APPENDIX G

LAKE SEDIMENTATION MONITORING PROGRAM

Mary River Project

March 2015

Lake Sedimentation Monitoring Program:

2013/2014

North/South Consultants Inc.
Aquatic Environment Specialists

Mary River Project

Lake Sedimentation Monitoring Program: 2013/2014

March 2015

Prepared by

North/South Consultants Inc.

For

Baffinland Iron Mines Corporation

North/South Consultants Inc.
Aquatic Environment Specialists

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1.0 INTRODUCTION AND BACKGROUND

The Mary River Project is an iron ore mine, located in the Qikiqtani Region of Nunavut on northern Baffin Island, owned and operated by Baffinland Iron Mines Corporation (BIM). The Project includes the construction, operation, closure, and reclamation of an open-pit mine and associated infrastructure for extraction, transportation and shipment of iron ore.

As described in the Final Environmental Impact Statement (FEIS) and the Addendum to the FEIS, the Mary River Project is expected to result in increased sediment deposition in mine area waterbodies, including lakes, due to dust deposition and, potentially, due to introduction of suspended solids from various activities in the drainage basins (e.g., wastewater discharges). Dust will be directly deposited on waterbodies and indirectly introduced from runoff within the watersheds, which is expected to be greatest during the snowmelt/freshet period.

Potential effects of dust on aquatic ecosystems include effects on water quality, when suspended in the water column (i.e., total suspended solids [TSS], metals, nutrients, water clarity), and effects once deposited on the lake bottom or streambed. Sedimentation of dust in lakes and streams may affect aquatic biota indirectly through changes in sediment quality (e.g., metals, nutrients, particle size, organic matter) and habitat quality (i.e., changes in substrate composition). High rates of sedimentation may also directly affect benthic macroinvertebrates (BMI; i.e., smothering) and fish eggs (i.e., smothering of eggs).

The Aquatic Effects Monitoring Plan (AEMP) for the freshwater environment, submitted on June 27, 2014 (BIM 2014), includes a lake sedimentation monitoring component to address potential effects of the Project as described in the FEIS and the Addendum to the FEIS.

A lake sedimentation study was initiated in 2013 to measure baseline sedimentation in a mine area lake and the preliminary results of this program were presented in North/South Consultants Inc. (NSC 2014). In brief, the program involved deployment of five replicate sediment traps at three sites in Sheardown Lake NW in the open-water season of 2013 (August 2 – September 6, 2013). The sites were selected to generate measurements of sedimentation rates at a deep site, where sedimentation is typically greatest, and at two shallower locations – one of which was located in potential Arctic Char (*Salvelinus alpinus*) spawning habitat, to generate baseline information on the critical habitat of concern with respect to this effects pathway.

Traps were retrieved near the end of the open-water season (September 6, 2013), emptied, and redeployed. Contents of the traps were submitted to an accredited analytical laboratory (ALS Laboratories, Winnipeg, MB) and analysed for total dry weight. Due to minimal sediment sample size, additional analyses could not be conducted.

This report presents the results of the lake sedimentation study conducted over the period of fall 2013 through fall 2014 (i.e., additional measurements collected since the previous report). The program was intended to collect measurements of baseline sedimentation rates in Sheardown Lake NW through the ice-cover season of 2013/2014 and to provide a second year of measurements of baseline sedimentation rates in the open-water season of 2014.

2.0 METHODS

Sampling undertaken in the 2013/2014 lake sedimentation program included measurements of sedimentation rates through the use of sediment traps.

2.1 SEDIMENT TRAPS

Each sediment trap consisted of three 50-cm long PVC pipes of known diameter (5 cm total diameter with walls 1.6 mm in thickness), with an aspect ratio of approximately 10:1. An aspect ratio of > 5:1 is recommended for cylindrical sediment traps (Mudroch and MacKnight 1994). The bottoms of the pipes were sealed and clamped together.

