Attachment 2

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CONSULTING

MEMORANDUM

To:	Bill Mercer	Date:	August 7, 2009
Copy To:	Paul Schmidt, Jason Cox	File No.:	NB101-390/1-A.01
From:	Ryan Weir	Cont. No.:	NB09-00477
Re:	Review of Meteorological Data for Thor Lake Project		

This memorandum summarizes the review of meteorological data for the Avalon Rare Metals Inc. Thor Lake Project. The review included the analysis of climate normals data from four nearby meteorological stations and various correction factors to develop meteorological parameters which will form part of the pre-feasibility study design criteria for the project.

Thor Lake is relatively located approximately at 105 km southeast of Yellowknife. The climate is semi-arid subarctic with low annual precipitation levels and is characterized by long and cold winters, extending generally from October to April, and cool, short summers.

REPRESENTATIVE METEOROLOGICAL STATIONS

Meteorological stations have been installed by Environment Canada to record data at various locations across Canada. The data from each location is used to summarize or describe the climatic conditions of that particular location in the form of climate normals. At the completion of each decade, Environment Canada updates its climate normals for as many locations and as many climatic characteristics as possible (2009).

Four Environment Canada stations are situated near the Thor Lake Project, including Fort Reliance, Hay River A, Yellowknife A and Yellowknife Hydro. The location of the stations is shown on Figure 1. The climate normals for these four stations are based on at least 20 years worth of data, recorded between 1971 and 2000. Due to a limited record of site specific meteorological data for the Thor Lake Project, climate normals data for the four stations mentioned above have been used to develop meteorological design parameters for the site, as discussed below.

PRECIPITATION

Meteorological data manipulation and correction has been done in order to minimize the error that exists in the measurement of precipitation. The processes used to determine the corrections factors are described in Appendix A. As a result, the estimated monthly Average Precipitation Adjustment Factors range from 1.09 to 1.42 while the estimated annual Average Precipitation Adjustment Factor is 1.20.

Based on the correction, monthly and annual precipitation values to be used for the Thor Lake Project are presented on Table 1 and summarized below.

- Average annual total precipitation is approximately 354 mm
- On an annual basis, total precipitation consists of approximately 61% rainfall and 39% snowfall
- Rainfall generally occurs during the months of May through October
- Snowfall generally occurs during the months of October through April

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A graphical representation of climate normals for the four representative meteorological stations and the estimated site specific meteorological data is presented on Figure 2.

EVAPORATION

There is no evaporation data recorded on site, and there is only one station in the Northwest Territories where evaporation is recorded, the Yellowknife A station (approximately 105 km from the project site). The climate normals present the data as the daily average lake evaporation amount. These values are then multiplied by the number of days in each month to determine the total lake evaporation amount for each month. The Environment Canada climate normals for this station provide evaporation amounts for four months, from June through September.

Evaporation is expected to occur during other months such as April and May however there is no data provided for these months as part of the climate normals. As such the estimated mean lake evaporation data for the Hay River station (presented by Golder Associates Ltd., 1998) will be used for the project, as data is provided for the months from April through September.

The monthly lake evaporation amounts for Yellowknife A and estimated amounts for Hay River are presented on Table 2. The evaporation data from the Yellowknife A station range from 51 mm in September to 155 mm in July. The average annual evaporation amount is 467.5 mm. For the Hay River station, the estimated evaporation data range from 19 mm in April to 120 mm in July. The average annual lake evaporation amount is 430 mm.

TEMPERATURE

The monthly average temperatures for the four representative meteorological stations were averaged and the resultant temperatures taken as the monthly average temperatures for the project site. The temperature data are presented on Table 1 and shown graphically on Figure 2. The monthly average temperatures range from -26.3°C in January to 15.6°C in July. Monthly average temperatures rise above 0°C for significant periods of time in May (considered to be when freshet occurs) and fall below 0°C for significant periods of time in October (considered to be when freeze up occurs).

EXTREME RAINFALL EVENTS

Extreme event rainfall depths are used in the design of various stormwater management facilities, including ditches, berms, pond, sediment basins, culverts, etc. Rainfall depths for potential extreme events were estimated using the *Rainfall Frequency Atlas for Canada* (Hogg and Carr, 1985) in conjunction with a Gumbel distribution. The extreme rainfall depths for storm durations between 15 minutes and 24 hours and for return periods ranging from 2 to 1000 years are presented on Table 3. For example, a rainfall depth of approximately 75 mm was estimated for a 24-hour, 1 in 1,000 year rainfall event. The intensity-duration-frequency curves (IDF) for these events are presented on Figure 3.

The extreme rainfall depths presented on Table 3 are slightly lower than those presented by Golder for Hay River, with the difference increasing with respect to return period. For example, KPL estimated a rainfall depth of 57 mm for a 24-hour, 1 in 100 year rainfall event while Golder estimated a rainfall depth of 69 mm for the same event.

RECOMMENDATIONS

In order to better define meteorological parameters for the project, it is recommended that collection of site specific meteorological data continue through the use of the on-site meteorological station.

We trust this provides you with you the information you require at this time. Feel free to contact us if you have any questions or comments.

Signed: _____
Ryan Weir, E.I.T.
Geological Engineering

LICENSED PROFESSIONAL ENGINEER
D. M. M. DUFF
AUG 07 2009
PROVINCE OF ONTARIO

Reviewed: _____
Deena Duff, P.Eng.
Senior Engineer

Approved: _____
Matthew R. Parfitt, P.Eng.
Project Manager

Attachments:

Table 1 Rev 0	Climate Normals and Estimated Site Specific Meteorological Data
Table 2 Rev 0	Extreme Rainfall Events – Canadian Rainfall Atlas Results
Table 3 Rev 0	Lake Evaporation Values for Station Yellowknife A
Figure 1 Rev 0	Representative Meteorological Stations
Figure 2 Rev 0	Climate Normals and Site Specific Meteorological Data Comparison
Figure 3 Rev 0	Intensity-Duration-Frequency Graph
Appendix A Rev 0	Meteorological Data Manipulation and Correction

References:

1. Environment Canada. Canadian Climate Normals 1971-2000. Obtained from website: <http://www.climate.weatheroffice.ec.gc.ca/climate_normals/stnselect_e.html>.

2. Golder Associates Ltd. Thor Lake Demonstration Project - Tailings Management Facility Design - Hay River, NWT. May 1998.

3. Hogg, W.D. and D.A. Carr. Rainfall Frequency Atlas for Canada. Ottawa (ON): Canadian Climate Program; 1985.

4. Mekis, E. Working Towards Homogenized Precipitation Time-Series: Daily Rain Gauge and Snowfall Ruler Adjustments. Proc. of WCRP Workshop on Determination of Solid Precipitation in Cold Climate Regions, 9-14 July 2002, Climate Research Branch, Meteorological Service of Canada., Fairbanks. <http://acsys.npolar.no/reports/archive/solidprecip/3_Ext_Abstracts/Mekis_exabs.pdf>.

5. Metcalfe, J.R., S. Ishida, B.E. Goodison. "A Corrected Precipitation Archive for the Northwest Territories of Canada". CORRECTED PRECIPITATION ARCHIVE. University of Saskatchewan and Climate Research Branch, Atmospheric Environment Service. 30 July 2009. <http://www.usask.ca/geography/MAGS/Data/Public_Data/precip_corr/pcpncor_e.htm>.

6. Metcalfe, J.R., B. Routledge, K. Devine. "Rainfall Measurement in Canada: Changing Observational Methods and Archive Adjustment Procedures". Journal of Climate. 10 (1997): 92-101. <http://ams.allenpress.com/archive/1520-0442/10/1/pdf/i1520-0442-10-1-92.pdf>.

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TABLE 1

AVALON RARE METALS INC.
THOR LAKE PROJECT

CLIMATE NORMALS AND ESTIMATED SITE SPECIFIC METEOROLOGICAL DATA

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Station	Period of Record	Total Years of Record	Item / Month	J	F	M	A	M	J	J	A	S	O	N	D	Year
			Average Days	31	28	31	30	31	30	31	31	30	31	30	31	365
Fort Reliance	1971 to 2000	>=20	Average Monthly Rainfall (mm)	0.0	0.0	0.0	2.5	13.9	29.3	33.2	50.0	29.9	13.1	0.4	0.0	172.3
			Average Monthly Snowfall (cm)	17.8	16.6	15.2	15.9	5.0	1.1	0.0	0.0	2.6	20.3	29.9	22.4	146.8
			Average Monthly Precipitation (mm)	11.0	9.9	9.6	14.5	19.2	30.5	33.2	50.0	32.2	28.5	19.7	13.7	272.0
			Average Daily Temperature (°C)	-28.1	-26.1	-21.0	-8.6	2.5	9.9	14.3	12.9	6.5	-2.0	-14.6	-24.4	-6.6
Hay River A	1971 to 2000	25 to 30	Average Monthly Rainfall (mm)	0.1	0.1	0.1	4.2	19.8	32.7	41.9	50.5	37.8	15.3	0.5	0.1	203.1
			Average Monthly Snowfall (cm)	17.3	15.4	14.5	8.1	5.0	0.1	0.0	0.0	1.7	19.1	26.4	17.5	125.0
			Average Monthly Precipitation (mm)	16.4	14.6	13.7	12.2	24.8	32.8	41.9	50.5	39.6	33.8	24.2	16.0	320.4
			Average Daily Temperature (°C)	-23.1	-20.2	-14.4	-2.7	6.1	12.6	15.9	14.5	8.5	0.4	-11.9	-20.3	-2.9
Yellowknife A	1971 to 2000	25 to 30	Average Monthly Rainfall (mm)	0.0	0.0	0.2	2.4	14.5	26.9	35.0	40.9	29.5	14.7	0.2	0.2	164.5
			Average Monthly Snowfall (cm)	18.8	17.8	17.3	10.2	4.5	0.0	0.0	0.1	3.1	23.0	34.2	23.0	151.8
			Average Monthly Precipitation (mm)	14.1	12.9	13.4	10.8	19.1	26.9	35.0	40.9	32.9	35.0	23.5	16.3	280.7
			Average Daily Temperature (°C)	-26.8	-23.4	-17.3	-5.3	5.6	13.5	16.8	14.2	7.1	-1.7	-13.8	-23.7	-4.6
Yellowknife Hydro	1971 to 2000	>=20	Average Monthly Rainfall (mm)	0.0	0.0	0.1	2.0	15.6	28.9	37.3	41.4	30.9	15.4	0.1	0.0	171.8
			Average Monthly Snowfall (cm)	16.8	17.2	15.4	9.3	3.4	0.1	0.0	0.0	1.7	16.4	27.0	23.8	131.0
			Average Monthly Precipitation (mm)	16.8	17.2	15.5	11.2	19.1	29.0	37.3	41.4	32.6	31.8	27.1	23.8	302.8
			Average Daily Temperature (°C)	-27.3	-25.4	-18.4	-6.6	4.0	12.0	15.4	12.9	6.1	-2.2	-14.6	-25.1	-5.8
Overall Average Monthly Rainfall (mm)				0.0	0.0	0.1	2.8	16.0	29.5	36.9	45.7	32.0	14.6	0.3	0.1	177.9
Overall Average Monthly Snowfall (cm)				17.7	16.8	15.6	10.9	4.5	0.3	0.0	0.0	2.3	19.7	29.4	21.7	138.7
Overall Average Monthly Precipitation (mm)				14.6	13.7	13.1	12.2	20.6	29.8	36.9	45.7	34.3	32.3	23.6	17.5	294.0
Percent Rainfall				0%	0%	1%	23%	78%	99%	100%	100%	93%	45%	1%	0%	61%
Percent Snowfall				100%	100%	99%	77%	22%	1%	0%	0%	7%	55%	99%	100%	39%
Adjusted Average Rainfall (mm)				0.0	0.0	0.1	2.9	19.7	33.4	41.0	50.0	35.8	15.2	0.3	0.1	198.6
Adjusted Average Snowfall (mm water equivalent)				19.7	18.5	18.2	14.4	5.4	0.4	0.0	0.0	2.7	23.6	29.3	22.8	154.9
Adjusted Average Precipitation (mm)				19.7	18.5	18.3	17.3	25.1	33.8	41.0	50.0	38.5	38.8	29.7	22.9	353.5
Average Temperature (°C)				-26.3	-23.8	-17.8	-5.8	4.6	12.0	15.6	13.6	7.1	-1.4	-13.7	-23.4	-5.0
Average Precipitation Adjustment Factor				1.35	1.35	1.40	1.42	1.22	1.13	1.11	1.09	1.12	1.20	1.26	1.31	1.20

