Table 2-3: Summary of QA/QC Assessment of 2018 Data, SNP Station TL-1

QC Test	n	SRK QC Criteria	Results
Ion Balance			
Ion balance	7	EC>100 us/cm, %difference should be within ± 10%	All Passed
Metals (Water)			
Comparison with total metals	10	Total metals>dissolved metals, (Total metals-dissolved metals)/average ≤ 30%, for values >10 DL. okay 10% of metal scan failing.	All Passed
Lab Duplicate	16	For samples >10X detection limit (DL), % RPD within ± 30%, okay 10% of metal scan failing.	All Passed
Lab Blank	101	Within specified tolerance ranges.	All Passed
Physical tests			
pH lab vs field	29	Difference should not be greater than 1 pH unit	All Passed
Specific conductivity in lab v/s field	4	For samples >10X detection limit (DL), % RPD within ± 30%, okay	All Passed
Lab Duplicate	30	For samples >10X detection limit (DL), % RPD within ± 30%, okay	All Passed
Lab Blank	69	Within specified tolerance ranges.	All Passed
Standard reference material	49	Within specified tolerance ranges.	All Passed
Anions and Nutrients (Water)			
Lab Duplicate	11	For samples >10X detection limit (DL), % RPD within ± 30%, okay.	All Passed
Lab Blank	174	Within specified tolerance ranges.	All Passed
Travel blank	1	<5x Detection Limit	-
Standard reference material	51	Within specified tolerance ranges.	All Passed
Cl lab vs field	3	For samples >10X detection limit (DL), % RPD within ± 30%, okay	Sample from August 20, September 3 and September 10 failed with %RPD between 49%, 54% and 37% respectively
Total S-IC and S-ICP comparison			
Comparison between S-IC and S-ICP	3	For samples >10X detection limit (DL), % RPD within ±20%	All Passed
Trends			
Trend analysis	All graph data	Check for anomalously high or low data	TL-1 on 18-Jun-18 field EC of 225 uS/cm. Value confirmed with TMAC. Data point not included in assessment.

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.027_2018 Geochem ComplianceSupport\!020_Project_Data\Lab data\North dam\QAQC\[Summary Table QAQC_1CT022.027_2018_NorthDam_MAC.xls]Summary

Table 2-4: Summary of QA/QC Assessment of 2018 Data, SNP Station TL-5

QC Test	SRK QC Criteria	Description of Data Set and Result
Field vs. Lab pH	For any samples, ± 1 difference unit	No field measurements collected.
Lab method Blank	<5X DL	(Physical test: n=19 for TSS; Anions: n=18 for SO_4; Nutrients: n=21 for NH3,n=18 for NO_2, n=19 for NO_3, CN Species: n=21 for Cyanate, n=12 for CN Free, n=12 for Thioscyanate, n=22 for CN Total, n=21 for CN WAD; Metals: n=18 for T-Hg, n=22 for T-Metals). All passed.
Lab Duplicate	For samples >10X detection limit (DL), % RPD within ± 20%, okay 10% of metal scan failing.	(Physical test: n=1 for TSS; Nutrients: n=1 for NH_3; CN Species: n=11 for Cyanate, n=2 for Thioscyanate; Metals: n=1 for T-Hg, n=7 for T-Metals) All passed.
Field Blank	<5X DL	(n=1) Failed for Anions: SO_4, Metals: T-Ca, T-Mg, T-Ka, T-Rb, T-Na, T-Sr, T-S with results >10X DL. Attributed to sample contamination.
Field Duplicates	>10X DL, RPD better than ±20%	(n=1) Failed for CN species: Cyanate, Metals: T-As, T-Cd, T-Cs, T-Co, T-Cu, T-Se, T-Zn. May be attributed to disturbed sediments during sampling or sample contamination
Standards/ Controls	Within tolerance ranges	(Physical test: n=19 for TSS, n=11 for pH; Anions: n=18 for SO_4; Nutrients: n=20 for NH_3,n=19 for NO_2, n=18 for NO_3, CN Species: n=20 for Cyanate, n=12 for CN Free, n=12 for Thioscyanate, n=22 for CN Total, n=21 for CN WAD; Metals: n=18 for T-Hg, n=23 for T-Metals) All passed.
Ion Balance	EC>100 uS/cm, imbalance not greater than 10%	Only total metals analyzed therefore could not conduct QC test.
Total vs. Dissolved metals	Total metals >Dissolved metals, (Total metals-Dissolved metals)/(average(total metals, dissolved metals)=±30%	Only total metals analyzed therefore could not conduct QC test.

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CH008.023_Geochem_Monitoring\G_Tailings Monitoring\2018\1. Working Files\QAQC\[1CT022.027_HopeBay_TailingsMonitoringData_2018_Summary QAQC.xlsx]

3 Results

North Dam seepage data from the 2018 are summarized in Table 3-1 with full results presented in Attachment 1. The scope of the water chemistry assessment is to determine if TIA Reclaim Pond water is present in seepage at the downstream toe of the North Dam. This section discusses a subset of the water quality data, specifically EC, ammonia, nitrite, chloride, sulphate, and other major ions, which were identified as geochemical tracers of TIA Reclaim Pond. For other parameters, there were no appreciable differences in concentration between toe seepage samples and TL-1.

Table 3-1: Summary of 2018 North Dam Seepage Monitoring Data

Location	Date	pH	EC uS/cm	Total Alkalinity mg/L as $CaCO_3$	SO_4 mg/L	Cl mg/L	Total Ammonia mg/L as N	NO_3 mg/L as N	NO_2 mg/L as N	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	As mg/L	Co mg/L	Cu mg/L	Mn mg/L	Mo mg/L	Ni mg/L	Zn mg/L
V-notch weir	6/25/2018	7.6	280	110	16	21	0.019	0.1	0.0014	33	8.3	17	2	0.00081	0.0004	0.01	0.038	0.001	0.0018	0.005
	7/2/2018	8	360	130	20	24	0.0067	0.35	0.001	37	8.3	22	1.5	0.00052	0.00013	0.0075	0.0081	0.00056	0.0012	0.0067
	7/9/2018	7.9	400	140	23	29	0.0084	0.63	0.001	39	8.9	30	1.7	0.00046	0.00012	0.0072	0.0054	0.00051	0.00081	0.001
	7/16/2018	8.2	360	130	28	21	0.0086	0.67	0.001	38	8.9	26	1.8	0.00059	0.00015	0.0086	0.0078	0.00067	0.0011	0.001
	7/23/2018	8.1	380	120	39	19	0.0061	1.1	0.001	35	9	36	2.3	0.00058	0.0003	0.0087	0.0054	0.001	0.001	0.005
	7/30/2018	8.1	400	130	39	21	0.0059	1.1	0.001	31	9.4	39	2.4	0.00056	0.0003	0.0096	0.004	0.001	0.0011	0.005
	8/6/2018	8.3	410	140	36	24	0.0062	0.74	0.001	38	9.5	33	2	0.00062	0.00015	0.0084	0.005	0.00094	0.0011	0.001
	8/13/2018	7.9	360	130	28	19	0.007	0.33	0.001	43	9.2	24	1.6	0.00061	0.00011	0.0078	0.0034	0.00072	0.0011	0.001
	8/20/2018	8	390	140	26	23	0.005	0.39	0.001	37	8.3	22	1.3	0.00044	0.0001	0.0072	0.0032	0.00059	0.00097	0.001
	8/27/2018	7.9	380	140	22	24	0.0064	0.35	0.001	41	9.1	21	1.4	0.00047	0.00012	0.0083	0.0045	0.00045	0.0012	0.001
	9/3/2018	7.9	380	150	25	26	0.0094	0.27	0.001	45	9.7	24	1.4	0.00045	0.0001	0.0076	0.0038	0.00057	0.0011	0.001
	9/10/2018	7.9	390	140	18	28	0.0068	0.23	0.001	47	9	20	2	0.0005	0.0003	0.007	0.0051	0.001	0.001	0.005
Other Toe Seeps	6/25/2018	7.7	270	100	11	18	0.011	0.022	0.001	34	6.5	13	2	0.00056	0.0003	0.0076	0.011	0.001	0.0015	0.005

Source: P:\01_SITES\Hope.Bay\1CT022.027_2018 Geochem ComplianceSupport\North Dam Seepage Monitoring\[DamSeepage_HistoricalWQ_Compilation_amd_lnb_knk_Rev05.xlsx]

Note: Trace element data for samples collected on June 25 are totals. Data for all other samples are dissolved.