Sedimentation rates measured in the open-water season of 2013 were relatively low (i.e., 0.073-0.250 mg/cm^2/day; NSC 2014) and it was anticipated that rates would be even lower for the ice-cover season in Sheardown Lake NW. Low sedimentation rates can be challenging to measure using conventional methods (e.g., sediment traps) as it can be difficult to obtain sufficient volumes of sediment for laboratory analysis. To ensure that sufficient sediment volumes of sediments were collected in 2013/2014, five replicate sediment traps were deployed at each sampling site – which is consistent with the methods employed in the open-water season of 2013 – with the intent of pooling the replicate samples in the event that sufficient volumes could not be obtained from individual traps. If sufficient volumes were obtained from individual traps for analysis, replicate traps were to provide sample replication and measures of variability within a site.

Upon retrieval of sediment traps, it was determined that pooling of samples collected over the ice-cover and open-water seasons of 2013/2014 was not required. Replicate samples were treated and analysed individually.

2.2 SAMPLING SITES

Increases in sedimentation rates may affect BMIs (through smothering and changes in substrate characteristics), Arctic Char habitat (notably spawning areas which are typically hard substrates), and/or Arctic Char eggs (through deposition on incubating eggs). Therefore the sampling sites were located in a potential Arctic Char spawning area (SL-SHAL2), a shallow, soft substrate area (SL-SHAL1), and a deep-water area (SL-DEEP1). Collectively this information was intended to provide information on sedimentation rates in different habitat types in the lake.

Specific spawning sites have not been identified within Sheardown Lake NW and the FEIS conservatively assumed that areas of hard substrate at water depths ranging from 2-12 m in the lakes could potentially provide spawning habitat. One area in Sheardown Lake NW best matched these criteria and was selected for sediment trap deployment beginning in 2013 to represent potential Arctic Char spawning habitat (Site SL-SHAL2; Figure 1). A second sampling site was located in an area with a similar range in water depth (2-12 m), but with a soft substrate (SL-SHAL1), for comparison. A third sampling site was selected near the deepest point in the lake (SL-DEEP1) as these areas are typically the ultimate depositional areas in lakes and because sampling the profundal zone (i.e., depth > 12 m) would provide a measure of a dominant aquatic habitat type.

Sites were first identified and sampled in the open-water season of 2013. Since initiation of the program, traps have been redeployed in the same locations, though some movement of traps from the original deployment locations occurred over the course of the program.

2.3 INSTALLATION AND RETRIEVAL OF SEDIMENT TRAPS

Following sampling in the open-water season of 2013, sediment traps were redeployed in fall 2013 (September 6, 2013), as described in NSC (2014), and retrieved after ice-off in 2014 (July 27-28, 2014) to provide a measure of winter sedimentation rates. After removing the contents, traps were redeployed in approximately the same locations as they were retrieved, and left in place until fall 2014 (Figure 1). Traps were again retrieved, emptied, and redeployed on August 30-September 1, 2014.

Once located, traps were slowly raised to the surface to minimize/avoid loss of trap contents. The contents (water and sediments) of each trap were transferred into a 4 L plastic container and the traps were then rinsed several times with lake water to ensure that all of the sediment in the trap was transferred to the sample container. Samples were then stored in a cool, dark location until submission to the analytical laboratory (ALS Laboratories, Winnipeg, MB).

Water depth, Universal Transverse Mercator units (UTMs) and observations regarding contents of the traps or site conditions at retrieval were also recorded.

2.4 LABORATORY ANALYSES

Due to low volumes of sediment captured in sediment traps, samples could only be analysed for total dry weight. Samples were analysed at ALS Laboratories (Winnipeg, MB) by filtering samples, which included sediments and water, through a pre-weighed

0.70 µm glass fibre filter, rinsing the filter apparatus and container three times, and drying the filter at 105 ^{o}C for two hours. Samples were allowed to cool for one hour and weighed.

2.5 DATA ANALYSIS

Sediment deposition rates were calculated as follows:

Sedimentation rate (mg/cm^2/day) = Total dry weight of sample (mg)/sediment trap surface area (cm^2)/days of deployment.