I:\1\01\00390\01\A\Correspondence\NB09-00477 - Meteorological Data Review\[Climate Normals.xls]Table 1 - Climate Normals

NOTES:

1. DATA OBTAINED FROM ENVIRONMENT CANADA WEBSITE.
2. ADJUSTED AVERAGE VALUES CALCULATED BY APPLYING CORRECTION FACTORS DESCRIBED IN KPL MEMO NB09-00477 TO AVERAGE VALUES FOR REPRESENTATIVE METEOROLOGICAL STATIONS.
3. PRECIPITATION IS THE WATER EQUIVALENT OF RAINFALL AND SNOWFALL COMBINED.
4. TOTAL YEARS OF RECORD INDICATES THAT THERE WAS A MINIMUM AMOUNT OF DAILY VALUES MISSING FOR ONE OR MORE PARAMETERS FOR A GIVEN YEAR, AS DEFINED BY THE ENVIRONMENT CANADA WEBSITE.

0	AUG/07/09	ISSUED WITH MEMO NB09-00477	RDW	DWMD	MKP
REV	DATE	DESCRIPTION	PREPD	CHKD	APPD

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TABLE 2

AVALON RARE METALS INC.
THOR LAKE PROJECT

LAKE EVAPORATION VALUES FOR STATION YELLOWKNIFE A AND HAY RIVER

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Station	Parameter	Month												Total
		January	February	March	April	May	June	July	August	September	October	November	December	
Yellowknife A	Lake Evaporation (mm)	-	-	-	-	-	153	155	108.5	51	-	-	-	467.5
Hay River [1]	Estimated Mean Lake Evaporation (mm)	-	-	-	19	67	103	120	89	32	-	-	-	430

#N/A

NOTES:
1. HAY RIVER DATA OBTAINED FROM GOLDER ASSOCIATES LTD (1998).
2. YELLOWKNIFE A DATA OBTAINED FROM ENVIRONMENT CANADA WEBSITE.
3. YELLOWKNIFE A DATA OBTAINED FROM DAILY VALUES MULTIPLIED BY THE NUMBER OF DAYS FOR A GIVEN MONTH.

0	AUG06'09	ISSUED WITH MEMO NB09-00477	EV	DMMD	MRP
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

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TABLE 3

AVALON RARE METALS INC.
THOR LAKE PROJECT

EXTREME RAINFALL EVENTS - CANADIAN RAINFALL ATLAS RESULTS

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Duration	Mean Annual Extreme ($\bar{X}_{ave}$) (mm)	Standard Deviation (S)	Return Period (T) (year)	Frequency Factor (K_T)	Rainfall Depth (X_T) (mm)
24 hr	26	10	2	-0.164	24.36
			5	0.719	33.19
			10	1.305	39.05
			15	1.635	42.35
			20	1.866	44.66
			25	2.044	46.44
			50	2.592	51.92
			100	3.137	57.37
			200	3.679	62.79
			500	4.395	69.95
			1,000	4.936	75.36
12 hr	21	8	2	-0.164	19.69
			5	0.719	26.75
			10	1.305	31.44
			15	1.635	34.08
			20	1.866	35.93
			25	2.044	37.35
			50	2.592	41.74
			100	3.137	46.10
			200	3.679	50.43
			500	4.395	56.16
			1,000	4.936	60.49
6 hr	15	5	2	-0.164	14.18
			5	0.719	18.60
			10	1.305	21.53
			15	1.635	23.18
			20	1.866	24.33
			25	2.044	25.22
			50	2.592	27.96
			100	3.137	30.69
			200	3.679	33.40
			500	4.395	36.98
			1,000	4.936	39.68
2 hr	10.5	3	2	-0.164	10.01
			5	0.719	12.66
			10	1.305	14.42
			15	1.635	15.41
			20	1.866	16.10
			25	2.044	16.63
			50	2.592	18.28
			100	3.137	19.91
			200	3.679	21.54
			500	4.395	23.69
			1,000	4.936	25.31
1 hr	8.5	3.5	2	-0.164	7.93
			5	0.719	11.02
			10	1.305	13.07
			15	1.635	14.22
			20	1.866	15.03
			25	2.044	15.65
			50	2.592	17.57
			100	3.137	19.48
			200	3.679	21.38
			500	4.395	23.88
			1,000	4.936	25.78
30 min	7	3.5	2	-0.164	6.43
			5	0.719	9.52
			10	1.305	11.57
			15	1.635	12.72
			20	1.866	13.53
			25	2.044	14.15
			50	2.592	16.07
			100	3.137	17.98
			200	3.679	19.88
			500	4.395	22.38
			1,000	4.936	24.28
15 min	5	2.5	2	-0.164	4.59
			5	0.719	6.80
			10	1.305	8.26
			15	1.635	9.08
			20	1.866	9.67
			25	2.044	10.11
			50	2.592	11.48
			100	3.137	12.84
			200	3.679	14.20
			500	4.395	15.99
			1,000	4.936	17.34

9N/A

NOTES:

1. VALUES FOR MEAN ANNUAL EXTREME AND STANDARD DEVIATION OBTAINED FROM RAINFALL FREQUENCY ATLAS FOR CANADA.
2. FREQUENCY FACTOR OBTAINED BY THE FORMULA $K_T = -0.6 \cdot \ln[-\ln(0.5^{1/T})] + \ln(T/T-1)]$ WHERE T IS THE RETURN PERIOD.
3. RAINFALL OBTAINED BY THE FORMULA $X_T = \bar{X}_{ave} + K_T \times S$ WHERE X_T IS THE RAINFALL DEPTH, $\bar{X}_{ave}$ IS THE MEAN ANNUAL EXTREME, K_T IS THE FREQUENCY FACTOR AND S IS THE STANDARD DEVIATION.

REV	DATE	DESCRIPTION	PREPD	CHKD	APPD
0	AUG/09/09	ISSUED WITH MEMO NB09-0247	RDW	BV	MRP

NOTE:

1. IMAGE CAPTURED FROM GOOGLE EARTH©.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	AUG06'09	ISSUED WITH MEMO NB09-00477	RDW	DMMD	MRP

AVALON RARE METALS INC.

THOR LAKE PROJECT

REPRESENTATIVE METEOROLOGICAL STATIONS

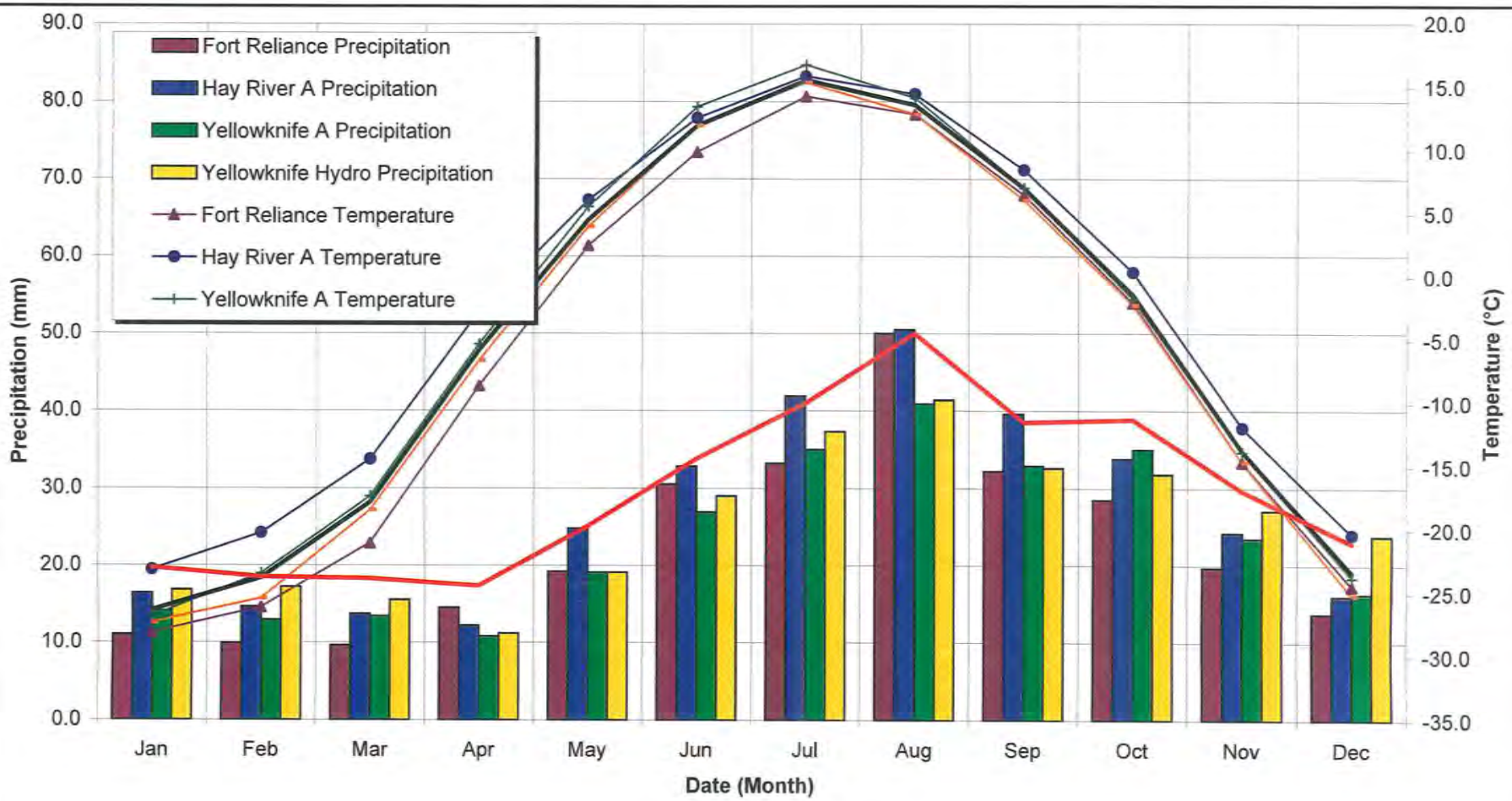
Knight Piésold CONSULTING

P/A NO. NB101-390/1

REF. NO. NB09-00477

FIGURE 1

REV 0



NOTES:
1. TEMPERATURE AND PRECIPITATION DATA FOR REPRESENTATIVE STATIONS OBTAINED FROM ENVIRONMENT CANADA WEBSITE.
2. AVERAGE MONTHLY TEMPERATURE OBTAINED FROM AVERAGE OF CLIMATE NORMALS FOR REPRESENTATIVE METEOROLOGICAL STATIONS.
3. ADJUSTED AVERAGE VALUES CALCULATED BY APPLYING CORRECTION FACTORS DESCRIBED IN KPL. MEMO NB09-00477 TO AVERAGE VALUES FOR REPRESENTATIVE METEOROLOGICAL STATIONS.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	AUG06'09	ISSUED WITH MEMO NB09-00477	RDW	EV	MRP

AVALON RARE METALS INC.

