



APPENDIX 6-I

Water Quality Prediction Summary Tables



Table 6-I-1. Water Quality Predictions (Treated; Average and Maximum) for the Attenuation Pond for Operations

Parameter	Unit	Portage Effluent Limits		Guidelines for the Protection of:				Attenuation Pond Operations (Treated Effluent)	
		Maximum Concentration in a Grab Sample (MC)	Maximum Average Concentration (MAC)	Aquatic Life	Aquatic Life (CCME 1999)		Drinking Water (HC 2014)	Maximum	Average
				SSWQO ^(a)	Acute	Chronic			
Conventional Parameters									
Total dissolved solids	mg/L	1,400	1,400	-	-	-	-	751	384
Major Ions									
Calcium	mg/L	-	-	-	-	-	-	79	41
Magnesium	mg/L	-	-	-	-	-	-	21	13
Potassium	mg/L	-	-	-	-	-	-	63	26
Sodium	mg/L	-	-	-	-	-	-	78	41
Chloride	mg/L	2,000	1,000	-	640	120	-	69	53
Fluoride	mg/L	-	-	-	-	0.12	1.5	1.4 ^(C)	0.69 ^(C)
Sulphate	mg/L	-	-	-	-	-	-	228	99
Nutrients									
Nitrate	mg-N/L	-	-	-	124	2.9	10	6.4 ^(C)	5.9 ^(C)
Total ammonia	mg-N/L	32	16	-	-	7.7 - 17	-	0.15	0.14
Total phosphorus	mg-P/L	2	1	-	-	0.004 to 0.1	-	0.82 ^(C)	0.58 ^(C)
Dissolved phosphorus	mg-P/L	2	1	-	-	0.004 to 0.1	-	0.81 ^(C)	0.57 ^(C)
Total Metals									
Aluminum	µg/L	1,500	1,500	-	-	100	100	322 ^(C, D)	322 ^(C, D)
Antimony	µg/L	-	-	-	-	-	6.0	47 ^(D)	21 ^(D)
Arsenic	µg/L	600	300	28	-	5.0	10	155 ^(C, D)	155 ^(C, D)
Barium	µg/L	-	-	-	-	-	1,000	124	74
Beryllium	µg/L	-	-	-	-	-	-	0.23	0.12
Bismuth	µg/L	-	-	-	-	-	-	0.15	0.08
Boron	µg/L	-	-	-	29,000	1,500	5,000	1,007	464
Cadmium	µg/L	4.0	2.0	-	0.34	0.04	5.0	0.11 ^(C)	0.064 ^(C)
Chromium	µg/L	-	-	-	-	1.0	50	25 ^(C)	16 ^(C)
Cobalt	µg/L	-	-	-	-	-	-	8.4	4.5
Copper	µg/L	200	100	-	-	2.0	-	23 ^(C)	11 ^(C)
Iron	µg/L	-	-	-	-	300	-	1,053 ^(C)	1,053 ^(C)
Lead	µg/L	200	100	-	-	1.0	10	5.1 ^(C)	2.4 ^(C)
Lithium	µg/L	-	-	-	-	-	-	20	11
Manganese	µg/L	-	-	-	-	-	-	886	530
Mercury	µg/L	0.8	0.4	-	-	0.026	1.0	0.11 ^(C)	0.047 ^(C)
Molybdenum	µg/L	-	-	-	-	73	-	22	12
Nickel	µg/L	400	200	-	-	25	-	74 ^(C)	39 ^(C)
Selenium	µg/L	-	-	-	-	1.0	50	6.1 ^(C)	2.6 ^(C)
Silver	µg/L	-	-	-	-	0.25	-	0.22	0.09
Strontium	µg/L	-	-	-	-	-	-	511	293
Thallium	µg/L	-	-	-	-	0.8	-	0.37	0.14
Tin	µg/L	-	-	-	-	-	-	0.89	0.4
Uranium	µg/L	-	-	-	33	15	20	10	5.2
Vanadium	µg/L	-	-	-	-	-	-	47	22
Zinc	µg/L	800	400	-	-	30	-	22	11

Concentrations are higher than relevant water quality guidelines are indicated by superscripts. The COPCs are indicated by the bolded values

(MC) = concentration higher than the relevant discharge criteria maximum concentration in a grab sample.

(MAC) = concentration higher than the relevant discharge criteria maximum average concentration from four consecutive samples.

(C) = concentration higher than the relevant chronic aquatic life guideline or beyond the recommended pH, DO or total alkalinity concentration range.

(D) = concentration higher than the relevant drinking water guideline or beyond the recommended pH or DO concentration range.

- = no guideline or data.

a) Site-specific Water Quality Objective (SSWQO) developed for the Whale Tail Project (Volume 6, Appendix 6-N).



Table 6-I-2. Water Quality Predictions for the Flooded Pit for Early and Late Post-closure

Parameter	Unit	Guidelines for the protection of:				Flooded Pit Post-closure			
		Aquatic Life	Aquatic Life (CCME 1999)		Drinking Water (HC 2014)	Early (Year 11)		Late (Year 21)	
		SSWQO ^(a)	Acute	Chronic		Maximum	Average	Maximum	Average
Conventional Parameters									
Total dissolved solids	mg/L	-	-	-	-	37	37	37	37
Major Ions		-							
Calcium	mg/L	-	-	-	-	5.1	5.1	5.1	5.1
Magnesium	mg/L	-	-	-	-	1.7	1.7	1.7	1.7
Potassium	mg/L	-	-	14	-	3.1	3.1	3.1	3.1
Sodium	mg/L	-	-	-	-	2.0	2.0	2.0	2.0
Chloride	mg/L	-	640	120	-	3.9	3.9	3.9	3.9
Fluoride	mg/L	-	-	0.12	1.5	0.066	0.066	0.066	0.066
Sulphate	mg/L	-	-	-	-	11	11	11	11
Nutrients		-							
Nitrate	mg-N/L	-	124	2.9	10	0.11	0.11	0.11	0.11
Total ammonia	mg-N/L	-	-	7.7	-	0.0029	0.0029	0.0029	0.0029
Total phosphorus	mg-P/L	-	-	0.004 to 0.1	-	0.039^(C)	0.039^(C)	0.039^(C)	0.039^(C)
Dissolved Metals		-							
Aluminum	µg/L	-	-	-	-	0.2	0.2	0.2	0.2
Antimony	µg/L	-	-	-	6.0	0.68	0.68	0.68	0.68
Arsenic	µg/L	28	-	5.0	10	11 ^(C, D)	11 ^(C, D)	11 ^(C, D)	11 ^(C, D)
Barium	µg/L	-	-	31	1,000	9.3	9.3	9.3	9.3
Beryllium	µg/L	-	0.34	0.04	-	0.014	0.01	0.014	0.014
Bismuth	µg/L	-	-	1.0	-	0.026	0.03	0.026	0.026
Boron	µg/L	-	29,000	1,500	5,000	20	20	20	20
Cadmium	µg/L	-	0.34	2.0	5.0	0.0076	0.0076	0.0076	0.0076
Chromium	µg/L	-	-	1.0	50	0.16	0.16	0.16	0.16
Cobalt	µg/L	-	-	1.0	-	0.26	0.26	0.26	0.26
Copper	µg/L	-	-	2.0	-	0.67	0.67	0.67	0.67
Iron	µg/L	-	-	300	-	30	30	30	30
Lead	µg/L	-	-	1.0	10	0.13	0.13	0.13	0.13
Lithium	µg/L	-	-	-	-	1.4	1.4	1.4	1.4
Manganese	µg/L	-	-	-	-	47	47	47	47
Mercury	µg/L	-	-	25	1.0	0.0043	0.0044	0.0043	0.0043
Molybdenum	µg/L	-	-	73	-	1.3	1.3	1.3	1.3
Nickel	µg/L	-	-	25	-	2.5	2.5	2.5	2.5
Selenium	µg/L	-	-	1.0	50	0.23	0.23	0.23	0.23
Silver	µg/L	-	-	0.25	-	0.0069	0.0068	0.0069	0.0069
Strontium	µg/L	-	-	-	-	31	31	31	31
Thallium	µg/L	-	-	0.8	-	0.0099	0.0099	0.0099	0.0099
Tin	µg/L	-	-	-	-	0.087	0.0870	0.087	0.087
Uranium	µg/L	-	33	15	20	1.1	1.1	1.1	1.1
Vanadium	µg/L	-	-	-	-	0.66	0.66	0.66	0.66
Zinc	µg/L	-	-	30	-	1.0	1.0	1.0	1.0

Concentrations are higher than relevant water quality guidelines are indicated by superscripts. The COPCs are indicated by the bolded values

^(C) = concentration higher than the relevant chronic aquatic life guideline or beyond the recommended pH, DO or total alkalinity concentration range.

^(D) = concentration higher than the relevant drinking water guideline or beyond the recommended pH or DO concentration range.

^(K) = concentration higher than the relevant trigger meadowbank or beyond the recommended pH or DO concentration range.

^(T) = concentration higher than the relevant threshold or beyond the recommended pH or DO concentration range.

^(B) = concentration higher than the relevant baseline level or beyond the recommended pH or DO concentration range.

- = no guideline or data.

a) Site-specific Water Quality Objective (SSWQO) developed for the Whale Tail Project (Volume 6, Appendix 6-N).