Percent relative standard deviation (PRSD) of replicate samples was calculated as follows:

PRSD = Standard deviation of the replicate values/Mean of the triplicate values x 100.

3.0 RESULTS

The following provides a description of the results of the 2013/2014 lake sedimentation monitoring program. Results are presented for the ice-cover season, defined as the period of deployment from September 2013 through July 2014, and the open-water season, defined as the period of deployment from July 2014 through late August/September 2014. Analytical laboratory results are presented in Appendix 1.

3.1 ICE-COVER SEASON 2013/2014

Fourteen of the 15 sediment traps deployed in September 2013 were located and retrieved in July 2014 (Table 1). Seven traps were retrieved July 27 and another seven were retrieved the following day, for a total deployment period of 324-325 days. Each of the five traps deployed in September 2013 at site SL-SHAL1 had drifted into deeper water, though traps were still within 20 m of their original deployment location (Figure 1). Despite extensive searching, sediment trap SL-SHAL1E could not be located during the July sampling period. In addition, the sample bottle for site SL-DEEP1C became uncapped in transit from site and the results for this sample were omitted from the statistical calculations presented in Tables 2 and 3.

Sedimentation rates were low in winter (averaging between 0.027 and 0.050 $mg/cm^2/year$), and lower than measured in the open-water seasons of 2013 and 2014, in all three locations (Tables 1 and 2). Within site variability was also low; PRSDs ranged from 3.7 to 13.4% and were within the criterion of 18% that is often applied for water quality replicates (British Columbian Ministry of Environment, Land, and Parks [BCMELP] 1998).

3.2 OPEN-WATER SEASON 2014

All 14 traps deployed in July 2014 were retrieved and sampled in late August/early September, 2014 (Table 1). The single replicate trap (SL-SHAL1E) that could not be located in July 2014 was located during the fall sampling period. While this trap was retrieved and the contents analysed, the results were omitted from the calculated sedimentation rates presented in Tables 2 and 3 due to the varying deployment period. In addition, the sample bottle for site SL-SHAL2E became uncapped in transit from site and the results for this sample were omitted from the statistical calculations presented in Tables 2 and 3.

Sedimentation rates for the open-water season of 2014 (averaging 0.091-0.131 mg/cm^2/day) were higher than observed for the ice-cover season, but rates were lower than observed in the open-water season of 2013 (Table 2). Within site variability was low (< 4%) for two of the sites (SL-SHAL1 and SL-DEEP1) but was high for the second shallow location (103%). Examination of the replicate trap data for the SL-SHAL2 site indicates that two of the four traps (excluding the sample that became uncapped during shipping) contained notably higher amounts of sediment than the others. However, the overall rates of sedimentation in all four traps deployed at SL-SHAL2 were relatively low.

4.0 DISCUSSION

As expected, sedimentation rates were notably lower for the ice-cover season than the open-water seasons of 2013 or 2014, and excluding results for two traps from nearshore area SL-SHAL2, rates were lower in the open-water season of 2014 than 2013 (Table 2).

Overall, sedimentation rates measured in 2013 and 2014 in Sheardown Lake NW were low and similar to other arctic lakes. Most studies of sedimentation rates in arctic lakes have estimated rates on an annual basis through the use of sediment coring techniques. To facilitate general comparisons to these literature values, estimates of annual sedimentation rates for Sheardown Lake NW were derived by summing the amount of sediment measured in traps deployed from fall 2013 through fall 2014 (Table 3); although traps were deployed for 359 days rather than a full calendar year, these estimates of 'annual' sedimentation rates were deemed adequate for general comparative purposes. Rates varied on the order of 16 to 21 mg/cm^2/year in Sheardown Lake NW in 2013/2014. These rates are similar to those reported for seven lakes in the Rivière George Region, Northern Quebec (3.9-12 mg/cm^2/year) reported by Laing et al. (2002) and for five Canadian arctic lakes (7-49.8 mg/cm^2/year), reported by Lockhart et al. (1998).

