



Photo 7: Whale Tail Pit P3, looking south-southwest; water flowing from a fault or brittle structure (November 13, 2022).



Photo 8: Whale Tail Pit P3, looking south-southwest; water flowing from a fault or brittle structure (November 13, 2022).

ATTACHMENT E

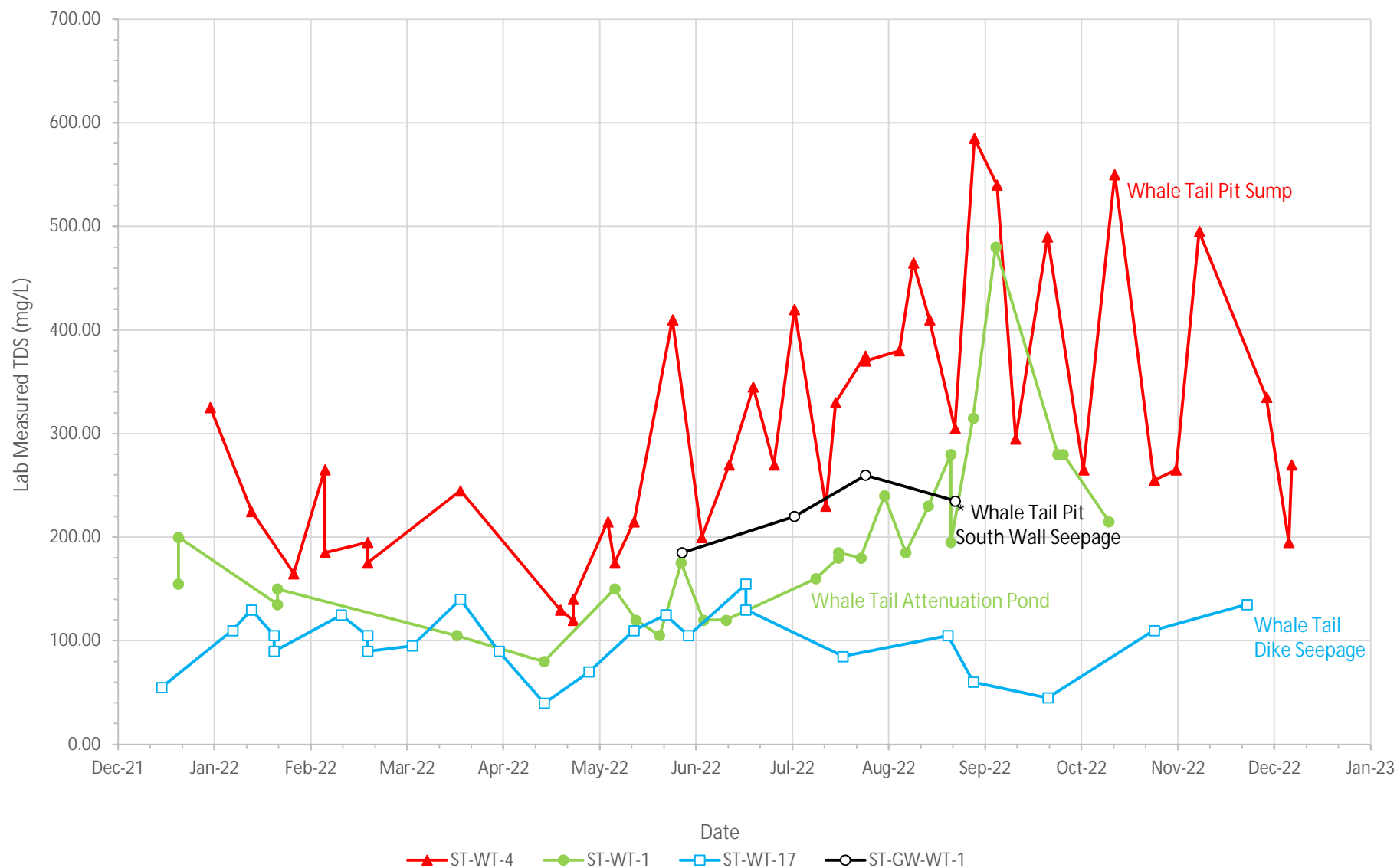
Supplemental 2022 Water Quality Data

		Sample date	13-06-2022	18-07-2022	09-08-2022	06-09-2022
		Sample name	ST-GW-WT-1	ST-GW-WT-1	ST-GW-WT-1	ST-GW-WT-1
		Sample type	N	N	N	N
		Depth range	-	-	-	-
Parameter	Unit					
WQ01- Field Measured						
Temperature	°C		3.6	2.4	9.9	4.7
pH	pH units		7.03	6.66	7.02	6.78
Conductivity	uS/cm		281	310	340	418
Dissolved oxygen	mg/L		11.22	10.55	10.84	10.29
Dissolved oxygen	%		104.9	98.9	111.2	104.5
Turbidity	NTU		3	0.92	10.7	1.87
Arsenic, field measure	mg/L		0.01	-	-	-
WQ02- Conventional Parameters						
pH	pH units		7.67	7.76	8.02	7.68
Turbidity	NTU		3.8	3.3	0.2	1.3
Specific conductivity	ms/cm		0.293	0.319	0.345	0.386
Hardness, as CaCO3	mg/L		107	123	133	131
Total alkalinity, as CaCO3	mg/L		49	51	55	56
Carbonate, as CaCO3	mg/L		< 1.0	< 1.0	< 1.0	< 1.0
Bicarbonate, as CaCO3	mg/L		49	50	54	55
TDS	mg/L		185	220	260	235
TSS	mg/L		12	2	4	2
Total organic carbon	mg/L		1.9	2.5	1.6	1.6
Dissolved organic carbon	mg/L		1.6	2.1	1.3	1.4
Sodium Adsorption Ratio (salinity in water)	-		-	-	-	0.30
WQ03- Major Ions						
Bromide	mg/L		-	-	-	< 1.0
Chloride	mg/L		32	36	43	39
Cyanide	mg/L		0.00291	0.00197	0.00169	0.0109
Cyanide (free)	mg/L		0.0058	0.0045	< 0.0020	-
Fluoride	mg/L		-	-	-	0.20
Silica	mg/L		9.7	11	10	9.4
Sulfate	mg/L		37	43	39	67
WQ04- Nutrients and Chlorophyll a						
Ammonia (NH3)	mg/L		0.52	0.50	0.090	1.9
Ammonia Nitrogen (as N)	mg/L		0.42	0.41	0.074	1.6
