lake station, but within the historical ranges. The chlorophyll a (Chl a) concentration at the Outlet station (0.42 µg/L) was the lowest historical Chl a concentration for this station. The In-Lake, South Inlet and North Inlet Chl a concentrations were within their historical ranges observed for the late summer season (refer to Tables 8 and 9 in the Attachment).

As compared to late summer sampling events from 2006 to 2013, TSS, turbidity and fecal coliform results were within the historical ranges for previous late summer sampling events. TSS and faecal coliform results were below the seasonal median values, though the turbidity values were generally above the seasonal median values. In particular, the North Inlet had proportional higher turbidity concentrations when compared to the respective median values.

Sincerely,

STANTEC CONSULTING LTD.

ORIGINAL SIGNED BY

Matt Steeves, B.Sc
Aquatic Scientist
Tel: (902) 468-7777
matt.steeves@stantec.com

ORIGINAL SIGNED BY

Amber Fox, MREM
Project Manager
Tel: (902) 468-7777
amber.fox@stantec.com

cc: Cameron Deacoff, Halifax Regional Municipality

Attachments: Figures 1-8, Tables 8-11, and Maxxam Certificate of Analysis

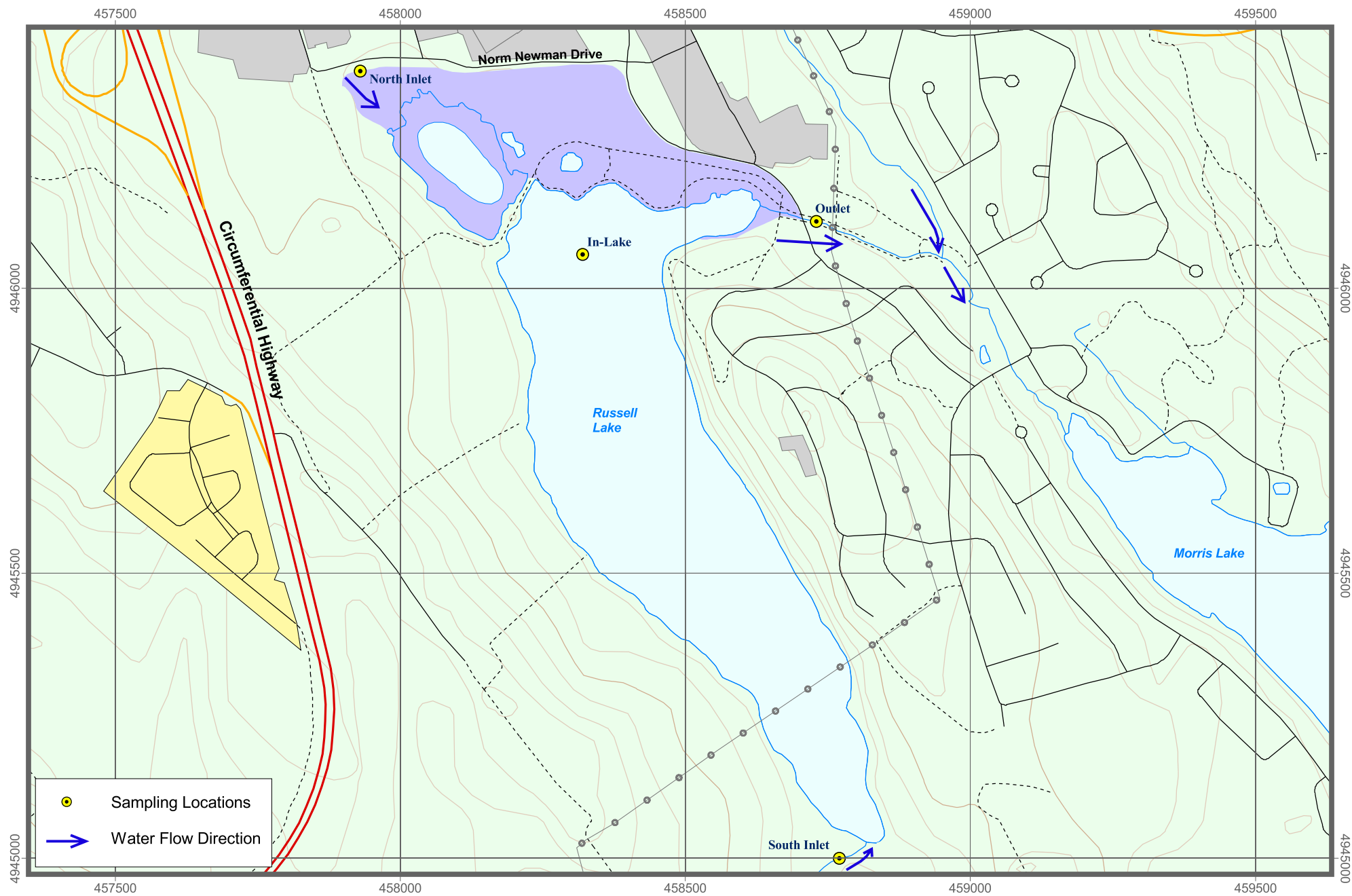


Figure 1

Russell Lake Sampling Locations



Stantec

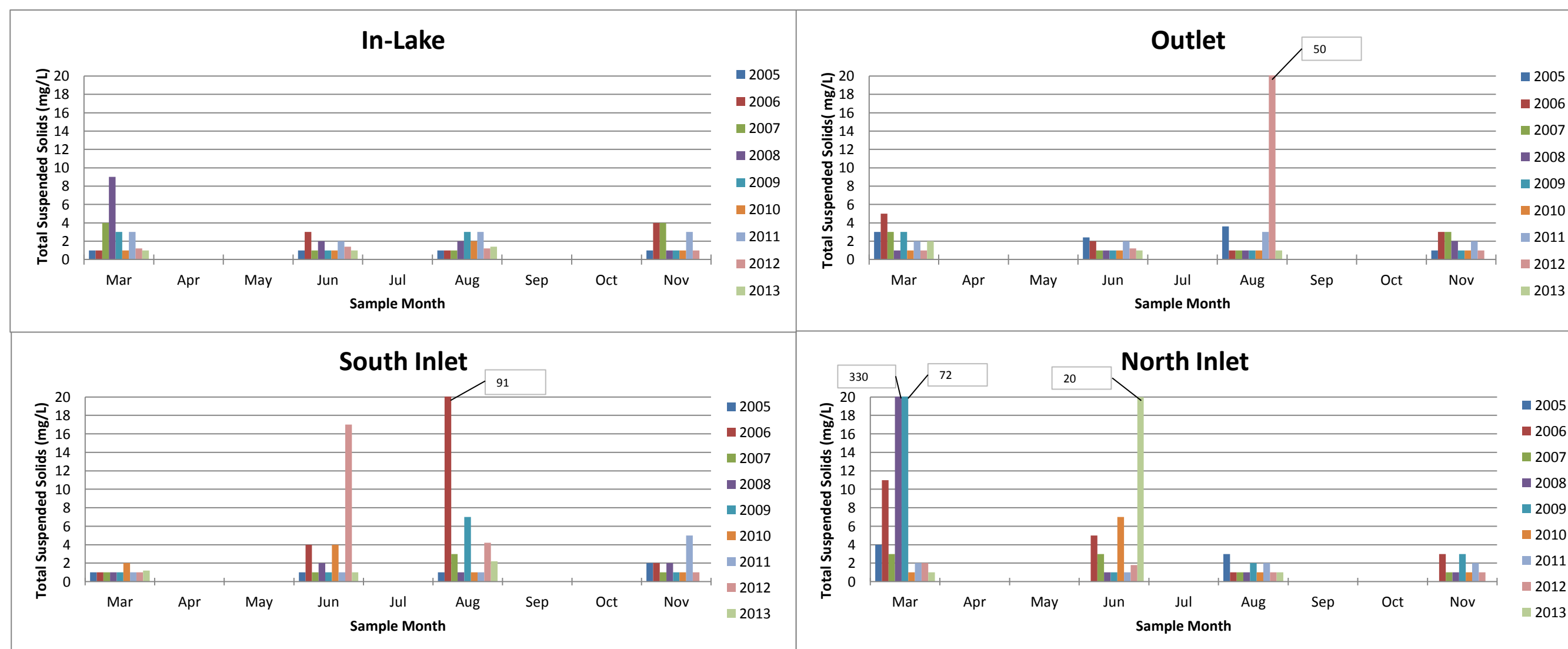


Figure 2. Total Suspended Solids at four sites in Russell Lake from April 2005 to August 2013