Comparison to one study that measured sedimentation rates in an arctic lake over the ice-cover period, indicates that rates measured in Sheardown Lake NW over the winter of 2013/2014 were similar to, though slightly higher than, rates measured in Lac de Gras, NT for the ice-cover season (Diavik Diamond Mines Inc. 2002).

5.0 REFERENCES

Baffinland Iron Mines Corporation (BIM). 2014. Aquatic effects monitoring plan. June, 2014.

British Columbia Ministry of Environment, Lands, and Parks (BCMELP). 1998. Guidelines for interpreting water quality data. Version 1, May 1998. Prepared for the Land Use Task Force Resource Inventory Committee.

Diavik Diamond Mines Inc. 2002. Sediment deposition study – Dike A154 15 pp. + appendices.

Laing, T.E., R. Pienitz, and S. Payette. 2002. Evaluation of limnological responses to recent environmental change and caribou activity in the Riviere George Region, northern Quebec, Canada. Arct. Ant. Alp. Res. 34: 454-464.

Lockhart, W.L., P. Wilkinson, B.N. Billeck, R.A. Danell, R.V. Hunt, G.J. Brunskill, J. Delaronde, and V. St. Louis. 1998. Fluxes of mercury to lake sediments in central and northern Canada inferred from dated sediment cores. Biogeochemistry 40: 163-173.

Mudroch, A., and S.D. MacKnight (Eds). 1994. Handbook of techniques for aquatic sediment sampling. Second Edition, Lewis Publishers. 235 p.

North/South Consultants Inc. (NSC). 2014. Sediment trap sampling program: Open-water season 2013. A report prepared for Baffinland Iron Mines Corporation by NSC, Winnipeg, MB. June 2014.

TABLES AND FIGURES

Table 1. Location of, and results from, sediment traps deployed in Sheardown Lake NW: 2013/2014.

Sampling Period & Replicate Site	UTM (17W)		Total Depth (m)	Dominant Substrate	Date Deployed	Date Retrieved	Set Duration (days)	Total Dry Weight (g)	Sedimentation Rate ($mg/cm^2/day$)
	Easting	Northing							
Winter 2013/2014									
SL-DEEP1A	560227	7913044	29.7	Silt	6-Sep-13	28-Jul-14	325	0.756	0.045
SL-DEEP1B	560228	7913045	29.7	Silt	6-Sep-13	28-Jul-14	325	0.984	0.059
SL-DEEP1C [1]	560222	7913050	29.7	Silt	6-Sep-13	28-Jul-14	325	0.554	-
SL-DEEP1D	560231	7913037	29.7	Silt	6-Sep-13	28-Jul-14	325	0.878	0.052
SL-DEEP1E	560230	7913037	29.7	Silt	6-Sep-13	28-Jul-14	325	0.747	0.045
SL-SHAL1A	560336	7913305	9.0	Silt	6-Sep-13	27-Jul-14	324	0.566	0.034
SL-SHAL1B	560340	7913301	9.0	Silt	6-Sep-13	27-Jul-14	324	0.526	0.031
SL-SHAL1C	560337	7913302	9.0	Silt	6-Sep-13	28-Jul-14	325	0.547	0.033
SL-SHAL1D	560342	7913301	9.0	Silt	6-Sep-13	28-Jul-14	325	0.602	0.036
SL-SHAL1E [2]	-	-	-	-	-	-	-	-	-
SL-SHAL2A	560581	7913092	6.1	Cobble	6-Sep-13	27-Jul-14	324	0.442	0.026
SL-SHAL2B	560577	7913091	6.1	Cobble	6-Sep-13	27-Jul-14	324	0.477	0.029
SL-SHAL2C	560580	7913095	6.1	Cobble	6-Sep-13	27-Jul-14	324	0.462	0.028
SL-SHAL2D	560580	7913092	6.1	Cobble	6-Sep-13	27-Jul-14	324	0.461	0.028
SL-SHAL2E	560581	7913088	6.1	Cobble	6-Sep-13	27-Jul-14	324	0.436	0.026