Table 3-2: Statistical Summary of Monitoring Data at North Dam Seepage, TL-1 and TL-5

Station	Year*	Statistic	pH		EC		Total Alkalinity mg/L as $CaCO_3$	SO_4 mg/L	Cl mg/L	Total Ammonia	NO_3	NO_2	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	As mg/L	Co mg/L	Cu mg/L	Mn mg/L	Mo mg/L	Ni mg/L	Zn mg/L
			Field	Lab	Field	Lab				mg/L as N													
					uS/cm																		
North Dam Seepage	2011	Min	7.9	8	180	--	230	190	690	29	82	--	73	62	460	34	0.0035	0.005	0.017	0.54	0.0053	0.0025	0.015
		Median	7.9	8	1800	--	230	190	690	29	82	--	73	62	460	34	0.0035	0.005	0.017	0.54	0.0053	0.0025	0.015
		Max	7.9	8	3500	--	230	190	690	29	82	--	73	62	460	34	0.0035	0.005	0.017	0.54	0.0053	0.0025	0.015
		n	2	1	2	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1
	2012	Min	7.3	8	140	370	150	9	30	0.72	0.73	0.021	38	9.9	27	3.8	0.00041	0.00054	0.0038	0.14	0.00066	0.0015	0.0029
		Median	7.5	8	270	370	150	9	30	0.72	0.73	0.021	38	9.9	27	3.8	0.00041	0.00054	0.0038	0.14	0.00066	0.0015	0.0029
		Max	7.6	8	410	370	150	9	30	0.72	0.73	0.021	38	9.9	27	3.8	0.00041	0.00054	0.0038	0.14	0.00066	0.0015	0.0029
		n	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	2017-2018	Min	7.1	7.6	280	270	100	11	15	0.005	0.022	0.001	27	7.4	20	1.3	0.00044	0.0001	0.007	0.0032	0.00045	0.00081	0.001
		Median	7.5	7.9	380	380	130	25	21	0.007	0.39	0.001	38	9	26	1.8	0.00052	0.00015	0.0083	0.0051	0.00072	0.0011	0.001
		Max	8.8	8.3	420	410	150	39	29	0.019	1.4	0.0021	47	9.7	39	2.8	0.00062	0.0003	0.014	0.0081	0.001	0.0014	0.0067
		n	14	15	14	15	15	15	15	15	15	15	13	13	13	13	13	13	13	13	13	13	13
TL-1 (TIA Reclaim Pump)	2011-2016	Min	7.5	7.1	150	85	32	1	3.5	0.005	0.005	0.001	5.8	1.3	12	1.3	0.00017	0.0001	0.00072	0.0033	0.00053	0.0005	0.0013
		Median	7.5	7.8	150	210	35	2.4	39	0.05	0.05	0.05	12	5.7	14	1.6	0.0004	0.002	0.0013	0.005	0.005	0.002	0.002
		Max	7.5	9	150	340	45	5.7	63	0.26	1.2	0.05	21	9.7	24	2.6	0.0004	0.002	0.0014	0.018	0.005	0.002	0.012
		n	1	84	1	43	10	49	84	84	84	84	47	47	13	13	6	6	6	6	6	6	3
	2017	Min	7.5	7.4	340	530	75	81	60	0.21	0.085	0.0017	28	8.3	61	4.4	0.0004	0.0007	0.0067	0.054	0.00064	0.0016	0.0016
		Median	7.9	7.9	540	530	75	81	70	1.1	0.67	0.023	28	8.3	61	4.4	0.0004	0.0007	0.0067	0.054	0.00064	0.0016	0.0016
		Max	8.6	8.1	790	530	75	81	92	1.9	1.6	0.12	28	8.3	61	4.4	0.0004	0.0007	0.0067	0.054	0.00064	0.0016	0.0016
		n	14	17	13	1	1	1	17	30	19	19	1	1	1	1	1	1	1	1	1	1	1
	2018	Min	7.3	7.6	1100	1900	82	260	110	0.92	0.61	0.02	56	21	220	15	0.00054	0.0014	0.0076	0.16	0.0013	0.0039	0.001
		Median	7.9	8.2	1900	2200	93	300	380	2.7	1.1	0.2	67	30	300	18	0.00058	0.0015	0.013	0.31	0.0016	0.0042	0.002
		Max	10	9.2	2700	3100	110	380	660	9.8	2	0.3	100	50	510	27	0.00087	0.0027	0.029	0.4	0.0026	0.0081	0.005
		n	34	39	30	8	10	10	18	49	18	18	13	13	14	13	13	13	13	13	13	13	14
TL-5 (Tailings Supernatant)	2017-2018	Min	--	7.7	--	--	--	6	--	11	0.1	0.02	33	22	520	36	0.00088	0.0053	0.0057	0.063	0.0032	0.011	0.006
		Median	--	8.2	--	--	--	1400	--	21	14	0.41	96	40	910	75	0.0042	0.012	0.11	0.17	0.0068	0.063	0.033
		Max	--	8.5	--	--	--	2800	--	61	40	18	220	140	1800	130	0.11	0.089	0.9	0.88	0.012	0.14	0.87
		n	0	22	0	0	0	22	0	30	22	22	30	30	30	30	30	30	30	30	30	30	30

Source: P:\01_SITES\Hope.Bay\1CT022.027_2018 Geochem ComplianceSupport\North Dam Seepage Monitoring\[DamSeepage_HistoricalWQ_Compilation_amd_lnb_knk_Rev05.xlsx]

Note:

TL-5 trace element data are totals. Trace element data for all other stations are dissolved.

*Tailings deposition in the TIA commenced in 2017.

3.1 Comparison of TIA Surface Water Measurements

For each North dam seepage sampling event, field measurements of EC and chloride are collected at TIA stations TL-1 and surface water immediately upstream of the North dam (Figure 2-1). Field measurements of field EC and chloride at TL-1 and upstream of the dam face are at near parity, suggesting that TIA Reclaim Pond water is well mixed in this area and that samples collected at TL-1 are representative of pond chemistry at the upstream side of the North dam.

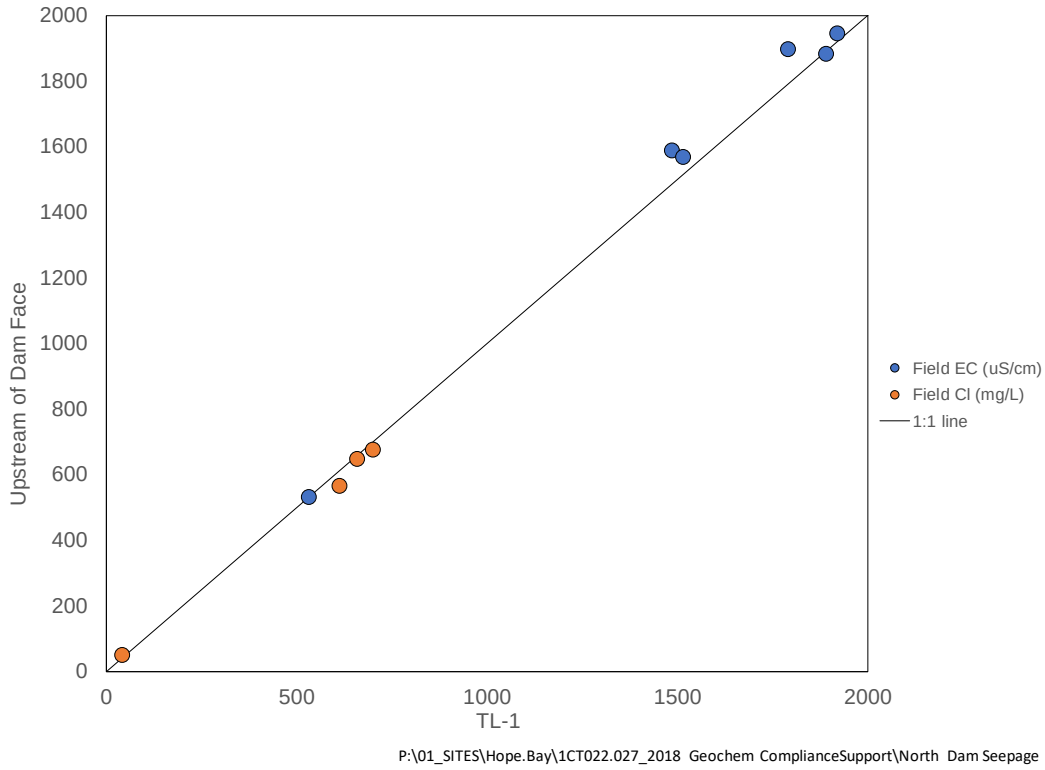

Figure 3-1: Comparison of Field EC and Chloride at TIA Surface Stations

3.2 pH and EC

The pH for North Dam seepage samples ranged from 7.6 to 8.3 and has been stable since 2011 (Figure 3-2).

EC data are summarized as follows:

- TL-5: EC is not monitored at this station.
- TL-1: Since 2017, EC at TL-1 has exhibited an increasing trend with values in 2018 between 1,100 and 2,700 µS/cm.
- North dam toe seepage: EC levels in 2018 ranged from 267 to 414 µS/cm, with levels at TL-1 3 to 10 times higher than toe seep samples. EC levels have consistently been <500 µS/cm since 2011, except for 12-TLR-13. Seep sample 12-TLR-13 was collected from the apron of the dam after the first year of construction and had an anomalously high EC of ~3,500 µS/cm.