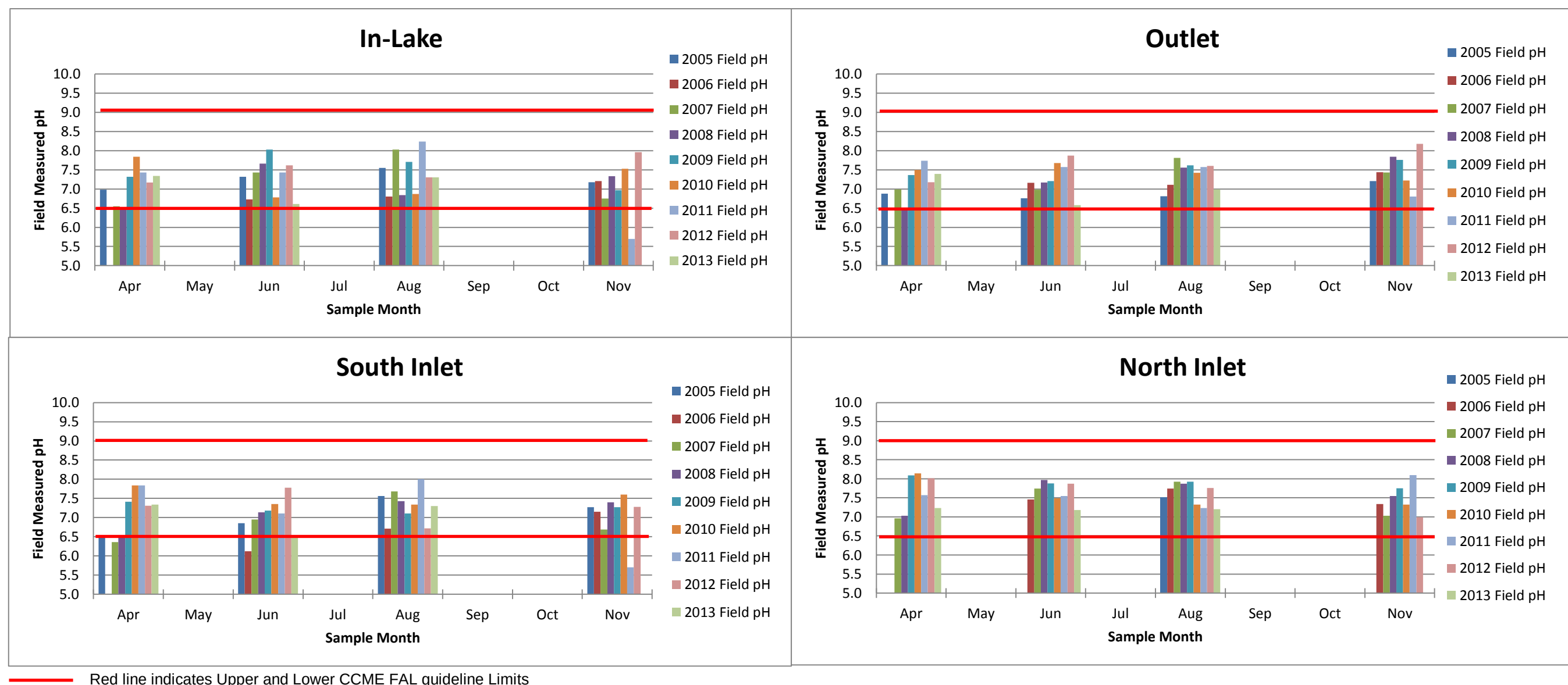


Figure 3. pH at four sites in Russell Lake from April 2005 