THOR LAKE PROJECT

CLIMATE NORMALS AND SITE SPECIFIC METEOROLOGICAL DATA COMPARISON

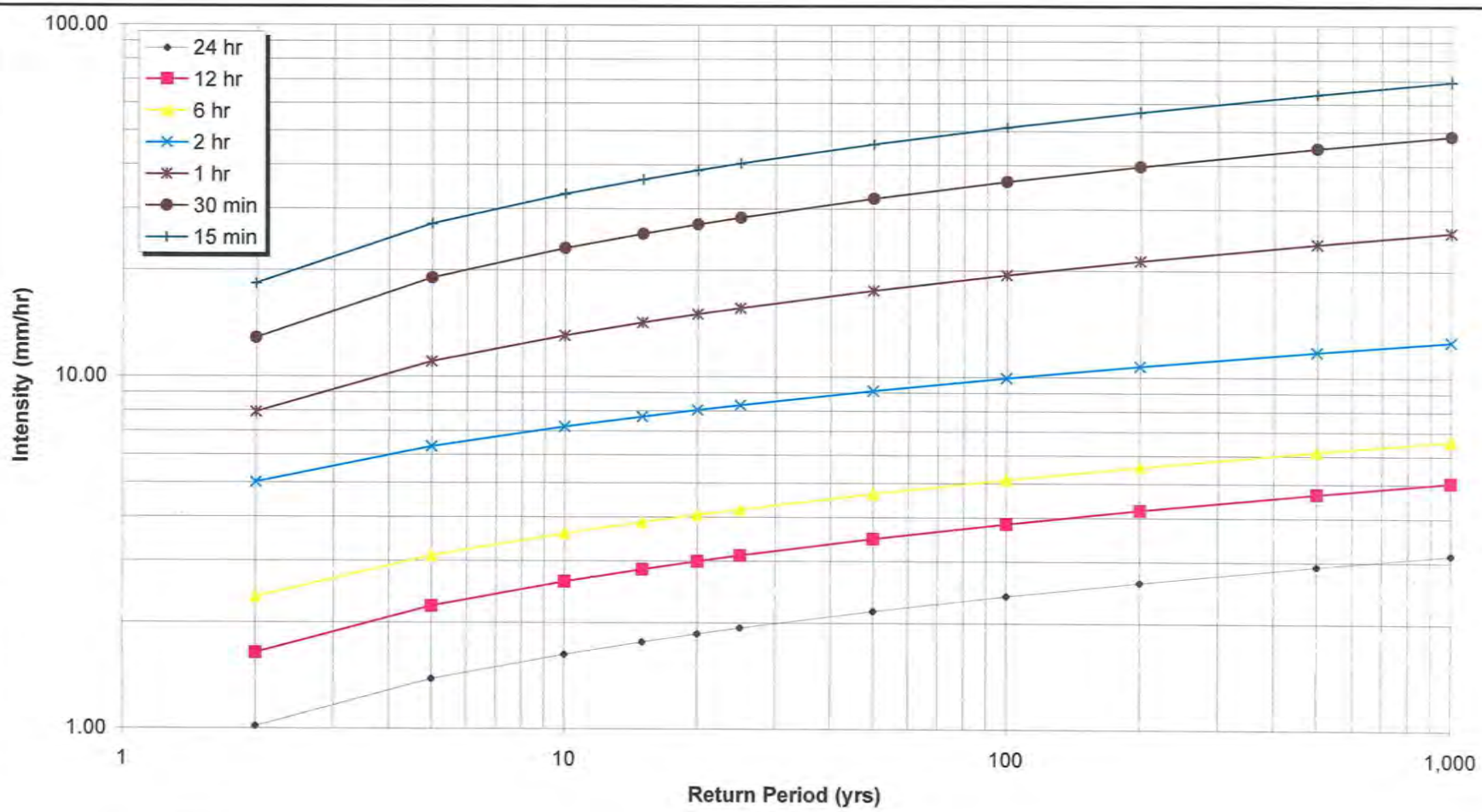
Knight Piésold CONSULTING

P/A NO. NB101-390/1

REF. NO. NB09-00477

FIGURE 2

REV 0



NOTES:

1. VALUES FOR MEAN ANNUAL EXTREME AND STANDARD DEVIATION OBTAINED FROM RAINFALL FREQUENCY ATLAS FOR CANADA.
2. FREQUENCY FACTOR OBTAINED BY THE FORMULA $K_T = -(6^{0.5})/\pi\,(0.5772 + \ln\ln(T/T-1))$ WHERE T IS THE RETURN PERIOD.
3. RAINFALL OBTAINED BY THE FORMULA $X_T = X_{AV} + K_T + S$ WHERE X_T IS THE RAINFALL DEPTH, X_{AV} IS THE MEAN ANNUAL EXTREME, K_T IS THE FREQUENCY FACTOR AND S IS THE STANDARD DEVIATION.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
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AVALON RARE METALS INC.

THOR LAKE PROJECT

INTENSITY-DURATION-FREQUENCY GRAPH

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P/A NO. NB101/390-1

REF. NO. NB09-00477

FIGURE 3

REV 0

APPENDIX A

METEOROLOGICAL DATA MANIPULATION AND CORRECTION

It is widely known that considerable error exists in the measurement of precipitation (Metcalfe et al., 1997). These errors arise from both climatic and non-climatic sources including: instrumentation changes, how trace precipitation is recorded, wind action over a gauge, and differences in snow density (Mekis, 2002; Metcalfe et al., 1997; Metcalfe et al., 2009). Since trace amounts alone can account for up to 80% of total precipitation in some northern Canadian locations (Mekis, 2002), the error associated with the climate normals around Thor Lake is expected to be significant. Metcalfe et al. (1997) provide a simplified procedure for adjusting archived meteorological data and Mekis provides more general regional data corrections to help account for these variations. Both sources have been used for developing design criteria for the Thor Lake Project.

Starting in the 1970s, Environment Canada began to change rain gauge instrumentation from the Meteorological Service of Canada (MSC) gauge, made of copper with a soft plastic insert, to the standard Type B gauge. The different gauges were noted to have different wetting loss characteristics such as evaporation from the gauge before the cell is emptied and water retained in the gauge after emptying (Metcalfe et al, 1997 and Mekis, 2002). Metcalfe et al. (1997) suggest a wetting loss correction of 0.17 mm for each six-hour rainfall observation greater than 0.2 mm for values prior to 1965 and 0.14 mm for values from 1965 to 1971. No wetting loss correction is suggested for data from 1972 to present. Since the climate normals from 1971 to 2000 were used to approximate conditions at Thor Lake, the wetting loss correction was assumed to be negligible.

In the climate normals data, trace precipitation is defined as precipitation less than 0.2 mm in a six-hour period (Metcalfe et al., 1997). In the past values for trace precipitation was recorded as zero by weather station attendants. It was only recently that these values were deemed measureable (Metcalfe et al, 1997). To account for trace precipitation in Arctic regions such as Thor Lake, precipitation values greater than 0 mm but less than 0.2 mm (i.e., recorded as trace precipitation) must be adjusted to an empirical value of 0.03 mm (Metcalfe et al, 1997 and Mekis, 2002).

Undercatch is the amount of precipitation lost due to wind action over the orifice of a gauge. The amount of undercatch differed between the two types of gauges referred to above (MSC and Type-B) because of the difference in opening sizes. Metcalfe et al. (1997) suggest a conversion factor of 1.04 for the MSC gauge and 1.02 for the Type-B gauge be applied to meteorological data to normalize the data. It is not yet certain what type(s) of gauges exist at the stations used to approximate the weather at the Thor Lake Project; therefore the more conservative value of 1.04 was assumed. This factor was applied after other factors.

The climate normals assume a snow density of 100 kg/m^3 (i.e., the amount of water contained in 1 cm of fresh snow is equivalent to 1 mm of rainfall) which could be an underestimation of the amount of water contained in the snowfall. In actuality, snow densities around the Thor Lake area have been estimated at approximately 112 kg/m^3 (Metcalfe et al, 2009). Therefore a snow density correction factor of 1.12 was applied to snowfall amounts in conjunction with the undercatch factor.

After applying the simplified procedure suggested by Metcalfe et al. (1997) and snow density corrections, average monthly rainfall values for the Thor Lake Project site are between 4 and 24% higher (12% for average annual rainfall) than the average of the values from the four stations. Snowfall water equivalent values are 16 to 53% higher (33% for average annual snowfall) and total precipitation values are 9 to 42% higher (20% for average annual precipitation). The average total precipitation increase is consistent with the value reported from Yellowknife (26%; Metcalfe et al, 2009). The adjustment factor has the same

value for rainfall but slightly higher value for snowfall and total precipitation than Mekis' regional data (i.e. rainfall increase of approximately 12%, snowfall of 20% and total precipitation of 15%). As a result, the estimated monthly Average Precipitation Adjustment Factors range from 1.09 to 1.42 while the estimated annual Average Precipitation Adjustment Factor is 1.20.

Attachment 3

Knight Piésold
CONSULTING

MEMORANDUM

To:	Mr. David Swisher	Date:	September 20, 2011
Copy To:	Jordin Barclay, Kevin Hawton, Cara Stapley	File No.:	NB101-390/2-A.01
From:	Ryan Weir	Cont. No.:	NB11-00454
Re:	Thor Lake Project – Mine Site Groundwater Quality Test Results		

Six (6) groundwater monitoring wells were previously installed (March and April, 2011) near the proposed infrastructure for the Thor Lake Project at the Nechalacho Mine Site in NWT. In early August 2011, a program was carried out by Knight Piésold to develop and sample the recently installed wells for the purposes of collecting baseline water quality data. Three (3) groundwater monitoring wells were successfully developed and sampled, however monitoring wells HG4, HG-5 and HG-6 could not be sampled because they were frozen or due to damage from frost heaving. Figure 1 shows the locations of the monitoring wells, including HG-3, which was recently re-established as part of the Phase 3 site investigations, in relation to existing monitoring wells and thermistor instrumentation installations. Monitoring well HG-3 has not yet been sampled.

The 3 water samples were sent to ALS Laboratory Group (ALS) in Yellowknife for completion of a complete suite of analytical tests, including:

- Physical tests
- Anions and nutrients
- Cyanides
- Total metals
- Dissolved metals

The results from the laboratory testing are summarized on Table 1. The laboratory certificates of analysis are included in Appendix A.

Planning for the next sampling event (Fall event) will commence soon in preparation for the work to be carried out in October or November, 2011. Should you have any questions, please do not hesitate to contact us.