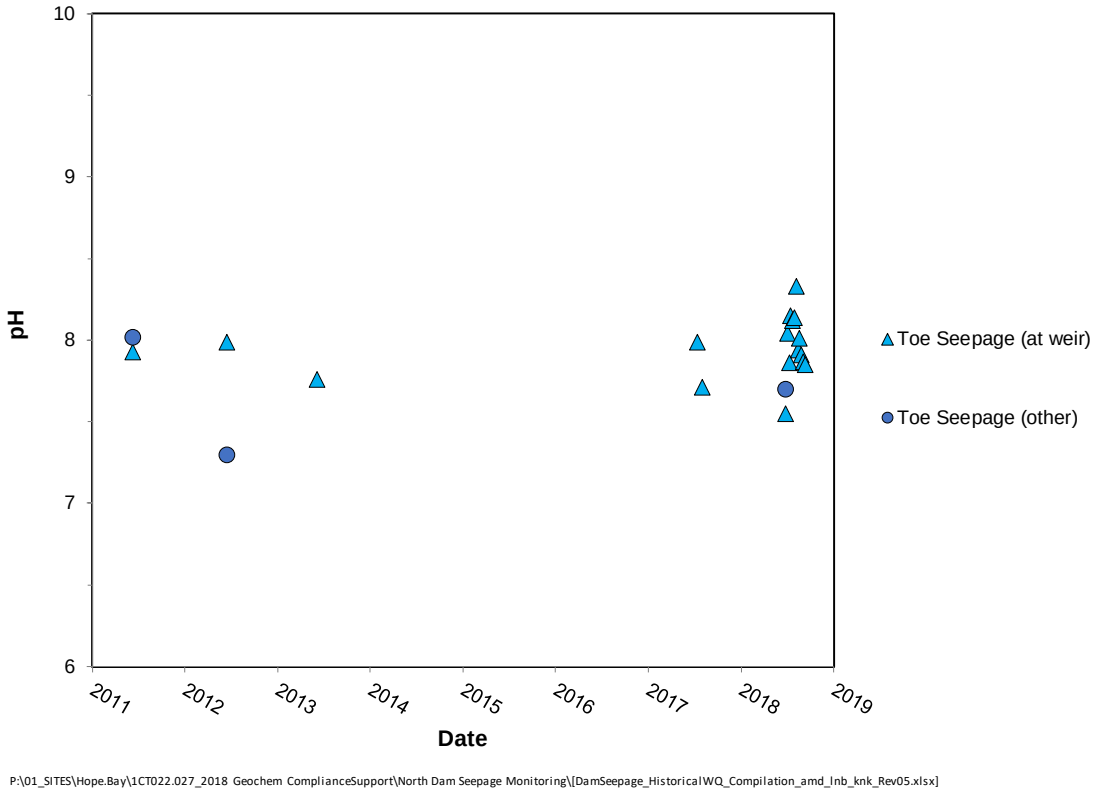

Figure 3-2: pH Monitoring Data

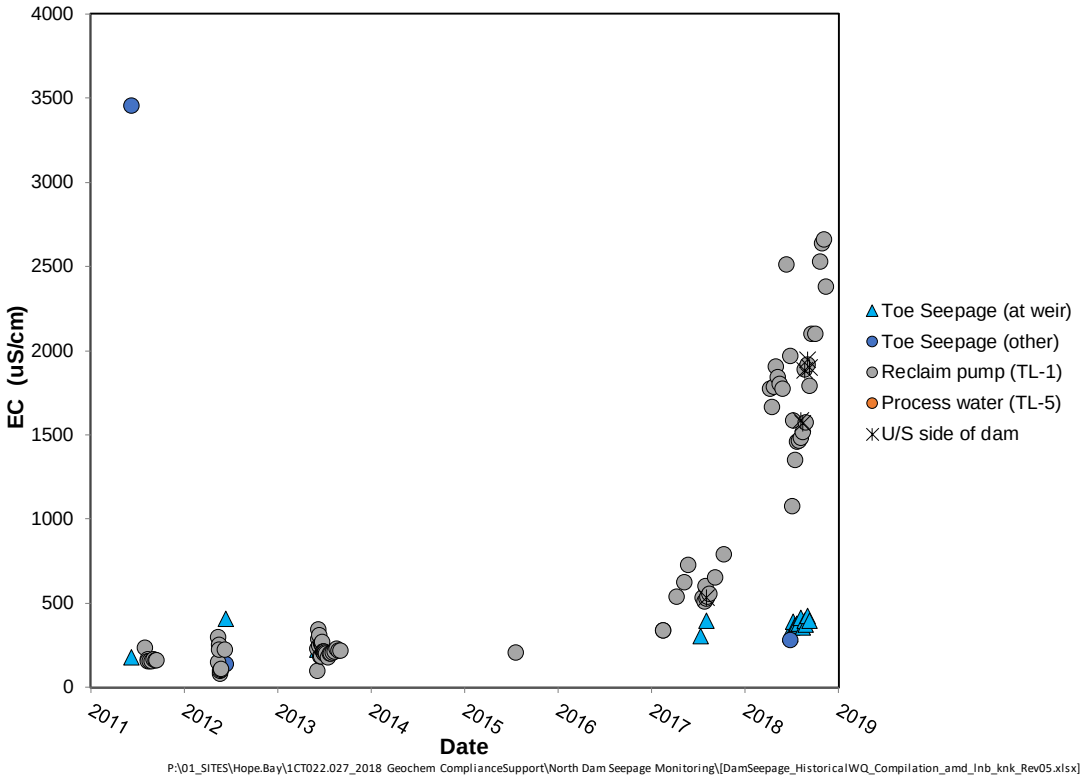

Figure 3-3: EC Monitoring Data

3.3 Ammonia and Nitrite

Sources of ammonia and nitrite introduced to the TIA by tailings include i) ore containing blasting residues and ii) degradation of cyanate and thiocyanate, which are produced as a by-product of the cyanide destruction circuit in the mill.

Ammonia data are summarized as follows (Figure 3-4):

- TL-5: ammonia concentrations in 2018 ranged from 11 to 32 mg/L as N and were roughly equivalent with levels in 2017. Concentrations at TL-5 were consistently higher than TL-1 by at least twofold.
- TL-1: ammonia concentrations in 2018 ranged from 0.92 to 9.8 mg/L as N. Since 2017, ammonia concentrations have been exhibiting an increasing trend with biologically-mediated seasonal fluctuations, where maximum concentrations are exhibited in winter and minimum concentrations in summer.
- North dam toe seepage: ammonia concentrations in 2018 ranged from below detection (0.005 mg/L as N) to 0.019 mg/L as N, with levels at TL-1 at least 50 times higher than toe seep samples. Ammonia concentrations are equivalent to 2017 samples and lower than seepage samples from 2011 and 2012 (29 and 0.72 mg/L as N, respectively). Ammonia concentrations for the 2012 North dam seepage sample are typical of seepage samples collected from other Doris as-built infrastructure using Quarry 2 rock (ranging from 0.0098 to 0.66 mg/L with an average of 0.1 mg/L, n=43). This suggests that the observed decrease of ammonia concentrations in North Dam seepage since construction of the dam is likely due to the flushing of blast residues.

Nitrite data are summarized as follows (Figure 3-5):

- TL-5: nitrite concentrations in 2018 ranged from 0.18 to 0.64 mg/L as N and were within the range of concentrations indicated in 2017. Concentrations at TL-5 were consistently higher than TL-1.
- TL-1: nitrite concentrations in 2018 ranged from below detection (0.02 mg/L as N) to 0.30 mg/L as N. Since 2017, nitrite concentrations have been exhibiting an increasing trend with data suggesting the following seasonal trend: rapid decrease in June, followed by a steady increase between June and August, and relatively stable concentrations during Fall and Winter.
- North dam toe seepage: nitrite concentrations in 2018 were all below or near the limit of detection (0.001 mg/L as N), with concentrations at TL-5 at least 14 times higher. Nitrite concentrations were roughly equivalent or slightly lower than values observed in 2017 (0.0012 to 0.021 mg/L as N).

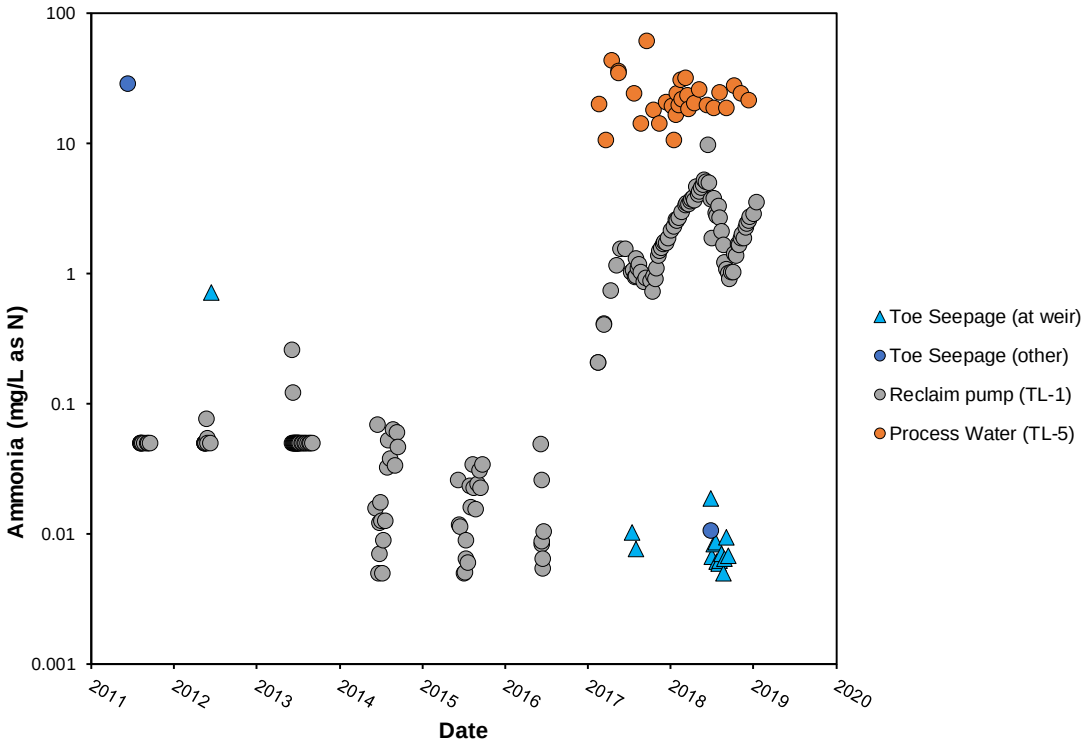

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Figure 3-4: Ammonia Monitoring Data