to August 2013

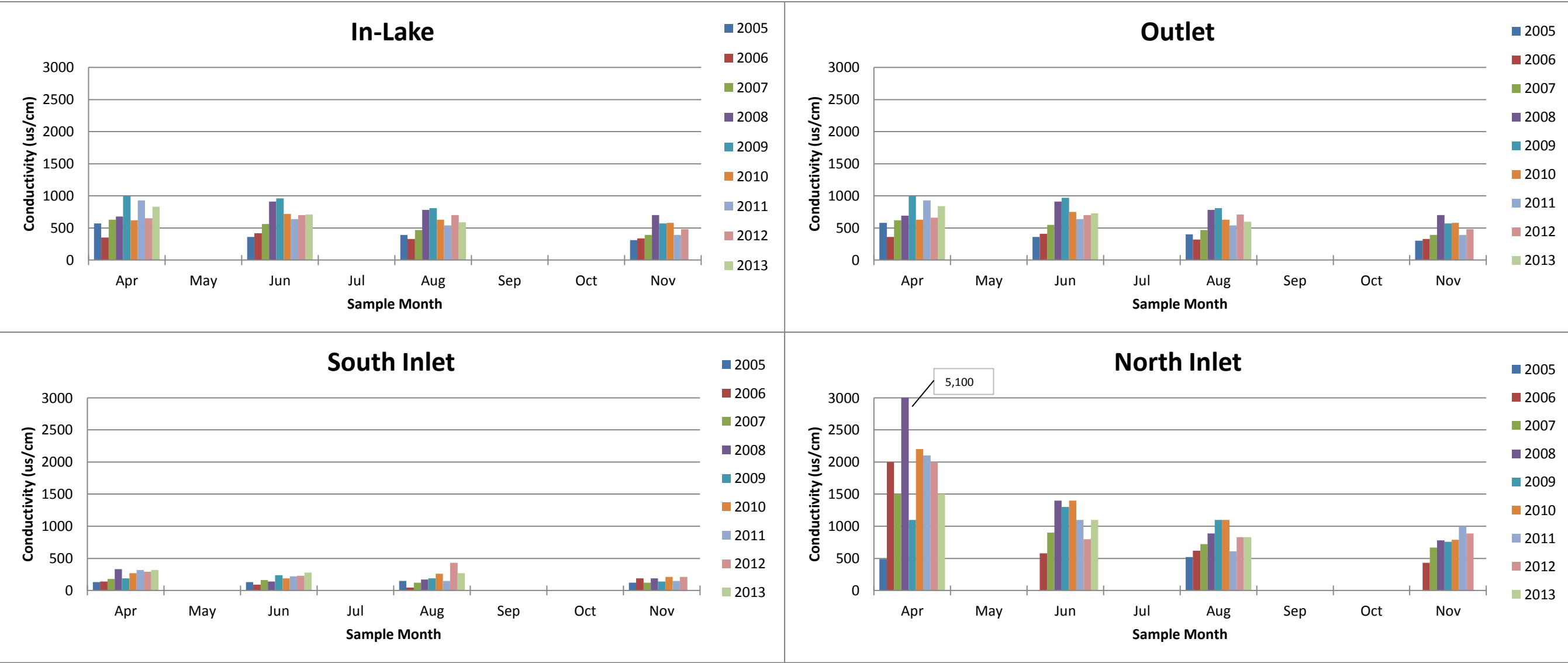
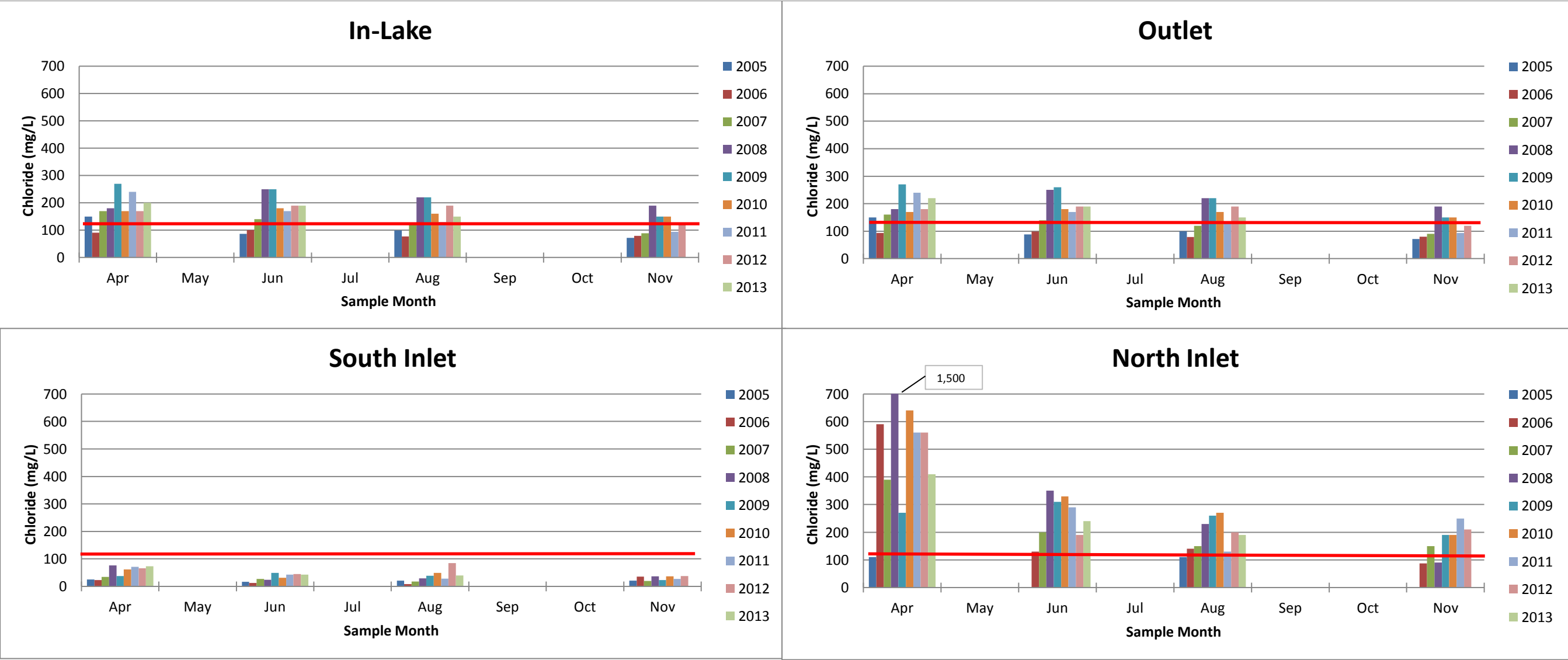


