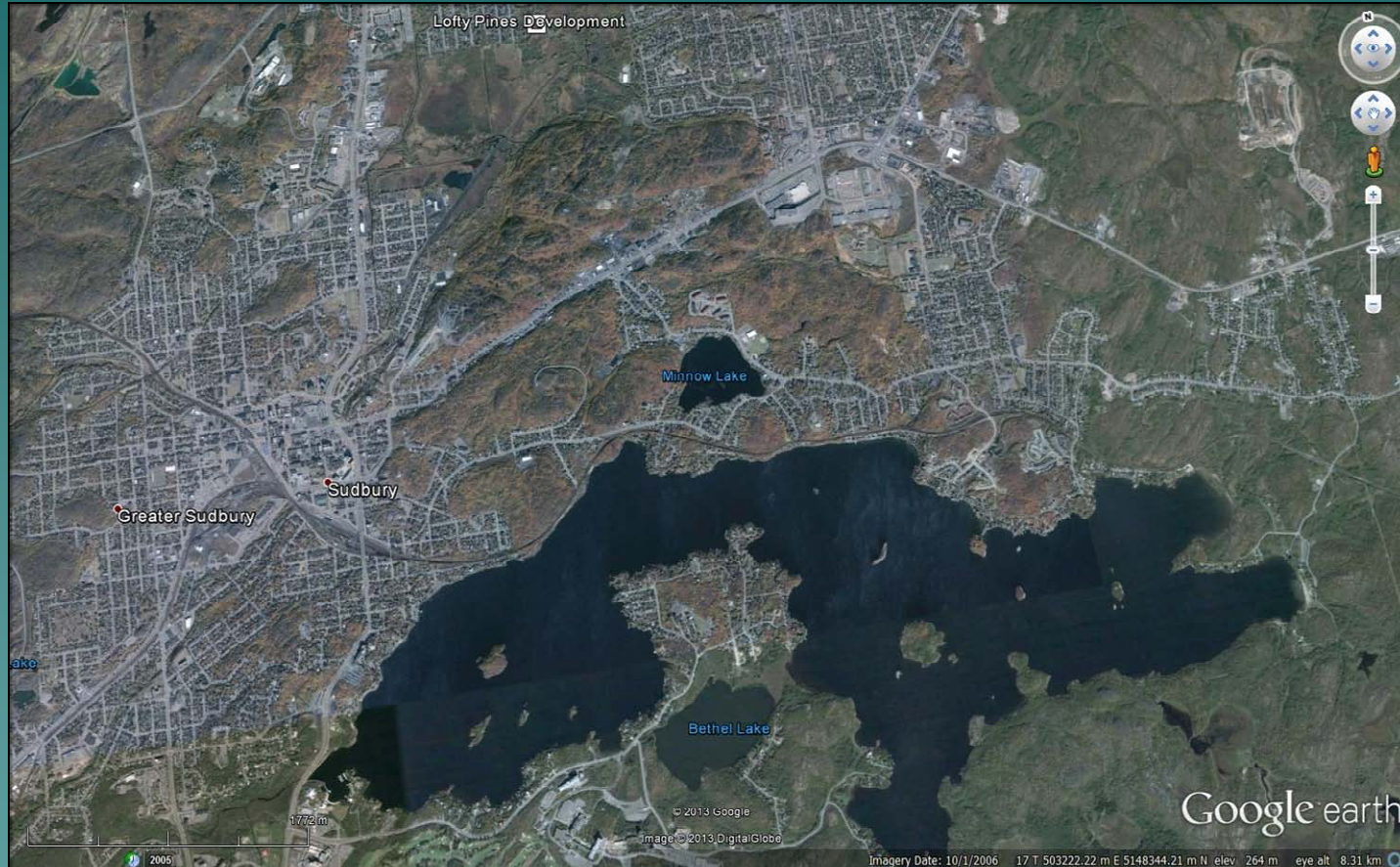


MINNOW LAKE SEDIMENT QUALITY ASSESSMENT

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Minnow Lake Restoration Committee

Minnow Lake Watershed



Minnow Lake Watershed

Study Objectives

- ◆ Evaluation of sediment quality throughout Minnow Lake
 - ◆ Assessment of current sediment quality
 - MOE's Provincial Sediment Quality Guidelines
 - ◆ Comparison with historic chemistry results (1994 survey results)
 - ◆ Determine the lakewide extent of sediment contamination
 - ◆ Mapping of sediment accumulations associated with the storm water outlets