Table 1. - continued -

Sampling Period & Replicate Site	UTM (17W)		Total Depth (m)	Dominant Substrate	Date Deployed	Date Retrieved	Set Duration (days)	Total Dry Weight (g)	Sedimentation Rate ($mg/cm^2/day$)
	Easting	Northing							
Open Water 2014									
SL-DEEP1A	560235	7913039	29.5	Silt	28-Jul-14	31-Aug-14	34	0.234	0.133
SL-DEEP1B	560229	7913043	29.4	Silt	28-Jul-14	31-Aug-14	34	0.233	0.133
SL-DEEP1C	560227	7913045	29.5	Silt	28-Jul-14	31-Aug-14	34	0.219	0.125
SL-DEEP1D	560230	7913032	29.6	Silt	28-Jul-14	31-Aug-14	34	0.228	0.130
SL-DEEP1E	560222	7913052	29.5	Silt	28-Jul-14	31-Aug-14	34	0.239	0.136
SL-SHAL1A	560346	7913299	9.1	Silt	27-Jul-14	31-Aug-14	35	0.159	0.088
SL-SHAL1B	560342	7913300	9.1	Silt	27-Jul-14	31-Aug-14	35	0.171	0.095
SL-SHAL1C	560360	7913307	8.9	Silt	28-Jul-14	31-Aug-14	34	0.156	0.089
SL-SHAL1D	560337	7913299	8.8	Silt	28-Jul-14	31-Aug-14	34	0.165	0.094
SL-SHAL1E [2]	560341	7913296	8.8	Silt	6-Sep-13	01-Sep-14	360	0.771	0.042
SL-SHAL2A [3]	560581	7913092	6.0	Cobble	27-Jul-14	31-Aug-14	35	0.903	0.500
SL-SHAL2B [3]	560577	7913091	5.9	Cobble	27-Jul-14	31-Aug-14	35	0.303	0.168
SL-SHAL2C	560580	7913095	6.2	Cobble	27-Jul-14	31-Aug-14	35	0.109	0.060
SL-SHAL2D	560580	7913092	6.2	Cobble	27-Jul-14	31-Aug-14	35	0.132	0.073
SL-SHAL2E [1]	560581	7913088	6.3	Cobble	27-Jul-14	31-Aug-14	35	0.076	-

1. Contents of sample jars may have been partially lost during transport from site to the analytical laboratory as containers became unsealed in transit.
2. Trap from site SL-SHAL1E could not be located following the winter 2013/2014 deployment period, but was relocated and sampled in fall 2014; data for this sample therefore represent sedimentation over the ice-cover season of 2013/2014 and the open-water season of 2014 collectively.
3. Sites SL-SHAL2A and SL-SHAL2B both accumulated unusually high amounts of sediment during the open water 2014 sampling period.

Table 2. Summary statistics from sediment traps deployed in Sheardown Lake NW in 2013 and 2014.

Sampling Period/Sampling Area	Total Dry Weight (g)				Sedimentation Rate (mg/cm^2/day)			PRSD (%)
	n [1]	Mean	SD [2]	Range	Mean	SD	Range	
Open-water 2013 [3]								
SL-SHAL1	5	0.219	0.035	0.158 - 0.249	0.121	0.019	0.087 - 0.138	16.0
SL-SHAL2	5	0.147	0.014	0.132 - 0.170	0.082	0.008	0.073 - 0.094	9.7
SL-DEEP1	5	0.440	0.015	0.413 - 0.451	0.244	0.008	0.229 - 0.250	3.5
Winter 2013/2014								
SL-SHAL1	4	0.560	0.032	0.526 - 0.602	0.033	0.002	0.031 - 0.036	5.7
SL-SHAL2	5	0.456	0.017	0.436 - 0.477	0.027	0.001	0.026 - 0.029	3.7
SL-DEEP1	4	0.841	0.112	0.747 - 0.984	0.050	0.007	0.045 - 0.059	13.4
Open-water 2014								
SL-SHAL1	4	0.163	0.007	0.156 - 0.171	0.091	0.003	0.088 - 0.095	3.7
SL-SHAL2 [4]	4	0.362	0.371	0.109 - 0.903	0.200	0.205	0.060 - 0.500	103
SL-SHAL2 [5]	2	0.121	0.016	0.109 - 0.132	0.067	0.009	0.060 - 0.073	13.5
SL-DEEP1	5	0.231	0.008	0.219 - 0.239	0.131	0.004	0.125 - 0.136	3.3

