Table 5.6-F1: Predicted Pit Lake Water Quality under the Base Case Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life, McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Groundwater - All sampling locations	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Closure
		Maximum	notes	30-Day Average	notes	95th Percentile	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
Conventional																							
Total Dissolved Solids[b]	mg/L	-			-	157	26	26	26	26	26	26	26	26	26	25	25	25	25	25	25	25	25
Alkalinity[c]	mg/L	see notes			W, s	39	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L	-			-	68	8.9	9	9.1	9.1	9.0	9.0	8.9	8.9	8.9	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.7
Major Ions																							
Calcium	mg/L	see notes			W, t	24	3.0	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Chloride	mg/L	600	A	150	A	7.9	0.9	0.9	0.9	0.8	0.73	0.75	0.75	0.75	0.76	0.77	0.77	0.76	0.76	0.76	0.74	0.73	0.7
Fluoride	mg/L	0.4-1.2	A, e	-	-	0.18	0.01	0.01	0.01	0.01	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0098
Magnesium	mg/L	-			-	2.3	0.34	0.35	0.35	0.35	0.35	0.35	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.35
Potassium	mg/L	-			-	2.7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.99	0.99	0.99	0.99	0.99	0.99	0.98
Sodium	mg/L	-			-	8.1	1.1	1.1	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0
Sulphate	mg/L	-	-	128	A, f	41	1.9	2.0	2.0	2.0	1.9	1.9	1.8	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Nutrients																							
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	0.036	0.0025	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Nitrate	mg/L (as N)	32.8	A	3	A	0.42	0.11	0.11	0.096	0.09	0.088	0.086	0.084	0.082	0.081	0.08	0.08	0.08	0.08	0.079	0.079	0.079	0.079
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)	-			-	0.18	0.029	0.029	0.027	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026
Total Phosphorus	mg/L	0.005			A	0.69	0.003	0.003	0.003	0.003	0.0029	0.003	0.0031	0.0031	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0031
Dissolved Metals																							
Aluminum	mg/L	0.032	A, i	0.011	A, i	0.049	0.012	0.012	0.0075	0.0054	0.0048	0.0045	0.0043	0.0041	0.0039	0.0038	0.0037	0.0036	0.0036	0.0035	0.0035	0.0035	0.0034
Antimony	mg/L	-	-	0.009	W	0.0005	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024
Arsenic	mg/L	0.005	A	0.005	A	0.0025	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026
Barium	mg/L	-	-	1	W	0.01	0.01	0.01	0.01	0.01	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0098	0.0098	0.0098
Beryllium	mg/L	-	-	0.00013	W	0.001	0.00049	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Boron	mg/L	1.2	A	1.2	A	0.05	0.049	0.05	0.05	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049
Cadmium	mg/L	0.000029-0.000092	A, j	0.000033-0.000075	A, j	0.000023	0.000013	0.000013	0.000013	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000011	0.000011	0.000011
Chromium	mg/L	-	-	0.001	W, k	0.001	0.00049	0.0005	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Cobalt	mg/L	0.11	A	0.004	A	0.0003	0.00018	0.00018	0.00018	0.00018	0.00017	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002[l]	A, l	0.001	0.0007	0.0007	0.0007	0.0007	0.00065	0.00068	0.00068	0.00069	0.0007	0.0007	0.0007	0.0007	0.00071	0.00071	0.00071	0.0007	0.00068
Iron	mg/L	0.35	A	-	-	0.067	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.0005	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	mg/L	-			-	0.005	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.053	0.005	0.005	0.005	0.004	0.0034	0.0038	0.0038	0.0038	0.004	0.004	0.004	0.004	0.0041	0.0042	0.0041	0.004	0.0035
Mercury	mg/L	-	-	0.00000125	A, o	0.00001	0.0000049	0.000005	0.000005	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049
Molybdenum	mg/L	2	A	≤1	A	0.0022	0.00049	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Nickel	mg/L	-	-	0.025-0.065	W, p	0.0012	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00049
Selenium	mg/L	-	-	0.002	A	0.001	0.00049	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Silicon	mg/L	-			-	8.9	4.2	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00002	0.000011	0.000011	0.000011	0.000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.000011	0.000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	-	-	0.0008	W	0.0002	0.0001	0.0001	0.0001	0.0001	0.000099	0.0001	0.000099	0.000099	0.0001	0.0001	0.000099	0.000099	0.000099	0.000099	0.000099	0.000098	0.000098
Tin	mg/L	-			-	0.0005	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00024	0.00024
Titanium	mg/L	-			-	0.005	0.0049	0.005	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049
Uranium	mg/L	-	-	0.0085	W	0.00081	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-			-	0.0011	0.00049	0.0005	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025

Notes:

A = approved guideline, W = working guideline

a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.

f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water

g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0

h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6
BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2

i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2); minimum baseline surface water pH = 5.57

j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = $2.718^{[0.736*\ln(hardness)-4.943]}$; BC WQG short-term max (ug/L) = $2.718^{[1.03*\ln(hardness)-5.274]}$

k) guideline is for Cr(VI)

l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000

m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP((1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L

n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605

o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline

p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15

q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015

r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000

s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.

t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.