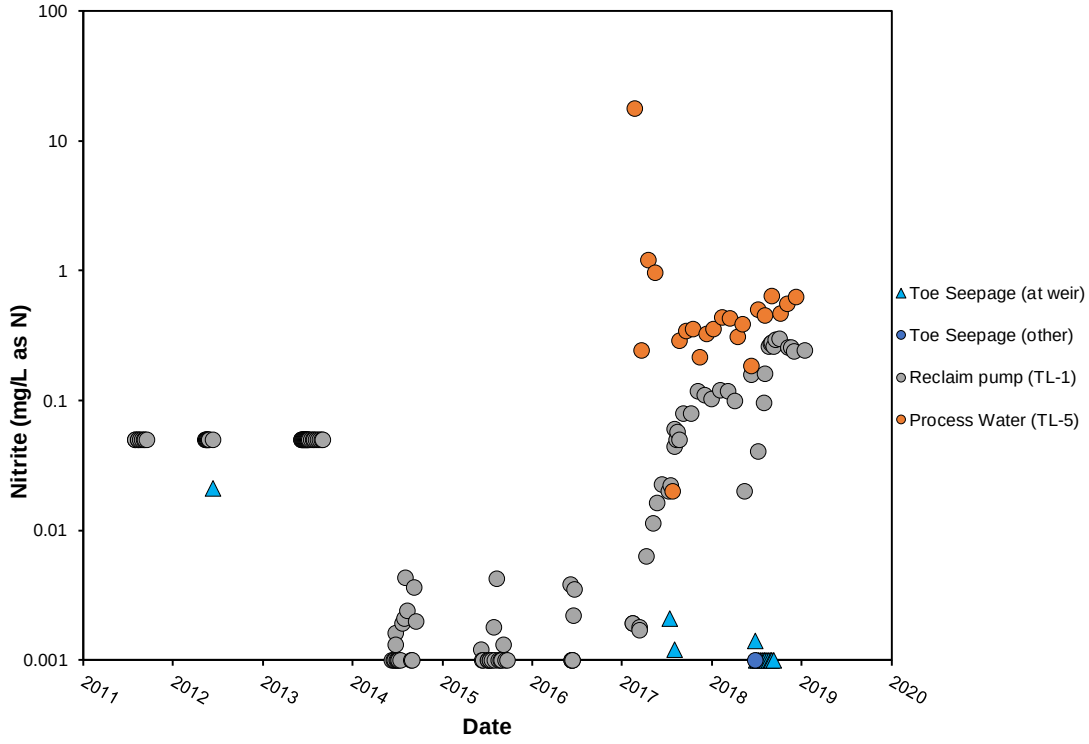

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Figure 3-5: Nitrite Monitoring Data

3.4 Chloride and Sulphate

Calcium chloride drilling brines are used in the underground mine. As a result, the ore contains calcium chloride salts, which are processed in the mill and subsequently discharged into the TIA. In addition, saline mine water containing calcium chloride is pumped to the TIA. Drilling brines are not used during quarry development therefore construction rock does not contain calcium chloride drilling brines. Chloride data are summarized as follows (Figure 3-6):

- TL-5: chloride is not monitored at this station.
- TL-1: chloride concentrations in 2018 ranged from 106 to 662 mg/L. Since 2017, chloride concentrations have been exhibiting an increasing trend.
- North dam toe seepage: chloride concentrations in 2018 ranged from 18 to 29 mg/L, with levels at TL-1 at least 3 times higher than toe seepage samples. Chloride concentrations in 2018 were equivalent to 2013 and 2017 North dam seepage samples (ranging from 15 to 30 mg/L) but lower than the 2011 seepage sample 11-TLR5. 11-TLR5 was collected from the apron of the dam and had an anomalously higher chloride concentration (685 mg/L) compared to the other seepage samples.

The source of sulphate to the TIA is the processing of ore containing sulphide minerals and milling reagents. Sulphate data are summarized as follows (Figure 3-7):

- TL-5: sulphate concentrations in 2018 ranged from 690 to 2,770 mg/L and were roughly equivalent with levels in 2017. Concentrations at TL-5 were consistently higher than TL-1 by at least twofold.
- TL-1: sulphate concentrations in 2018 ranged from 264 to 379 mg/L. Since 2017, sulphate data indicate an increasing trend, however the trend analysis is based on a limited data set.
- North dam toe seepage: chloride concentrations in 2018 ranged from 11 to 39 mg/L, with levels at TL-1 at least 7 times higher than toe seepage samples. Sulphate concentrations in 2018 were equivalent or higher than 2012 and 2017 North dam seepage samples (ranging from 9 to 25 mg/L) but lower than the 2011 seepage sample 11-TLR5. 11-TLR5 was collected from the apron of the dam and had an anomalously higher sulphate concentration (193 mg/L) compared to the other seepage samples.

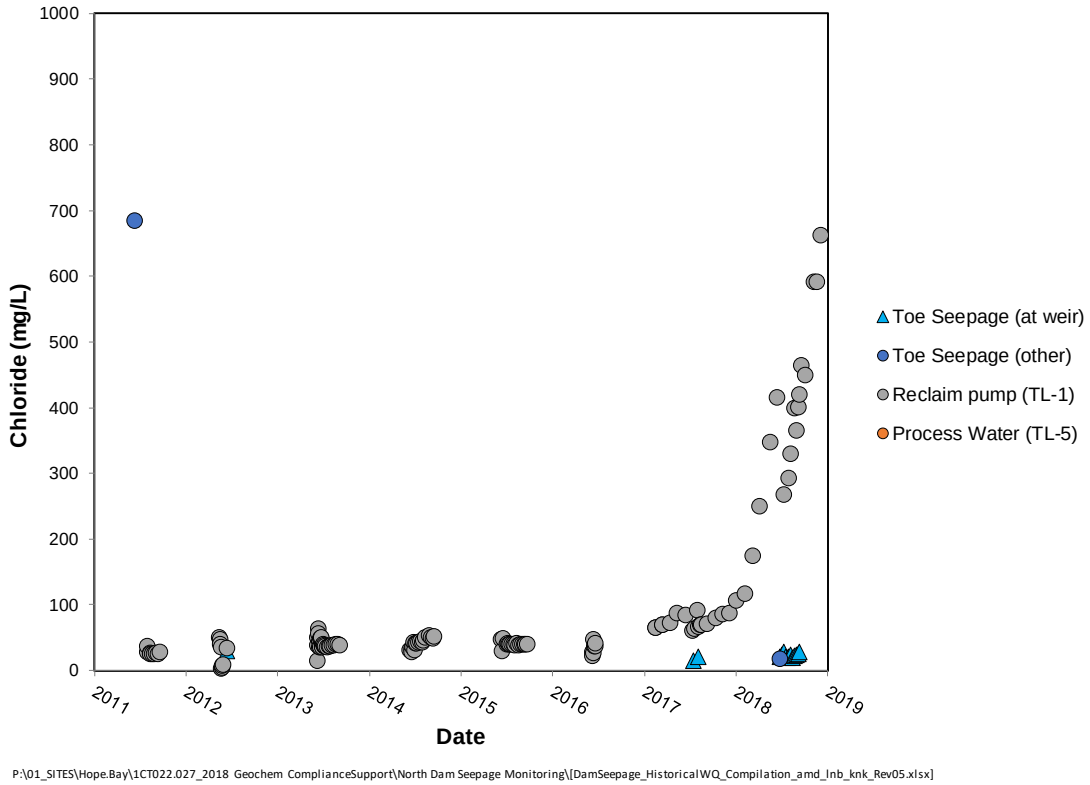

Figure 3-6: Chloride Monitoring Data

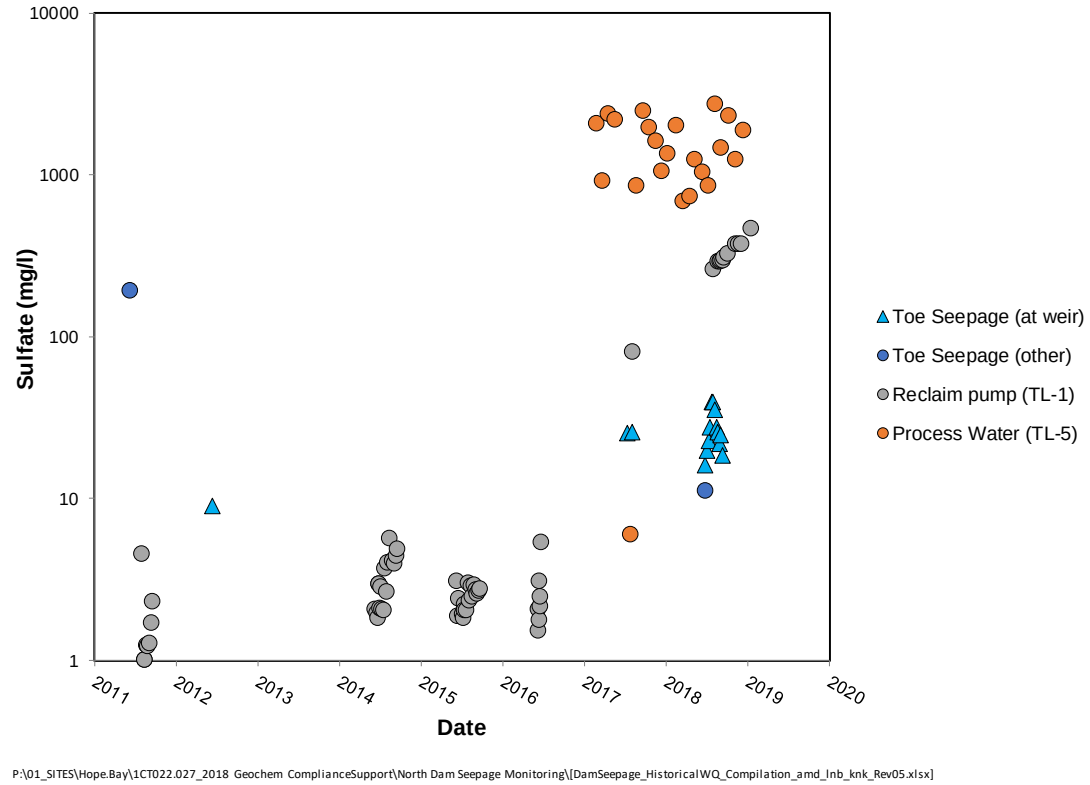

Figure 3-7: Sulphate Monitoring Data

3.5 Major Ions

Figure 3-8 compares the major ion chemistry of TL-1 and North dam seepage prior to tailings deposition (2011-16) and since tailings deposition (2017-18) on a Piper diagram with a summary of samples presented in Table 3-3. A summary of the overall data set for major ion chemistry is presented in Table 3-2. Of note, is that TL-5 and most TL-1 samples could not be plotted because the major ion data set was incomplete.