1. n = number of samples collected and included in summary statistic calculations.
2. SD = standard deviation.
3. Results reported in NSC (2014).
4. Summary statistics presented for all SL-SHAL2 samples analysed.
5. Summary statistics for site SL-SHAL2 excluding results from replicate samples SL-SHAL2A and SL-SHAL2B samples.

Table 3. Approximate annual sedimentation rates (i.e., deployment period of 359 days) in Sheardown Lake: 2013/2014.

Site	Sedimentation Rate (mg/cm^2/year) [1]						PRSD (%)
	Mean	Median	SD	Range	N	Days of Deployment	
SL-SHAL1	14.0	13.8	0.6	13.5-14.9	4	359	4.4
SL-SHAL2 [2]	15.9	13.3	7.0	11.1-26.1	4	359	43.9
SL-SHAL2 [3]	11.3	11.3	0.3	11.1-11.5	2	359	2.6
SL-DEEP1	20.8	20.3	2.1	19.1-23.6	4	359	10.2

1. Year approximated by 359 day deployment period.
2. Summary statistics presented for all SL-SHAL2 samples analysed.
3. Summary statistics for site SL-SHAL2 excluding results from replicate samples SL-SHAL2A and SL-SHAL2B.

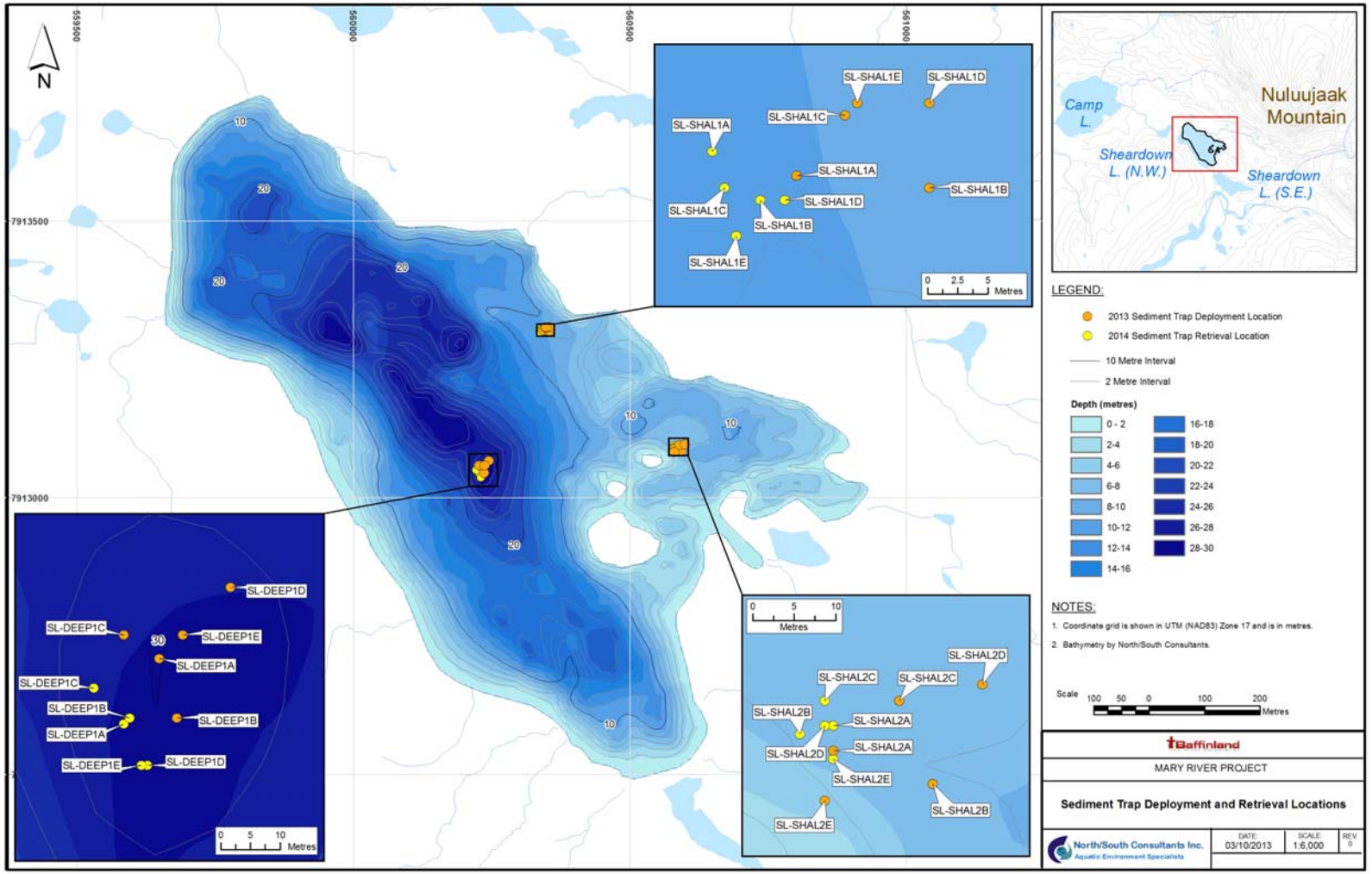