Figure 4. Conductivity at four sites in Russell Lake from April 2005 to August 2013



Red line indicates long-term CCME FAL guideline limit of 120 mg/L for chloride

Figure 5. Chloride concentrations at four sites in Russell Lake from April 2005 to August 2013

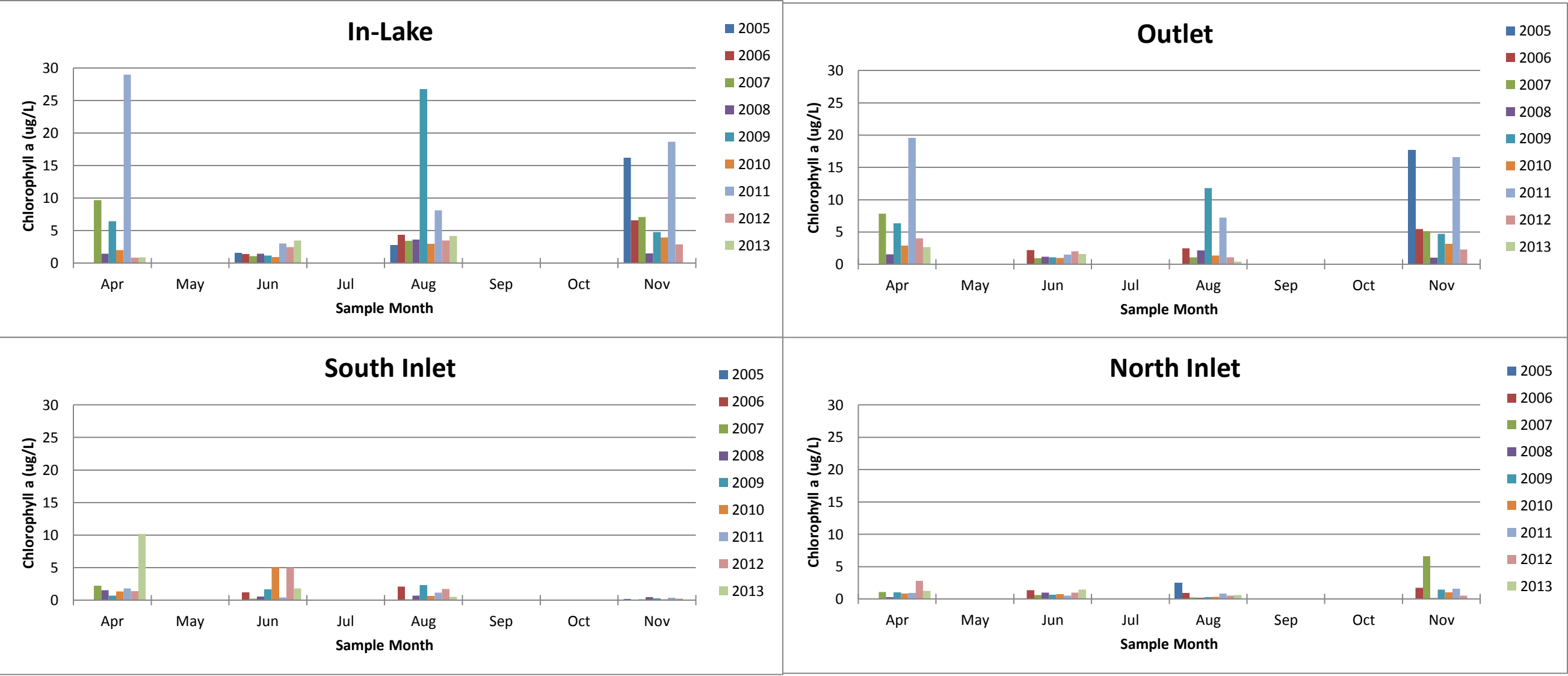
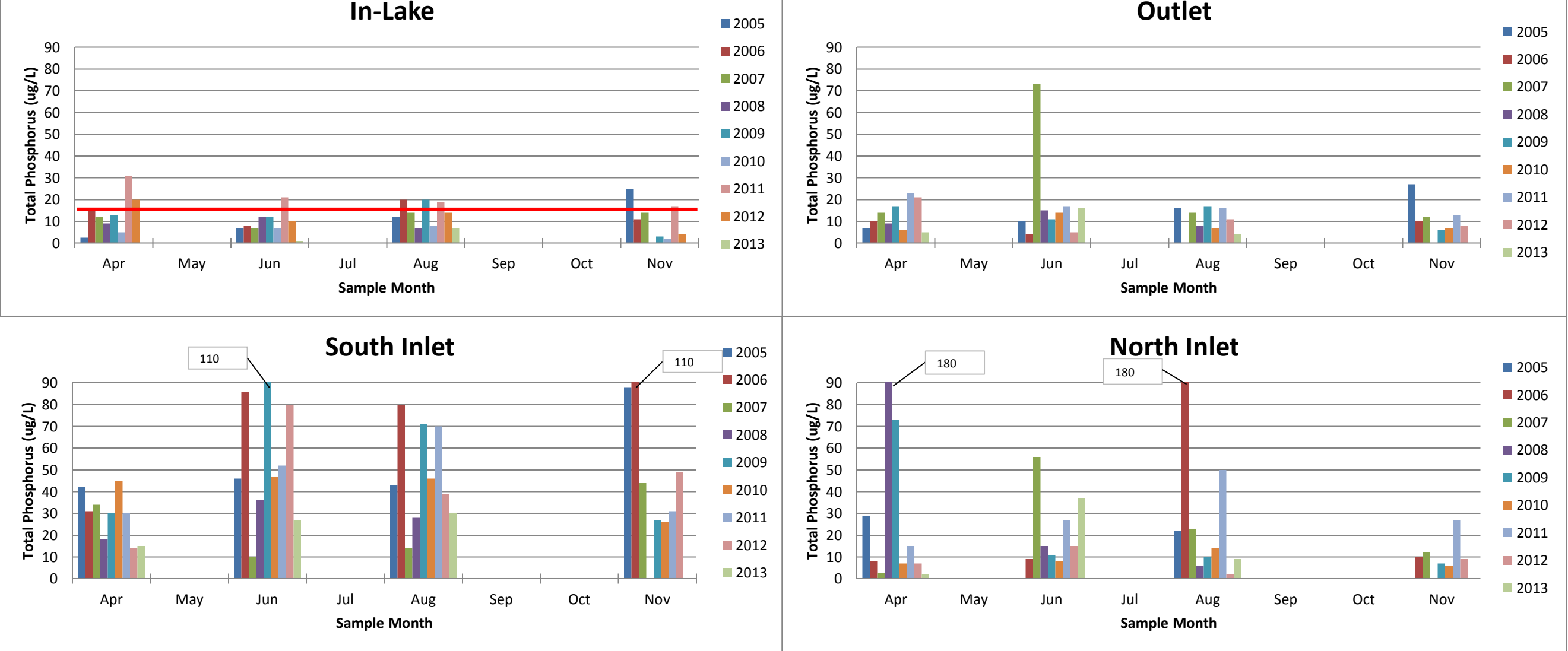