123	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5.6-F2: Predicted Pit Lake Water Quality under the Base Case Scenario compared to CCME Guidelines, McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Groundwater - All sampling locations	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Closure
		Short-term	Long-term	notes	95th Percentile	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
Conventional																						
Total Dissolved Solids[b]	mg/L	-		-	157	26	26	26	26	26	26	26	26	26	25	25	25	25	25	25	25	25
Alkalinity[c]	mg/L	-		-	39	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L	-		-	68	8.9	9	9.1	9.1	9.0	9.0	8.9	8.9	8.9	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.7
Major Ions																						
Calcium	mg/L	-		-	24	3.0	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Chloride	mg/L	640	120	-	7.9	0.9	0.9	0.9	0.8	0.73	0.75	0.75	0.75	0.76	0.77	0.77	0.76	0.76	0.76	0.74	0.73	0.7
Fluoride	mg/L	0.12		I	0.18	0.01	0.01	0.01	0.01	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0098
Magnesium	mg/L	-		-	2.3	0.34	0.35	0.35	0.35	0.35	0.35	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.35
Potassium	mg/L	-		-	2.7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.99	0.99	0.99	0.99	0.99	0.99	0.98
Sodium	mg/L	-		-	8.1	1.1	1.1	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0
Sulphate	mg/L	-		-	41	1.9	2.0	2.0	2.0	1.9	1.9	1.8	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Nutrients																						
Ammonia	mg/L (as N)	0.41		e	0.036	0.0025	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Nitrate	mg/L (as N)	550	13	-	0.42	0.11	0.11	0.096	0.09	0.088	0.086	0.084	0.082	0.081	0.08	0.08	0.08	0.08	0.079	0.079	0.079	0.079
Nitrite	mg/L (as N)	0.06		-	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.18	0.029	0.029	0.027	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026
Total Phosphorus	mg/L	-	see notes	I	0.69	0.003	0.003	0.003	0.003	0.0029	0.003	0.0031	0.0031	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0031
Dissolved Metals																						
Aluminum	mg/L	0.005		f	0.049	0.012	0.012	0.0075	0.0054	0.0048	0.0045	0.0043	0.0041	0.0039	0.0038	0.0037	0.0036	0.0036	0.0035	0.0035	0.0035	0.0034
Antimony	mg/L	-		-	0.0005	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024
Arsenic	mg/L	0.005		-	0.0025	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026
Barium	mg/L	-		-	0.01	0.01	0.01	0.01	0.01	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0098	0.0098	0.0098
Beryllium	mg/L	-		-	0.001	0.00049	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Boron	mg/L	29	1.5	-	0.05	0.049	0.05	0.05	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049
Cadmium	mg/L	0.0001-0.0002	0.00004	g	0.000023	0.000013	0.000013	0.000013	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000011	0.000011	0.000011
Chromium	mg/L	0.001		h	0.001	0.00049	0.0005	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Cobalt	mg/L	-		-	0.0003	0.00018	0.00018	0.00018	0.00018	0.00017	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018
Copper	mg/L	0.002		i	0.001	0.0007	0.0007	0.0007	0.0007	0.00065	0.00068	0.00068	0.00069	0.0007	0.0007	0.0007	0.0007	0.00071	0.00071	0.00071	0.0007	0.00068
Iron	mg/L	0.3		-	0.067	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	mg/L	0.001		j	0.0005	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	mg/L	-		-	0.005	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	-		-	0.053	0.005	0.005	0.005	0.004	0.0034	0.0038	0.0038	0.0038	0.004	0.004	0.004	0.004	0.0041	0.0042	0.0041	0.004	0.0035
Mercury	mg/L	0.000026		-	0.00001	0.0000049	0.000005	0.000005	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049
Molybdenum	mg/L	0.073		I	0.0022	0.00049	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Nickel	mg/L	0.025		k	0.0012	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00049
Selenium	mg/L	0.001		-	0.001	0.00049	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Silicon	mg/L	-		-	8.9	4.2	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Silver	mg/L	0.0001		-	0.00002	0.000011	0.000011	0.000011	0.000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.000011	0.000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	0.0008		-	0.0002	0.0001	0.0001	0.0001	0.0001	0.000099	0.0001	0.000099	0.000099	0.0001	0.0001	0.000099	0.000099	0.000099	0.000099	0.000099	0.000098	0.000098
Tin	mg/L	-		-	0.0005	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00024	0.00024
Titanium	mg/L	-		-	0.005	0.0049	0.005	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049
Uranium	mg/L	0.033	0.015	-	0.00081	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-		-	0.0011	0.00049	0.0005	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Zinc	mg/L	0.03		-	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025