Nitrate (as N)	mg/L		< 0.10	< 0.10	0.28	0.13
Nitrite (as N)	mg/L		0.030	< 0.010	0.027	0.018
Nitrate + nitrite (as N)	mg/L		< 0.10	< 0.10	0.30	0.15
Total Kjeldahl nitrogen	mg/L		0.54	0.37	0.11	1.7
Total phosphorus	mg/L		0.020	0.015	< 0.0010	0.0011
Orthophosphate (P)	mg/L		< 0.010	< 0.010	< 0.010	< 0.010
WQ06- Total Metals						
Aluminum	mg/L		0.281	0.0067	0.0702	0.0283
Antimony	mg/L		< 0.00050	< 0.00050	< 0.00050	0.00103
Arsenic	mg/L		0.0262	0.0390	0.0166	0.00700
Barium	mg/L		0.0772	0.0820	0.100	0.0814
Beryllium	mg/L		< 0.00010	< 0.00010	< 0.00010	< 0.00010
Bismuth	mg/L		-	-	-	< 0.0010
Boron	mg/L		< 0.050	< 0.050	< 0.050	< 0.050
Cadmium	mg/L		< 0.000010	< 0.000010	< 0.000010	< 0.000010
Calcium (total)	mg/L		32.3	36.9	40.4	38.5
Chromium	mg/L		0.0083	< 0.0010	0.0023	0.0012
Cobalt	mg/L		-	-	-	0.00522
Copper	mg/L		0.00052	< 0.00050	< 0.00050	< 0.00050
Iron	mg/L		1.08	0.998	0.279	0.415
Lead	mg/L		0.00027	< 0.00020	< 0.00020	< 0.00020
Lithium	mg/L		0.0052	0.0052	0.0056	0.0082
Magnesium (total)	mg/L		6.29	7.45	7.73	8.38
Manganese	mg/L		0.238	0.241	0.144	0.291
Mercury	mg/L		< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L		0.0134	0.0123	0.0196	0.0199
Nickel	mg/L		0.0039	< 0.0010	0.0029	0.0063
Potassium (total)	mg/L		3.05	2.77	4.55	5.10
Selenium	mg/L		< 0.00010	< 0.00010	< 0.00010	0.00017
Silicon	mg/L		-	-	-	3.90
Silver	mg/L		< 0.000020	< 0.000020	< 0.000020	< 0.000020
Sodium (total)	mg/L		6.13	7.75	8.62	7.72
Strontium	mg/L		0.155	0.184	0.184	0.188
Sulphur	mg/L		-	-	-	19.9
Tellurium	mg/L		-	-	-	< 0.0010
Thallium	mg/L		0.000017	< 0.000010	0.000017	0.000015
Tin	mg/L		< 0.0050	< 0.0050	< 0.0050	< 0.0050
Titanium	mg/L		0.0215	< 0.0050	< 0.0050	< 0.0050
Uranium	mg/L		0.00029	0.00014	0.00041	0.00071