Figure 6. Chlorophyll a concentrations at four sites in Russell Lake from April 2005 to August 2013



Red Line indicates HRM Lake Specific Guideline Concentration for Total Phosphorus

Figure 7. Total Phosphorous concentrations at four sites in Russell Lake from April 2005 to August 2013



Red line indicates Upper CCME Recreational Use guideline Limit

Figure 8. Faecal Coliform at four sites in Russell Lake from April 2005 to August 2013

TABLE 8 Surface Water Quality Data for Russell Lake, In-Lake (2005-2013)

Analyte	Units	CCME FWAL	In-Lake																																				
			2005				2006				2007				2008				2009				2010				2011				2012				2013				
Apr	Jun	Aug	Nov	Mar	Jun	Aug	Oct	Apr	Jun	Aug	Oct	Mar	Jun	Aug	Oct	Apr	Jun	Aug	Oct	Mar	Jun	Aug	Nov	Mar	Jun	Aug	Nov	Apr	Jun	Aug	Nov	Apr	June	Aug	Fall				
General Chemistry																																							
Total Alkalinity (asCaCO ₃)	mg/L		20	17	21	17	15	20	25	26	22	29	27	30	19	22	28	34	27	30	36	35	30	35	36	36	32	31	33	35	27	33	35	36	32	34	37		
Chloride	mg/L		150	87	99	72	91	100	77	79	170	140	120	89	180	250	220	190	270	250	220	150	170	180	160	150	240	170	130	94	170	190	190	120	200	190	150		
Colour	TCU		12	12	8	18	12	14	13	11	9	9	8	12	10	11	15	9	16	9	14	20	14	8	10	15	14	19	22	21	10	7.9	6.2	15	11	14	9.6		
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	69	65	58	69	60	53	47	56	63	62	52	66	63	59		
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	<0.05	0.11	<0.05	<0.05	<0.05	0.08	<0.05	<0.05	<0.05	0.095	<0.05	<0.05	<0.05	<0.05	0.14	<0.05	<0.05				
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	-	-	<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	-	-	<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	<0.05	<0.05	<0.05	<0.05	0.12	<0.05	<0.05	0.064	<0.05	<0.05	0.059	0.054	0.063			
Total Kjeldahl 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	2.4	4.1	3.3	2.7	3.5	4.2	<5	2.7	2.9	3.1	4	3.1	3.1	3.6		
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	<0.01	<0.01	<0.01	<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	7	8	2	31	21	19	17	20	10	14	4	<1	<u>1</u>	7		
Dissolved Phosphorus	mg/L		<0.005	-	<0.1	-	0.006	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002		
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	7.5	7.5	7.4	7.5	6.8	7.6	7.5	7.5	7.7	7.8	7.7	7.4	7.6	7.7		
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	1.2	2.4	2.4	1.9	0.8	2.0	2.5	1.9	1	2.0	3.5	2.3	1.1	2.3		
Sulphate	mg/L		16	12	13	13	15	15	11	12	17	18	16	13	20	24	23	20	25	26	20	17	18	18	16	16	23	17	16	13	16	18	15	13	21	17	14		
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	0.5	1	1.2	2.8	1.0	2.2	1.2	1.2	1.1	0.9	1.3	0.62	0.48	1.2		
Conductivity	µS/cm		570	360	390	310	350	420	330	340	630	560	470	390	680	910	780	700	1000	960	810	570	620	720	630	580	930	640	540	390	650	700	700	480	830	710	590		
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	358	139	309	456	332	279	207	328	365	359	256	403	363	308		
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	35	36	36	31	31	33	35	27	33	35	36	32	34	37		
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	<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	23	22	20	24	20	18	16	19	21	21	17.5	22.3	21.3	20		
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	2.6	2.4	2.2	2.3	2.2	2.0	1.9	2	2.3	2.4	2.06	2.48	2.27	2.26		
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	2.2	2.1	2.3	2	1.9	1.8	1.9	1.8	2.0	2.0	1.95	2.15	2.15	2.11		
Sodium	mg/L		92	52	64	46	58	64	54	45	100	85	73	63	110	150	140	110	180	160	130	89	95	107	89	94	144	102	85	57	99	115	109	74.4	131	108	94		
*Total Suspended Solids	mg/L		<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	3	<u>1</u>	4	4	1	1	4	9	2	2	1	3	<u>1</u>	3	1	<u>1</u>	<u>1</u>	2	<u>1</u>	3	2	3	3	1.2	1.4	1.2	1	1	1	1.4		
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	0.96	2.99	3.96	29.01	3.04	8.11	18.67	0.84	2.46	3.48	2.87	0.89	3.48	4.20		
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	-	4	2.3	2.6	1.7	1.6	1.5	1.4	4.5	2.8	3.6	2.7	4.5	3.0	2.5	
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	8.1	7.6	13.1	13.1	7.4	5.9	10.5	10.5	8.2	9.6	10.6	13.4	8.0	7.5		
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	6.8	6.9	7.5	7.4	7.4	8.2	5.7	7.2	7.6	7.3	8.0	7.3	6.6	7.3		
Conductivity	µS/cm		602	334	188	129		393	310	330	612	527	474	278	444	1701	1514	600	1031	278	831	-	601	698	635	570	917	631	526	387	648	635	652	443	654	582	140		
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	20.6	22.6	8.7	3.4	18.3	20.7	8.0	6.8	18.9	25.0	10.1	5.2	21.6	22.3		
Bacteriological																																							
**E.Coli	CFU/100ml																						1	<u>1</u>	3	3	<1	3	67	4	1	45	1	20	<u>1</u>	<u>1</u>	10		
**Fecal Coliform	CFU/100 ml		<u>1</u>	<u>1</u>	1	1		5	1300	<u>1</u>	3	120	300	140	11	8	440	2	150	<u>1</u>	3200	32	<u>1</u>	160	20	57	2	3	240	<u>1</u>	4	30	1	<u>10</u>	<u>1</u>	<u>1</u>	50		