Figure 1. Sediment trap sampling sites in Sheardown Lake NW, 2013/2014.

APPENDIX 1. ALS LABORATORY REPORTS

North/South Consultants
ATTN: MEGAN COOLEY
83 Scurfield Blvd
Winnipeg MB R3Y 1G4

Date Received: 11-SEP-14
Report Date: 16-DEC-14 10:55 (MT)
Version: FINAL REV. 2

Client Phone: 204-284-3366

Certificate of Analysis

Lab Work Order #: L1516375

Project P.O. #: NOT SUBMITTED
Job Reference: MARY RIVER
C of C Numbers:
Legal Site Desc:

Other Information: INV COMMENTS: Special Request is for Sediment Trap Analysis. Reissue for W496460, correct pricing

Comments: METHOD USED FOR SEDIMENT TRAP ANALYSIS: FRACTIONS 1 TO 15:
THE CAPTURED WATER AND SEDIMENT WERE FILTERED THROUGH A PRE-WEIGHED 0.70 MICRON GLASS FIBRE FILTER. THE CONTAINER AND FILTER APPARATUS WERE RINSED THREE TIMES, THEN THE FILTER WAS DRIED AT 105 C FOR 2 HOURS AND COOLED FOR ONE HOUR PRIOR TO RE-WEIGHING.
METHOD DETECTION LIMIT (D.L.) 0.0050 G

QUALITY CONTROL INCLUDED WITH THIS ANALYSIS:
METHOD BLANK; <0.0050 GRAMS
LABORATORY CONTROL STANDARD: 96.0% RECOVERY
16-DEC-2014 Revised reprot