Figure 3-8 indicates that almost all samples can be categorized into the four following geochemical groups: i) TL-1 samples collected prior to tailings deposition (2011-16); ii) TL-1 in 2017 (note one sample plotted in Figure 3-8); iii) TL-1 in 2018 and iv) North dam seepage samples from all years (2011-18). Of note is that the major ion chemistry of the North dam seepage samples is geochemically distinct from TL-1, both prior to and after tailings deposition. Each group is discussed as follows:

- TL-1
  - 2011-16: Prior to tailings deposition the major cations were characterized by sodium and calcium (medians of 14 and 7.5 mg/L, respectively) and the major anions by bicarbonate and chloride (medians of 35 mg/L as $CaCO_3$ and 26 mg/L, respectively).
  - 2017: Tailings deposition commenced in January 2017. The data from the one sample collected in August indicated that the major cation chemistry continued to be dominated by sodium and calcium but at higher concentrations (61 and 28 mg/L, respectively) and major anion chemistry shifted from bicarbonate-chloride to sulphate-bicarbonate (81 mg/L as $CaCO_3$ and 75 mg/L, respectively).
  - 2018: the major cation chemistry continued to be dominated by sodium and calcium but at higher concentrations (medians of 300 and 68 mg/L, respectively) and that the major anion chemistry shifted from sulphate-bicarbonate to chloride-sulphate (medians of 440 and 300 mg/L, respectively.
- North Dam Seepage: all seepage samples are grouped together in Figure 3-8 except the seepage sample collected in 2011 (sample ID 11-TLR-15). Major ion concentrations are higher for 11-TLR-15 compared to all other North dam seepage samples, including sample 12-TLR-14. The higher ion concentrations may be attributable to the hypersaline pocket of groundwater was intersected during the construction season prior to sample collection. The major ion chemistry of 12-TLR-14 and the 2017-18 seepage samples is summarized as follows:
  - 12-TLR-14 was collected at the same location as the v-notch weir with the major cation chemistry characterized by calcium and sodium (38 and 27 mg/L, respectively) and major anion chemistry characterized by bicarbonate and chloride (150 mg/L as $CaCO_3$ and 30 mg/L, respectively).
  - 2017-18: Compared to 12-TLR-14, the major ion chemistry was equivalent for cations (median calcium and sodium concentrations of 37 and 24 mg/L, respectively) but variable compared to selected anions. Consistent with 12-TLR-14, major anion chemistry was

dominated by bicarbonate with equivalent concentrations (median of 130 mg/L as $CaCO_3$), however based on median concentrations, chloride and sulphate were both significant anions (21 and 25 mg/L, respectively). Chloride and sulphate concentrations for the 2017-18 seepage samples are variable and the range of concentrations (15 to 30 mg/L and 11 to 39 mg/L, respectively) are equivalent to 12-TLR-14.

Table 3-3: Summary of Major Ion Chemistry, North Dam Seepage and TL-1

Station	Date Range	Statistic[1]	Cations[2]				Anions[2]		
			Ca	Mg	K	Na	Total Alkalinity[3]	Cl	SO4
North Dam Seepage	2011-13	11-TLR-15	73	62	34	460	230	690	190
		12-TLR-14	38	9.9	3.8	27	150	30	9
	2017-18	Median	37	8.9	2	24	130	21	25
		Count	15	15	15	15	15	15	15
TL-1	2011-16	Median	7.5	5	1.6	14	35	26	1.5
		Count	10	10	10	10	10	10	10
	2017	August	28	8.3	4.4	61	75	67	81
	2018	Median	68	31	19	300	93	440	300
		Count	10	10	10	10	10	10	10

Source: P:\01_SITES\Hope.Bay\1CT022.027_2018 Geochem ComplianceSupport\North Dam Seepage Monitoring\[DamSeepage_HistoricalWQ_Compilation_amd_lnb_knk_Rev05.xlsx]

Notes

1 Sample IDs presented for North Dam Seepage (2011-13) sample set

2 All units mg/L. Units for alkalinity are mg/L as CaCO3.

3 Alkalinity in Figure 3-8 plotted as bicarbonate. Referred to as bicarbonate in text in Section 3.5.

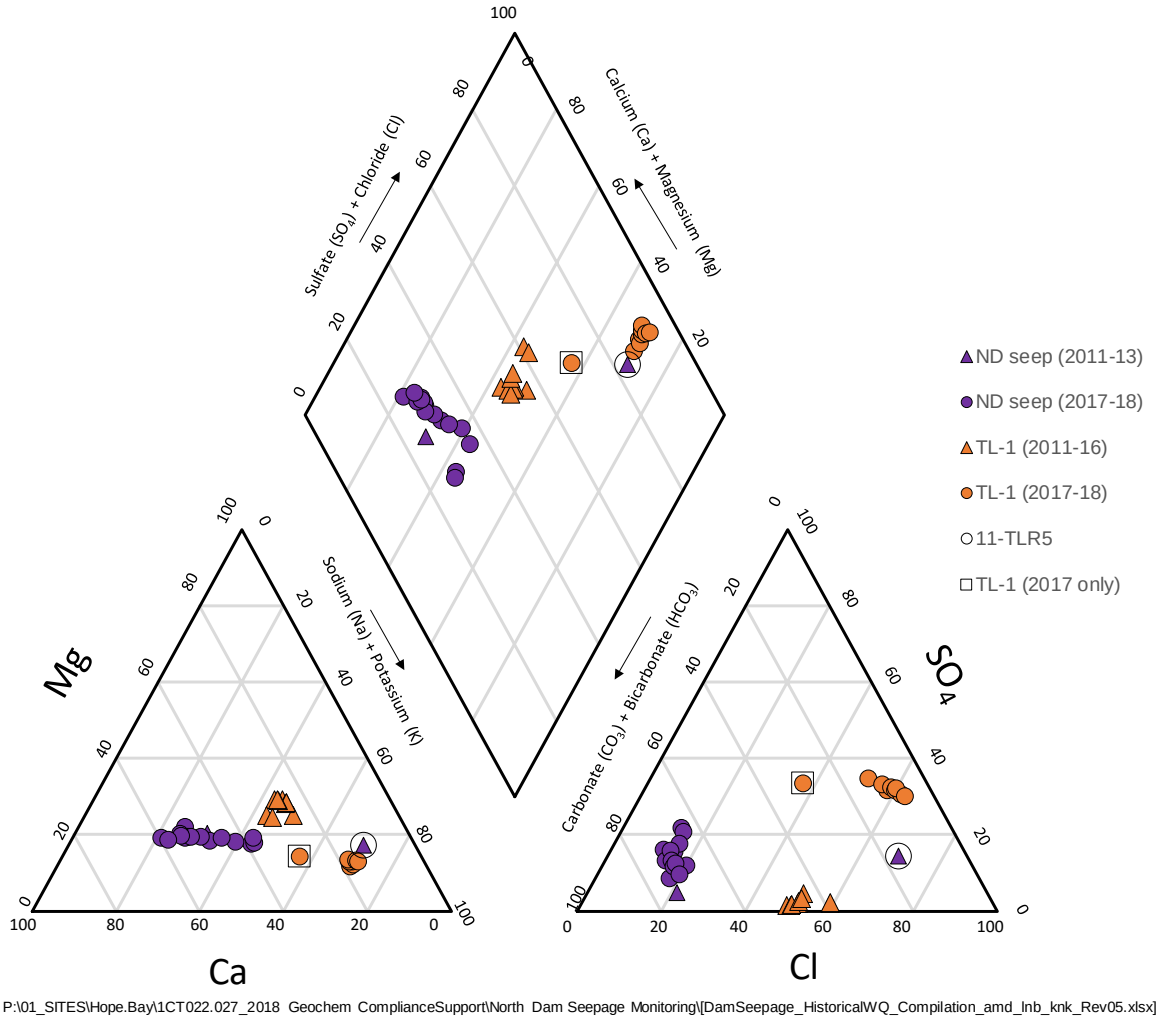

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Figure 3-8: Piper Plot of TL-1 and North Dam Seepage Samples

4 Conclusion and Recommendations

In 2017, TMAC initiated a monitoring program of North Dam seepage by request from the EOR, including sample collection for water quality analysis. SRK reviewed the water quality database for North dam seepage samples, and SNP stations TL-1 (TIA Reclaim Pond water collected at the reclaim pump) and TL-5 (tailings supernatant discharge from mill) to investigate the potential source of the toe seep. A review of the geochemical data is summarized as follows:

- EC, ammonia, nitrite, chloride and sulphate were identified as geochemical tracers of TIA Reclaim Pond water, with concentrations in TIA Reclaim Pond water uniformly higher than North Dam toe seepage samples.
- Major ion concentrations and chemistry as assessed using a Piper diagram indicated that North Dam toe seepages are geochemically distinct from TIA Reclaim Pond water, prior to and after tailings deposition in the TIA.
- For other parameters, there were no appreciable differences in concentration between the toe seepage samples and TIA Reclaim Pond water.
- No data suggest the presence of TIA Reclaim Pond water in the North Dam toe seepage.

TL-5 is currently not within the scope of the North Dam seepage water quality monitoring program (SRK 2018a) but has been included in this memo to assess and understand the source loads to the TIA in the context of evaluating trends of geochemical tracers (such as major ion chemistry in Figure 3-8) of TIA Reclaim Pond water. On this basis, SRK recommends geochemical monitoring at TL-5 as part of the North Dam geochemical monitoring program once per month and for the same analytical parameters as TL-1, as outlined in SRK (2018a). SRK also recommends a QA/QC program of field blanks and duplicates as a method of validating the geochemical data set. These recommended changes are to be included in an updated version of the North Dam seepage water quality monitoring program (SRK 2018a) and implemented in 2019.