Signed: Ryan Weir, E.I.T.
Geological Engineering

Approved: Kevin E. Hawton, P.Eng.
Senior Engineer

Attachments:

Table 1 Rev 0	Water Sample Laboratory Test Results Summary
Figure 1 Rev 0	Monitoring Well Locations
Appendix A	Laboratory Certificate of Analysis

/rdw

Knight Piésold CONSULTING

TABLE 1

AVALON RARE METALS INC.
THOR LAKE PROJECT

WATER SAMPLE LABORATORY TEST RESULTS SUMMARY

Print Sep/20/11 15:30:24

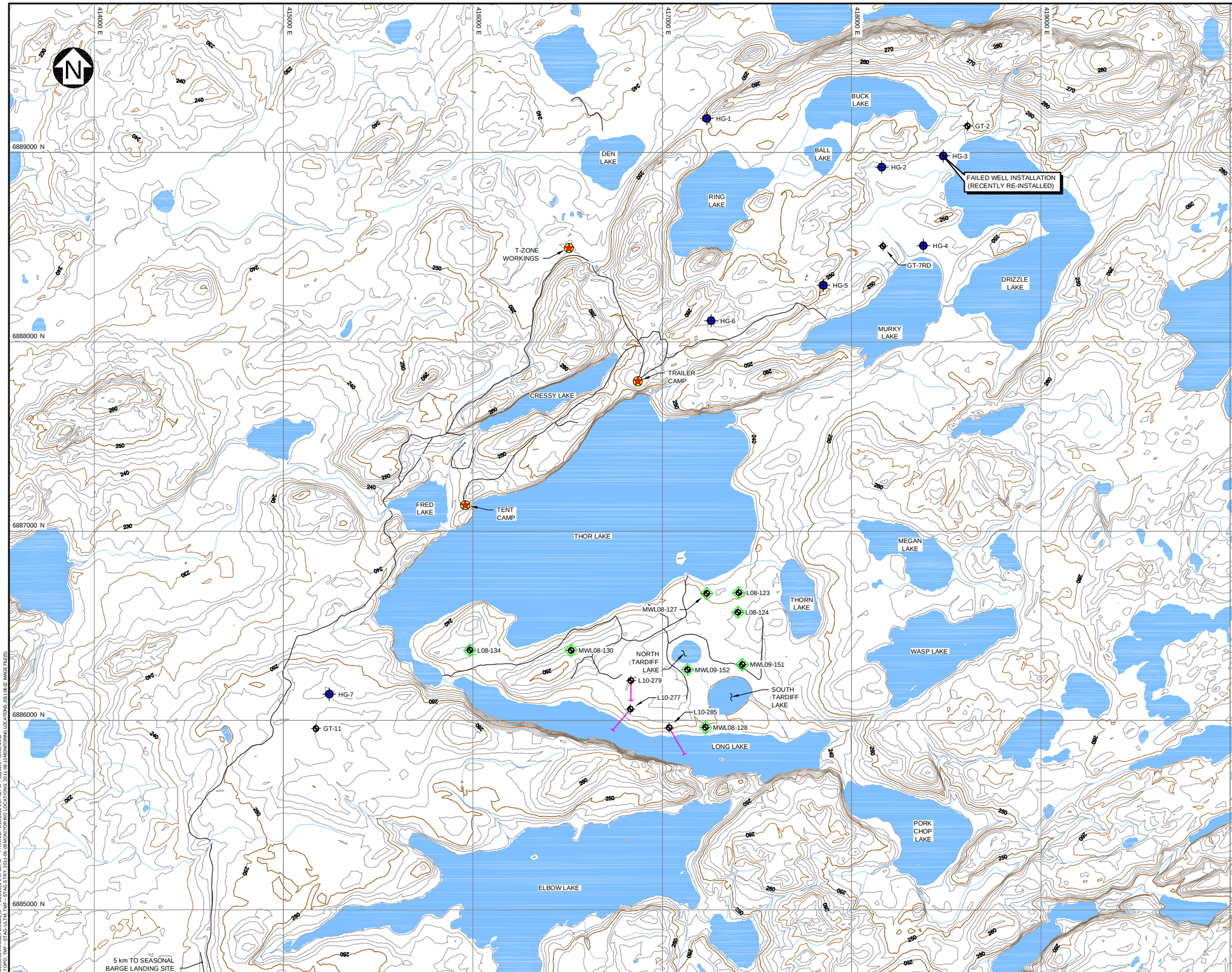
	Date Sampled			05-Aug-11	05-Aug-11	-	-	-	05-Aug-11
	Lab ID			L1041037-1	L1041037-2	-	-	-	L1041037-3
Samples	**Sample Type**	**Units**	**MDL**	**HG-1**	**HG-2**	**HG-4**	**HG-5**	**HG-6**	**HG-7**
Physical Tests	Colour, True	T.C.U.	2.0	5.0	13.0	-	-	-	13.0
	Conductivity	uS/cm	0.20	526	724	-	-	-	412
	Hardness (as CaCO3)	mg/L	-	196	324	-	-	-	208
	pH	pH	0.10	8.34	8.16	-	-	-	8.18
	Total Suspended Solids	mg/L	3.0	525	14500	-	-	-	867
	Total Dissolved Solids	mg/L	-	285	387	-	-	-	212
	Turbidity	-	0.10	141	566	-	-	-	520
Anions and Nutrients	Acidity (as CaCO3)	mg/L	5.0	5.7	13.7	-	-	-	7.0
	Alkalinity, Bicarbonate (as CaCO3)	mg/L	5.0	303	453	-	-	-	259
	Alkalinity, Carbonate (as CaCO3)	mg/L	5.0	<5.0	<5.0	-	-	-	<5.0
	Alkalinity, Hydroxide (as CaCO3)	mg/L	5.0	<5.0	<5.0	-	-	-	<5.0
	Alkalinity, Total (as CaCO3)	mg/L	5.0	255	371	-	-	-	212
	Ammonia-N, Total	-	-	0.202	0.121	-	-	-	<0.050
	Bromide (Br)	-	1.0	<0.10	<0.10	-	-	-	<0.10
	Chloride (Cl)	mg/L	0.50	5.44	14.1	-	-	-	1.12
	Nitrate (as N)	mg/L	0.050	<0.050	<0.050	-	-	-	0.322
	Nitrate and Nitrite as N	mg/L	0.071	<0.071	<0.071	-	-	-	0.322
	Nitrite (as N)	mg/L	0.050	<0.050	<0.050	-	-	-	<0.050
	Total Kjeldahl Nitrogen	-	-	1.14	0.39	-	-	-	0.23
	Total Nitrogen	-	-	1.14	0.39	-	-	-	0.55
	Orthophosphate-Dissolved (as P)	-	0.010	-	-	-	-	-	-
	Total Phosphate as P	-	0.020	<0.020	0.031	-	-	-	<0.020
	Sulfate (SO4)	mg/L	0.50	17.4	12.1	-	-	-	8.36
Cyanides	Cyanide, Total	mg/L	0.0020	0.0194	0.0064	-	-	-	0.0116
Total Metals	Aluminum (Al)-Total	mg/L	0.010	2.62	27.8	-	-	-	7.40
	Antimony (Sb)-Total	mg/L	0.00040	<0.00080	<0.00080	-	-	-	<0.00080
	Arsenic (As)-Total	mg/L	0.00040	0.00250	0.0196	-	-	-	0.0162
	Barium (Ba)-Total	mg/L	0.0030	0.151	1.17	-	-	-	0.136
	Beryllium (Be)-Total	mg/L	0.0010	<0.0020	0.0029	-	-	-	<0.0020
	Boron (B)-Total	mg/L	0.050	0.095	0.213	-	-	-	<0.050
	Cadmium (Cd)-Total	mg/L	0.000050	<0.0010	0.0012	-	-	-	0.0019
	Calcium (Ca)-Total	mg/L	0.50	51.6	194	-	-	-	57.3
	Chromium (Cr)-Total	mg/L	0.0050	<0.0050	0.0635	-	-	-	0.0259
	Cobalt (Co)-Total	mg/L	0.0020	0.0063	0.0836	-	-	-	0.0122
	Copper (Cu)-Total	mg/L	0.0010	0.0097	0.152	-	-	-	0.111
	Iron (Fe)-Total	mg/L	0.010	3.27	36.6	-	-	-	10.1
	Lead (Pb)-Total	mg/L	0.00010	0.0172	0.0461	-	-	-	0.0103
	Lithium (Li)-Total	mg/L	0.010	0.037	0.057	-	-	-	<0.010
	Magnesium (Mg)-Total	mg/L	0.10	18.1	82.6	-	-	-	22.5
	Manganese (Mn)-Total	mg/L	0.0020	1.27	7.42	-	-	-	0.438
	Mercury (Hg)-Total	mg/L	0.00010	-	-	-	-	-	-
	Molybdenum (Mo)-Total	mg/L	0.0050	0.135	0.0159	-	-	-	0.0110
	Nickel (Ni)-Total	mg/L	0.0020	0.0081	0.118	-	-	-	0.0273
	Potassium (K)-Total	mg/L	0.10	3.65	9.75	-	-	-	2.92
	Selenium (Se)-Total	mg/L	0.00040	<0.00080	<0.00080	-	-	-	<0.00080
	Silver (Ag)-Total	mg/L	0.00010	<0.0050	<0.0050	-	-	-	0.0068
	Strontium (Sr)-Total	mg/L	-	0.322	0.511	-	-	-	0.0693
	Sodium (Na)-Total	mg/L	1.0	41.6	31.3	-	-	-	3.3
	Thallium (Tl)-Total	mg/L	0.00010	<0.050	<0.050	-	-	-	<0.050
	Tin (Sn)-Total	mg/L	0.050	<0.050	<0.050	-	-	-	<0.050
	Titanium (Ti)-Total	mg/L	0.0010	0.0302	0.780	-	-	-	0.120
	Uranium (U)-Total	mg/L	0.00010	0.00881	0.0106	-	-	-	0.00241
	Vanadium (V)-Total	mg/L	0.0010	0.0026	0.0903	-	-	-	0.0088
	Zinc (Zn)-Total	mg/L	0.0040	0.106	0.784	-	-	-	0.158
Dissolved Metals	Aluminum (Al)-Dissolved	mg/L	0.010	<0.010	<0.010	-	-	-	0.027
	Antimony (Sb)-Dissolved	mg/L	0.00040	<0.00080	<0.00080	-	-	-	<0.00080
	Arsenic (As)-Dissolved	mg/L	0.00040	0.00112	0.0137	-	-	-	0.00732
	Barium (Ba)-Dissolved	mg/L	0.0030	0.0746	0.123	-	-	-	0.0300
	Beryllium (Be)-Dissolved	mg/L	0.0010	<0.0010	<0.0010	-	-	-	<0.0010
	Bismuth (Bi)-Dissolved	mg/L	0.000050	-	-	-	-	-	-
	Boron (B)-Dissolved	mg/L	0.050	0.129	0.290	-	-	-	<0.050
	Cadmium (Cd)-Dissolved	mg/L	0.000050	<0.0010	<0.0010	-	-	-	<0.0010
	Calcium (Ca)-Dissolved	mg/L	0.50	49.5	63.1	-	-	-	50.0
	Chromium (Cr)-Dissolved	mg/L	0.0050	<0.0050	<0.0050	-	-	-	<0.0050
	Cobalt (Co)-Dissolved	mg/L	0.0020	<0.0020	0.0035	-	-	-	<0.0020
	Copper (Cu)-Dissolved	mg/L	0.0010	<0.0010	<0.0010	-	-	-	0.0071
	Iron (Fe)-Dissolved	mg/L	0.010	0.019	0.142	-	-	-	0.043
	Lead (Pb)-Dissolved	mg/L	0.00010	<0.0050	<0.0050	-	-	-	<0.0050
	Lithium (Li)-Dissolved	mg/L	0.0030	0.0350	0.0261	-	-	-	0.0032
	Magnesium (Mg)-Dissolved	mg/L	0.10	17.5	40.5	-	-	-	20.2
	Manganese (Mn)-Dissolved	mg/L	0.0020	0.667	1.40	-	-	-	0.0395
	Mercury (Hg)-Dissolved	mg/L	0.00010	-	-	-	-	-	-
	Molybdenum (Mo)-Dissolved	mg/L	0.0050	0.149	0.0267	-	-	-	0.0097
	Nickel (Ni)-Dissolved	mg/L	0.0020	0.0029	0.0060	-	-	-	0.0032
	Potassium (K)-Dissolved	mg/L	0.50	2.43	4.16	-	-	-	1.34
	Selenium (Se)-Dissolved	mg/L	0.00040	<0.00080	<0.00080	-	-	-	<0.00080
	Silver (Ag)-Dissolved	mg/L	0.00010	<0.0050	<0.0050	-	-	-	<0.0050
	Strontium (Sr)-Dissolved	mg/L	0.00010	0.304	0.309	-	-	-	0.0522
	Sodium (Na)-Dissolved	mg/L	1.0	40.2	30.3	-	-	-	2.7
	Thallium (Tl)-Dissolved	mg/L	0.00010	<0.050	<0.050	-	-	-	<0.050
	Tin (Sn)-Dissolved	mg/L	0.050	<0.050	<0.050	-	-	-	<0.050
	Titanium (Ti)-Dissolved	mg/L	0.0010	<0.0010	<0.0010	-	-	-	<0.0010
	Uranium (U)-Dissolved	mg/L	0.00010	0.00691	0.00686	-	-	-	0.00143
	Vanadium (V)-Dissolved	mg/L	0.0010	<0.0010	<0.0010	-	-	-	<0.0010
	Zinc (Zn)-Dissolved	mg/L	0.0020	0.0064	0.0287	-	-	-	0.0042
	Ion Balance	%	-	105	98.0	-	-	-	96.3