Notes:

I = interim guideline

a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0

f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)

g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^(1.016*log(hardness)-1.71))/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037

h) guideline is for Cr(VI)

i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000

j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007

k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15

l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5.6-F3: Predicted Pit Lake Water Quality under the Conservative Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life, McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Groundwater - All sampling locations	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Closure
		Maximum	notes	30-Day Average	notes	95th Percentile	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
Conventional																							
Total Dissolved Solids[b]	mg/L	-			-	157	61	63	42	34	31	29	27	26	25	24	24	24	23	23	23	23	22
Alkalinity[c]	mg/L	see notes			W, s	39	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L	-			-	68	20	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
Major Ions																							
Calcium[u]	mg/L	see notes			W, t	24	6.8	7.1	7.2	7.1	7.1	7.0	7.0	7.0	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
Chloride[u]	mg/L	600	A	150	A	7.9	1.1	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Fluoride[u]	mg/L	0.45-0.71	A, e	-	-	0.18	0.025	0.026	0.026	0.026	0.026	0.025	0.025	0.025	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024
Magnesium[u]	mg/L	-			-	2.3	0.78	0.79	0.79	0.8	0.81	0.83	0.84	0.85	0.85	0.86	0.86	0.85	0.85	0.85	0.85	0.85	0.85
Potassium[u]	mg/L	-			-	2.7	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Sodium[u]	mg/L	-			-	8.1	**37**	**38**	**19**	**11**	8.7	7.2	6.1	5.4	4.7	4.3	3.9	3.5	3.2	2.9	2.8	2.6	2.7
Sulphate[u]	mg/L	-	-	128-218	A, f	41	5.5	5.9	6.1	5.9	5.7	5.6	5.2	5.0	4.8	4.6	4.6	4.7	4.6	4.6	4.6	4.7	4.6
Nutrients																							
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	0.036	0.013	0.014	0.015	0.014	0.014	0.013	0.012	0.012	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
Nitrate[u]	mg/L (as N)	32.8	A	3	A	0.42	0.19	0.19	0.18	0.18	0.18	0.17	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.15
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)	-			-	0.18	0.063	0.063	0.059	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052
Total Phosphorus[u]	mg/L	0.005-0.015 in lakes			A	0.69	0.0082	0.0086	0.0087	0.0086	0.0086	0.0084	0.0083	0.0082	0.0081	0.008	0.0081	0.0081	0.0081	0.0081	0.008	0.008	0.0079
Dissolved Metals																							
Aluminum	mg/L	0.032	A, i	0.011	A, i	0.049	0.042	0.042	0.04	0.041	0.041	0.042	0.043	0.043	0.043	0.044	0.043	0.043	0.043	0.043	0.043	0.043	0.043
Antimony	mg/L	-	-	0.009	W	0.0005	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024
Arsenic	mg/L	0.005	A	0.005	A	0.0025	0.00068	0.00074	0.00076	0.00073	0.00072	0.0007	0.00065	0.00061	0.00059	0.00057	0.00057	0.00058	0.00057	0.00057	0.00057	0.00058	0.00057
Barium	mg/L	-	-	1	W	0.01	0.012	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.011
Beryllium	mg/L	-	-	0.00013	W	0.001	0.00049	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Boron	mg/L	1.2	A	1.2	A	0.05	0.049	0.05	0.05	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049
Cadmium	mg/L	0.000041-0.000092	A, j	0.000042-0.000075	A, j	0.000023	0.000017	0.000017	0.000016	0.000015	0.000014	0.000013	0.000013	0.000013	0.000013	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012
Chromium	mg/L	-	-	0.001	W, k	0.001	0.00049	0.0005	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Cobalt	mg/L	0.11	A	0.004	A	0.0003	0.00018	0.00018	0.00018	0.00018	0.00017	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018
Copper	mg/L	0.0046-0.0075	A, l	0.002-0.0023	A, l	0.001	0.00067	0.00068	0.0007	0.00068	0.00065	0.00068	0.00068	0.00069	0.0007	0.0007	0.0007	0.0007	0.00071	0.00071	0.00071	0.0007	0.00068
Iron	mg/L	0.35	A	-	-	0.067	0.038	0.041	0.042	0.04	0.04	0.039	0.036	0.034	0.033	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.031
Lead	mg/L	0.016-0.041	A, m	-	A, m	0.0005	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	mg/L	-			-	0.005	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	0.84-1.18	A, n	0.72-0.86	A, n	0.053	0.042	0.047	0.05	0.048	0.046	0.045	0.04	0.037	0.035	0.033	0.032	0.033	0.033	0.032	0.032	0.033	0.032
Mercury	mg/L	-	-	0.00000125	A, o	0.00001	0.0000049	0.000005	0.000005	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049
Molybdenum	mg/L	2	A	≤1	A	0.0022	0.00083	0.00088	0.0009	0.00087	0.00086	0.00083	0.00079	0.00077	0.00075	0.00073	0.00074	0.00074	0.00073	0.00073	0.00073	0.00074	0.00072
Nickel	mg/L	-	-	0.025-0.065	W, p	0.0012	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00049
Selenium	mg/L	-	-	0.002	A	0.001	0.00049	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Silicon[u]	mg/L	-			-	8.9	1.3	1.3	0.73	0.49	0.4	0.35	0.3	0.27	0.24	0.22	0.2	0.19	0.18	0.18	0.17	0.17	0.16
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00002	0.000011	0.000011	0.000011	0.000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.000011	0.000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	-	-	0.0008	W	0.0002	0.000099	0.0001	0.0001	0.00010	0.000099	0.00010	0.000099	0.000099	0.00010	0.00010	0.000099	0.000099	0.000099	0.000099	0.000099	0.000098	0.000098
Tin	mg/L	-			-	0.0005	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00024	0.00024
Titanium	mg/L	-			-	0.005	0.0049	0.005	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049
Uranium	mg/L	-	-	0.0085	W	0.00081	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-			-	0.0011	0.0007	0.00071	0.00071	0.00071	0.00071	0.00072	0.00073	0.00073	0.00074	0.00074	0.00074	0.00073	0.00073	0.00073	0.00073	0.00073	0.00073
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025