5 References

Nunavut Water Board (2016) Water Licence No. 2AM-DOH1323 – Amendment No. 1. Issued on November 4, 2016.

SRK Consulting (Canada) Inc., 2012. 2011 Waste Rock and Quarry Monitoring Report. Report prepared for Hope Bay Mining Ltd. by by SRK Consulting (Canada) Inc., March 2012. Project number 1CT022.016.

SRK Consulting (Canada) Inc., 2013. 2012 Hope Bay Seepage Monitoring Program. Memo prepared for Hope Bay Mining Ltd. Project No. 1CH005.057. January 2013

SRK Consulting (Canada) Inc., 2014. 2013 Hope Bay Seepage Monitoring Program. Report prepared for TMAC Resources Inc. Project No. 1CT022.000. February 2014.

SRK Consulting (Canada) Inc., 2018a. Hope Bay Project, North Dam Monitoring: Standard Operating Procedures – Revision 2. Technical report prepared for TMAC Resources Inc by SRK Consulting (Canada) Inc., May 2018. Project number 1CT022.016.

SRK Consulting (Canada) Inc., 2018b. North Dam – July 2017 Review of Toe Seep. Technical memo prepared for TMAC Resources Inc by SRK Consulting (Canada) Inc., February 27, 2018. Project number 1CT022.016.

Attachment 1: Water Quality Data, 2018 North Dam Seepage Samples

Location	Sample ID (field or lab)	Date	Height at V-notch weir	pH Field Measurement	Conductivity Field Measurement	Oxidation - Reduction Potential, Field	Temperature Field Measurement	Flow	Field Cl	Conductivity (lab)	Hardness (as CaCO3)	pH	Total Suspended Solids	Total Dissolved Solids	Acidity (as CaCO3)	Alkalinity, Total (as CaCO3)	Ammonia, Total (as N)	Bromide (Br)	Chloride (Cl)	Fluoride (F)	Nitrate (as N)	Nitrite (as N)	Total Nitrogen	Cyanide, Total	Cyanide, Free	Cyanate
			cm	pH unit	µS/cm		C	L/s	mg/L	µS/cm	mg/L	pH unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
At V-notch Weir	ND-SEEPA	6/25/2018	-	7.5	320	67	2.2	0.073	-	280	120	7.6	-	-	-	110	0.019	-	21	-	0.1	0.0014	0.63	0.005	0.005	2
	NDSEEP	7/2/2018	-	7.3	360	38	8.2	-	-	360	-	8	-	-	-	130	0.0067	-	24	-	0.35	0.001	0.76	0.005	0.005	2
	NDSEEP	7/9/2018	-	7.4	390	44	11	-	-	400	-	7.9	-	-	-	140	0.0084	0.1	29	0.072	0.63	0.001	0.91	0.005	0.005	0.2
	NDSEEP	7/16/2018	2	7.5	370	23	3.6	-	-	360	130	8.2	3	-	1	130	0.0086	-	21	0.073	0.67	0.001	1	0.005	0.005	2
	NDSEEP	7/23/2018	1.5	7.4	380	62	6	-	-	380	120	8.1	-	-	-	120	0.0061	-	19	-	1.1	0.001	1.4	0.005	0.005	2
	NDSEEP	7/30/2018	1.6	7.1	380	11	8.5	-	-	400	120	8.1	-	-	-	130	0.0059	-	21	-	1.1	0.001	1.4	0.005	0.005	2
	NDSEEP	8/6/2018	2	7.2	420	85	4.9	-	-	410	-	8.3	-	-	-	140	0.0062	-	24	-	0.74	0.001	1.2	0.005	0.005	2
	NDSEEP	8/13/2018	4.1	7.6	360	82	3.1	-	-	360	-	7.9	-	-	-	130	0.007	-	19	-	0.33	0.001	0.78	0.005	0.005	2
	NDSEEP	8/20/2018	4	8.8	400	48	2.8	-	39	390	-	8	-	-	-	140	0.005	-	23	-	0.39	0.001	0.8	0.005	0.005	2
	NDSEEP	8/27/2018	1.2	7.5	370	24	6.6	-	27	380	-	7.9	-	-	-	140	0.0064	-	24	-	0.35	0.001	0.81	0.005	0.005	2
	NDSEEP	9/3/2018	3	7.8	420	72	5.2	-	24	380	150	7.9	10	260	4.6	150	0.0094	0.054	26	0.062	0.27	0.001	0.7	0.005	0.005	2
	NDSEEP	9/10/2018	Not measured	7.8	400	61	0.2	-	25	390	150	7.9	3	-	-	140	0.0068	-	28	-	0.23	0.001	0.68	0.005	0.005	2
Other Toe Seeps	ND-SEEPB	6/25/2018	NA	7.7	280	84	4.4	-	-	270	110	7.7	-	-	-	100	0.011	-	18	-	0.022	0.001	0.5	0.005	0.005	2
TIA at u/s face of North Dam	ND Upstream	8/6/2018	NA	8.4	1600	98	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ND Upstream	8/13/2018	NA	9.2	1600	72	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ND Upstream	8/20/2018	NA	9.6	1900	42	7.2	-	650	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ND Upstream	9/3/2018	NA	10	1900	46	6.5	-	680	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ND Upstream	9/10/2018	NA	9.2	1900	57	3.1	-	570	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: V-notch weir installed on July 9, 2018.

NA denotes not applicable to this station.

Trace elements reported as dissolved except specified with "*"

Location	Sample ID (field or lab)	Date	Phosphorus (P)-Total	Sulfate (SO4)	Al	Sb	As	Ba	Be	Bi	B	Cd	Ca	Cs	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Rb
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
At V-notch Weir	ND-SEEPA	6/25/2018	-	16	0.169*	0.0005*	0.00081*	0.02*	0.0001*	-	0.1*	0.000005*	33*	-	0.001*	0.0004*	0.0103*	0.28*	0.0005*	0.0031*	8.3*	0.0381*	0.000005*	0.001*	0.0018*	-	2*	-
	NDSEEP	7/2/2018	0.05	20	0.059	0.0001	0.00052	0.0063	0.0001	0.00005	0.044	0.000024	37	0.00001	0.00021	0.00013	0.0075	0.088	0.00014	0.0027	8.3	0.0081	-	0.00056	0.0012	0.05	1.5	0.00072
	NDSEEP	7/9/2018	0.05	23	0.043	0.0001	0.00046	0.0063	0.0001	0.00005	0.052	0.000005	39	0.00001	0.00021	0.00012	0.0072	0.089	0.00005	0.0026	8.9	0.0054	-	0.00051	0.00081	0.05	1.7	0.00064
	NDSEEP	7/16/2018	-	28	0.058	0.0001	0.00059	0.0067	-	0.00005	0.06	0.000005	38	-	0.00024	0.00015	0.0086	0.11	0.00005	0.0026	8.9	0.0078	-	0.00067	0.0011	0.05	1.8	-
	NDSEEP	7/23/2018	-	39	0.11	0.0005	0.00058	0.02	0.00002	-	0.1	0.000005	35	-	0.001	0.0003	0.0087	0.14	0.0005	0.0023	9	0.0054	-	0.001	0.001	-	2.3	-
	NDSEEP	7/30/2018	-	39	0.16	0.0005	0.00056	0.02	0.00002	-	0.1	0.000005	31	-	0.001	0.0003	0.0096	0.12	0.0005	0.0021	9.4	0.004	-	0.001	0.0011	-	2.4	-
	NDSEEP	8/6/2018	0.05	36	0.098	0.0001	0.00062	0.0074	0.0001	0.00005	0.084	0.000005	38	0.00001	0.00028	0.00015	0.0084	0.11	0.00005	0.0028	9.5	0.005	-	0.00094	0.0011	0.05	2	0.001
	NDSEEP	8/13/2018	0.05	28	0.058	0.0001	0.00061	0.0074	0.0001	0.00005	0.056	0.000005	43	0.00001	0.00025	0.00011	0.0078	0.085	0.00005	0.0028	9.2	0.0034	-	0.00072	0.0011	0.05	1.6	0.00084
	NDSEEP	8/20/2018	0.05	26	0.054	0.0001	0.00044	0.0067	0.0001	0.00005	0.05	0.000005	37	0.00001	0.00024	0.0001	0.0072	0.094	0.00005	0.0024	8.3	0.0032	-	0.00059	0.00097	0.05	1.3	0.00067
	NDSEEP	8/27/2018	0.05	22	0.061	0.0001	0.00047	0.0068	0.0001	0.00005	0.037	0.000005	41	0.00001	0.00023	0.00012	0.0083	0.11	0.00005	0.0027	9.1	0.0045	-	0.00045	0.0012	0.05	1.4	0.0007
	NDSEEP	9/3/2018	0.01	25	0.054	0.0001	0.00045	0.0073	0.00002	0.00005	0.044	0.000005	45	-	0.00024	0.0001	0.0076	0.1	0.00005	0.0027	9.7	0.0038	0.000005	0.00057	0.0011	0.05	1.4	-
	NDSEEP	9/10/2018	0.3	18	0.037	0.0005	0.0005	0.02	0.0001	0.2	0.1	0.000005	47	-	0.001	0.0003	0.007	0.11	0.0005	0.0023	9	0.0051	0.000005	0.001	0.001	0.3	2	-
Other Toe Seeps	ND-SEEPB	6/25/2018	-	11	0.151*	0.0005*	0.0006*	0.02*	0.0001*	-	0.1*	0.000006*	34*	-	0.001*	0.0003*	0.008*	0.26*	0.0005*	0.0025*	6.5*	0.0111*	0.000005*	0.001*	0.0015*	-	2*	-
TIA at u/s face of North Dam	ND Upstream	8/6/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ND Upstream	8/13/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ND Upstream	8/20/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ND Upstream	9/3/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ND Upstream	9/10/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: V-notch weir installed on July 9, 2018.