I:\1\01\00390\02\A\Correspondence\NB11-00454 - Thor Lake Water Quality Results\[Table.xlsx]1

NOTES:

1. NO TEST RESULTS FOR HG-4, HG-5 OR HG-6; WELLS FROZEN OR DAMAGED DUE TO FROST HEAVING.

0	20SEP'11	ISSUED WITH MEMO NB 11-00454	RDW	KEH	KEH
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



REV	DATE	DESCRIPTION	PREPARED	DRAWN	CHK'D	APP'D
0	20SEP'11	ISSUED WITH MEMO	CLS	SIR	RDW	KEH

LEGEND:

- WATER
- EXISTING ACCESS ROAD
- EXISTING MONITORING WELL (BY STANTEC)
- MONITORING WELL
- EXISTING GEOMECHANICAL / GEOTECHNICAL THERMISTOR INSTALLATION

NOTES:

1. COORDINATE GRID IS UTM (NAD83) ZONE 12N AND IS IN METRES.
2. PLAN BASED ON INFORMATION PROVIDED BY AVALON RARE METALS INC.
3. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 2 METRES.

SCALE 200 100 0 200 400 600 800 1000 m

AVALON RARE METALS INC.

THOR LAKE PROJECT

MONITORING WELL LOCATIONS

Knight Piésold CONSULTING

P/A NO.	REF NO.
NB101-390/2	NB11-00454

FIGURE 1 REV 0

SAVED: I:\1001\000\00\A\Acad\FIGURES_O, 9/20/2011 2:37:13 PM PRINTED: 9/20/2011 3:37:53 PM Layout1, SRICHARD
XREF FILE(S): TOPO; TMF--STAG-ULTM; TMF--STAG-STRT; 2011-06-09 MONITORING LOCATIONS; 2011-06-10 MONITORING LOCATIONS; 2011-06-10 MONITORING LOCATIONS; 2011-06-22 IMAGE FILE(S):

Knight Piésold
CONSULTING

APPENDIX A

LABORATORY CERTIFICATE OF ANALYSIS

(Pages A-1 to A-7)

KNIGHT PIESOLD LTD.
ATTN: RYAN WEIR / CARA STAPLEY / KEVIN HAWTON
1650 Main Street West
North Bay ON P1B 8G5

Date Received: 05-AUG-11
Report Date: 15-AUG-11 10:58 (MT)
Version: FINAL

Client Phone: 705-476-2165

Certificate of Analysis

Lab Work Order #: L1041037

Project P.O. #: NOT SUBMITTED
Job Reference: NB101-39012
C of C Numbers: 10-100987
Legal Site Desc:

Jessica Spira
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 9936-67 Avenue, Edmonton, AB T6E 0P5 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1041037-1	L1041037-2	L1041037-3		
	Description	WATER	WATER	WATER		
	Sampled Date	05-AUG-11	05-AUG-11	05-AUG-11		
	Sampled Time	09:35	08:50	07:35		
	Client ID	HG1	HG2	HG7		
Grouping	**Analyte**					
WATER						
Physical Tests	Color, True (T.C.U.)	5.0	13.0	13.0		
	Total Suspended Solids (mg/L)	525	14500	867		
	Turbidity (NTU)	141	566	520		
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	5.7	13.7	7.0		
	Alkalinity, Total (as CaCO3) (mg/L)	255	371	212		
	Ammonia (as N) (mg/L)	0.202	0.121	<0.050		
	Bicarbonate (HCO3) (mg/L)	303	453	259		
	Bromide (Br) (mg/L)	<0.10	<0.10	<0.10		
	Carbonate (CO3) (mg/L)	<5.0	<5.0	<5.0		
	Chloride (Cl) (mg/L)	5.44	14.1	1.12		
	Conductivity (EC) (uS/cm)	526	724	412		
	Hardness (as CaCO3) (mg/L)	196	324	208		
	Hydroxide (OH) (mg/L)	<5.0	<5.0	<5.0		
	Ion Balance (%)	105	98.0	96.3		
	Nitrate and Nitrite (as N) (mg/L)	<0.071	<0.071	0.322		
	Nitrate (as N) (mg/L)	<0.050	<0.050	0.322		
	Nitrite (as N) (mg/L)	<0.050	<0.050	<0.050		
	Total Kjeldahl Nitrogen (mg/L)	1.14	0.39	0.23		
	Total Nitrogen (mg/L)	1.14	0.39	0.55		
	pH (pH)	8.34	8.16	8.18		
	Phosphorus (P)-Total (mg/L)	<0.020	0.031	<0.020		
	TDS (Calculated) (mg/L)	285	387	212		
	Sulfate (SO4) (mg/L)	17.4	12.1	8.36		
Cyanides	Cyanide, Total (mg/L)	0.0194	0.0064	0.0116		
Total Metals	Aluminum (Al)-Total (mg/L)	2.62	27.8	7.40		
	Antimony (Sb)-Total (mg/L)	<0.00080	<0.00080	<0.00080		
	Arsenic (As)-Total (mg/L)	0.00250	0.0196	0.0162		
	Barium (Ba)-Total (mg/L)	0.151	1.17	0.136		
	Beryllium (Be)-Total (mg/L)	<0.0020	0.0029	<0.0020		
	Boron (B)-Total (mg/L)	0.095	0.213	<0.050		
	Cadmium (Cd)-Total (mg/L)	<0.0010	0.0012	0.0019		
	Calcium (Ca)-Total (mg/L)	51.6	194	57.3		
	Chromium (Cr)-Total (mg/L)	<0.0050	0.0635	0.0259		
	Cobalt (Co)-Total (mg/L)	0.0063	0.0836	0.0122		
	Copper (Cu)-Total (mg/L)	0.0097	0.152	0.111		
	Iron (Fe)-Total (mg/L)	3.27	36.6	10.1		
	Lead (Pb)-Total (mg/L)	0.0172	0.0461	0.0103		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1041037-1	L1041037-2	L1041037-3		
	Description	WATER	WATER	WATER		
	Sampled Date	05-AUG-11	05-AUG-11	05-AUG-11		
	Sampled Time	09:35	08:50	07:35		
	Client ID	HG1	HG2	HG7		
Grouping	**Analyte**					
WATER						
Total Metals	Lithium (Li)-Total (mg/L)	0.037	0.057	<0.010		
	Magnesium (Mg)-Total (mg/L)	18.1	82.6	22.5		
	Manganese (Mn)-Total (mg/L)	1.27	7.42	0.438		
	Molybdenum (Mo)-Total (mg/L)	0.135	0.0159	0.0110		
	Nickel (Ni)-Total (mg/L)	0.0081	0.118	0.0273		
	Potassium (K)-Total (mg/L)	3.65	9.75	2.92		
	Selenium (Se)-Total (mg/L)	<0.00080	<0.00080	<0.00080		
	Silver (Ag)-Total (mg/L)	<0.0050	<0.0050	0.0068		
	Sodium (Na)-Total (mg/L)	41.6	31.3	3.3		
	Strontium (Sr)-Total (mg/L)	0.322	0.511	0.0693		
	Thallium (Tl)-Total (mg/L)	<0.050	<0.050	<0.050		
	Tin (Sn)-Total (mg/L)	<0.050	<0.050	<0.050		
	Titanium (Ti)-Total (mg/L)	0.0302	0.780	0.120		
	Uranium (U)-Total (mg/L)	0.00881	0.0106	0.00241		
	Vanadium (V)-Total (mg/L)	0.0026	0.0903	0.0088		
	Zinc (Zn)-Total (mg/L)	0.106	0.784	0.158		
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	<0.010	<0.010	0.027		
	Antimony (Sb)-Dissolved (mg/L)	<0.00080	<0.00080	<0.00080		
	Arsenic (As)-Dissolved (mg/L)	0.00112	0.0137	0.00732		
	Barium (Ba)-Dissolved (mg/L)	0.0746	0.123	0.0300		
	Beryllium (Be)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Boron (B)-Dissolved (mg/L)	0.129	0.290	<0.050		
	Cadmium (Cd)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Calcium (Ca)-Dissolved (mg/L)	49.5	63.1	50.0		
	Chromium (Cr)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050		
	Cobalt (Co)-Dissolved (mg/L)	<0.0020	0.0035	<0.0020		
	Copper (Cu)-Dissolved (mg/L)	<0.0010	<0.0010	0.0071		
	Iron (Fe)-Dissolved (mg/L)	0.019	0.142	0.043		
	Lead (Pb)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050		
	Lithium (Li)-Dissolved (mg/L)	0.0350	0.0261	0.0032		
	Magnesium (Mg)-Dissolved (mg/L)	17.5	40.5	20.2		
	Manganese (Mn)-Dissolved (mg/L)	0.667	1.40	0.0395		
	Molybdenum (Mo)-Dissolved (mg/L)	0.149	RRVAP 0.0267	0.0097		
	Nickel (Ni)-Dissolved (mg/L)	0.0029	0.0060	0.0032		
	Potassium (K)-Dissolved (mg/L)	2.43	4.16	1.34		
	Selenium (Se)-Dissolved (mg/L)	<0.00080	<0.00080	<0.00080		
	Silver (Ag)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1041037-1	L1041037-2	L1041037-3		
	Description	WATER	WATER	WATER		
	Sampled Date	05-AUG-11	05-AUG-11	05-AUG-11		
	Sampled Time	09:35	08:50	07:35		
	Client ID	HG1	HG2	HG7		
Grouping	**Analyte**					
WATER						
Dissolved Metals	Sodium (Na)-Dissolved (mg/L)	40.2	30.3	2.7		
	Strontium (Sr)-Dissolved (mg/L)	0.304	0.309	0.0522		
	Thallium (Tl)-Dissolved (mg/L)	<0.050	<0.050	<0.050		
	Tin (Sn)-Dissolved (mg/L)	<0.050	<0.050	<0.050		
	Titanium (Ti)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Uranium (U)-Dissolved (mg/L)	0.00691	0.00686	0.00143		
	Vanadium (V)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Zinc (Zn)-Dissolved (mg/L)	0.0064	0.0287	0.0042		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRVAP	Reported Result Verified by Alternate Process