FWAL - Freshwater Aquatic Life

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

****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

April 2005 result for TP is italicized because result was below detection limit (DL) and shown as 2.5 (1/2 DL). The DL is now 2 ug/L.

TABLE 9 Surface Water Quality Data for Russell Lake, Outlet (2005-2013)

Analyte	Units	CCME FWAL	Outlet																																			
			2005				2006				2007				2008				2009				2010				2011				2012				2013			
			Apr	Jun	Aug	Nov	Mar	Jun	Aug	Oct	Apr	Jun	Aug	Oct	Mar	Jun	Aug	Oct	Apr	Jun	Aug	Oct	Mar	Jun	Aug	Nov	Mar	Jun	Aug	Nov	Apr	Jun	Aug	Nov	Apr	June	Aug	Fall
General Chemistry																																						
Total Alkalinity (asCaCO ₃)	mg/L		19	17	23	17	16	21	25	26	22	26	27	30	19	23	27	33	27	29	36	34	30	34	37	37	29	33	34	34	28	30	37	37	32	38	34	
Chloride	mg/L		150	88	100	72	93	99	79	80	160	140	120	90	180	250	220	190	270	260	220	150	170	180	170	150	240	170	130	93	180	190	190	120	220	190	150	
Colour	TCU		11	12	12	18	12	14	14	11	9	9	9	12	11	10	16	9	16	10	16	18	16	14	14	18	13	21	21	22	13	8.7	10	16	9.4	18	12	
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	73	62	58	68	55	54	48	58	61	63	55	69	65	58	
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	<0.05	<0.05	<0.05	0.07	<0.05	<0.05	<0.05	0.092	<0.05	<0.05	<0.05	0.12	0.054	<0.05	
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	-	-	<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	-	-	<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	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.11	<0.05		
Total Kjeldahl 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	3	3.7	3.6	2.5	3.7	4.2	<0.01	3	3.2	3.5	4.1	2.8	3.9	3.8	
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	<0.01	<0.01	<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	14	7	7	23	17	16	13	21	5	11	8	5	16	4	
Dissolved Phosphorus	mg/L		0.005	-	<0.1	-	0.007	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	<0.01	<0.002	
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	7.3	7.7	7.5	7.5	7.7	6.6	7.6	7.5	7.7	7.6	7.7	7.4	7.3	7.55	
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	0.9	2.4	2.4	1.7	0.8	2.1	2.4	1.3	1.1	2.4	3.4	2	1.3	2.2	
Sulphate	mg/L		16	12	12	16	14	14	11	12	17	18	16	13	19	24	23	20	25	24	20	17	17	18	17	16	23	17	15.0	13	16	18	15	12	21	17	16	
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	1	0.6	0.8	2.4	0.6	1.3	1.1	1.8	0.88	0.34	1.3	0.8	0.88	0.33	
Conductivity	µS/cm		580	360	400	300	360	410	320	330	620	550	470	390	690	910	780	700	1000	970	810	570	630	750	630	580	930	640	540	390	660	700	710	480	840	730	600	
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	365	319	308	450	324	279	207	339	360	365	260	425	370	310	
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	34	37	36	29	33	33	34	28	30	37	36	32	38	34	
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	<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	25	21	20	23	19	18	16	20.0	20.7	21.3	148.3	23.3	22	19.5	
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	2.7	2.3	2.1	2.3	2.0	2	1.9	2.00	2.24	2.39	2.13	2.59	2.3	2.24	
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	2.2	2.0	2.2	2.0	1.8	1.8	1.9	2.00	1.99	1.97	1.95	2.27	2.11	1.96	
Sodium	mg/L		92	57	65	46	61	64	52	44	110	87	71	61	110	150	140	110	160	170	130	88	98	112	85	93	143	95.1	87	58	104	113	110	77.4	138	109	94	
**Total Suspended Solids	mg/L		3	2.4	3.6	<u>1</u>	5	2	<u>1</u>	3	3	<u>1</u>	<u>1</u>	3	1	1	<u>1</u>	2	3	1	1	1	1	<u>1</u>	<u>1</u>	1	2	2	3	2	<u>1</u>	1.2	50	<u>1</u>	2	1	<u>1</u>	
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	11.80	4.72	2.92	1.00	1.35	3.18	19.56	1.49	7.22	16.61	4.03	2.02	1.08	2.3	2.69	1.58	0.42	
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	5.0	5.6	13.4	12.6	7.3	5.5	11.2	11.0	8.9	8.1	10.5	13.8	4.3	8.0	
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	7.7	7.4	7.2	7.7	7.6	7.6	6.8	7.2	7.9	7.6	8.2	7.4	6.6	7.0	
Conductivity	µS/cm		635	345	201	136		389	399	344	613	532	473	272	448	1703	1505	602	1023	278	834	-	592	702	633	571	914	634	529	389	659	633	657	444	654	601	160	
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	20.5	22.8	7.9	5.0	21.0	21	9.3	7.6	20.3	25.9	8.4	5.2	23.5	21.7	
Bacteriological																																						
**E.Coli	CFU/100ml																																					
**Fecal Coliform	CFU/100 ml		<u>1</u>	8	10	<u>1</u>		170	2700	<u>1</u>	1	700	3000	640	9	160	930	4	140	24	8100	160	<u>1</u>	35	600	200	4	23	490	<u>1</u>	<u>1</u>	70	100	<u>1</u>	<u>1</u>	100	70	