NA denotes not applicable to this station.

Trace elements reported as dissolved except specified with "*

Location	Sample ID (field or lab)	Date	Se	Si	Ag	Na	Sr	S	Te	Tl	Th	Sn	Ti	W	U	V	Zn	Zr
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
At V-notch Weir	ND-SEEPA	6/25/2018	0.00015*	-	0.00002*	17*	-	-	-	0.00001*	-	0.0005*	0.01*	-	0.0002*	0.0009*	0.005*	-
	NDSEEP	7/2/2018	0.00016	3.1	0.00001	22	0.048	6.4	0.0002	0.00001	0.0001	0.00012	0.00084	0.0001	0.00018	0.0005	0.0067	0.00018
	NDSEEP	7/9/2018	0.00016	3.4	0.00001	30	0.052	7.4	0.0002	0.00001	0.0001	0.0001	0.00095	0.0001	0.00021	0.0005	0.001	0.00022
	NDSEEP	7/16/2018	0.00022	3.4	0.00001	26	0.056	9.5	-	0.00001	-	0.0001	0.0013	-	0.00019	0.0005	0.001	0.0003
	NDSEEP	7/23/2018	0.0003	-	0.00002	36	-	-	-	0.0002	-	0.0005	0.01	-	0.00024	0.0005	0.005	-
	NDSEEP	7/30/2018	0.0003	-	0.00002	39	-	-	-	0.0002	-	0.0005	0.01	-	0.00026	0.0005	0.005	-
	NDSEEP	8/6/2018	0.00034	3.4	0.00001	33	0.058	11	0.0002	0.00001	0.00014	0.0001	0.0024	0.0001	0.00024	0.0005	0.001	0.00031
	NDSEEP	8/13/2018	0.00025	3.9	0.00001	24	0.055	9.6	0.0002	0.00001	0.0001	0.0001	0.0013	0.0001	0.00018	0.0005	0.001	0.00018
	NDSEEP	8/20/2018	0.0002	3.6	0.00001	22	0.05	8.9	0.0002	0.00001	0.0001	0.0001	0.0017	0.0001	0.00016	0.0005	0.001	0.0002
	NDSEEP	8/27/2018	0.00015	3.8	0.00001	21	0.057	7.5	0.0002	0.00001	0.00012	0.0001	0.0016	0.0001	0.00018	0.0005	0.001	0.00024
	NDSEEP	9/3/2018	0.00023	4	0.00001	24	0.061	8.5	-	0.00001	-	0.0001	0.0014	-	0.00015	0.0005	0.001	0.0003
	NDSEEP	9/10/2018	0.00011	3.7	0.00002	20	0.057	-	-	0.0002	-	0.0005	0.01	-	0.0002	0.0005	0.005	-
Other Toe Seeps	ND-SEEPB	6/25/2018	0.00008*	-	0.00002*	13*	-	-	-	0.00001*	-	0.0005*	0.01*	-	0.0002*	0.0009*	0.005*	-
TIA at u/s face of North Dam	ND Upstream	8/6/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ND Upstream	8/13/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ND Upstream	8/20/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ND Upstream	9/3/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ND Upstream	9/10/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: V-notch weir installed on July 9, 2018.

NA denotes not applicable to this station.

Trace elements reported as dissolved except specified with "*

Appendix L – 2018 AGI Inspection Feedback Presentation

Hope Bay Project 2018 Annual Geotechnical Inspection: On Site Feedback

Maritz Rykaart, PhD, PEng, Doris Camp, Nunavut, August 2-7, 2018

TMAC RESOURCES

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Feedback Outline

- Purpose and scope of Annual Geotechnical Inspection (AGI)
- Overarching Comments
- Area Specific Feedback
  - Boston
  - Windy Road
  - Doris
  - Roberts Bay
  - Tailings Impoundment Area (TIA)

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Purpose and Scope of AGI (Legal)

- Water License/Project Certificate condition
  - Professional Engineer registered in Nunavut to conduct an annual geotechnical inspection
  - Public record report to be submitted to the Nunavut Water Board (NWB) complete with TMAC response and proposed action plan to address areas of concern
- Engineer-of-Record responsibility for dams
  - Independent of Water License conditions
  - Professional duty as required under Canadian Dam Association Guidelines; not doing it means SRK cannot act as EOR

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Purpose and Scope of AGI (Functional)

- Ensure dams are managed, maintained and operated safely
- Identify areas of surface geotechnical concern that may impact safety of operations, result in non-compliance, or lead to undue future liability (technical and financial)
- Identify other areas of general concern (including water/waste management) that may result in non-compliance, or lead to future liability (technical and financial)
  - This aspect is opportunistic because of SRK's comprehensive understanding of the site infrastructure and overall regulatory regime
- The AGI is not conducted as, or intended to be an "audit", or a "policing" activity. It is intended to be a functional supporting activity

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AGI Process

- Physically inspect all areas of interest annually (walking, driving and flying)
- Talking/interviewing relevant site staff (on site, and follow-up conversations)
- Review monitoring data and/or relevant records (much of this is done throughout the year, and immediately following the site visit)
- Submit formal inspection report(s) to TMAC which ultimately get submitted to NWB
- TMAC required to action items of concern in accordance with Engineers recommendation (after agreement on the issue of course)

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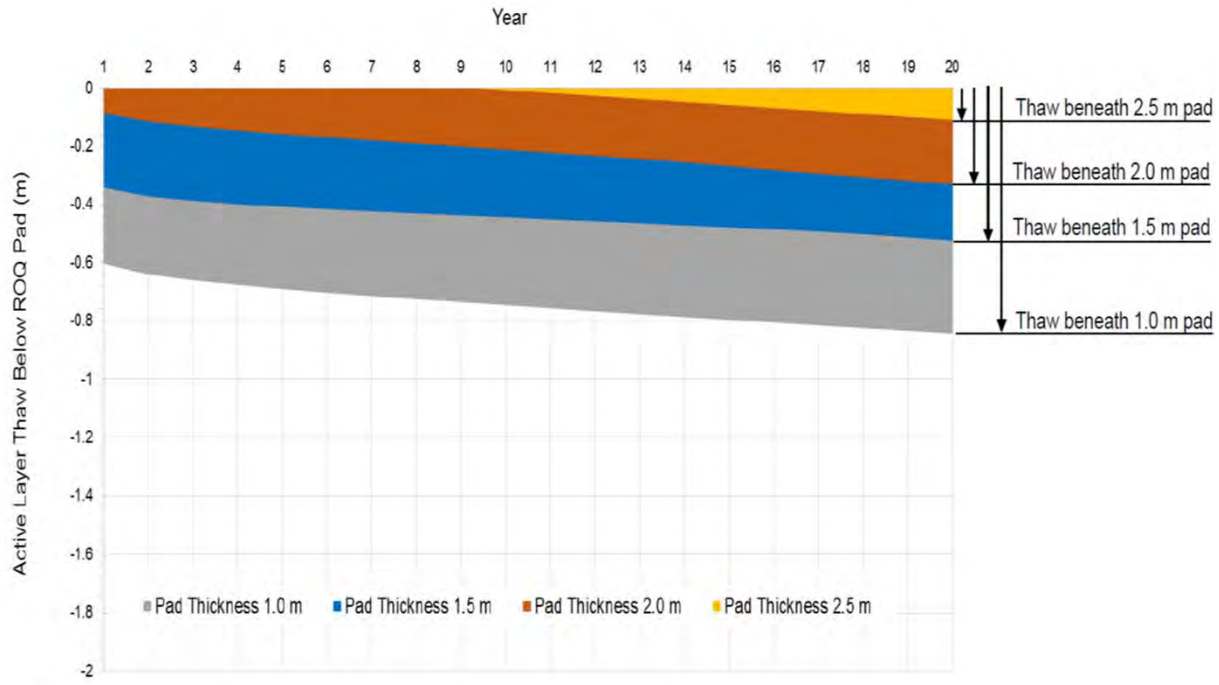
Overarching Comments

Reminder: Pad/Road Thickness

- All pads/road are thermal blankets designed to prevent permafrost degradation
- Goal is not to deepen the active layer thickness
- To achieve that goal, unheated pads/roads must be at least 1 m thick
- Note depressed freezing point of -2oC applies



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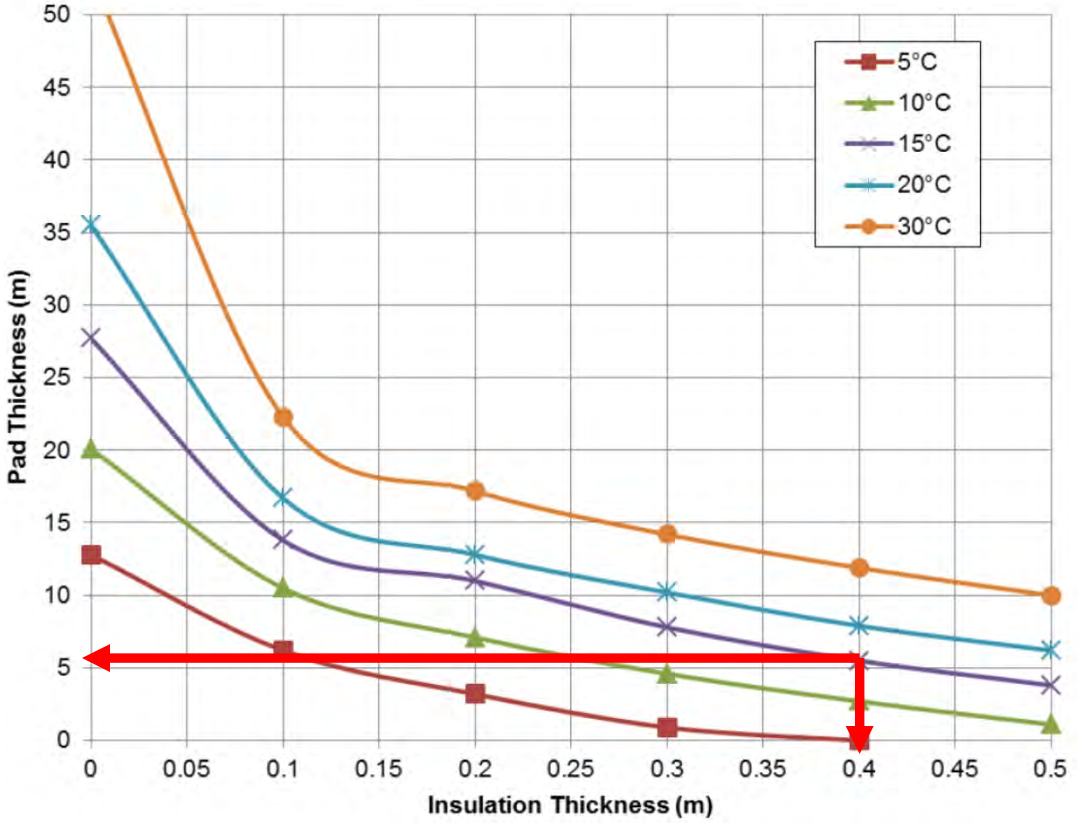
Reminder: Uninsulated vs. Insulated Buildings