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-ED	Water	Acidity (as CaCO3)	APHA 2310 B - Potentiometric Titration
BR-IC-ED	Water	Bromide by IC	APHA 4110 B-ION CHROMATOGRAPHY
CL-IC-ED	Water	Chloride by IC	APHA 4110 B-ION CHROMATOGRAPHY
CN-T-MID-HH-COL-VA	Water	Total Cyanide by HH Distillation	APHA 4500-CN Cyanide
This analysis is carried out using procedures adapted from APHA Method 4500-CN "Cyanide". Total or strong acid dissociable (SAD) cyanide are determined by sample distillation and analysis using the chloramine-T colourimetric method.			
COL-TRU-ED	Water	Color, True	APHA 2120
The reported color applies to the pH of the sample as submitted unless otherwise noted on the report.			
IONBALANCE-ED	Water	Ion Balance Calculation	APHA 1030E
MET-D-L-ICP-ED	Water	Diss. Metals in Water by ICPOES (Low)	APHA 3120 B-ICP-OES
MET-D-MS-ED	Water	Dissolved Metals in Water by ICPMS	SW 846 - 6020-ICPMS
MET-T-L-ICP-ED	Water	Total Metals in Water by ICPOES (Low)	APHA 3120 B-ICP-OES
MET-T-MS-ED	Water	Total Metals in Water by ICPMS	SW 846 - 6020-ICPMS
N-T-CALC-ED	Water	Total Nitrogen (Calculation)	APHA 4500 N-Calculated
Total Nitrogen is a calculated parameter. Total Nitrogen = Total Kjeldahl Nitrogen + [Nitrate and Nitrite (as N)]			
NH3-CFA-ED	Water	Ammonia in Water by Colour	APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.			
NO2+NO3-CALC-ED	Water	Nitrate+Nitrite	CALCULATION
NO2-IC-ED	Water	Nitrite as N by IC	APHA 4110 B-ION CHROMATOGRAPHY
NO3-IC-ED	Water	Nitrate as N by IC	APHA 4110 B-ION CHROMATOGRAPHY
P-T-COL-ED	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity	APHA 4500-H, 2510, 2320
All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
SO4-IC-ED	Water	Sulfate by IC	APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TOTSUS-ED	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
TKN-CFA-ED	Water	TKN in Water by Colour	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 celcius with analysis using an automated colourimetric finish.			
TURBIDITY-ED	Water	Turbidity	APHA 2130 B-Nephelometer

** 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
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BC, CANADA

Chain of Custody Numbers:

10-100987

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
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 of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
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.

10- 100987

Page 1 of 1

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

Report To		Report Format / Distribution		Service Request: (Rush subject to availability - Contact ALS to confirm TAT)	
Company:	Knight Piésold Ltd	Standard: X	Other (specify):	X	Regular (Standard Turnaround Times - Business Days)
Contact:	Ryan Weir, Cara Stapley, Kevin Hawton	Select: PDF X	Excel X Digital Fax X		Priority(2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT
Address:	1650 Main Street West	Email 1:	rweir@knightpiesold.com		Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT
	North Bay ON P1B 8G5	Email 2:	cstapley@knightpiesold.com		Same Day or Weekend Emergency - Contact ALS to confirm TAT
Phone:	705 476 2165 Fax: 705 4748095	Email 3:	khawton@knightpiesold.com		

Invoice To	Same as Report ? (circle) Yes or No (If No, provide details)	Client / Project Information	
	Copy of Invoice with Report? (circle) Yes or No	Job #:	NB101-390/2
Company:	Avalon Rare Metals Inc.	PO / AFE:	To be provided by invoicee
Contact:	N/A	LSD:	N/A
Address:	N/A		
Phone:	N/A Fax: N/A	Quote #:	Q30599

Lab Work Order # (lab use only)	L1041037	ALS Contact:	Maureen Olinek	Sampler:	RDW

Analysis Request (Indicate Filtered or Preserved, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Number of Containers
	HG1	05-08-11	09:35	Water	
	HG2	05-08-11	08:50	Water	
	HG7	05-08-11	07:35	Water	

As per quote Q30599

* Nutrients and dissolved metals field filtered
* Cyanide, metals, total nitrogen, and nutrients preserved.

L1041037-COFC

Special Instructions / Regulations / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Ryan Weir	Date: 05-08-11	Time:	Received by:	Date:	Time:	Temperature: °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY GENF 18.01 Front

Attachment 4

Knight Piésold
CONSULTING

MEMORANDUM

To:	Mr. David Swisher	Date:	November 17, 2011
Copy To:	Kevin Hawton, Ryan Weir	File No.:	NB101-390/2-A.01
From:	Cara Stapley	Cont. No.:	NB11-00542
Re:	Thor Lake Project – Thor Lake Site Groundwater Quality Test Results (Event 2)		

Seven (7) groundwater monitoring wells have been installed near the proposed infrastructure for the Thor Lake Project at the Nechalacho Mine Site in Northwest Territories. In August, 2011, the six (6) wells installed in March and April, 2011 were developed and sampled as reported in memorandum "Thor Lake Project – Mine Site Groundwater Quality Test Results", Cont. No. NB11-00454, issued on September 20, 2011. In late October 2011, a program was carried out by Knight Piésold to develop the well installed in August 2011 (HG-3B), and check and sample (where possible) all seven wells for the purpose of collecting additional baseline water quality data. Two (2) groundwater monitoring wells were successfully sampled, however monitoring wells HG2, HG3B, HG-4, HG-5 and HG-6 could not be sampled because they were frozen or damaged due to frost heaving. Figure 1 shows the locations of the monitoring wells.

The two (2) water samples from HG-1 and HG-7 were sent to ALS Laboratory Group (ALS) in Yellowknife for completion of a complete suite of analytical tests, including:

- Physical tests
- Anions and nutrients
- Cyanide
- Total metals
- Dissolved metals

The results from the laboratory testing are summarized on Table 1. The laboratory certificate of analysis is included in Appendix A.

It is recommended that a third water sampling event take place in April 2012, for the purpose of establishing a complete set of baseline data (from all seasons). Should you have any questions, please do not hesitate to contact us.

Signed: CStapley
Cara Stapley, P.Eng.
Geological Engineer

Approved:
Kevin Hawton, P.Eng.
Senior Engineer

Attachments:
Table 1 Rev 0 Laboratory Results Summary
Figure 1 Rev 0 Monitoring Well and Instrumentation Locations
Appendix A Laboratory Certificate of Analysis