FWAL - Freshwater Aquatic Life

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

****Results below detection limits shown as 1**

Cells left intentionally blank for graphs to indicate no sample collected

Cells with dash indicate no

TABLE 10 Surface Water Quality Data for Russell Lake, South Inlet (2005-2013)

Analyte	Units	CCME FWAL	South Inlet																																					
			2005				2006				2007				2008				2009				2010				2011				2012				2013					
			Apr	Jun	Aug	Nov	Mar	Jun	Aug	Sep	Oct	Apr	Jun	Aug	Oct	Mar	Jun	Aug	Oct	Apr	Jun	Aug	Oct	Mar	Jun	Aug	Nov	Mar	Jun	Aug	Nov	Apr	Jun	Aug	Nov	Apr	June	Aug	Fall	
General Chemistry																																								
Total Alkalinity (asCaCO 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	41	56	27	25	35	24	28	28	28	32	73	36	27	60	56	
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	31	49	37	71	43	28	27	66	45	85	38	73	43	40		
Colour	TCU		24	27	21	45	14	68	380	44	38	23	47	52	41	17	52	150	51	51	50	150	57	26	47	87	59	22	83	200	42	18	99	38	59	24	62	53		
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	47	54	43	42	40	31	38	48	44	89	44	46	71	74		
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	0.06	0.1	<0.05	<0.05	<0.05	<0.05	42	0.067	0.19	0.14	0.11	0.066	0.13	<0.05		
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	-	-	0.1	<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	-	-	<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	<0.05	0.06	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.24	<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	8.1	12	8.4	4.2	9.1	17	5	5.1	11	9.7	8.4	5	9.4	7.5		
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	0.03	0.02	0.03	0.01	0.02	0.03	0.01	0.012	0.028	0.015	0.013	<1	0.015	0.014		
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	47	46	26	30	52	70	31	14	80	39	49	15	27	30		
Dissolved Phosphorus	mg/L		0.037	-	<0.1	-	0.021	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.003	0.011	0.015		
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	7.6	7.6	7.4	7.4	7.5	7.0	7.4	7.4	7.5	7.4	7.9	7.6	7.3	7.4	7.6	
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	6.8	7.2	6.4	4.8	4.1	4.8	6.8	4.1	4.5	9	6.9	3.4	5.7	7.7		
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	3	<2	18	14	<2	<2	11	11	14	10	7.3	14	12	17		
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	1.7	4.1	1.5	0.9	1.0	2.5	4.5	1.3	39	7.5	5.5	1.8	1.4	5.6		
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	190	260	210	320	220	150	150	290	230	430	210	320	280	270		
TDS (calculated)	µg/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	101	139	119	165	112	83	93	155	134	237	116	167	154	155		
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	40	56	27	25	35	24	28	28	32	73	36	27	60	56		
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	<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	13	16.1	13	13	12	9.7	11	147	135	28.1	13.1	14	22	22.7		
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	3.6	3.3	2.6	2.7	2.5	1.75	2.5	2.7	2.49	4.5	2.75	2.5	4.1	4.2		
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	0.9	1.4	1.6	1.1	0.8	1.1	1.4	1.4	2.16	2.63	1.45	1.8	2.1	2.2		
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	19	26	24	44	28	21	16	37	30	51	23	42	27	26		
**Total Suspended Solids	mg/L		<u>1</u>	<u>1</u>	<u>1</u>	2	<u>1</u>	4	91	2	<u>1</u>	<u>1</u>	<u>1</u>	3	1	<u>1</u>	2	1	2	<u>1</u>	<u>1</u>	7	<u>1</u>	2	4	<u>1</u>	<u>1</u>	<u>1</u>	1	<u>1</u>	5	<u>1</u>	17	4.2	<u>1</u>	1.2	1	2.2		
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	5.05	0.64	0.13	1.80	0.42	1.18	0.36	1.39	4.99	1.71	0.24	10.17	1.81	0.51		
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	9.3	9.5	15.1	13.7	7.9	6.3	11.0	10.4	8.2	9.8	10.2	15.0	8.3	10.4		
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	7.4	7.3	7.6	7.8	7.1	8.0	5.7	7.3	7.8	6.7	7.3	7.3	6.5	7.3		
Conductivity	µS/cm		124	105	185	78		94	161	-	142	174	145	121	74	187	260	331	164	191	69	232	-	268	187	270	205	316	214	145.0	157.0	334	213	392	191	234.3	222	689		
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	13.0	16.6	5.4	2.1	13.3	17	7.0	2.6	15.1	17.1	5.3	2.7	15.8	-		
Bacteriological																																								
**E. Coli	CFU/100ml																							2	<u>1</u>	500	7	<u>1</u>	4	>250	5	<u>1</u>	340	<u>1</u>	30	10	100	100		
**Fecal Coliform	CFU/100 ml		<u>1</u>	14	66	<u>1</u>		1	100		<u>1</u>	<u>1</u>	2	200	6	2	2	150	3	3	1	2200	2	<u>1</u>	<u>1</u>	1100	280	<u>1</u>	5	12	200	11	<u>1</u>	310	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	