Sediment Sampling Station Locations 1994 and 2012



Survey Methods

- ◆ Sampling conducted at same stations in 1994 and 2012
 - ◆ Collected using an Ekman dredge grab sampler
 - ◆ Top 2.5 cm of sediment removed
 - ◆ Submitted for chemical analyses to Testmark Laboratories
 - ◆ Stations geo-referenced, samples photographed and physical description recorded

Example Sediment Sample



Sediment Chemistry Results

TABLE 1: Minnow Lake Sediment Chemistry Results - 1994 and 2012 Surveys

PSQG	LEL	Date	ML-1	ML-2	ML-3	ML-4	ML-5	ML-6	ML-7	ML-8	ML-9	ML-10	ML-11	ML-12	Mean
	SEL														
As (ug/g)	6	09/06/1994													
	33	16/10/2012	23.8	18.2	21.6	22.5	17.2	19.7	7.95	-	21.5	15.6	18.2	14.3	18.2
Cd (ug/g)	0.6	09/06/1994													
	10	16/10/2012	4	3.95	5.28	5.11	5.58	4.96	2.16	-	4.63	4.82	4.03	3.63	4.38
Cr (ug/g)	26	09/06/1994													
	110	16/10/2012	33.3	49.1	67.6	69.2	74.3	67.3	36.3	-	55.1	64.4	64.7	72.7	59.5
Cu (ug/g)	16	09/06/1994	520	350	1200	1100	1100	1100	330	820	1000	1000	940	820	857
	110	16/10/2012	686	569	788	788	813	809	275	-	821	846	690	662	704
Fe (ug/g)	20000	09/06/1994													
	40000	16/10/2012	18600	26200	33300	34200	31700	32900	15000	-	27200	29600	32000	29600	28209
Mn (ug/g)	460	09/06/1994													
	1100	16/10/2012	269	535	601	504	621	588	248	-	360	455	497	521	473
Pb (ug/g)	31	09/06/1994													
	250	16/10/2012	112	123	217	205	238	207	65.3	-	179	204	155	144	168
Ni (ug/g)	16	09/06/1994	840	780	2100	1800	1900	1900	700	1500	1900	1900	1500	1500	1527
	75	16/10/2012	1380	1210	1530	1390	1330	1400	586	-	1630	1420	1230	1020	1284
Zn (ug/g)	120	09/06/1994	260	230	610	680	680	670	64	200	570	570	580	580	475
	820	16/10/2012	365	395	592	582	571	550	202	-	486	535	499	530	482
TP (mg/kg)	600	09/06/1994	560	840	1000	1060	1170	1100	440	920	870	1040	940	930	905
	2000	16/10/2012	56	115	156	108	177	134	103	-	146	153	109	172	130
TKN (mg/kg)	550	09/06/1994	5180	6770	6140	4890	5360	5020	2960	5660	4890	5060	4110	4850	5074
	4800	16/10/2012	3660	4870	4170	2170	1290	2900	815	-	2490	1980	1470	1390	2473

Note: Hg levels measured in 2012 all less than Method Detection Limit (<0.05 ug/g)

Criteria and Definitions

- ◆ PSQG – Provincial Sediment Quality Guidelines (MOE – 1193)
- ◆ LEL – Lowest Effect Level
 - ◆ Level of contamination which has no effect on the majority of the sediment dwelling organisms (benthic macroinvertebrates)
- ◆ SEL – Severe Effect Level
 - ◆ Level of contamination likely to affect the health of sediment dwelling organisms

Criteria and Definitions Continued

- ◆ Parameters analyzed:
 - ◆ As – arsenic
 - ◆ Cd – cadmium
 - ◆ Cr – chromium
 - ◆ Cu – copper
 - ◆ Fe – iron
 - ◆ Hg - mercury
 - ◆ Mn – manganese
 - ◆ Pb – lead
 - ◆ Ni – nickel
 - ◆ Zn – zinc
 - ◆ TP – total phosphorus
 - ◆ TKN – total Kjeldahl nitrogen


Summary of Chemistry Results

- ◆ All parameters analyzed (metals and organic compounds) exceeded MOE's PSQG for Lowest Effect Levels
- ◆ Several parameters exceeded the Severe Effect Levels
 - ◆ Copper – 7 times SEL
 - ◆ Nickel – 17 times SEL

Results Continued

- ◆ Metal concentrations showed little improvement between 1994 and 2012 surveys
- ◆ Reductions in TP and TKN from 1994 to 2012
- ◆ Exceedances of MOE's PSQG were lakewide
- ◆ Highest concentrations generally located in middle basin of lake

Sediment Mapping

- ◆ Increase in sediment accumulations around storm water outlets noted in recent years – result of development within watershed
 - ◆ Mapping of depth and extent around outlets mapped in 2013
 - ◆ Results pending
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Sediment Mapping