/cls

1650 Main Street West, North Bay, ON P1B 8G5
Phone: 705-476-2165 Facsimile: 705-474-8095

Knight Piésold CONSULTING

TABLE 1

AVALON RARE METALS INC.
THOR LAKE PROJECT

THOR LAKE SITE GROUNDWATER QUALITY TEST RESULTS (EVENT 2)
LABORATORY RESULTS SUMMARY

Print Nov/18/11 8:21:24

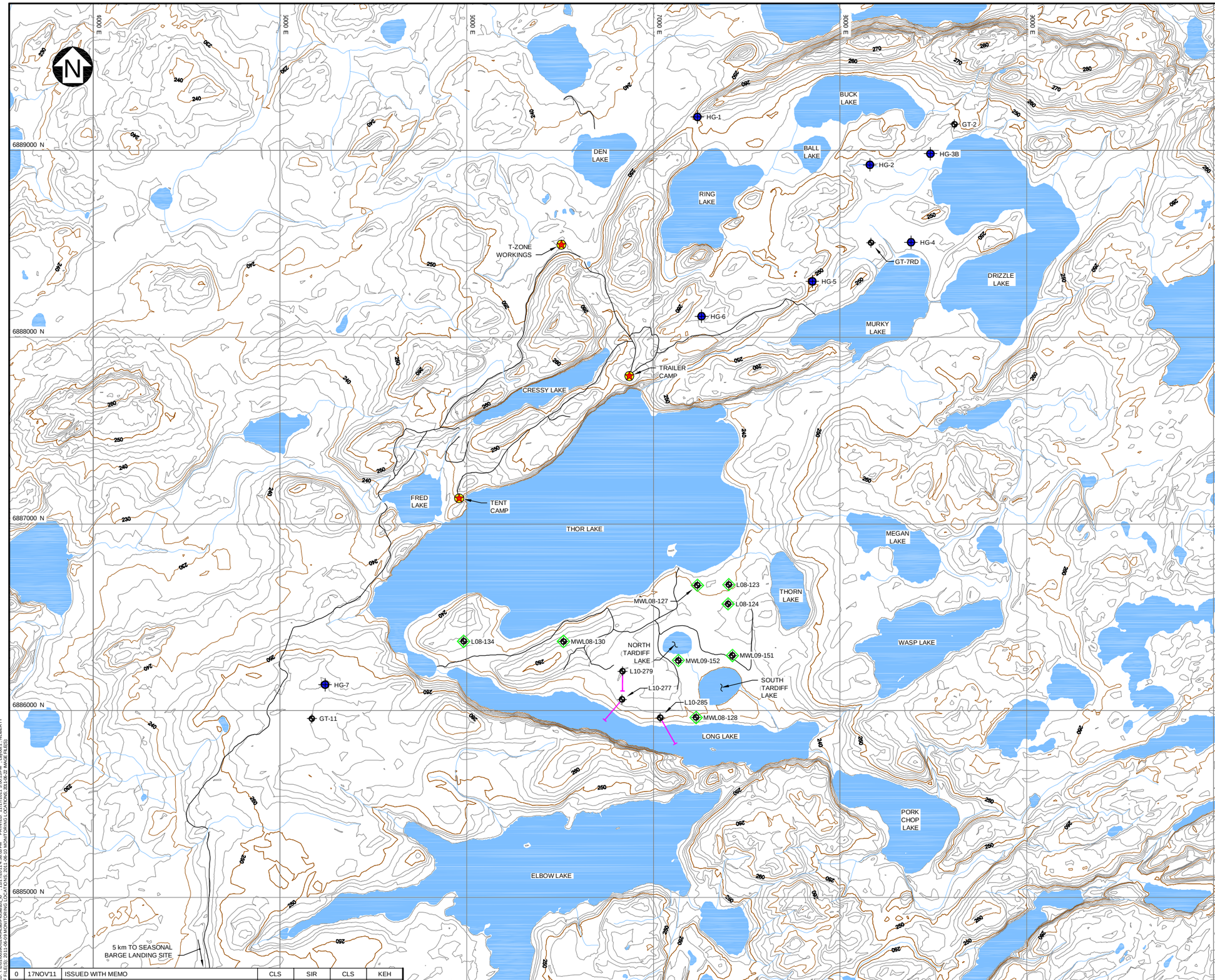
Date Sampled				28-Oct-11	-	-	-	-	-	28-Oct-11
Lab ID				L1078351-1	-	-	-	-	-	L1078351-2
Samples	**Sample Type**	**Units**	**MDL**	**HG-1**	**HG-2**	**HG-3B**	**HG-4**	**HG-5**	**HG-6**	**HG-7**
Physical Tests	Colour, True	T.C.U.	2.0	9.0	-	-	-	-	-	17.1
	Conductivity	uS/cm	0.20	507	-	-	-	-	-	455
	Hardness (as CaCO3)	mg/L	-	158	-	-	-	-	-	253
	pH	pH	0.10	8.20	-	-	-	-	-	8.13
	Total Suspended Solids	mg/L	3.0	318	-	-	-	-	-	361
	Total Dissolved Solids (Calculated)	mg/L	-	275	-	-	-	-	-	237
	Turbidity	-	0.10	59.1	-	-	-	-	-	25.4
Anions and Nutrients	Acidity (as CaCO3)	mg/L	5.0	<5.0	-	-	-	-	-	<5.0
	Alkalinity, Total (as CaCO3)	mg/L	5.0	233	-	-	-	-	-	235
	Ammonia-N, Total	mg/L	0.050	0.275	-	-	-	-	-	<0.050
	Bicarbonate (HCO3)	mg/L	5.0	284	-	-	-	-	-	287
	Bromide (Br)	mg/L	0.1	<0.10	-	-	-	-	-	<0.10
	Carbonate (CO3)	mg/L	5.0	<5.0	-	-	-	-	-	<5.0
	Chloride (Cl)	mg/L	0.50	4.93	-	-	-	-	-	<0.50
	Hydroxide (OH)	mg/L	5.0	<5.0	-	-	-	-	-	<5.0
	Nitrate (as N)	mg/L	0.050	<0.050	-	-	-	-	-	0.154
	Nitrate and Nitrite as N	mg/L	0.071	<0.071	-	-	-	-	-	0.154
	Nitrite (as N)	mg/L	0.050	<0.050	-	-	-	-	-	<0.050
	Total Kjeldahl Nitrogen	mg/L	0.2	1.20	-	-	-	-	-	0.22
	Total Nitrogen	mg/L	0.21	1.20	-	-	-	-	-	0.38
	Total Phosphate as P	mg/L	0.020	0.070	-	-	-	-	-	0.031
	Sulfate (SO4)	mg/L	0.50	19.0	-	-	-	-	-	6.48
Cyanide	Cyanide, Total	mg/L	0.0020	<0.0020	-	-	-	-	-	<0.0020
Total Metals	Aluminum (Al)-Total	mg/L	0.010	3.51	-	-	-	-	-	0.624
	Antimony (Sb)-Total	mg/L	0.00080	<0.00080	-	-	-	-	-	<0.00080
	Arsenic (As)-Total	mg/L	0.00080	0.00198	-	-	-	-	-	0.0253
	Barium (Ba)-Total	mg/L	0.0030	0.106	-	-	-	-	-	0.0360
	Beryllium (Be)-Total	mg/L	0.0020	<0.0020	-	-	-	-	-	<0.0020
	Boron (B)-Total	mg/L	0.050	0.149	-	-	-	-	-	<0.050
	Cadmium (Cd)-Total	mg/L	0.0010	<0.0010	-	-	-	-	-	<0.0010
	Calcium (Ca)-Total	mg/L	0.50	38.2	-	-	-	-	-	55.3
	Chromium (Cr)-Total	mg/L	0.0050	<0.0050	-	-	-	-	-	<0.0050
	Cobalt (Co)-Total	mg/L	0.0020	0.0026	-	-	-	-	-	0.0066
	Copper (Cu)-Total	mg/L	0.0010	0.0061	-	-	-	-	-	0.0099
	Iron (Fe)-Total	mg/L	0.010	4.33	-	-	-	-	-	1.55
	Lead (Pb)-Total	mg/L	0.0050	0.0060	-	-	-	-	-	<0.0050
	Lithium (Li)-Total	mg/L	0.010	0.044	-	-	-	-	-	<0.010
	Magnesium (Mg)-Total	mg/L	0.10	13.0	-	-	-	-	-	23.1
	Manganese (Mn)-Total	mg/L	0.0020	0.759	-	-	-	-	-	0.0894
	Mercury (Hg)-Total	mg/L	0.00010	-	-	-	-	-	-	-
	Molybdenum (Mo)-Total	mg/L	0.0050	0.0977	-	-	-	-	-	0.0083
	Nickel (Ni)-Total	mg/L	0.0020	0.0059	-	-	-	-	-	0.0114
	Potassium (K)-Total	mg/L	0.10	4.25	-	-	-	-	-	1.47
	Selenium (Se)-Total	mg/L	0.00080	<0.00080	-	-	-	-	-	<0.00080
	Silver (Ag)-Total	mg/L	0.0050	<0.0050	-	-	-	-	-	<0.0050
	Sodium (Na)-Total	mg/L	1.0	55.5	-	-	-	-	-	1.7
	Strontium (Sr)-Total	mg/L	0.0020	0.251	-	-	-	-	-	0.0434
	Thallium (Tl)-Total	mg/L	0.050	<0.050	-	-	-	-	-	<0.050
	Tin (Sn)-Total	mg/L	0.050	<0.050	-	-	-	-	-	<0.050
	Titanium (Ti)-Total	mg/L	0.0010	0.0934	-	-	-	-	-	0.0128
	Uranium (U)-Total	mg/L	0.00010	0.00597	-	-	-	-	-	0.00148
	Vanadium (V)-Total	mg/L	0.0010	0.0026	-	-	-	-	-	<0.0010
	Zinc (Zn)-Total	mg/L	0.0040	0.0498	-	-	-	-	-	0.0096
Dissolved Metals	Aluminum (Al)-Dissolved	mg/L	0.010	0.015	-	-	-	-	-	0.019
	Antimony (Sb)-Dissolved	mg/L	0.00080	<0.00080	-	-	-	-	-	<0.00080
	Arsenic (As)-Dissolved	mg/L	0.00080	0.00112	-	-	-	-	-	0.00937
	Barium (Ba)-Dissolved	mg/L	0.0030	0.0646	-	-	-	-	-	0.0309
	Beryllium (Be)-Dissolved	mg/L	0.0010	<0.0010	-	-	-	-	-	<0.0010
	Bismuth (Bi)-Dissolved	mg/L	0.000050	-	-	-	-	-	-	-
	Boron (B)-Dissolved	mg/L	0.050	0.142	-	-	-	-	-	<0.050
	Cadmium (Cd)-Dissolved	mg/L	0.0010	<0.0010	-	-	-	-	-	<0.0010
	Calcium (Ca)-Dissolved	mg/L	0.50	40.4	-	-	-	-	-	61.1
	Chromium (Cr)-Dissolved	mg/L	0.0050	<0.0050	-	-	-	-	-	<0.0050
	Cobalt (Co)-Dissolved	mg/L	0.0020	<0.0020	-	-	-	-	-	<0.0020
	Copper (Cu)-Dissolved	mg/L	0.0010	<0.0010	-	-	-	-	-	0.0047
	Iron (Fe)-Dissolved	mg/L	0.010	0.016	-	-	-	-	-	0.049
	Lead (Pb)-Dissolved	mg/L	0.0050	<0.0050	-	-	-	-	-	<0.0050
	Lithium (Li)-Dissolved	mg/L	0.0030	0.0431	-	-	-	-	-	0.0045
	Magnesium (Mg)-Dissolved	mg/L	0.10	13.8	-	-	-	-	-	24.4
	Manganese (Mn)-Dissolved	mg/L	0.0020	0.689	-	-	-	-	-	0.0332
	Mercury (Hg)-Dissolved	mg/L	0.00010	-	-	-	-	-	-	-
	Molybdenum (Mo)-Dissolved	mg/L	0.0050	0.0998	-	-	-	-	-	0.0085
	Nickel (Ni)-Dissolved	mg/L	0.0020	0.0042	-	-	-	-	-	<0.0020
	Potassium (K)-Dissolved	mg/L	0.50	2.69	-	-	-	-	-	1.37
	Selenium (Se)-Dissolved	mg/L	0.00080	<0.00080	-	-	-	-	-	<0.00080
	Silver (Ag)-Dissolved	mg/L	0.0050	<0.0050	-	-	-	-	-	<0.0050
	Sodium (Na)-Dissolved	mg/L	1.0	54.0	-	-	-	-	-	1.6
	Strontium (Sr)-Dissolved	mg/L	0.0050	0.248	-	-	-	-	-	0.0451
	Thallium (Tl)-Dissolved	mg/L	0.050	<0.050	-	-	-	-	-	<0.050
	Tin (Sn)-Dissolved	mg/L	0.050	<0.050	-	-	-	-	-	<0.050
	Titanium (Ti)-Dissolved	mg/L	0.0010	<0.0010	-	-	-	-	-	<0.0010
	Uranium (U)-Dissolved	mg/L	0.00010	0.00527	-	-	-	-	-	0.00153
	Vanadium (V)-Dissolved	mg/L	0.0010	<0.0010	-	-	-	-	-	<0.0010
	Zinc (Zn)-Dissolved	mg/L	0.0020	0.0051	-	-	-	-	-	0.0024
	Ion Balance	%	-	108	-	-	-	-	-	106

I:\1\01\00390\02\A\Correspondence\NB11-00542 - Thor Water Quality Event 2\[Table 1.xlsx]1

NOTES:

1. NO TEST RESULTS FOR HG-2, HG-3B, HG-4, HG-5 OR HG-6; WELLS FROZEN OR DAMAGED DUE TO FROST HEAVING.

0	17NOV'11	ISSUED WITH MEMO NB 11-00542	CLS	KEH	KEH
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



LEGEND:

- WATER
- EXISTING ACCESS ROAD
- EXISTING MONITORING WELL (BY STANTEC)
- MONITORING WELL
- EXISTING GEOMECHANICAL / GEOTECHNICAL THERMISTOR INSTALLATION

NOTES:

1. COORDINATE GRID IS UTM (NAD83) ZONE 12N AND IS IN METRES.
2. PLAN BASED ON INFORMATION PROVIDED BY AVALON RARE METALS INC.
3. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 2 METRES.

SCALE 200 100 0 200 400 600 800 1000 m

REV	DATE	DESCRIPTION	PREPARED	DRAWN	CHK'D	APP'D
0	17NOV11	ISSUED WITH MEMO	CLS	SIR	CLS	KEH

AVALON RARE METALS INC.