TABLE 11 Surface Water Quality Data for Russell Lake, North Inlet (2005-2013)

Analyte		Units	CCME FWAL	North Inlet																																				
				2005				2006				2007				2008				2009				2010				2011				2012				2013				
				Apr	Jun	Aug	Nov	Mar	Jun	Aug	Oct	Apr	Jun	Aug	Oct	Mar	Jun	Aug	Oct	Apr	Jun	Aug	Oct	Mar	Jun	Aug	Nov	Mar	Jun	Aug	Nov	Apr	Jun	Aug	Nov	Apr	June	Aug	Fall	
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	110	99	77	83	92	77	98	84	68	76	93	59	71	84		
Chloride		mg/L		110		110		590	130	140	87	390	200	150	150	1500	350	230	91	270	310	260	190	640	330	270	190	560	290	130	250	560	190	200	210	410	240	190		
Colour		TCU		28	-	17	-	7	21	13	20	12	13	15	12	7	16	49	13	30	24	25	27	11	22	38	33	13	36	63	18	9.3	41	21	20	11	46	18		
Hardness (as CaCO ₃)		mg/L		62	-	93	-	-	86	110	81	160	150	120	120	230	150	130	120	100	140	140	110	200	170	160	120	220	150	90	170	210	99	110	130	140	110	120		
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	0.26	0.24	0.36	0.47	0.27	0.38	0.35	0.27	0.74	0.27	0.32	0.53	0.48	0.2		
Nitrate (as N)		mg/L	13000		-	-	-	0.4	<0.05	0.07	1.27	0.32	-	-	-	-	-	-	-	-	-	-	0.23	-	-	0.23	0.36	-	-	-	-	-	-	-	-	-	-	-		
Nitrite (as N)		mg/L	60	<0.01	-	-	-	<0.01	<0.01	<0.01	0.03	<0.01	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	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	<0.05	0.15	0.07	<0.05	0.06	0.1	0.12	0.15	0.082	<0.05	0.091	<0.05	0.51	<0.05		
Total Kjeldahl 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	5	7	4.5	3.1	5.1	6.6	6	3.3	6.2	4.4	4.5	3	13	3.8		
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	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.010	0.010	<0.01	<0.01	<0.01	<0.01	<0.01	
*Total Phosphorus		ug/L		29		22		8	9	180	10	<u>2.5</u>	56	23	12	180	15	6		73	11	10	7	7	8	14	6	15	27	50	27	7	15	2	9	2	37	9		
Dissolved Phosphorus		mg/L		-	-	-	-	0.007	-	-	-	5.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	0.004	0.005		
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	7.9	8.0	7.8	7.9	7.9	7.9	8.0	8.0	7.98	8.1	8.04	7.7	7.4	8.0		
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	5.5	5.9	6.1	5.3	4.1	5.8	5.8	3.8	5.2	5	6.4	4.5	3.2	5.1		
Sulphate		mg/L		26	-	21	-	40	17	12	26	46	50	30	23	97	22	32	20	38	28	14	23	<0.01	17	19	29	46	23	22.0	22	36	28	15	19	40	21	11		
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	0.9	2.7	1.3	1.3	1.8	4.3	1.9	2	5.1	1.7	1.3	1.2	3.7	1.1		
Conductivity		µS/cm		490		520		2000	580	620	430	1500	900	720	670	5100	1400	890	780	1100	1300	1100	760	2200	1400	1100	790	2100	1100	610	1000	2000	800	830	890	1500	1100	830		
TDS (calculated)		mg/L		262	-	274	-	1110	310	339	234	804	488	392	364	2740	693	521	413	563	652	560	407	1170	-	574	428	1080	593	335	544	1030	427	439	468	800	478	420		
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	104	98	76	82	92	76	97	84	67	75	92	58	70	84		
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	<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	57	54	40	75	51	31	57	71	34	39	44	48	38	41		
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	7	5.8	4.2	8.6	6.1	3.3	7.3	8.3	3.7	4.4	5.4	5.1	4.6	5.0		
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	3.4	3.7	3.1	3.8	2.8	2.9	3.1	3.5	3.1	2.3	2.6	3.0	2.8	2.3		
Sodium		mg/L		75		68		360	83	91	49	250	120	98	90	990	210	150	100	180	200	160	110	350	174	148	109	330	162	89	132	292	118	121	116	253	121	113		
**Total Suspended Solids		mg/L		4		3		11	5	<u>1</u>	3	3	3	1	1	330	<u>1</u>	<u>1</u>	<u>1</u>	72	<u>1</u>	2	3	1	7	<u>1</u>	<u>1</u>	2	1	2	2	2	1.8	<u>1</u>	<u>1</u>	<u>1</u>	20	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	0.75	0.35	1.04	0.94	0.51	0.84	1.61	2.78	0.98	0.51	0.53	1.26	1.43	0.62		
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	8.8	7.9	14.2	13.9	5.4	7.0	11.0	13.3	8.9	11.0	10.5	12.5	7.6	7.7		
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	7.5	7.3	7.3	7.6	7.6	7.2	8.1	8.0	7.9	7.8	7.0	7.2	7.2	7.2		
Conductivity		µS/cm				170			542	754	437	1523	908	728	444	3036	2540	1750	681	1075	366	1069	-	2093	1293	1119	780	2142	1142	598	999	1957	633	765	823	1178	843	226		
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	15.8	19.0	7.2	2.5	16.1	18	8.2	4.6	17.4	20.9	8.4	3.2	18.9	19.3		
Bacteriological																																								
E.Coli		CFU/100ml																						45	1	21	7	1	6	>250	14		<u>1</u>	>250	100	60	30	300	<u>1</u>	
**Fecal Coliform		CFU/100 ml				<u>1</u>			35	4200	<u>1</u>	6	34	10000	710	22	22	830	5	6400	20	1700	51	<u>1</u>	65	1100	180	13	150	490	15	1	>250	800	30	<u>1</u>	400	200		

FWAL - Freshwater Aquatic Life

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

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

Cells left intentionally blank for graphs to indicate no sample collected

Cells with dash indicate no sample collected