Judy Dalmaijer
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1516375-1 SDL-DEEP1A Sampled By: CLIENT on 31-AUG-14 @ 15:28 Matrix: SEDIMENT **Miscellaneous Parameters** Special Request	See Below Additional Text: 0.234 g					15-SEP-14	R2963911
L1516375-2 SDL-DEEP1B Sampled By: CLIENT on 31-AUG-14 @ 15:28 Matrix: SEDIMENT **Miscellaneous Parameters** Special Request	See Below Additional Text: 0.233 g					15-SEP-14	R2963911
L1516375-3 SDL-DEEP1C Sampled By: CLIENT on 31-AUG-14 @ 15:28 Matrix: SEDIMENT **Miscellaneous Parameters** Special Request	See Below Additional Text: 0.219 g					15-SEP-14	R2963911
L1516375-4 SDL-DEEP1D Sampled By: CLIENT on 31-AUG-14 @ 15:28 Matrix: SEDIMENT **Miscellaneous Parameters** Special Request	See Below Additional Text: 0.228 g					15-SEP-14	R2963911
L1516375-5 SDL-DEEP1E Sampled By: CLIENT on 31-AUG-14 @ 15:28 Matrix: SEDIMENT **Miscellaneous Parameters** Special Request	See Below Additional Text: 0.239 g					15-SEP-14	R2963911
L1516375-6 SDL-SHAL1A Sampled By: CLIENT on 31-AUG-14 @ 15:09 Matrix: SEDIMENT **Miscellaneous Parameters** Special Request	See Below Additional Text: 0.159 g					15-SEP-14	R2963911
L1516375-7 SDL-SHAL1B Sampled By: CLIENT on 31-AUG-14 @ 15:09 Matrix: SEDIMENT **Miscellaneous Parameters** Special Request	See Below Additional Text: 0.171 g					15-SEP-14	R2963911
L1516375-8 SDL-SHAL1C Sampled By: CLIENT on 31-AUG-14 @ 15:09 Matrix: SEDIMENT **Miscellaneous Parameters** Special Request	See Below Additional Text: 0.156 g					15-SEP-14	R2963911
L1516375-9 SDL-SHAL1D Sampled By: CLIENT on 31-AUG-14 @ 15:09 Matrix: SEDIMENT **Miscellaneous Parameters**							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1516375-9 SDL-SHAL1D Sampled By: CLIENT on 31-AUG-14 @ 15:09 Matrix: SEDIMENT Special Request	See Below Additional Text: 0.165 g					15-SEP-14	R2963911
L1516375-10 SDL-SHAL1E Sampled By: CLIENT on 01-SEP-14 @ 08:00 Matrix: SEDIMENT **Miscellaneous Parameters** Special Request	See Below Additional Text: 0.771 g					15-SEP-14	R2963911
L1516375-11 SDL-SHAL2A Sampled By: CLIENT on 31-AUG-14 @ 14:41 Matrix: SEDIMENT **Miscellaneous Parameters** Special Request	See Below Additional Text: 0.903 g					15-SEP-14	R2963911
L1516375-12 SDL-SHAL2B Sampled By: CLIENT on 31-AUG-14 @ 14:41 Matrix: SEDIMENT **Miscellaneous Parameters** Special Request	See Below Additional Text: 0.303 g					15-SEP-14	R2963911
L1516375-13 SDL-SHAL2C Sampled By: CLIENT on 31-AUG-14 @ 14:41 Matrix: SEDIMENT **Miscellaneous Parameters** Special Request	See Below Additional Text: 0.109 g					15-SEP-14	R2963911
L1516375-14 SDL-SHAL2D Sampled By: CLIENT on 31-AUG-14 @ 14:41 Matrix: SEDIMENT **Miscellaneous Parameters** Special Request	See Below Additional Text: 0.132 g					15-SEP-14	R2963911
L1516375-15 SDL-SHAL2E Sampled By: CLIENT on 31-AUG-14 @ 14:41 Matrix: SEDIMENT **Miscellaneous Parameters** Special Request	See Below Additional Text: 0.0764 g					15-SEP-14	R2963911

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
DENSITY-BULK-SK	Soil	Bulk Density - Disturbed Soil	CSSS 50.2-Wt./Vol Density
The disturbed sample is dried at 35C and ground to pass a 2 mm screen using a flail grinder. A known volume of the sry soil is weighed to determine bulk density.			
SPECIAL REQ-61-WP	Misc.	Special Request Inorganics Winnipeg	SPECIAL REQUEST

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

Chain of Custody Numbers:

Additional Information:

INV COMMENTS	Special Request is for Sediment Trap Analysis. Reissue for W496460, correct pricing

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L1516375 Report Date: 16-DEC-14

Client: North/South Consultants
83 Scurfield Blvd
Winnipeg MB R3Y 1G4
Contact: MEGAN COOLEY

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.