

**Ministry of the Environment**

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**MEMORANDUM**

August 16, 2011

**TO:** Dan Joyner  
Sr. Environmental Officer  
Belleville Area Office  
Eastern Region

**FROM:** Dana Cruikshank  
Surface Water Scientist  
Water Resources Group  
Technical Support Section  
Eastern Region

**RE:** 2010 Water Quality Sampling  
Stoco Lake

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In the summer of 2010 I was asked by Victor Castro, Surface Water Group Leader to go to Stoco Lake to collect water samples as well as temperature and dissolved oxygen profiles at the deepest point in the lake. On July 8, 2010 the lake was sampled at the deepest point as well as the area off from the sewage lagoon discharge point. At the time pharmaceuticals were tagged as being the next up and coming environmental issue. Because of the sewage lagoon discharge we thought Stoco would be a good candidate to detect pharmaceuticals if present. Therefore samples were taken at both locations for product codes that covered all the pharmaceuticals our lab analyzed. This request apparently backlogged our receipt of the other chemistry which we did not receive from the lab until February 2011. There was still no pharmaceutical data reported but it was suppose to be forthcoming. A request to the lab last week indicates they have nothing in their database. I therefore will summarize the July 2010 data. A sediment sample was also taken from the near shore area by the sewage lagoons.

Figure one shows the locations of the two sampling locations.



**Figure 1: Sampling Locations for July 8, 2010, Stoco Lake**

### **Water Quality**

Composite samples were taken from the euphotic zone at STO-1 and STO-2 and from a metre over bottom at STO-1. The attached LIMs data sheets report all the chemistry from the samples taken on July 8, 2010.

Secchi depth was 3.4 and 3.6 metres at STO-1 and STO-2 respectively which indicates a lake that is somewhat eutrophic.

Total phosphorus (TP) concentrations were 9 and 11  $\mu\text{g/L}$  for STO-1 and STO-2 respectively. The concentration at a metre over bottom at STO-1 was 10  $\mu\text{g/L}$ . Usually bottom concentrations of TP are significantly higher than the surface ones at this time of year as particulates sink to the bottom. Concentrations of TP at these concentrations according to the PWQO are unlikely to result in frequent algae blooms.

Nitrate and nitrite concentrations were however significantly higher in the bottom sample of the main basin. The presence of nitrite in these concentrations would suggest that sewage input was occurring to the lake as it is not normally found in natural waters.

Cadmium, cobalt and copper either just exceeded PWQO or were elevated in all samples in Stoco Lake. It is unlikely that aquatic toxicity would occur at these concentrations. The potential of toxicity of these metals increase with water hardness and the data from this sampling event indicates water hardness in Stoco Lake is around 100 mg/l CaCO<sub>3</sub> which is the dividing line concentration of determining PWQO exceedances or not.

### Temperature and Dissolved Oxygen

**Table 1 Stoco Lake, Temperature and Dissolved Oxygen Concentrations July 8, 2011.**

Depth	STO-1		STO-2	
	Temp °C	DO mg/L	Temp °C	DO mg/L
0	28.09	8.81	29.72	8.55
1	27.47	8.98	29.50	8.66
2	26.29	9.19	27.73	9.04
3	23.92	8.50	24.75	8.49
4	21.93	7.49	21.88	5.25
5	20.83	5.71	21.87	4.75
6	19.79	3.60		
7	18.02	1.05		
8	15.58	0.20		
9	14.01	0.19		
10	13.58	0.17		
11	13.41	0.16		
12	13.32	0.14		
13	13.21	0.14		
14	13.05	0.13		

Temperatures were relatively warm to the bottom of the lake. Dissolved oxygen concentrations started to decline between 4 and 5 metres and there was little or no DO below 7 metres.

### Sediment Chemistry

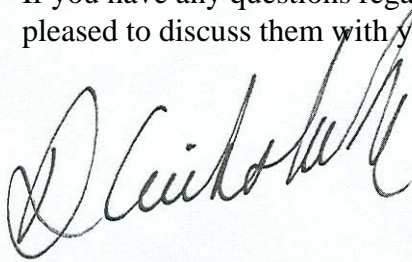
A sediment sample was taken at STO-2 which was located off shore from the sewage lagoons. When compared to the contaminated sediment guidelines; TOC, arsenic, nickel and zinc exceeded lowest effect levels (LEL) and manganese just exceeded the severe effect level (SEL).

It should be noted that arsenic was just under the SEL value. LEL indicates a level of contamination that can be tolerated by the majority of sediment organisms and the sediment is considered to be marginally polluted. SEL exceedances indicate a level of contamination that is expected to be detrimental to the majority of sediment dwelling organisms and the sediment is considered to be heavily contaminated.

A review of the literature indicates that while manganese sediment toxicity may occur to some bottom dwelling organisms at these concentrations the possibility of toxicity increases in the presence of other metals like nickel, cadmium and zinc. All three of these metals are in elevated concentrations in Stoco Lake.

It is my understanding that surface water staff are out today on Stoco Lake collecting water and sediment samples and doing some weed identification. This sampling event will provide additional data for assessment. If results are similar your office may wish to consider asking EMRB to conduct some cage mussel studies next year.

If you have any questions regarding the above comments or recommendations I would be pleased to discuss them with you.

A handwritten signature in black ink, appearing to read 'Dana Cruikshank', is written over a light blue rectangular background.

Dana Cruikshank  
DC/gl

c: Christine Brown  
SW File 07-02-11-03-01 (Stoco Lake)