Notes:

A = approved guideline, W = working guideline

a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.

f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water

g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0

h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6
BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2

i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2); minimum baseline surface water pH = 5.57

j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = $2.718^{[0.736*\ln(hardness)-4.943]}$; BC WQG short-term max (ug/L) = $2.718^{[1.03*\ln(hardness)-5.274]}$

k) guideline is for Cr(VI)

l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000

m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP((1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L

n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605

o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline

p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15

q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015

r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000

s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.

t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.

u) based on probabilistic model results.

123	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5.6-F4: Predicted Pit Lake Water Quality under the Conservative Scenario compared to CCME Guidelines, McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Groundwater - All sampling locations	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Closure
		Short-term	Long-term	notes	95th Percentile	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
Conventional																						
Total Dissolved Solids[b]	mg/L	-		-	157	61	63	42	34	31	29	27	26	25	24	24	24	23	23	23	23	22
Alkalinity[c]	mg/L	-		-	39	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L	-		-	68	20	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
Major Ions																						
Calcium[n]	mg/L	-		-	24	6.8	7.1	7.2	7.1	7.1	7.0	7.0	7.0	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
Chloride[n]	mg/L	640	120	-	7.9	1.1	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Fluoride[n]	mg/L	0.12		l	0.18	0.025	0.026	0.026	0.026	0.026	0.025	0.025	0.025	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024
Magnesium[n]	mg/L	-		-	2.3	0.78	0.79	0.79	0.8	0.81	0.83	0.84	0.85	0.85	0.86	0.86	0.85	0.85	0.85	0.85	0.85	0.85
Potassium[n]	mg/L	-		-	2.7	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Sodium[n]	mg/L	-		-	8.1	**37**	**38**	**19**	**11**	8.7	7.2	6.1	5.4	4.7	4.3	3.9	3.5	3.2	2.9	2.8	2.6	2.7
Sulphate[n]	mg/L	-		-	41	5.5	5.9	6.1	5.9	5.7	5.6	5.2	5.0	4.8	4.6	4.6	4.7	4.6	4.6	4.6	4.7	4.6
Nutrients																						
Ammonia	mg/L (as N)	0.41		e	0.036	0.013	0.014	0.015	0.014	0.014	0.013	0.012	0.012	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
Nitrate[n]	mg/L (as N)	550	13	-	0.42	0.19	0.19	0.18	0.18	0.18	0.17	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.15
Nitrite	mg/L (as N)	0.06		-	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.18	0.063	0.063	0.059	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052
Total Phosphorus[n]	mg/L	-	see notes	l	0.69	0.0082	0.0086	0.0087	0.0086	0.0086	0.0084	0.0083	0.0082	0.0081	0.008	0.0081	0.0081	0.0081	0.0081	0.008	0.008	0.0079
Dissolved Metals																						
Aluminum	mg/L	0.005		f	0.049	0.042	0.042	0.04	0.041	0.041	0.042	0.043	0.043	0.043	0.044	0.043	0.043	0.043	0.043	0.043	0.043	0.043
Antimony	mg/L	-		-	0.0005	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024