Table 6-I-3. Water Quality Predictions for Whale Tail Lake (North Basin) for Early and Lake Post-closure

Parameter	Unit	Guidelines for the protection of:				Meadowbank (Azimuth 2015b)		Baseline (Whale Tail)	Whale Tail Lake (North Basin) Post-Closure			
		Aquatic Life	Aquatic Life (CCME 1999)		Drinking Water (HC 2014)				Early (Year 11)		Late (Year 21)	
		SSWQO ^(a)	Acute	Chronic		Trigger	Threshold		Maximum	Average	Maximum	Average
Conventional Parameters												
Total dissolved solids	mg/L	-	-	-	-	18	-	21	55 ^(R, B)	50 ^(R, B)	12	12
Major Ions												
Calcium	mg/L	-	-	-	-	-	-	2.2	7.5 ^(B)	6.8 ^(B)	2.2	2.1
Magnesium	mg/L	-	-	-	-	0.83	-	0.79	2.2 ^(R, B)	2.0 ^(R, B)	1.1	1.1
Potassium	mg/L	-	-	-	-	0.5	-	0.44	6.7 ^(R, B)	6.0 ^(R, B)	0.7	0.7
Sodium	mg/L	-	-	-	-	0.98	-	0.55	1.9 ^(R, B)	1.7 ^(R, B)	0.59	0.58
Chloride	mg/L	-	640	120	-	60	120	3.0	2.4	2.2	1.8	1.8
Fluoride	mg/L	-	-	0.12	1.5	-	-	0.034	0.087 ^(B)	0.078 ^(B)	0.031	0.031
Sulphate	mg/L	-	-	-	-	65	128	2.6	22 ^(B)	19 ^(B)	1.8	1.8
Nutrients												
Nitrate	mg-N/L	-	124	2.9	10	1.5	3.0	0.0025	0.19 ^(B)	0.17 ^(B)	0.0078 ^(B)	0.0075 ^(B)
Total ammonia	mg-N/L	-	-	7.7	-	0.065	0.13	0.1	0.0017	0.0016	0.000042	0.000039
Total phosphorus	mg-P/L	-	-	0.004 to 0.1	-	0.006	0.004	0.003	0.091 ^(C)	0.084 ^(C)	0.014 ^(C)	0.014 ^(C)
Total Metals												
Aluminum	µg/L	-	-	100	100	54	100	22	322 ^(C, D, R, T, B)	322 ^(C, D, R, T, B)	322 ^(C, D, R, T, B)	322 ^(C, D, R, T, B)
Antimony	µg/L	-	-	-	6.0	10	20	0.22	1.3 ^(B)	1.1 ^(B)	0.1	0.1
Arsenic	µg/L	28	-	5.0	10	2.6	5.0	0.29	13 ^(C, D, R, T, B)	12 ^(C, D, R, T, B)	5.9 ^(C, R, T, B)	5.9 ^(C, R, T, B)
Barium	µg/L	-	-	-	1,000	501	1,000	4.4	13 ^(B)	12 ^(B)	7	7
Beryllium	µg/L	-	-	-	-	2.7	5.3	0.05	0.011	0.010	0.019	0.019
Bismuth	µg/L	-	-	-	-	-	-	0.25	0.007	0.007	0.003	0.003
Boron	µg/L	-	29,000	1,500	5,000	760	1,500	5.0	16 ^(B)	14 ^(B)	5.6	5.5
Cadmium	µg/L	-	0.34	0.04	5.0	0.025	0.04	0.005	0.009 ^(B)	0.0088 ^(B)	0.004	0.004
Chromium	µg/L	-	-	31	50	0.56	1.0	0.14	9.1 ^(C, R, T, B)	9.0 ^(C, R, T, B)	9.1 ^(C, R, T, B)	9.1 ^(C, R, T, B)
Cobalt	µg/L	-	-	-	-	-	-	0.05	0.74 ^(B)	0.72 ^(B)	0.58 ^(B)	0.58 ^(B)
Copper	µg/L	-	-	2.0	-	1.2	2.0	0.55	0.92 ^(B)	0.88 ^(B)	0.93	0.92
Iron	µg/L	-	-	300	-	155	300	37	769 ^(C, R, T, B)	767 ^(C, R, T, B)	773 ^(C, R, T, B)	773 ^(C, R, T, B)
Lead	µg/L	-	-	1.0	10	0.53	1.0	6.9	0.23	0.22	0.16	0.16
Lithium	µg/L	-	-	-	-	48	96	0.5	2.3 ^(B)	2.1 ^(B)	0.87	0.87
Manganese	µg/L	-	-	-	-	316	679	6.4	44 ^(B)	41 ^(B)	15 ^(B)	15 ^(B)
Mercury	µg/L	-	-	0.026	1.0	0.018	0.026	0.005	0.0041	0.0037	0.0027	0.0027
Molybdenum	µg/L	-	-	73	-	37	73	0.059	2.9 ^(B)	2.6 ^(B)	0.11 ^(B)	0.11 ^(B)
Nickel	µg/L	-	-	25	-	13	25	0.86	6.4 ^(B)	6.2 ^(B)	5.2 ^(B)	5.2 ^(B)
Selenium	µg/L	-	-	1.0	50	0.55	1.0	0.05	0.48 ^(B)	0.43 ^(B)	0.042	0.041
Silver	µg/L	-	-	0.25	-	-	-	0.005	0.0059 ^(B)	0.0057 ^(B)	0.008	0.008
Strontium	µg/L	-	-	-	-	28	49	15	46 ^(R, B)	42 ^(R, B)	12.5	12.4
Thallium	µg/L	-	-	0.8	-	0.41	0.8	0.005	0.017 ^(B)	0.015 ^(B)	0.011 ^(B)	0.011 ^(B)



Table 6-I-3. Water Quality Predictions for Whale Tail Lake (North Basin) for Early and Late Post-closure

Parameter	Unit	Guidelines for the protection of:				Meadowbank (Azimuth 2015b)		Baseline (Whale Tail)	Whale Tail Lake (North Basin) Post-Closure			
		Aquatic Life	Aquatic Life (CCME 1999)		Drinking Water (HC 2014)				Early (Year 11)		Late (Year 21)	
		SSWQO ^(a)	Acute	Chronic		Trigger	Threshold		Maximum	Average	Maximum	Average
Tin	µg/L	-	-	-	-	0.2	-	0.05	0.095 ^(B)	0.085 ^(B)	0.062	0.062
Uranium	µg/L	-	33	15	20	7.5	15	0.045	2.6 ^(B)	2.4 ^(B)	0.12 ^(B)	0.11 ^(B)
Vanadium	µg/L	-	-	-	-	3.5	6.0	0.5	1.6 ^(B)	1.5 ^(B)	1.1 ^(B)	1.1 ^(B)
Zinc	µg/L	-	-	30	-	6.3	24	1.5	1.5 ^(B)	1.5	1.24	1.24

Concentrations are higher than relevant water quality guidelines are indicated by superscripts. The COPCs are indicated by the bolded values

^(C) = concentration higher than the relevant chronic aquatic life guideline or beyond the recommended pH, DO or total alkalinity concentration range.

^(D) = concentration higher than the relevant drinking water guideline or beyond the recommended pH or DO concentration range.

^(R) = concentration higher than the relevant trigger meadowbank or beyond the recommended pH or DO concentration range.

^(T) = concentration higher than the relevant threshold or beyond the recommended pH or DO concentration range.

^(B) = concentration higher than the relevant baseline level or beyond the recommended pH or DO concentration range.

- = no guideline or data.

a) Site-specific Water Quality Objective (SSWQO) developed for the Whale Tail Project (Volume 6, Appendix 6-N).



Table 6-I-4. Water Quality Predictions for the Waste Rock Storage Facility Pond for Early and Late Post-closure