- Permanently heated buildings require insulation or air space beneath building
- Effect of building heat is very extensive
- Much of Doris Camp is constructed in thick ice-rich overburden so thaw and sinkhole development is a real concern

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Reminder: Don’t Disturb Permafrost

- Damage occurs fast, progresses rapidly and is very hard to fix!

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Reminder: Road/Pad Shoulders at Highest Risk in August

- Active layer thickness at its peak in August
- Road/pad toes do not have adequate thermal protection so there is inevitable local deepening of active layer; made worse if there is local ponding
- Causes instability of shoulder which is often masked by grading
- Keep equipment off shoulders

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Potential Issue: Pipeline Permafrost Damage

- Uninsulated warm pipelines should not be on tundra
- Preferential flow corridors are created which can onset permafrost damage

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Suggestion: Prioritize Landfill

- Significantly more general construction debris around site
- Probably time to get non-hazardous Landfill going as KIA and INAC may use the general debris status to demand higher closure bond
- Would need License “modification” or “amendment” to get Landfill moved to Quarry 2

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Reminder: Annual Construction Summary Report

- Purpose
  - License requirement
  - Landowner expectation
  - Normal best practice
- Submission requirements
  - IFC Drawings
  - QA/QC Documentation (in accordance with IFC Technical Specifications
  - As-built Drawings (including all interim surveys)

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Cautionary Note: Construction QA/QC

- Prevent rework, improve performance & minimize maintenance
- Maintain credibility and instill confidence
- Reduce risk of liability bond increasing
- Avoids “false positives” when problems occur
- Compliance and signoff requirement

Construction Concern: Lack of Compaction

- Increased risk of liner sloughing because anchoring is not secured
- Increased risk of liner puncture damage because vehicle load distribution is concentrated
- Not possible to discern when real problems occur
- Increased maintenance requirement

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Construction Concern: Poor Slope Finishing

- Shoulder damage/risk gets masked
- Increased risk of localized ponding which increases risk of shoulder damage

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Context for Remainder of Feedback

- All areas were inspected, but comments or observations only by exception, i.e. where something is worth noting
- Much of the feedback will not be formally recorded in the AGI report(s) and the context behind that will be discussed
- Although the comments seem extensive, the reality is that the site is in very good shape!

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Boston 2018 AGI Observations

Airstrip, roads, camp pad, ponds, ore stockpiles, permafrost damaged areas, vent raise, portal, tank farm, orbit spill area, tundra discharge areas

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Airstrip

- Extensive tension cracking on shoulders but some are 5+ m from crest which is less common (and more dangerous)
- Significant undulations and local depressions
- Will likely need charter company to review airstrip before landing aircraft

Lined Pond

- New pond not compacted and slopes over-steepened
- Pond will not perform well over long-term and liner slippage will occur
- Use of ore for construction could impact water quality and prevent ability to discharge

Tank Farm

- Both north and eastern berm has extensive tension cracking which is not stability induced but liner induced
- Likely good to operate provided no tension placed on inside berms (i.e. equipment traffic)
- Downstream slope of eastern berm has been cut due to road access and over-steepened. Needs to be remediated to avoid berm failure

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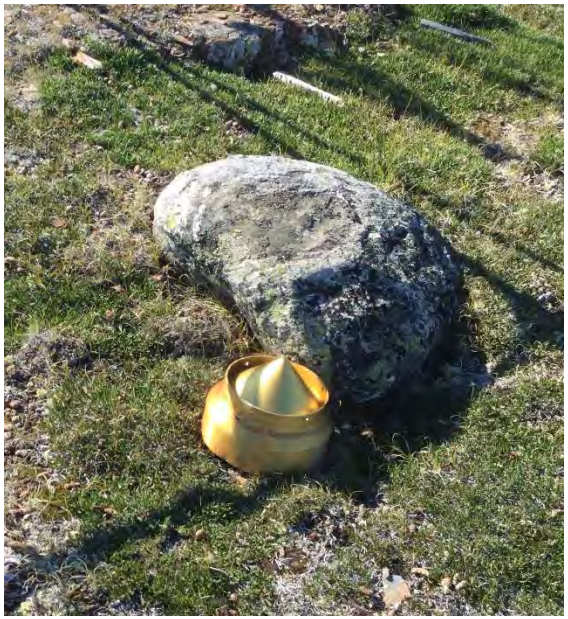
Erosion Gulley

- Initiated by erosion; growing rapidly due to permafrost degradation
- Requires remediation to avoid progression




Weather Station

- Top rain catcher ring has blown off



Windy Road 2018 AGI Observations

Road, arch culvert, bridges, quarries, exploration trenches, old Windy Camp, closed Patch Lake Drill Shop and Fuel Tanks Farms

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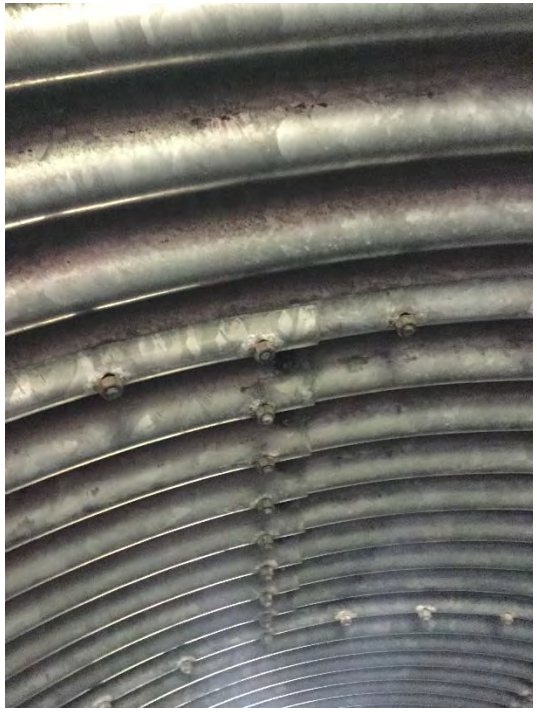
Windy Road Arch Culvert & Single Bridge

- Loose bolts on arch culvert
- Loose bolts on bridge railing



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Windy Road Double Bridge

- Loose bolts on bridge railing
- Pond on south abutment is starting to cause some instability. It should be backfilled with overburden, at least 1 m thick and compacted




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Windy Exploration Trench

- Some signs of road shoulder instability; small tension cracks
- Cause likely permafrost melt induced by large shoulder pond
- Keep observing for further progression

Quarry D Core Storage Pad

- Perimeter slope instability
- Multiple smaller sinkholes
- Make people aware of risks if area is to be used

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Patch Lake Drill Shop

- What is purpose of test pits?

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Doris 2018 AGI Observations

Camp area (Pads A through J and T), waste rock, ore storage, detox tailings management, water management structures (diversion, SCP, PCP, sedimentation berms, sumps), roads, airstrip, overburden storage, reagent storage, explosives storage, quarries, laydown areas, landfarm, mine portal, vent raise, fuel tank farm, treated sewage discharge

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Pad B – Power House

- Need to be careful not to construct heated buildings on this pad where airflow under the building is hindered
- This pad is constructed on very thick ice rich material and given the height and location of the pad, plus the weight of the genset, there can be no tolerance for anything that may compromise the foundation
- Monitoring to date does not suggest any issues at this point, but a precautionary approach is advised

7.5 ML Tank Farm

- Spalling rock continues and wedges are starting to be pushed out - risk profile increasing
- Smaller rocks likely won't damage liner or tanks, but can harm personnel
- Larger rocks or wedges can damage the liner or tanks
- As a minimum warning signs be posted against the falling hazard
- Larger issue should however be addressed:
  - Implement IFC rock bolting and mesh design, or
  - Establish frequent inspection of high walls by qualified rock mechanics engineer (TMAC mine engineer)

7.5 ML Tank Farm

- Be cautious about containment capacity
- Facility to be kept drained
- Don’t construct unplanned ramps

7.5 ML Tank Farm

- Some damage affecting the cover; small slough and grounding cable excavation
- Need to be cautious of vehicle traffic damage

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Doris Camp Diversion

- Fairly large tension crack with toe ponding – approximately 15 m in length
- Could be sign of melting ground ice
- Keep eye on it and if extensive localized ponding occurs remedial work may be required

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Pad T – Waste Rock & Ore Stockpiles

- Waste Rock Pile appears to be above (?) maximum design crest elevation of 75 m (rock outcrop above portal around same elevation)
- Design slope = 1H:2.5V; Current slope = angle of repose 1H:1V
- Minimum required design FOS likely not met; should be checked

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