Arsenic	mg/L	0.005		-	0.0025	0.00068	0.00074	0.00076	0.00073	0.00072	0.0007	0.00065	0.00061	0.00059	0.00057	0.00057	0.00058	0.00057	0.00057	0.00057	0.00058	0.00057
Barium	mg/L	-		-	0.01	**0.012**	**0.013**	**0.013**	**0.013**	**0.013**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.011**
Beryllium	mg/L	-		-	0.001	0.00049	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Boron	mg/L	29	1.5	-	0.05	0.049	0.05	0.05	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049
Cadmium	mg/L	0.0002-0.0012	0.00005-0.0001	g	0.000023	0.000017	0.000017	0.000016	0.000015	0.000014	0.000013	0.000013	0.000013	0.000013	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012
Chromium	mg/L	0.001		h	0.001	0.00049	0.0005	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Cobalt	mg/L	-		-	0.0003	0.00018	0.00018	0.00018	0.00018	0.00017	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018
Copper	mg/L	0.002		i	0.001	0.00067	0.00068	0.0007	0.00068	0.00065	0.00068	0.00068	0.00069	0.0007	0.0007	0.0007	0.0007	0.00071	0.00071	0.00071	0.0007	0.00068
Iron	mg/L	0.3		-	0.067	0.038	0.041	0.042	0.04	0.04	0.039	0.036	0.034	0.033	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.031
Lead	mg/L	0.001		j	0.0005	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	mg/L	-		-	0.005	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	-		-	0.053	0.042	0.047	0.05	0.048	0.046	0.045	0.04	0.037	0.035	0.033	0.032	0.033	0.033	0.032	0.032	0.033	0.032
Mercury	mg/L	0.000026		-	0.00001	0.0000049	0.000005	0.000005	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049	0.0000049
Molybdenum	mg/L	0.073		l	0.0022	0.00083	0.00088	0.0009	0.00087	0.00086	0.00083	0.00079	0.00077	0.00075	0.00073	0.00074	0.00074	0.00073	0.00073	0.00073	0.00074	0.00072
Nickel	mg/L	0.025		k	0.0012	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00049
Selenium	mg/L	0.001		-	0.001	0.00049	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Silicon[n]	mg/L	-		-	8.9	1.3	1.3	0.73	0.49	0.4	0.35	0.3	0.27	0.24	0.22	0.2	0.19	0.18	0.18	0.17	0.17	0.16
Silver	mg/L	0.0001		-	0.00002	0.000011	0.000011	0.000011	0.000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.000011	0.000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	0.0008		-	0.0002	0.000099	0.0001	0.0001	0.00010	0.000099	0.00010	0.000099	0.000099	0.00010	0.00010	0.000099	0.000099	0.000099	0.000099	0.000099	0.000098	0.000098
Tin	mg/L	-		-	0.0005	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00024	0.00024
Titanium	mg/L	-		-	0.005	0.0049	0.005	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049
Uranium	mg/L	0.033	0.015	-	0.00081	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-		-	0.0011	0.0007	0.00071	0.00071	0.00071	0.00071	0.00072	0.00073	0.00073	0.00074	0.00074	0.00074	0.00073	0.00073	0.00073	0.00073	0.00073	0.00073
Zinc	mg/L	0.03		-	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025

Notes:

I = interim guideline

a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0

f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)

g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^(1.016*log(hardness)-1.71))/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037

h) guideline is for Cr(VI)

i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000

j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007

k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15

l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1

n) based on probabilistic model results

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.