Parameter	Unit		Guidelines for the protection of:			Waste Rock Storage Facility Pond Post-Closure			
		Aquatic Life	Aquatic Life		Health Canada Drinking Water	Early (Year 11)		Late (Year 21)	
		SSWQO ^(a)	Acute (CCME)	Chronic (CCME)		Maximum	Average	Maximum	Average
Conventional Parameters									
Total dissolved solids	mg/L	-	-	-	-	3,161	1,027	3,161	1,027
Major Ions									
Calcium	mg/L	-	-	-	-	438	142	438	142
Magnesium	mg/L	-	-	-	-	126	41	126	41
Potassium	mg/L	-	-	-	-	405	132	405	132
Sodium	mg/L	-	-	-	-	89	29	89	29
Chloride	mg/L	-	640	120	-	83	27	83	27
Fluoride	mg/L	-	-	0.12	1.5	5.0 ^(C, D)	1.6 ^(C, D)	5.0 ^(C, D)	1.6 ^(C, D)
Sulphate	mg/L	-	-	-	-	1,292	420	1,292	420
Nutrients									
Nitrate	mg-N/L	-	124	2.9	10	0.019	0.019	0.019	0.019
Total ammonia	mg-N/L	-	-	7.7	-	0.0091	0.0090	0.0091	0.0090
Total phosphorus	mg-P/L	-	-	0.004 to 0.1	-	0.19 ^(C)	0.07 ^(C)	0.19 ^(C)	0.07 ^(C)
Total Metals									
Aluminum	µg/L	-	-	100	100	322 ^(C, D)	322 ^(C, D)	322 ^(C, D)	322 ^(C, D)
Antimony	µg/L	-	-	-	6.0	74 ^(D)	24 ^(D)	74 ^(D)	24 ^(D)
Arsenic	µg/L	28	-	5.0	10	155 ^(C, D)	101 ^(C, D)	155 ^(C, D)	101 ^(C, D)
Barium	µg/L	-	-	-	1000	549	181	549	181
Beryllium	µg/L	-	-	-	-	0.18	0.06	0.18	0.06
Bismuth	µg/L	-	-	-	-	0.19	0.07	0.19	0.07
Boron	µg/L	-	29,000	1,500	5000	591	192	591	192
Cadmium	µg/L	-	0.34	0.04	5.0	0.41 ^(A, C)	0.13 ^(C)	0.41 ^(A, C)	0.13 ^(C)
Chromium	µg/L	-	-	1.0	50	10 ^(C)	9.4 ^(C)	10 ^(C)	9.4 ^(C)
Cobalt	µg/L	-	-	-	-	8.7	3.2	8.7	3.2
Copper	µg/L	-	-	2.0	-	17 ^(C)	6.0 ^(C)	17 ^(C)	6.0 ^(C)
Iron	µg/L	-	-	300	-	813 ^(C)	811 ^(C)	813 ^(C)	811 ^(C)
Lead	µg/L	-	-	1.0	10	5.5 ^(C)	1.9 ^(C)	5.5 ^(C)	1.9 ^(C)
Lithium	µg/L	-	-	-	-	114	37	114	37
Manganese	µg/L	-	-	-	-	557	189	557	189
Mercury	µg/L	-	-	0.026	1.0	0.19 ^(C)	0.078 ^(C)	0.19 ^(C)	0.078 ^(C)
Molybdenum	µg/L	-	-	73	-	172 ^(C)	56	172 ^(C)	56
Nickel	µg/L	-	-	25	-	56 ^(C)	21	56 ^(C)	21
Selenium	µg/L	-	-	1.0	50	28 ^(C)	9.2 ^(C)	28 ^(C)	9.2 ^(C)
Silver	µg/L	-	-	0.25	-	0.13	0.05	0.13	0.05



Table 6-I-4. Water Quality Predictions for the Waste Rock Storage Facility Pond for Early and Late Post-closure

Parameter	Unit		Guidelines for the protection of:			Waste Rock Storage Facility Pond Post-Closure			
		Aquatic Life	Aquatic Life		Health Canada Drinking Water	Early (Year 11)		Late (Year 21)	
		SSWQO ^(a)	Acute (CCME)	Chronic (CCME)		Maximum	Average	Maximum	Average
Strontium	µg/L	-	-	-	-	2,581	840	2,581	840
Thallium	µg/L	-	-	0.8	-	0.69	0.23	0.69	0.23
Tin	µg/L	-	-	-	-	5.2	1.7	5.2	1.7
Uranium	µg/L	-	33	15	20	159^(A, C, D)	52^(A, C, D)	159^(A, C, D)	52^(A, C, D)
Vanadium	µg/L	-	-	-	-	48	16	48	16
Zinc	µg/L	-	-	30	-	48^(C)	16	48^(C)	16

Concentrations are higher than relevant water quality guidelines are indicated by superscripts. The COPCs are indicated by the bolded values

^(MC) = concentration higher than the relevant discharge criteria maximum concentration in a grab sample.

^(MAC) = concentration higher than the relevant discharge criteria maximum average concentration from four consecutive samples.

^(A) = concentration higher than the relevant acute aquatic life guideline or beyond the recommended pH, DO or total alkalinity concentration range.

^(C) = concentration higher than the relevant chronic aquatic life guideline or beyond the recommended pH, DO or total alkalinity concentration range.

^(D) = concentration higher than the relevant drinking water guideline or beyond the recommended pH or DO concentration range.

- = no guideline or data.

a) Site-specific Water Quality Objective (SSWQO) developed for the Whale Tail Project (Volume 6, Appendix 6-N).



Table 6-I-5. Water Quality Predictions (Average and Maximum) for Mammoth Lake for Operations, Closure, and Post-closure (Early and Late)

Parameter	Unit	Guidelines for the protection of:							Mammoth Lake (Early Post-closure)		Mammoth Lake (Late Post-closure)	
		Aquatic Life	Aquatic Life (CCME 1999)		Drinking Water (HC 2014)	Meadowbank (Azimuth 2015b)		Baseline (Mammoth)	Maximum	Average	Maximum	Average
		SSWQO ^(a)	Acute	Chronic		Trigger	Threshold					
Conventional Parameters												
Total dissolved solids	mg/L	-	-	-	-	18	-	22	42 ^(R, B)	30 ^(R, B)	39 ^(R, B)	38 ^(R, B)
Major Ions												
Calcium	mg/L	-	-	-	-	-	-	2.4	5.8 ^(B)	4.1 ^(B)	5.7 ^(B)	5.5 ^(B)
Magnesium	mg/L	-	-	-	-	0.83	-	0.79	1.8 ^(R, B)	1.3 ^(R, B)	1.8 ^(R, B)	1.7 ^(R, B)
Potassium	mg/L	-	-	-	-	0.5	-	0.53	3.9 ^(R, B)	2.0 ^(R, B)	3.9 ^(R, B)	3.8 ^(R, B)
Sodium	mg/L	-	-	-	-	0.98	-	0.55	2.1 ^(R, B)	2.0 ^(R, B)	1.3 ^(B)	1.3 ^(B)
Chloride	mg/L	-	640	120	-	60	120	2.6	3.7 ^(B)	3.6 ^(B)	2.6 ^(B)	2.6
Fluoride	mg/L	-	-	0.12	1.5	-	-	0.033	0.072 ^(B)	0.055 ^(B)	0.069 ^(B)	0.068 ^(B)
Sulphate	mg/L	-	-	-	-	65	128	2.9	13 ^(B)	7.4 ^(B)	13 ^(B)	12 ^(B)
Nutrients												
Nitrate	mg-N/L	-	124	2.9	10	1.5	3.0	0.0025	0.18 ^(B)	0.17 ^(B)	0.010 ^(B)	0.0099 ^(B)
Total ammonia	mg-N/L	-	-	7.7	-	0.065	0.13	0.035	0.0041	0.004	0.0003	0.0003
Dissolved phosphorus	mg-P/L	-	-	0.004 to 0.1	-	0.006	0.004	0.0038	0.029 ^(C, R, T, B)	0.019 ^(C, R, T, B)	0.006 ^(C, T, B)	0.006 ^(C, T, B)
Dissolved Metals												
Aluminum	µg/L	-	-	100	100	26	50	10	4.4	4.1	1.5	1.4
Antimony	µg/L	-	-	-	6.0	10	20	0.05	1.1 ^(B)	0.87 ^(B)	0.69 ^(B)	0.67 ^(B)
Arsenic	µg/L	28	-	5.0	10	2.6	5.0	0.47	5.9 ^(C, R, T, B)	5.1 ^(C, R, T, B)	3.0 ^(R, B)	2.9 ^(R, B)
Barium	µg/L	-	-	-	1000	501	1000	4.7	9.1 ^(B)	7.3 ^(B)	8.6 ^(B)	8.4 ^(B)
Beryllium	µg/L	-	-	-	-	2.7	5.3	0.05	0.014	0.013	0.013	0.013
Bismuth	µg/L	-	-	-	-	-	-	0.025	0.029	0.027	0.027	0.027
Boron	µg/L	-	29,000	1,500	5000	760	1500	5.0	23 ^(B)	22 ^(B)	10.4 ^(B)	10.2 ^(B)
Cadmium	µg/L	-	0.34	0.04	5.0	0.025	0.04	0.005	0.007 ^(B)	0.005 ^(B)	0.006 ^(B)	0.006 ^(B)
Chromium	µg/L	-	-	31	50	0.56	1.0	0.05	0.31 ^(B)	0.3 ^(B)	0.08	0.08
Cobalt	µg/L	-	-	-	-	-	-	0.05	0.21 ^(B)	0.2 ^(B)	0.1 ^(B)	0.09 ^(B)
Copper	µg/L	-	-	2.0	-	1.2	2.0	0.54	0.79 ^(B)	0.77 ^(B)	0.54	0.54
Iron	µg/L	-	-	300	-	155	300	15	15 ^(B)	15 ^(B)	16 ^(B)	16 ^(B)
Lead	µg/L	-	-	1.0	10	0.53	1.0	0.27	0.15	0.15	0.09	0.090
Lithium	µg/L	-	-	-	-	48	96	0.5	1.4 ^(B)	0.98 ^(B)	1.5 ^(B)	1.5 ^(B)
Manganese	µg/L	-	-	-	-	316	679	3.2	24 ^(B)	22 ^(B)	7.3 ^(B)	7.1 ^(B)
Mercury	µg/L	-	-	0.026	1.0	0.018	0.026	0.0063	0.0056	0.005	0.005	0.005
Molybdenum	µg/L	-	-	73	-	37	73	0.025	1.5 ^(B)	0.65 ^(B)	1.5 ^(B)	1.4 ^(B)
Nickel	µg/L	-	-	25	-	13	25	0.89	2.0 ^(B)	2.0 ^(B)	1.0 ^(B)	1.0 ^(B)
Selenium	µg/L	-	-	1.0	50	0.55	1.0	0.025	0.29 ^(B)	0.16 ^(B)	0.25 ^(B)	0.24 ^(B)
Silver	µg/L	-	-	0.25	-	-	-	0.005	0.0085 ^(B)	0.0082 ^(B)	0.006	0.006
Strontium	µg/L	-	-	-	-	28	49	13	34 ^(R, B)	24 ^(B)	33 ^(B)	32 ^(B)
Thallium	µg/L	-	-	0.8	-	0.41	0.8	0.005	0.012 ^(B)	0.011 ^(B)	0.011 ^(B)	0.011 ^(B)



Table 6-I-5. Water Quality Predictions (Average and Maximum) for Mammoth Lake for Operations, Closure, and Post-closure (Early and Late)

Parameter	Unit	Guidelines for the protection of:							Mammoth Lake (Early Post-closure)		Mammoth Lake (Late Post-closure)	
		Aquatic Life	Aquatic Life (CCME 1999)		Drinking Water (HC 2014)	Meadowbank (Azimuth 2015b)		Baseline (Mammoth)	Maximum	Average	Maximum	Average
		SSWQO ^(a)	Acute	Chronic		Trigger	Threshold					
Tin	µg/L	-	-	-	-	0.2	-	0.05	0.085 ^(B)	0.07 ^(B)	0.097 ^(B)	0.096 ^(B)
Uranium	µg/L	-	33	15	20	7.5	15	0.03	1.3 ^(B)	0.43 ^(B)	1.4 ^(B)	1.3 ^(B)
Vanadium	µg/L	-	-	-	-	3.5	6.0	0.25	1.1 ^(B)	1.0 ^(B)	0.65	0.64
Zinc	µg/L	-	-	30	-	6.3	24	0.5	1.0 ^(C)	0.91 ^(C)	0.95 ^(C)	0.94 ^(C)

Concentrations are higher than relevant water quality guidelines are indicated by superscripts. The COPCs are indicated by the bolded values

^(C) = concentration higher than the relevant chronic aquatic life guideline or beyond the recommended pH, DO or total alkalinity concentration range

^(D) = concentration higher than the relevant drinking water guideline or beyond the recommended pH or DO concentration range

^(R) = concentration higher than the relevant trigger meadowbank or beyond the recommended pH or DO concentration range

^(T) = concentration higher than the relevant threshold or beyond the recommended pH or DO concentration range

^(B) = concentration higher than the relevant baseline level or beyond the recommended pH or DO concentration range

- = no guideline or data.

a) Site-specific Water Quality Objective (SSWQO) developed for the Whale Tail Project (Volume 6, Appendix 6-N).



Table 6-I-6. Water Quality Predictions (Average and Maximum) for Lake A15 for Operations, Closure, and Post-closure (Early and Late)

Parameter	Unit	Guidelines for the protection of:							Lake A15 (Operations)		Lake A15 (Closure)		Lake A15 (Early Post-closure)		Lake A15 (Late Post-closure)	
		Aquatic Life	Aquatic Life (CCME 1999)		Drinking Water (HC 2014)	Meadowbank (Azimuth 2015b)		Baseline (A15 A14, A14-A13)	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average
		SSWQO ^(a)	Acute	Chronic		Trigger	Threshold									
Conventional Parameters																
Total dissolved solids	mg/L	-	-	-	-	18	-	18	52 ^(R, B)	49 ^(R, B)	54 ^(R, B)	36 ^(R, B)	35 ^(R, B)	27 ^(R, B)	30 ^(R, B)	29 ^(R, B)
Major Ions																
Calcium	mg/L	-	-	-	-	-	-	2.5	6.1 ^(B)	5.8 ^(B)	6.3 ^(B)	4.5 ^(B)	4.9 ^(B)	3.8 ^(B)	4.3 ^(B)	4.2 ^(B)
Magnesium	mg/L	-	-	-	-	0.83	-	0.86	1.9 ^(R, B)	1.8 ^(R, B)	1.9 ^(R, B)	1.4 ^(R, B)	1.5 ^(R, B)	1.2 ^(R, B)	1.3 ^(R, B)	1.3 ^(R, B)
Potassium	mg/L	-	-	-	-	0.5	-	0.57	3.3 ^(R, B)	3.1 ^(R, B)	3.5 ^(R, B)	2.2 ^(R, B)	2.9 ^(R, B)	1.7 ^(R, B)	3.4 ^(R, B)	3.3 ^(R, B)
Sodium	mg/L	-	-	-	-	0.98	-	0.58	4.9 ^(R, B)	4.6 ^(R, B)	5.1 ^(R, B)	3.1 ^(R, B)	2.0 ^(R, B)	1.9 ^(R, B)	0.93 ^(B)	0.91 ^(B)
Chloride	mg/L	-	640	120	-	60	120	2.1	6.6 ^(B)	6.2 ^(B)	6.7 ^(B)	4.5 ^(B)	3.4 ^(B)	3.3 ^(B)	1.5	1.5
Fluoride	mg/L	-	-	0.12	1.5	-	-	0.025	0.097 ^(B)	0.093 ^(B)	0.1 ^(B)	0.068 ^(B)	0.062 ^(B)	0.051 ^(B)	0.05 ^(B)	0.048 ^(B)
Sulphate	mg/L	-	-	-	-	65	128	3.3	13 ^(B)	12 ^(B)	13 ^(B)	8.5 ^(B)	10 ^(B)	6.5 ^(B)	11 ^(B)	11 ^(B)
Nutrients																
Nitrate	mg-N/L	-	124	2.9	10	1.5	3.0	0.014	0.59 ^(B)	0.55 ^(B)	0.61 ^(B)	0.33 ^(B)	0.17 ^(B)	0.16 ^(B)	0.0089	0.008
Total ammonia	mg-N/L	-	-	7.7	-	0.065	0.13	0.0073	0.014 ^(B)	0.013 ^(B)	0.015 ^(B)	7.70E-03 ^(B)	0.0038	3.60E-03	0.0003	0.0003
Dissolved phosphorus	mg-P/L	-	-	0.004 to 0.1	-	0.006	0.004	0.001	0.048 ^(C, R, I, B)	0.045 ^(C, R, I, B)	0.049 ^(C, R, I, B)	0.026 ^(C, R, I, B)	0.024 ^(C, R, I, B)	0.016 ^(C, R, I, B)	0.005 ^(C, I, B)	0.0048 ^(C, I, B)
Dissolved Metals																
Aluminum	µg/L	-	-	100	100	26	50	3.2	5.0 ^(B)	4.9 ^(B)	5.0 ^(B)	4.6 ^(B)	4.4 ^(B)	4.2 ^(B)	1.7	1.6
Antimony	µg/L	-	-	-	6.0	10	20	0.05	2.3 ^(B)	2.2 ^(B)	2.4 ^(B)	1.4 ^(B)	0.94 ^(B)	0.78 ^(B)	0.6 ^(B)	0.58 ^(B)
Arsenic	µg/L	28	-	5.0	10	2.6	5.0	0.32	16 ^(C, D, R, I, B)	15 ^(C, D, R, I, B)	16 ^(C, D, R, I, B)	8.8 ^(C, R, I, B)	5.3 ^(C, R, I, B)	4.6 ^(R, B)	2.7 ^(R, B)	2.6 ^(R, B)
Barium	µg/L	-	-	-	1000	501	1000	6.1	11 ^(B)	11 ^(B)	12 ^(B)	8.7 ^(B)	8.2 ^(B)	7.1 ^(B)	6.2 ^(B)	6.1
Beryllium	µg/L	-	-	-	-	2.7	5.3	0.01	0.022 ^(B)	0.022 ^(B)	0.023 ^(B)	0.017 ^(B)	0.014 ^(B)	0.013 ^(B)	0.0054	0.005
Bismuth	µg/L	-	-	-	-	-	-	0.025	0.032 ^(B)	0.031 ^(B)	0.032 ^(B)	0.030 ^(B)	0.029 ^(B)	0.028 ^(B)	0.012	0.012
Boron	µg/L	-	29,000	1,500	5000	760	1500	5.0	57 ^(B)	54 ^(B)	60 ^(B)	36 ^(B)	21 ^(B)	21 ^(B)	6.9 ^(B)	6.7 ^(B)
Cadmium	µg/L	-	0.34	0.04	5.0	0.025	0.04	0.0025	0.0092 ^(B)	0.0088 ^(B)	0.0095 ^(B)	0.0065 ^(B)	0.0058 ^(B)	0.0048 ^(B)	0.0043 ^(B)	0.0042 ^(B)
Chromium	µg/L	-	-	31	50	0.56	1.0	0.05	0.83 ^(R, B)	0.79 ^(R, B)	0.88 ^(R, B)	0.52 ^(B)	0.29 ^(B)	0.28 ^(B)	0.034	0.034
Cobalt	µg/L	-	-	-	-	-	-	0.05	0.5 ^(B)	0.47 ^(B)	0.52 ^(B)	0.31 ^(B)	0.2 ^(B)	0.19 ^(B)	0.088 ^(B)	0.0086 ^(B)
Copper	µg/L	-	-	2.0	-	1.2	2.0	0.8	1.5 ^(R, B)	1.5 ^(R, B)	1.6 ^(R, B)	1.1 ^(B)	0.8 ^(B)	0.79	0.32	0.31
Iron	µg/L	-	-	300	-	155	300	5.0	39 ^(B)	37 ^(B)	41 ^(B)	25 ^(B)	15 ^(B)	15 ^(B)	4.5	4.5
Lead	µg/L	-	-	1.0	10	0.53	1.0	0.025	0.31 ^(B)	0.29 ^(B)	0.32 ^(B)	0.21 ^(B)	0.14 ^(B)	0.14 ^(B)	0.068 ^(B)	0.0066 ^(B)
Lithium	µg/L	-	-	-	-	48	96	0.5	1.5 ^(B)	1.5 ^(B)	1.6 ^(B)	1.1 ^(B)	1.2 ^(B)	0.9 ^(B)	1.1 ^(B)	1.1 ^(B)
Manganese	µg/L	-	-	-	-	316	679	0.59	65 ^(B)	61 ^(B)	69 ^(B)	38 ^(B)	22 ^(B)	20 ^(B)	5.6 ^(B)	5.4 ^(B)
Mercury	µg/L	-	-	0.026	1.0	0.018	0.026	0.0025	0.008 ^(B)	0.0077 ^(B)	0.0082 ^(B)	0.0062 ^(B)	0.0053 ^(B)	0.0051 ^(B)	0.0033 ^(B)	0.0032 ^(B)
Molybdenum	µg/L	-	-	73	-	37	73	0.025	1.3 ^(B)	1.2 ^(B)	1.3 ^(B)	0.74 ^(B)	1.1 ^(B)	0.52 ^(B)	1.4 ^(B)	1.3 ^(B)
Nickel	µg/L	-	-	25	-	13	25	0.65	4.6 ^(B)	4.3 ^(B)	4.8 ^(B)	2.9 ^(B)	1.9 ^(B)	1.8 ^(B)	0.69 ^(B)	0.67 ^(B)
Selenium	µg/L	-	-	1.0	50	0.55	1.0	0.025	0.31 ^(B)	0.3 ^(B)	0.33 ^(B)	0.2 ^(B)	0.22 ^(B)	0.14 ^(B)	0.23 ^(B)	0.22 ^(B)
Silver	µg/L	-	-	0.25	-	-	-	0.005	0.015 ^(B)	0.015 ^(B)	0.015 ^(B)	0.011 ^(B)	0.0083 ^(B)	0.0081 ^(B)	0.0031	0.003
Strontium	µg/L	-	-	-	-	28	49	11	39 ^(R, B)	38 ^(R, B)	41 ^(R, B)	28 ^(R, B)	29 ^(R, B)	22 ^(B)	25 ^(B)	24 ^(B)
Thallium	µg/L	-	-	0.8	-	0.41	0.8	0.005	0.02 ^(B)	0.019 ^(B)	0.021 ^(B)	0.015 ^(B)	0.011 ^(B)	0.010 ^(B)	0.0074 ^(B)	0.0073 ^(B)
Tin	µg/L	-	-	-	-	0.2	-	0.12	0.096	0.092	0.1	0.089	0.082	0.078	0.066	0.065
Uranium	µg/L	-	33	15	20	7.5	15	0.023	0.57 ^(B)	0.54 ^(B)	0.6 ^(B)	0.34 ^(B)	0.86 ^(B)	0.32 ^(B)	1.3 ^(B)	1.2 ^(B)
Vanadium	µg/L	-	-	-	-	3.5	6.0	0.25	2.5 ^(B)	2.4 ^(B)	2.6 ^(B)	1.6 ^(B)	1.0 ^(B)	0.96 ^(B)	0.47 ^(B)	0.46 ^(B)
Zinc	µg/L	-	-	30	-	6.3	24	1.2	1.6 ^(C)	1.6 ^(C)	1.7 ^(C)	1.2 ^(C)	0.95	0.91	0.59	0.58

Concentrations are higher than relevant water quality guidelines are indicated by superscripts. The COPCs are indicated by the bolded values

^(C) = concentration higher than the relevant chronic aquatic life guideline or beyond the recommended pH, DO or total alkalinity concentration range.

^(U) = concentration higher than the relevant drinking water guideline or beyond the recommended pH or DO concentration range.

^(R) = concentration higher than the relevant trigger meadowbank or beyond the recommended pH or DO concentration range.

^(I) = concentration higher than the relevant threshold or beyond the recommended pH or DO concentration range.

^(B) = concentration higher than the relevant baseline level or beyond the recommended pH or DO concentration range.

- = no guideline or data.

a) Site-specific Water Quality Objective (SSWQO) developed for the Whale Tail Project (Volume 6, Appendix 6-N).



Table 6-I-7. Water Quality Predictions (Average and Maximum) for Lake A12 for Operations, Closure, and Post-closure (Early and Late)

Parameter	Unit	Guidelines for the protection of:							Lake A12 (Operations)		Lake A12 (Closure)		Lake A12 (Early Post-closure)		Lake A12 (Late Post-closure)	
		Aquatic Life	Aquatic Life (CCME 1999)		Drinking Water (HC 2014)	Meadowbank (Azimuth 2015b)		Baseline (A15 A14, A14-A13)	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average
		SSWQO ^(a)	Acute	Chronic		Trigger	Threshold									
Conventional Parameters																
Total dissolved solids	mg/L	-	-	-	-	18	-	18	49 ^(R, B)	46 ^(R, B)	51 ^(R, B)	36 ^(R, B)	32 ^(R, B)	27 ^(R, B)	29 ^(R, B)	29 ^(R, B)
Major Ions																
Calcium	mg/L	-	-	-	-	-	-	2.5	5.8 ^(B)	5.5 ^(B)	5.9 ^(B)	4.5 ^(B)	4.4 ^(B)	3.7 ^(B)	4.2 ^(B)	4.1 ^(B)
Magnesium	mg/L	-	-	-	-	0.83	-	0.86	1.8 ^(R, B)	1.7 ^(R, B)	1.8 ^(R, B)	1.4 ^(R, B)	1.4 ^(R, B)	1.2 ^(R, B)	1.2 ^(R, B)	1.2 ^(R, B)
Potassium	mg/L	-	-	-	-	0.5	-	0.57	3.1 ^(R, B)	2.9 ^(R, B)	3.2 ^(R, B)	2.1 ^(R, B)	2.4 ^(R, B)	1.6 ^(R, B)	3.1 ^(R, B)	3.1 ^(R, B)
Sodium	mg/L	-	-	-	-	0.98	-	0.58	4.6 ^(R, B)	4.2 ^(R, B)	4.7 ^(R, B)	3.0 ^(R, B)	1.9 ^(R, B)	1.8 ^(R, B)	0.91 ^(B)	0.9 ^(B)
Chloride	mg/L	-	640	120	-	60	120	2.1	6.2 ^(B)	5.9 ^(B)	6.4 ^(B)	4.4 ^(B)	3.3 ^(B)	3.3 ^(B)	1.5	1.5
Fluoride	mg/L	-	-	0.12	1.5	-	-	0.025	0.093 ^(B)	0.087 ^(B)	0.095 ^(B)	0.068 ^(B)	0.057 ^(B)	0.051 ^(B)	0.048 ^(B)	0.047 ^(B)
Sulphate	mg/L	-	-	-	-	65	128	3.3	12 ^(B)	11 ^(B)	12 ^(B)	8.3 ^(B)	8.6 ^(B)	6.1 ^(B)	10 ^(B)	10 ^(B)
Nutrients																
Nitrate	mg-N/L	-	124	2.9	10	1.5	3.0	0.014	0.55 ^(B)	0.5 ^(B)	0.57 ^(B)	0.32 ^(B)	0.16 ^(B)	0.16 ^(B)	0.0094	0.009
Total ammonia	mg-N/L	-	-	7.7	-	0.065	0.13	0.0073	0.013 ^(B)	0.012 ^(B)	0.014 ^(B)	0.008 ^(B)	0.004	0.004	0.00029	0.000
Dissolved phosphorus	mg-P/L	-	-	0.004 to 0.1	-	0.006	0.004	0.001	0.044 ^(C, R, I, B)	0.040 ^(C, R, I, B)	0.046 ^(C, R, I, B)	0.026 ^(C, R, I, B)	0.021 ^(C, R, I, B)	0.014 ^(C, R, I, B)	0.005 ^(C, I, B)	0.0048 ^(C, I, B)
Dissolved Metals																
Aluminum	µg/L	-	-	100	100	26	50	3.2	5.0 ^(B)	4.9 ^(B)	5.0 ^(B)	4.7 ^(B)	4.5 ^(B)	4.4 ^(B)	1.9	1.8
Antimony	µg/L	-	-	-	6.0	10	20	0.05	2.2 ^(B)	2.0 ^(B)	2.2 ^(B)	1.3 ^(B)	0.86 ^(B)	0.74 ^(B)	0.56 ^(B)	0.55 ^(B)
Arsenic	µg/L	28	-	5.0	10	2.6	5.0	0.32	15 ^(C, D, R, I, B)	14 ^(C, D, R, I, B)	15 ^(C, D, R, I, B)	8.5 ^(C, R, I, B)	4.9 ^(R, B)	4.4 ^(R, B)	2.5 ^(B)	2.5 ^(B)
Barium	µg/L	-	-	-	1000	501	1000	6.1	11 ^(B)	10 ^(B)	11 ^(B)	8.9 ^(B)	7.8 ^(B)	7.3 ^(B)	6.2 ^(B)	6.1
Beryllium	µg/L	-	-	-	-	2.7	5.3	0.01	0.022 ^(B)	0.020 ^(B)	0.022 ^(B)	0.018 ^(B)	0.015 ^(B)	0.014 ^(B)	0.006	0.006
Bismuth	µg/L	-	-	-	-	-	-	0.025	0.032 ^(B)	0.032 ^(B)	0.032 ^(B)	0.031 ^(B)	0.03 ^(B)	0.029 ^(B)	0.013	0.012
Boron	µg/L	-	29,000	1,500	5000	760	1500	5.0	53 ^(B)	49 ^(B)	55 ^(B)	35 ^(B)	20 ^(B)	20 ^(B)	6.8 ^(B)	6.7 ^(B)
Cadmium	µg/L	-	0.34	0.04	5.0	0.025	0.04	0.0025	0.0088 ^(B)	0.0083 ^(B)	0.009 ^(B)	0.0065 ^(B)	0.0054 ^(B)	0.0048 ^(B)	0.0042 ^(B)	0.0042 ^(B)
Chromium	µg/L	-	-	31	50	0.56	1.0	0.05	0.78 ^(R, B)	0.72 ^(R, B)	0.81 ^(R, B)	0.5 ^(B)	0.28 ^(B)	0.28 ^(B)	0.036	0.036
Cobalt	µg/L	-	-	-	-	-	-	0.05	0.47 ^(B)	0.43 ^(B)	0.48 ^(B)	0.3 ^(B)	0.19 ^(B)	0.18 ^(B)	0.085 ^(B)	0.084 ^(B)
Copper	µg/L	-	-	2.0	-	1.2	2.0	0.8	1.5 ^(R, B)	1.4 ^(R, B)	1.5 ^(R, B)	1.1 ^(B)	0.84 ^(B)	0.82 ^(B)	0.35	0.34
Iron	µg/L	-	-	300	-	155	300	5.0	37 ^(B)	35 ^(B)	38 ^(B)	25 ^(B)	16 ^(B)	16 ^(B)	5.1 ^(B)	5.0
Lead	µg/L	-	-	1.0	10	0.53	1.0	0.025	0.29 ^(B)	0.27 ^(B)	0.3 ^(B)	0.2 ^(B)	0.14 ^(B)	0.14 ^(B)	0.067 ^(B)	0.066 ^(B)
Lithium	µg/L	-	-	-	-	48	96	0.5	1.5 ^(B)	1.4 ^(B)	1.5 ^(B)	1.1 ^(B)	1.1 ^(B)	0.89 ^(B)	1.1 ^(B)	1.0 ^(B)
Manganese	µg/L	-	-	-	-	316	679	0.59	61 ^(B)	56 ^(B)	63 ^(B)	36 ^(B)	21 ^(B)	19 ^(B)	5.3 ^(B)	5.2 ^(B)
Mercury	µg/L	-	-	0.026	1.0	0.018	0.026	0.0025	0.0077 ^(B)	0.0073 ^(B)	0.0078 ^(B)	0.0061 ^(B)	0.0052 ^(B)	0.005 ^(B)	0.0032 ^(B)	0.0032 ^(B)
Molybdenum	µg/L	-	-	73	-	37	73	0.025	1.2 ^(B)	1.1 ^(B)	1.2 ^(B)	0.71 ^(B)	0.83 ^(B)	0.46 ^(B)	1.2 ^(B)	1.2 ^(B)
Nickel	µg/L	-	-	25	-	13	25	0.65	4.3 ^(B)	4.0 ^(B)	4.4 ^(B)	2.8 ^(B)	1.8 ^(B)	1.8 ^(B)	0.67 ^(B)	0.66 ^(B)
Selenium	µg/L	-	-	1.0	50	0.55	1.0	0.025	0.29 ^(B)	0.27 ^(B)	0.3 ^(B)	0.19 ^(B)	0.18 ^(B)	0.13 ^(B)	0.22 ^(B)	0.21 ^(B)
Silver	µg/L	-	-	0.25	-	-	-	0.005	0.014 ^(B)	0.014 ^(B)	0.015 ^(B)	0.012 ^(B)	0.0084 ^(B)	0.0083 ^(B)	0.0033	3.30E-03
Strontium	µg/L	-	-	-	-	28	49	11	38 ^(R, B)	35 ^(R, B)	38 ^(R, B)	27 ^(B)	26 ^(B)	21 ^(B)	24 ^(B)	23 ^(B)
Thallium	µg/L	-	-	0.8	-	0.41	0.8	0.005	0.02 ^(B)	0.019 ^(B)	0.02 ^(B)	0.014 ^(B)	0.011 ^(B)	0.011 ^(B)	0.0073 ^(B)	0.0071 ^(B)
Tin	µg/L	-	-	-	-	0.2	-	0.12	0.1	0.095	0.11	0.099	0.09	0.087	0.069	0.069
Uranium	µg/L	-	33	15	20	7.5	15	0.023	0.53 ^(B)	0.49 ^(B)	0.55 ^(B)	0.33 ^(B)	0.62 ^(B)	0.27 ^(B)	1.1 ^(B)	1.1 ^(B)
Vanadium	µg/L	-	-	-	-	3.5	6.0	0.25	2.4 ^(B)	2.2 ^(B)	2.4 ^(B)	1.6 ^(B)	0.97 ^(B)	0.94 ^(B)	0.45 ^(B)	0.45 ^(B)
Zinc	µg/L	-	-	30	-	6.3	24	1.2	1.6 ^(C)	1.5 ^(C)	1.6 ^(C)	1.2 ^(C)	0.95	0.94	0.61	0.6

Concentrations are higher than relevant water quality guidelines are indicated by superscripts. The COPCs are indicated by the bolded values

^(C) = concentration higher than the relevant chronic aquatic life guideline or beyond the recommended pH, DO or total alkalinity concentration range.

^(U) = concentration higher than the relevant drinking water guideline or beyond the recommended pH or DO concentration range.

^(R) = concentration higher than the relevant trigger meadowbank or beyond the recommended pH or DO concentration range.

^(I) = concentration higher than the relevant threshold or beyond the recommended pH or DO concentration range.

^(B) = concentration higher than the relevant baseline level or beyond the recommended pH or DO concentration range.

- = no guideline or data.

a) Site-specific Water Quality Objective (SSWQO) developed for the Whale Tail Project (Volume 6, Appendix 6-N).



Table 6-I-8. Water Quality Predictions (Average and Maximum) for Downstream Node 1 for Operations, Closure, and Post-closure (Early and Late)

Parameter	Unit	Guidelines for the protection of:							DS1 (Operations)		DS1 (Closure)		DS1 (Early Post-closure)		DS1 (Late Post-closure)	
		Aquatic Life	Aquatic Life (CCME 1999)		Drinking Water (HC 2014)	Meadowbank (Azimuth 2015b)		Baseline (DS1)	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average
		SSWQO ^(a)	Acute	Chronic		Trigger	Threshold									
Conventional Parameters																
Total dissolved solids	mg/L	-	-	-	-	18	-	20	16	15	15	14	15	14	15	15
Major Ions																
Calcium	mg/L	-	-	-	-	-	-	2.0	2.3 ^(B)	2.2 ^(B)	2.2 ^(B)	2.1 ^(B)	2.2 ^(B)	2.1 ^(B)	2.2 ^(B)	2.2 ^(B)
Magnesium	mg/L	-	-	-	-	0.83	-	0.85	0.74	0.72	0.72	0.69	0.72	0.7	0.73	0.71
Potassium	mg/L	-	-	-	-	0.5	-	0.34	0.68 ^(R, B)	0.63 ^(R, B)	0.65 ^(R, B)	0.58 ^(R, B)	0.61 ^(R, B)	0.58 ^(R, B)	0.79 ^(R, B)	0.75 ^(R, B)
Sodium	mg/L	-	-	-	-	0.98	-	0.73	0.93 ^(B)	0.86 ^(B)	0.88 ^(B)	0.79 ^(B)	0.81 ^(B)	0.78 ^(B)	0.7	0.69
Chloride	mg/L	-	640	120	-	60	120	0.95	1.6 ^(B)	1.5 ^(B)	1.5 ^(B)	1.4 ^(B)	1.4 ^(B)	1.4 ^(B)	1.3 ^(B)	1.2 ^(B)
Fluoride	mg/L	-	-	0.12	1.5	-	-	0.038	0.032	0.031	0.031	0.03	0.03	0.029	0.03	0.029
Sulphate	mg/L	-	-	-	-	65	128	1.2	2.9 ^(B)	2.7 ^(B)	2.8 ^(B)	2.5 ^(B)	2.6 ^(B)	2.5 ^(B)	3.1 ^(B)	3.0 ^(B)
Nutrients																
Nitrate	mg-N/L	-	124	2.9	10	1.5	3.0	0.0025	0.044 ^(B)	0.035 ^(B)	0.038 ^(B)	2.40E-02 ^(B)	0.024 ^(B)	0.021 ^(B)	0.0072 ^(B)	0.0071 ^(B)
Total ammonia	mg-N/L	-	-	7.7	-	0.065	0.13	0.0057	0.0009	0.00069	0.00078	0.00042	0.00043	0.00036	0.000035	0.000031
Dissolved phosphorus	mg-P/L	-	-	0.004 to 0.1	-	0.006	0.004	0.001	0.0046 ^(C, I, B)	0.0039 ^(B)	0.0042 ^(C, I, B)	0.0031 ^(B)	0.0031 ^(B)	0.0028 ^(B)	0.0022 ^(B)	0.0021 ^(B)
Dissolved Metals																
Aluminum	µg/L	-	-	100	100	26	50	5.4	3.9	3.9	3.9	3.8	3.9	3.9	3.7	3.6
Antimony	µg/L	-	-	-	6.0	10	20	0.05	0.2 ^(B)	0.16 ^(B)	0.17 ^(B)	0.12 ^(B)	0.13 ^(B)	0.11 ^(B)	0.11 ^(B)	0.1 ^(B)
Arsenic	µg/L	28	-	5.0	10	2.6	5.0	0.15	1.2 ^(B)	0.96 ^(B)	1.0 ^(B)	0.63 ^(B)	0.66 ^(B)	0.56 ^(B)	0.43 ^(B)	0.39 ^(B)
Barium	µg/L	-	-	-	1000	501	1000	3.1	6.0 ^(B)	5.9 ^(B)	5.9 ^(B)	5.8 ^(B)	5.9 ^(B)	5.8 ^(B)	5.7 ^(B)	5.7 ^(B)
Beryllium	µg/L	-	-	-	-	2.7	5.3	0.01	0.011 ^(B)	0.011 ^(B)	0.011 ^(B)	0.011 ^(B)	0.011 ^(B)	0.011 ^(B)	0.01	0.0099
Bismuth	µg/L	-	-	-	-	-	-	0.025	0.026 ^(B)	0.026 ^(B)	0.026 ^(B)	0.025 ^(B)	0.026 ^(B)	0.026 ^(B)	0.025	0.024
Boron	µg/L	-	29,000	1,500	5000	760	1500	5.0	8.5 ^(B)	7.7 ^(B)	7.9 ^(B)	6.7 ^(B)	7.0 ^(B)	6.6 ^(B)	5.4 ^(B)	5.3 ^(B)
Cadmium	µg/L	-	0.34	0.04	5.0	0.025	0.04	0.0025	0.0035 ^(B)	0.0034 ^(B)	0.0034 ^(B)	0.0034 ^(B)	0.0034 ^(B)	0.0033 ^(B)	0.0033 ^(B)	0.0032 ^(B)
Chromium	µg/L	-	-	31	50	0.56	1.0	0.05	0.1 ^(B)	0.089 ^(B)	0.094 ^(B)	0.076 ^(B)	0.079 ^(B)	0.073 ^(B)	0.051 ^(B)	0.05 ^(B)
Cobalt	µg/L	-	-	-	-	-	-	0.05	0.08 ^(B)	0.073 ^(B)	0.075 ^(B)	0.064 ^(B)	0.067 ^(B)	0.064 ^(B)	0.056 ^(B)	0.055 ^(B)
Copper	µg/L	-	-	2.0	-	1.2	2.0	0.64	0.68 ^(B)	0.66 ^(B)	0.66 ^(B)	0.64 ^(B)	0.65 ^(B)	0.64 ^(B)	0.6	0.59
Iron	µg/L	-	-	300	-	155	300	11	12 ^(B)	11 ^(B)	11 ^(B)	11	11	11	9.5	9.4
Lead	µg/L	-	-	1.0	10	0.53	1.0	0.025	0.06 ^(B)	0.056 ^(B)	0.057 ^(B)	0.050 ^(B)	0.053 ^(B)	0.05 ^(B)	0.045 ^(B)	0.045 ^(B)
Lithium	µg/L	-	-	-	-	48	96	0.5	0.58 ^(B)	0.56 ^(B)	0.56 ^(B)	0.54 ^(B)	0.56 ^(B)	0.55 ^(B)	0.58 ^(B)	0.56 ^(B)
Manganese	µg/L	-	-	-	-	316	679	0.68	4.9 ^(B)	3.9 ^(B)	4.2 ^(B)	2.6 ^(B)	2.8 ^(B)	2.4 ^(B)	1.2 ^(B)	1.2 ^(B)
Mercury	µg/L	-	-	0.026	1.0	0.018	0.026	0.0025	0.003 ^(B)	0.0029 ^(B)	0.0029 ^(B)	0.0028 ^(B)	0.0028 ^(B)	0.0028 ^(B)	0.0027 ^(B)	0.0026 ^(B)
Molybdenum	µg/L	-	-	73	-	37	73	0.025	0.11 ^(B)	0.089 ^(B)	0.097 ^(B)	0.067 ^(B)	0.073 ^(B)	0.064 ^(B)	0.16 ^(B)	0.15 ^(B)
Nickel	µg/L	-	-	25	-	13	25	0.25	0.68 ^(B)	0.62 ^(B)	0.64 ^(B)	0.54 ^(B)	0.56 ^(B)	0.53 ^(B)	0.44 ^(B)	0.43 ^(B)
Selenium	µg/L	-	-	1.0	50	0.55	1.0	0.025	0.044 ^(B)	0.04 ^(B)	0.041 ^(B)	0.034 ^(B)	0.036 ^(B)	0.034 ^(B)	0.047 ^(B)	0.044 ^(B)
Silver	µg/L	-	-	0.25	-	-	-	0.005	0.0058 ^(B)	0.0056 ^(B)	0.0056 ^(B)	0.0055 ^(B)	0.0056 ^(B)	0.0054 ^(B)	0.005 ^(B)	0.005
Strontium	µg/L	-	-	-	-	28	49	6.2	11 ^(B)	10 ^(B)	10 ^(B)	9.6 ^(B)	10 ^(B)	9.7 ^(B)	10 ^(B)	10 ^(B)
Thallium	µg/L	-	-	0.8	-	0.41	0.8	0.005	0.0062 ^(B)	0.0059 ^(B)	0.0059 ^(B)	0.0056 ^(B)	0.0058 ^(B)	0.0056 ^(B)	0.0054 ^(B)	0.0053 ^(B)
Tin	µg/L	-	-	-	-	0.2	-	0.13	0.11	0.11	0.12	0.11	0.12	0.11	0.11	0.11
Uranium	µg/L	-	33	15	20	7.5	15	0.043	0.061 ^(B)	0.052 ^(B)	0.055 ^(B)	0.043 ^(B)	0.047 ^(B)	0.042	0.15 ^(B)	0.13 ^(B)
Vanadium	µg/L	-	-	-	-	3.5	6.0	0.25	0.4 ^(B)	0.36 ^(B)	0.38 ^(B)	0.33 ^(B)	0.34 ^(B)	0.32 ^(B)	0.28 ^(B)	0.28 ^(B)
Zinc	µg/L	-	-	30	-	6.3	24	0.5	0.78 ^(C)	0.76 ^(C)	0.76 ^(C)	0.74 ^(C)	0.76 ^(C)	0.75 ^(C)	0.71 ^(C)	0.71 ^(C)

Concentrations are higher than relevant water quality guidelines are indicated by superscripts. The COPCs are indicated by the bolded values

^(C) = concentration higher than the relevant chronic aquatic life guideline or beyond the recommended pH, DO or total alkalinity concentration range.

^(B) = concentration higher than the relevant drinking water guideline or beyond the recommended pH or DO concentration range.

^(R) = concentration higher than the relevant trigger meadowbank or beyond the recommended pH or DO concentration range.

^(I) = concentration higher than the relevant threshold or beyond the recommended pH or DO concentration range.

^(B) = concentration higher than the relevant baseline level or beyond the recommended pH or DO concentration range.

- = no guideline or data.

a) Site-specific Water Quality Objective (SSWQO) developed for the Whale Tail Project (Volume 6, Appendix 6-N).



Table 6-I-9. Water Quality Predictions (Average and Maximum) for Downstream Node 2 for Operations, Closure, and Post-closure (Early and Late)

Parameter	Unit	Guidelines for the protection of:							DS2 (Operations)		DS2 (Closure)		DS2 (Early Post-closure)		DS2 (Late Post-closure)		
		Aquatic Life	Aquatic Life (CCME 1999)		Drinking Water (HC 2014)	Meadowbank (Azimuth 2015b)		Baseline (DS1, A5-A4)	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	
		SSWQO ^(a)	Acute	Chronic		Trigger	Threshold										
Conventional Parameters																	
Total dissolved solids	mg/L	-	-	-	-	18	-	20	29 ^(R, B)	25 ^(R, B)	28 ^(R, B)	21 ^(R, B)	21 ^(R, B)	20 ^(R)	22 ^(R, B)	21 ^(R, B)	
Major Ions																	
Calcium	mg/L	-	-	-	-	-	-	2.0	3.7 ^(B)	3.3 ^(B)	3.6 ^(B)	2.9 ^(B)	2.9 ^(B)	2.8 ^(B)	3.3 ^(B)	3.1 ^(B)	
Magnesium	mg/L	-	-	-	-	0.83	-	0.85	1.2 ^(R, B)	1.1 ^(R, B)	1.1 ^(R, B)	0.94 ^(R, B)	0.94 ^(R, B)	0.9 ^(R, B)	1.0 ^(R, B)	0.97 ^(R, B)	
Potassium	mg/L	-	-	-	-	0.5	-	0.59	1.6 ^(R, B)	1.3 ^(R, B)	1.5 ^(R, B)	1.1 ^(R, B)	1.0 ^(R, B)	0.93 ^(R, B)	1.9 ^(R, B)	1.7 ^(R, B)	
Sodium	mg/L	-	-	-	-	0.98	-	0.73	2.3 ^(R, B)	1.9 ^(R, B)	2.2 ^(R, B)	1.5 ^(R, B)	1.3 ^(R, B)	1.2 ^(R, B)	0.84 ^(B)	0.82 ^(B)	
Chloride	mg/L	-	640	120	-	60	120	1.1	3.4 ^(B)	2.9 ^(B)	3.2 ^(B)	2.3 ^(B)	2.3 ^(B)	2.1 ^(B)	1.5 ^(B)	1.4 ^(B)	
Fluoride	mg/L	-	-	0.12	1.5	-	-	0.038	0.056 ^(B)	0.049 ^(B)	0.054 ^(B)	0.042 ^(B)	0.041 ^(B)	0.039 ^(B)	0.04 ^(B)	0.038 ^(B)	
Sulphate	mg/L	-	-	-	-	65	128	2.4	6.4 ^(B)	5.4 ^(B)	6.1 ^(B)	4.4 ^(B)	4.1 ^(B)	3.8 ^(B)	6.6 ^(B)	6.0 ^(B)	
Nutrients																	
Nitrate	mg-N/L	-	124	2.9	10	1.5	3.0	0.0025	0.23 ^(B)	0.17 ^(B)	0.21 ^(B)	0.11 ^(B)	0.085 ^(B)	0.074 ^(B)	0.0096 ^(B)	0.0089 ^(B)	
Total ammonia	mg-N/L	-	-	7.7	-	0.065	0.13	0.0057	0.0055	0.0041	0.005	2.60E-03	0.0019	0.0016	0.00016	0.00014	
Dissolved phosphorus	mg-P/L	-	-	0.004 to 0.1	-	0.006	0.004	0.001	0.019 ^(C, R, I, B)	0.015 ^(C, R, I, B)	0.018 ^(C, R, I, B)	0.0098 ^(C, R, I, B)	0.0081 ^(C, R, I, B)	0.0071 ^(C, R, I, B)	0.004 ^(C, B)	0.0036 ^(B)	
Dissolved Metals																	
Aluminum	µg/L	-	-	100	100	26	50	5.4	4.6	4.4	4.5	4.4	4.4	4.4	3.4	3.1	
Antimony	µg/L	-	-	-	6.0	10	20	0.05	0.93 ^(B)	0.7 ^(B)	0.87 ^(B)	0.48 ^(B)	0.4 ^(B)	0.35 ^(B)	0.32 ^(B)	0.29 ^(B)	
Arsenic	µg/L	28	-	5.0	10	2.6	5.0	0.16	6.3 ^(C, R, I, B)	4.8 ^(R, B)	5.8 ^(C, R, I, B)	3.0 ^(R, B)	2.3 ^(B)	2.0 ^(B)	1.4 ^(B)	1.3 ^(B)	
Barium	µg/L	-	-	-	1000	501	1000	7.4	8.1 ^(B)	7.5 ^(B)	7.9 ^(B)	7.1	6.9	6.8	6.3	6.2	
Beryllium	µg/L	-	-	-	-	2.7	5.3	0.01	0.016 ^(B)	0.014 ^(B)	0.015 ^(B)	0.014 ^(B)	0.013 ^(B)	0.013 ^(B)	0.0096	0.0089	
Bismuth	µg/L	-	-	-	-	-	-	0.025	0.03 ^(B)	0.029 ^(B)	0.03 ^(B)	0.029 ^(B)	0.03 ^(B)	0.029 ^(B)	0.023	0.022	
Boron	µg/L	-	29,000	1,500	5000	760	1500	5.0	26 ^(B)	20 ^(B)	24 ^(B)	15 ^(B)	13 ^(B)	12 ^(B)	6.4 ^(B)	6.2 ^(B)	
Cadmium	µg/L	-	0.34	0.04	5.0	0.025	0.04	0.0063	0.0057	0.005	0.0054	0.0045	0.0043	0.0041	0.0039	0.0038	
Chromium	µg/L	-	-	31	50	0.56	1.0	0.05	0.36 ^(B)	0.28 ^(B)	0.34 ^(B)	0.2 ^(B)	0.17 ^(B)	0.16 ^(B)	0.05 ^(B)	0.048	
Cobalt	µg/L	-	-	-	-	-	-	0.05	0.23 ^(B)	0.18 ^(B)	0.21 ^(B)	0.14 ^(B)	0.12 ^(B)	0.11 ^(B)	0.073 ^(B)	0.07 ^(B)	
Copper	µg/L	-	-	2.0	-	1.2	2.0	0.82	1.0 ^(B)	0.91 ^(B)	0.97 ^(B)	0.84 ^(B)	0.78	0.77	0.58	0.53	
Iron	µg/L	-	-	300	-	155	300	12	22 ^(B)	19 ^(B)	21 ^(B)	16 ^(B)	14 ^(B)	14 ^(B)	9.0	8.3	
Lead	µg/L	-	-	1.0	10	0.53	1.0	0.14	0.15 ^(B)	0.12	0.14 ^(B)	0.096	0.092	0.085	0.058	0.056	
Lithium	µg/L	-	-	-	-	48	96	0.5	0.95 ^(B)	0.84 ^(B)	0.91 ^(B)	0.75 ^(B)	0.73 ^(B)	0.7 ^(B)	0.83 ^(B)	0.79 ^(B)	
Manganese	µg/L	-	-	-	-	316	679	0.68	26 ^(B)	19 ^(B)	24 ^(B)	13 ^(B)	10 ^(B)	8.8 ^(B)	3.3 ^(B)	2.9 ^(B)	
Mercury	µg/L	-	-	0.026	1.0	0.018	0.026	0.0025	0.005 ^(B)	0.0044 ^(B)	0.0047 ^(B)	0.0038 ^(B)	0.0039 ^(B)	0.0037 ^(B)	0.0031 ^(B)	0.003 ^(B)	
Molybdenum	µg/L	-	-	73	-	37	73	0.025	0.51 ^(B)	0.38 ^(B)	0.47 ^(B)	0.26 ^(B)	0.22 ^(B)	0.19 ^(B)	0.67 ^(B)	0.59 ^(B)	
Nickel	µg/L	-	-	25	-	13	25	0.25	2.1 ^(B)	1.7 ^(B)	1.9 ^(B)	1.2 ^(B)	1.1 ^(B)	1.0 ^(B)	0.57 ^(B)	0.56 ^(B)	
Selenium	µg/L	-	-	1.0	50	0.55	1.0	0.025	0.14 ^(B)	0.11 ^(B)	0.13 ^(B)	0.081 ^(B)	0.074 ^(B)	0.066 ^(B)	0.13 ^(B)	0.11 ^(B)	
Silver	µg/L	-	-	0.25	-	-	-	0.005	0.0093 ^(B)	0.0083 ^(B)	0.0089 ^(B)	0.0074 ^(B)	0.0072 ^(B)	0.007 ^(B)	0.0049	0.0046	
Strontium	µg/L	-	-	-	-	28	49	8.2	22 ^(B)	18 ^(B)	20 ^(B)	15 ^(B)	15 ^(B)	14 ^(B)	17 ^(B)	16 ^(B)	
Thallium	µg/L	-	-	0.8	-	0.41	0.8	0.005	0.012 ^(B)	0.01 ^(B)	0.011 ^(B)	0.0085 ^(B)	0.0081 ^(B)	0.0077 ^(B)	0.0066 ^(B)	0.0064 ^(B)	
Tin	µg/L	-	-	-	-	0.2	-	0.27	0.12	0.11	0.12	0.12	0.12	0.12	0.11	0.1	
Uranium	µg/L	-	33	15	20	7.5	15	0.043	0.24 ^(B)	0.18 ^(B)	0.22 ^(B)	0.13 ^(B)	0.12 ^(B)	0.1 ^(B)	0.62 ^(B)	0.54 ^(B)	
Vanadium	µg/L	-	-	-	-	3.5	6.0	0.25	1.1 ^(B)	0.92 ^(B)	1.1 ^(B)	0.7 ^(B)	0.63 ^(B)	0.58 ^(B)	0.38 ^(B)	0.36 ^(B)	
Zinc	µg/L	-	-	30	-	6.3	24	0.5	1.1 ^(B)	1.0 ^(B)	1.1 ^(B)	0.95 ^(B)	0.9 ^(B)	0.88 ^(B)	0.74 ^(B)	0.72 ^(B)	

Concentrations are higher than relevant water quality guidelines are indicated by superscripts. The COPCs are indicated by the bolded values

^(C) = concentration higher than the relevant chronic aquatic life guideline or beyond the recommended pH, DO or total alkalinity concentration range.

^(U) = concentration higher than the relevant drinking water guideline or beyond the recommended pH or DO concentration range.

^(T) = concentration higher than the relevant trigger meadowbank or beyond the recommended pH or DO concentration range.

^(I) = concentration higher than the relevant threshold or beyond the recommended pH or DO concentration range.

^(B) = concentration higher than the relevant baseline level or beyond the recommended pH or DO concentration range.

- = no guideline or data.

a) Site-specific Water Quality Objective (SSWQO) developed for the Whale Tail Project (Volume 6, Appendix 6-N).