THOR LAKE PROJECT

MONITORING WELL AND INSTRUMENTATION LOCATIONS

Knight Piésold CONSULTING

P/A NO.	REF NO.
NB101-390/2	NB11-00542

FIGURE 1 REV 0

SAVED: I:\1010\00\NB101-390\Acad\FIGS\NB101-0 11/17/2011 4:58:00 PM PRINTED: 11/17/2011 5:00:13 PM Layout1, NLIBERTY
XREF FILE(S): 2011-06-09 MONITORING LOCATIONS; 2011-06-10 MONITORING LOCATIONS; 2011-06-22 MAGE FILES()

Knight Piésold CONSULTING

APPENDIX A

LABORATORY CERTIFICATE OF ANALYSIS

(Pages A-1 to A-7)

KNIGHT PIESOLD LTD.
ATTN: RYAN WEIR / CARA STAPLEY /
KEVIN HAWTON
1650 Main Street West
North Bay ON P1B 8G5

Date Received: 28-OCT-11
Report Date: 15-NOV-11 16:37 (MT)
Version: FINAL

Client Phone: 705-476-2165

Certificate of Analysis

Lab Work Order #: L1078351

Project P.O. #: NB11-3501
Job Reference: NB101-39012
C of C Numbers: 10-165834
Legal Site Desc:

Jessica Spira
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 9936-67 Avenue, Edmonton, AB T6E 0P5 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

Environmental www.alsglobal.com
RIGHT SOLUTIONS RIGHT PARTNER

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1078351-1	L1078351-2			
	Description	WATER	WATER			
	Sampled Date	28-OCT-11	28-OCT-11			
	Sampled Time	09:20	09:55			
	Client ID	HG-1	HG-7			
Grouping	**Analyte**					
WATER						
Physical Tests	Color, True (T.C.U.)	9.0	17.1			
	Total Suspended Solids (mg/L)	318	361			
	Turbidity (NTU)	59.1	25.4			
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	<5.0	<5.0			
	Alkalinity, Total (as CaCO3) (mg/L)	233	235			
	Ammonia (as N) (mg/L)	0.275	<0.050			
	Bicarbonate (HCO3) (mg/L)	284	287			
	Bromide (Br) (mg/L)	<0.10	<0.10			
	Carbonate (CO3) (mg/L)	<5.0	<5.0			
	Chloride (Cl) (mg/L)	4.93	<0.50			
	Conductivity (EC) (uS/cm)	507	455			
	Hardness (as CaCO3) (mg/L)	158	253			
	Hydroxide (OH) (mg/L)	<5.0	<5.0			
	Ion Balance (%)	108	106			
	Nitrate and Nitrite (as N) (mg/L)	<0.071	0.154			
	Nitrate (as N) (mg/L)	<0.050	0.154			
	Nitrite (as N) (mg/L)	<0.050	<0.050			
	Total Kjeldahl Nitrogen (mg/L)	1.20	0.22			
	Total Nitrogen (mg/L)	1.20	0.38			
	pH (pH)	8.20	8.13			
	Phosphorus (P)-Total (mg/L)	0.070	0.031			
	TDS (Calculated) (mg/L)	275	237			
	Sulfate (SO4) (mg/L)	19.0	6.48			
Cyanides	Cyanide, Total (mg/L)	<0.0020	<0.0020			
Total Metals	Aluminum (Al)-Total (mg/L)	3.51	0.624			
	Antimony (Sb)-Total (mg/L)	<0.00080	<0.00080			
	Arsenic (As)-Total (mg/L)	0.00198	0.0253			
	Barium (Ba)-Total (mg/L)	0.106	0.0360			
	Beryllium (Be)-Total (mg/L)	<0.0020	<0.0020			
	Boron (B)-Total (mg/L)	0.149	<0.050			
	Cadmium (Cd)-Total (mg/L)	<0.0010	<0.0010			
	Calcium (Ca)-Total (mg/L)	38.2	55.3			
	Chromium (Cr)-Total (mg/L)	<0.0050	<0.0050			
	Cobalt (Co)-Total (mg/L)	0.0026	0.0066			
	Copper (Cu)-Total (mg/L)	0.0061	0.0099			
	Iron (Fe)-Total (mg/L)	4.33	1.55			
	Lead (Pb)-Total (mg/L)	0.0060	<0.0050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1078351-1	L1078351-2			
	Description	WATER	WATER			
	Sampled Date	28-OCT-11	28-OCT-11			
	Sampled Time	09:20	09:55			
	Client ID	HG-1	HG-7			
Grouping	**Analyte**					
WATER						
Total Metals	Lithium (Li)-Total (mg/L)	0.044	<0.010			
	Magnesium (Mg)-Total (mg/L)	13.0	23.1			
	Manganese (Mn)-Total (mg/L)	0.759	0.0894			
	Molybdenum (Mo)-Total (mg/L)	0.0977	0.0083			
	Nickel (Ni)-Total (mg/L)	0.0059	0.0114			
	Potassium (K)-Total (mg/L)	4.25	1.47			
	Selenium (Se)-Total (mg/L)	<0.00080	<0.00080			
	Silver (Ag)-Total (mg/L)	<0.0050	<0.0050			
	Sodium (Na)-Total (mg/L)	55.5	1.7			
	Strontium (Sr)-Total (mg/L)	0.251	0.0434			
	Thallium (Tl)-Total (mg/L)	<0.050	<0.050			
	Tin (Sn)-Total (mg/L)	<0.050	<0.050			
	Titanium (Ti)-Total (mg/L)	0.0934	0.0128			
	Uranium (U)-Total (mg/L)	0.00597	0.00148			
	Vanadium (V)-Total (mg/L)	0.0026	<0.0010			
	Zinc (Zn)-Total (mg/L)	0.0498	0.0096			
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	0.015	0.019			
	Antimony (Sb)-Dissolved (mg/L)	<0.00080	<0.00080			
	Arsenic (As)-Dissolved (mg/L)	0.00112	0.00937			
	Barium (Ba)-Dissolved (mg/L)	0.0646	0.0309			
	Beryllium (Be)-Dissolved (mg/L)	<0.0010	<0.0010			
	Boron (B)-Dissolved (mg/L)	0.142	<0.050			
	Cadmium (Cd)-Dissolved (mg/L)	<0.0010	<0.0010			
	Calcium (Ca)-Dissolved (mg/L)	40.4	61.1			
	Chromium (Cr)-Dissolved (mg/L)	<0.0050	<0.0050			
	Cobalt (Co)-Dissolved (mg/L)	<0.0020	<0.0020			
	Copper (Cu)-Dissolved (mg/L)	<0.0010	0.0047			
	Iron (Fe)-Dissolved (mg/L)	0.016	0.049			
	Lead (Pb)-Dissolved (mg/L)	<0.0050	<0.0050			
	Lithium (Li)-Dissolved (mg/L)	0.0431	0.0045			
	Magnesium (Mg)-Dissolved (mg/L)	13.8	24.4			
	Manganese (Mn)-Dissolved (mg/L)	0.689	0.0332			
	Molybdenum (Mo)-Dissolved (mg/L)	0.0998	0.0085			
	Nickel (Ni)-Dissolved (mg/L)	0.0042	<0.0020			
	Potassium (K)-Dissolved (mg/L)	2.69	1.37			
	Selenium (Se)-Dissolved (mg/L)	<0.00080	<0.00080			
	Silver (Ag)-Dissolved (mg/L)	<0.0050	<0.0050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1078351-1	L1078351-2			
	Description	WATER	WATER			
	Sampled Date	28-OCT-11	28-OCT-11			
	Sampled Time	09:20	09:55			
	Client ID	HG-1	HG-7			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Sodium (Na)-Dissolved (mg/L)	54.0	1.6			
	Strontium (Sr)-Dissolved (mg/L)	0.248	0.0451			
	Thallium (Tl)-Dissolved (mg/L)	<0.050	<0.050			
	Tin (Sn)-Dissolved (mg/L)	<0.050	<0.050			
	Titanium (Ti)-Dissolved (mg/L)	<0.0010	<0.0010			
	Uranium (U)-Dissolved (mg/L)	0.00527	0.00153			
	Vanadium (V)-Dissolved (mg/L)	<0.0010	<0.0010			
	Zinc (Zn)-Dissolved (mg/L)	0.0051	0.0024			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Sulfate (SO4)	MS-B	L1078351-1, -2
Matrix Spike	Chloride (Cl)	MS-B	L1078351-1, -2
Matrix Spike	Nitrate (as N)	MS-B	L1078351-1, -2
Matrix Spike	Sulfate (SO4)	MS-B	L1078351-1, -2
Matrix Spike	Phosphorus (P)-Total	MS-B	L1078351-1, -2
Matrix Spike	Phosphorus (P)-Total	MS-B	L1078351-1, -2
Matrix Spike	Phosphorus (P)-Total	MS-B	L1078351-1, -2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-ED	Water	Acidity (as CaCO3)	APHA 2310 B - Potentiometric Titration
BR-IC-ED	Water	Bromide by IC	APHA 4110 B-ION CHROMATOGRAPHY
CL-IC-ED	Water	Chloride by IC	APHA 4110 B-ION CHROMATOGRAPHY
CN-TOT-WT	Water	Cyanide, Total	APHA 4500CN C E-STRONG ACID DIST COLORIM

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

COL-TRU-ED	Water	Color, True	APHA 2120

The reported color applies to the pH of the sample as submitted unless otherwise noted on the report.

IONBALANCE-ED	Water	Ion Balance Calculation	APHA 1030E
MET-D-L-ICP-ED	Water	Diss. Metals in Water by ICPOES (Low)	APHA 3120 B-ICP-OES
MET-D-MS-ED	Water	Dissolved Metals in Water by ICPMS	SW 846 - 6020-ICPMS
MET-T-L-ICP-ED	Water	Total Metals in Water by ICPOES (Low)	APHA 3120 B-ICP-OES
MET-T-MS-ED	Water	Total Metals in Water by ICPMS	SW 846 - 6020-ICPMS
N-T-CALC-ED	Water	Total Nitrogen (Calculation)	APHA 4500 N-Calculated

Total Nitrogen is a calculated parameter. Total Nitrogen = Total Kjeldahl Nitrogen + [Nitrate and Nitrite (as N)]

NH3-CFA-ED	Water	Ammonia in Water by Colour	APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.

NO2+NO3-CALC-ED	Water	Nitrate+Nitrite	CALCULATION
NO2-IC-ED	Water	Nitrite as N by IC	APHA 4110 B-ION CHROMATOGRAPHY
NO3-IC-ED	Water	Nitrate as N by IC	APHA 4110 B-ION CHROMATOGRAPHY
P-T-COL-ED	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity	APHA 4500-H, 2510, 2320

All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

SO4-IC-ED	Water	Sulfate by IC	APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TOTSUS-ED	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
TKN-CFA-ED	Water	TKN in Water by Colour	APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 celcius with analysis using an automated colourimetric finish.

TURBIDITY-ED	Water	Turbidity	APHA 2130 B-Nephelometer

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

Reference Information

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
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

10-165834

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
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 of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
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.

10-165834

ALS environmental

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

Report To
Company: Knight Piésold Ltd.
Contact: Ryan Weir, Cara Stapley, Kevin Hawton
Address: 1650 Main Street West
Phone: 705 476 2165 Fax: 705 474 8095

Report Format / Distribution
Standard: X Other (specify):
Select: PDF X Excel X Digital Fax X
Email 1: rweir@knightpiesold.com
Email 2: cstapley@knightpiesold.com
Email 3: khawton@knightpiesold.com

Service Request: (Rush subject to availability - Contact ALS to confirm TAT)
X Regular (Standard Turnaround Times - Business Days)
Priority (2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT
Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT
Same Day or Weekend Emergency - Contact ALS to confirm TAT

Invoice To Same as Report ? (circle) Yes or No (if No, provide details)
Copy of Invoice with Report? (circle) Yes or No
Company:
Contact:
Address:
Phone:

Client / Project Information
Job #: NB101-390/2
PO / AFE: NB11-3501
LSD:
Quote #: Q30599

Lab Work Order # * L1078351-COFC *

ALS Contact: **Sampler:**

Analysis Request (Indicate Filtered or Preserved, F/P)

Sample #	(This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Number of Containers
	HG-1	28-OCT-11	09:20	Water	
	HG-7	28-OCT-11	09:55	Water	

Please analyze as per quote Q30599 Nutrients and dissolved metals field filtered Cyanide, metals, nitrogen & nutrients preserved

Special Instructions / Regulation with water or land use (CCME- Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC) / Hazardous Details

*UNABLE TO FIELD FILTER HG-1 DISS. METALS AND ~~NUTRIENTS~~ TOT. N, NO PRESERV. AD

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:
Ryan Weir	28-OCT-11	2:12	Spencer Sale	28th/Oct/11	2:12	1.8 °C	Spencer		

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY