

Appendix 7.6 Mine Groundwater Inflow and Quality

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Appendix 7.6-1 Underground Decline Inflow and Pumping Rates

Appendix 7.6-1
Groundwater Inflow and Pumping Rates from Underground Decline

Date	Time	Measured Pump Flow (sec/20 L)	Measured Pump Flow (L/min)	Pump Operation (hr/day)	Calculated Pump Flow (L/day)	Calculated Pump Flow (m³/day)	Comments
7/11/2005	12:02PM	64	19	15	16,928	17	
7/14/2005	9:01PM	61	20	15	17,705	18	
7/22/2004	7:57PM	23	51	15	46,154	46	
7/24/2005	9:47PM	23	53	15	47,368	47	
7/25/2005	10:04PM	24	50	15	45,000	45	
7/27/2005	10:00AM	28	42	15	38,028	38	
7/28/2005	5:15PM	28	43	15	39,130	39	See Note 1
7/29/2005	5:29PM	24	51	15	45,763	46	
8/1/2005	10:38PM	25	48	15	43,373	43	
8/6/2005	9:18PM	22	55	15	49,091	49	
8/9/2005	5:33PM	123	10	14	8,195	8	See Note 2
8/11/2005	11:00AM	9	129	14	108,387	108	
8/12/2005	8:37AM	26	46	14	38,769	39	
8/13/2005	2:52PM	11	107	14	89,600	90	
8/14/2005	8:34PM	10	120	14	100,800	101	
8/17/2005	2:15PM	10	121	14	101,808	102	
8/19/2005	11:20AM	12	97	14	81,396	81	
8/20/2005	10:00AM	11	108	14	90,745	91	
8/21/2005	10:35AM	11	105	14	88,200	88	

Notes:

- 1) Additional pumping of 36,000 L (150 L/minute x 4 hours) of rainwater from trench.
- 2) Pump at face turned off but electrical pump at underground sump on.
- 3) Pump flow measurements and operating times recorded by Yukon Zinc staff.

Appendix 7.6-2 Mine Baseline Groundwater Quality Sampling Results

Apendix 7.6-2
Mine Baseline Groundwater Quality Sampling Results

Sample Location/ Identification	Lynx	Wolverine	Wolverine	UG Portal Face	UG Portal Face	UG Portal Face	UG Portal Face	UG Portal Face	UG Portal Face	UG Portal Face	UG Portal Face	CCME – Aquatic Life
	PZ-A GW1	PZ-B GW1	PZ-B GW2 (Duplicate)									
Date Sampled	4/25/2005	4/21/2005	4/21/2005	6/16/2005	7/7/2005	7/11/2005	8/6/2005	8/11/2005	8/17/2005	8/27/2005	8/29/2005	
Sample Origin	Borehole	Borehole	Borehole	Decline at ~1343 m ASL	Decline at ~1340 m ASL	Decline at ~1338 m ASL	Decline at ~1327 m ASL	Decline at ~1325 m ASL	Decline at ~1322 m ASL	Decline at ~1316 m ASL	Decline at ~1314 m ASL	
Approximate Depth (m bgs)	150	108	108	4	7	9	20	22	25	31	33	
Physical Tests												
Conductivity (uS/cm)	152	145	151	389	354	-	344	352	350	328	-	-
Total Dissolved Solids	-	-	-	-	237	-	222	231	227	256	-	-
Hardness CaCO ₃	72.7	64.1	62.2	199	189	190	184	200	184	-	-	-
Alkalinity-Total CaCO ₃	54	63.7	63.4	108	121	-	-	-	-	110	-	-
pH	7.69	8.01	8.05	8.21	8.18	-	8.13	7.92	8.06	7.77	-	6.5 – 9.0
Total Suspended Solids	-	-	-	-	80.3	-	<3.0	12.4	7.4	425	-	-
Turbidity (NTU)	-	-	-	-	24.8	-	-	-	-	-	-	-
Dissolved Anions												
Bromide Br	<0.050	<0.050	<0.050	<0.050	-	-	<0.050	<0.050	<0.050	<0.050	-	-
Chloride Cl	1.14	<0.50	0.53	0.95	<0.50	-	<0.50	<0.50	<0.50	<0.50	-	-
Fluoride F	0.162	0.094	0.105	0.342	0.202	-	0.168	0.183	0.181	0.180	-	0.120 ¹
Sulphate SO ₄	22.2	11	11	103	74.6	-	69.6	68.2	66.7	68.8	-	-
Nutrients												
Ammonia Nitrogen* N	0.13	<0.0050	0.0067	0.134	0.059	0.039	0.032	-	0.103	0.475	-	1.04 ²
Nitrate Nitrogen N	0.085	0.0207	0.0138	0.0333	0.0072	<0.0050	<0.0050	<0.0050	0.0266	<0.0050	-	13
Nitrite Nitrogen N	<0.10	<0.10	<0.10	<0.10	0.0011	<0.0010	0.0036	<0.0010	0.0066	0.0011	-	0.06
Total Phosphate P	-	-	-	-	0.0765	-	0.0120	0.0165	0.0078	2.51	-	-
Dissolved Metals												
Aluminum D-Al	0.0407	0.0052	<0.0050	0.0194	0.0367	0.0112	<0.0050	<0.0050	0.0579	<0.20	<0.20	0.005 - 0.100
Antimony D-Sb	0.0028	0.00164	0.00051	0.0272	0.00115	0.00268	0.00059	<0.00050	<0.00050	<0.20	<0.20	-
Arsenic D-As	<0.00050	0.00053	0.00069	0.00053	<0.00050	0.00115	<0.00050	<0.00050	<0.00050	<0.20	<0.20	0.005
Barium D-Ba	0.111	0.061	0.058	0.035	0.025	<0.020	<0.020	0.021	0.032	0.048	0.028	-
Beryllium D-Be	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	-
Bismuth D-Bi	-	-	-	-	-	-	-	-	-	<0.20	<0.20	-
Boron D-B	<0.10	3.18	5.29	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-
Cadmium D-Cd	0.00118	<0.000050	<0.000050	<0.000050	<0.000050	0.000076	<0.000017	<0.000017	0.000079	<0.010	<0.010	0.000017
Calcium D-Ca	23.7	17.9	17.4	66.4	56.5	58.2	51.6	56.6	51.9	49.4	45.9	-
Chromium D-Cr	<0.0010	<0.0010	<0.0010	0.0017	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.010	<0.010	0.0010 ⁶ 0.0089 ⁷
Cobalt D-Co	0.00074	0.00052	0.0004	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.010	<0.010	0.05
Copper D-Cu	0.0165	0.0024	0.0029	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	<0.010	<0.010	0.002 – 0.004
Iron D-Fe	1.5	0.656	0.836	0.142	<0.030	0.032	0.433	<0.030	0.937	0.142	0.076	0.3
Lead D-Pb	0.00136	0.0108	0.0233	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00112	<0.050	<0.050	0.001 – 0.007
Lithium D-Li	0.008	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.010	-
Magnesium D-Mg	3.27	4.68	4.56	8.16	11.6	10.9	13.5	14.3	13.2	13.4	13.9	-
Manganese D-Mn	0.173	0.129	0.119	0.0606	0.0736	0.0528	0.0499	0.0282	0.0642	0.0618	0.0421	-
Mercury D-Hg	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.00010	<0.00010	-	0.000026
Molybdenum D-Mo	0.0017	0.0028	0.0022	0.0033	<0.0010	0.0019	<0.0010	<0.0010	<0.0010	<0.030	<0.030	0.073
Nickel D-Ni	0.0076	0.0046	0.0041	0.0018	0.0017	0.0019	<0.0010	<0.0010	<0.0010	<0.050	<0.050	0.025 – 0.150
Phosphorus D-P	-	-	-	-	-	-	-	-	-	<0.30	<0.30	-
Potassium D-K	2	<2.0	<2.0	4.4	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-
Selenium D-Se	0.0107	<0.0010	<0.0010	0.0017	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.20	<0.20	0.001
Silicon D-Si	-	-	-	-	-	-	-	-	-	4.55	4.91	-
Silver D-Ag	0.000029	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.010	<0.010	0.0001
Sodium D-Na	<2.0	7	10	12.7	<2.0	4.4	<2.0	<2.0	<2.0	<2.0	<2.0	-
Strontium D-Sr	-	-	-	-	-	-	-	-	-	0.465	0.473	-
Thallium D-Tl	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.20	<0.20	0.0008
Tin D-Sn	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.030	<0.030	-
Titanium D-Ti	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-
Uranium D-U	0.00028	0.0003	0.0002	0.0021	0.00120	0.0002	0.00139	0.00197	0.00124	0.00193	-	-
Vanadium D-V	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	-
Zinc D-Zn	0.211	0.0227	0.0176	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0193	0.0214	<0.0050	0.03

**Apendix 7.6-2
Mine Baseline Groundwater Quality Sampling Results**

Sample Location/ Identification	Lynx	Wolverine	Wolverine	UG Portal Face	UG Portal Face	UG Portal Face	UG Portal Face	UG Portal Face	UG Portal Face	UG Portal Face	UG Portal Face	CCME – Aquatic Life
	PZ-A GW1	PZ-B GW1	PZ-B GW2 (Duplicate)									
Date Sampled	4/25/2005	4/21/2005	4/21/2005	6/16/2005	7/7/2005	7/11/2005	8/6/2005	8/11/2005	8/17/2005	8/27/2005	8/29/2005	
Sample Origin	Borehole	Borehole	Borehole	Decline at ~1343 m ASL	Decline at ~1340 m ASL	Decline at ~1338 m ASL	Decline at ~1327 m ASL	Decline at ~1325 m ASL	Decline at ~1322 m ASL	Decline at ~1316 m ASL	Decline at ~1314 m ASL	
Approximate Depth (m bgs)	150	108	108	4	7	9	20	22	25	31	33	
Total Metals												
Aluminum T-Al	1.17	0.357	0.161	1.32	0.899	0.190	<0.0050	0.0495	0.0896	345	-	-
Antimony T-Sb	0.00583	0.00120	0.00115	0.0245	0.00126	0.00260	0.00059	<0.00050	<0.00050	<0.20	-	-
Arsenic T-As	0.00500	0.00167	0.00138	0.00104	0.00064	0.00119	<0.00050	<0.00050	<0.00050	<0.20	-	-
Barium T-Ba	0.274	0.139	0.112	0.086	0.047	0.026	0.023	0.036	0.037	11.2	-	-
Beryllium T-Be	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0336	-	-
Bismuth T-Bi	-	-	-	-	-	-	-	-	-	<0.20	-	-
Boron T-B	<0.10	2.99	3.72	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-
Cadmium T-Cd	0.00413	0.000088	0.000056	0.000225	0.000108	0.000084	<0.000017	0.000026	<0.000017	0.527	-	-
Calcium T-Ca	25.5	17.5	17.2	64.5	57.8	57.0	51.7	54.7	51.7	238	-	-
Chromium T-Cr	0.0152	0.0042	0.0039	0.0059	0.0015	0.0010	<0.0010	<0.0010	<0.0010	0.981	-	-
Cobalt T-Co	0.00282	0.00134	0.00137	0.00137	0.00121	0.00052	<0.00030	<0.00030	<0.00030	0.427	-	-
Copper T-Cu	0.319	0.0451	0.0491	0.0058	0.0039	<0.0010	<0.0010	<0.0010	<0.0010	4.61	-	-
Iron T-Fe	26.1	10.2	10.5	7.01	3.90	0.791	0.509	0.965	0.893	1100	-	-
Lead T-Pb	0.0639	0.265	0.391	0.00334	0.00131	0.00066	<0.00050	<0.00050	0.00075	5.03	-	-
Lithium T-Li	0.0160	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.342	-	-
Magnesium T-Mg	4.05	4.50	4.38	8.30	11.8	10.5	13.5	13.6	13.2	252	-	-
Manganese T-Mn	0.423	0.195	0.204	0.211	0.151	0.0659	0.0514	0.0671	0.0596	31.1	-	-
Mercury T-Hg	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.00010	<0.00010	-	-	-
Molybdenum T-Mo	0.0044	0.0022	0.0016	0.0039	<0.0010	0.0015	<0.0010	<0.0010	<0.0010	<0.030	-	-
Nickel T-Ni	0.0259	0.0098	0.0102	0.0093	0.0052	0.0029	<0.0010	<0.0010	<0.0010	1.54	-	-
Phosphorus T-P	-	-	-	-	-	-	-	-	-	14.5	-	-
Potassium T-K	<2.0	<2.0	<2.0	4.6	<2.0	<2.0	<2.0	<2.0	<2.0	36.9	-	-
Selenium T-Se	0.0107	<0.0010	<0.0010	0.0019	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.20	-	-
Silicon T-Si	-	-	-	-	-	-	-	-	-	151	-	-
Silver T-Ag	0.000487	0.000054	<0.000020	0.000066	0.000049	<0.000020	<0.000020	<0.000020	<0.000020	0.038	-	-
Sodium T-Na	<2.0	5.8	7.1	13.2	<2.0	2.5	<2.0	<2.0	<2.0	2.1	-	-
Strontium T-Sr	-	-	-	-	-	-	-	-	-	1.67	-	-
Thallium T-Tl	0.00028	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.20	-	-
Tin T-Sn	0.00079	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.030	-	-
Titanium T-Ti	0.038	<0.010	<0.010	0.014	0.019	<0.010	<0.010	<0.010	<0.010	11.1	-	-
Uranium T-U	0.00097	0.00046	0.00040	0.00277	0.00134	0.00141	0.00197	0.00187	0.00201	-	-	-
Vanadium T-V	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	1.19	-	-
Zinc T-Zn	0.780	0.209	0.249	0.125	0.0170	0.0083	<0.0050	0.0167	0.0164	42.1	-	-
Organic Parameters												
Total Organic Carbon	14.7	6.25	3.94	7.42	-	-	-	-	-	-	-	-
Dissolved Organic Carbon	-	-	-	-	0.65	0.89	0.99	-	<0.50	-	0.81	-

Notes:

"mbgs" refers to metres below ground surface.

"<" indicates result is less than the detection limit.

"italics" Exceeds CCME guidelines for the protection of aquatic life.

All results are expressed as milligrams per litre except where noted.

PZ-B GW2 is a blind duplicate of PZ-B GW1. Discussion of variances?

1 Guideline for inorganic fluoride.

2 Based on temperature of 10 degrees and a pH of 8.0.

3 Based on pH between 7.5 and 8.0.

4 Based on chloride <2 mg/L.

5 Based on hardness between 30 and 90 mg/L.

6 Standard for chromium (+6).

7 Standard for chromium (+3).

8 Based on hardness between 50 and 75 mg/L.

9 Based on hardness between 50 and 100 mg/L.

10 Based on hardness between 60 and 120 mg/L.

11 Based on hardness <100 mg/L.

12 Based on hardness <90 mg/L.