Project : AMQ
Location : ST-GW-WT-1
Date range : 06-13-2022 - 09-06-2022

		Sample date	13-06-2022	18-07-2022	09-08-2022	06-09-2022
		Sample name	ST-GW-WT-1	ST-GW-WT-1	ST-GW-WT-1	ST-GW-WT-1
		Sample type	N	N	N	N
		Depth range	-	-	-	-
Parameter	Unit					
Vanadium	mg/L		< 0.0050	< 0.0050	< 0.0050	< 0.0050
Zinc	mg/L		< 0.0050	< 0.0050	< 0.0050	< 0.0050
WQ07- Dissolved Metals						
Aluminum	mg/L		< 0.0030	0.0044	0.0039	< 0.0030
Antimony	mg/L		< 0.00050	< 0.00050	< 0.00050	0.00104
Arsenic	mg/L		0.0125	0.0341	0.0143	0.00273
Barium	mg/L		0.0720	0.0815	0.107	0.0822
Beryllium	mg/L		< 0.00010	< 0.00010	< 0.00010	< 0.00010
Bismuth	mg/L		-	-	-	< 0.0010
Boron	mg/L		< 0.050	< 0.050	< 0.050	< 0.050
Cadmium	mg/L		< 0.000010	< 0.000010	< 0.000010	< 0.000010
Calcium (Dissolved)	mg/L		-	-	-	38.3
Chromium	mg/L		< 0.0010	< 0.0010	0.0444	< 0.0010
Cobalt	mg/L		-	-	-	0.00536
Copper	mg/L		0.00359	< 0.00020	0.00176	0.00025
Iron	mg/L		0.0388	0.729	0.251	0.0826
Lead	mg/L		< 0.00020	< 0.00020	< 0.00020	< 0.00020
Lithium	mg/L		0.0048	0.0050	0.0050	0.0078
Magnesium (Dissolved)	mg/L		-	-	-	8.39
Manganese	mg/L		0.242	0.247	0.146	0.296
Mercury	mg/L		< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L		0.0135	0.0128	0.0212	0.0201
Nickel	mg/L		0.0041	< 0.0010	0.0233	0.0067
Potassium (Dissolved)	mg/L		-	-	-	5.15
Selenium	mg/L		0.00014	< 0.00010	< 0.00010	0.00020
Silicon	mg/L		-	-	-	3.79
Silver	mg/L		< 0.000020	< 0.000020	< 0.000020	< 0.000020
Sodium (Dissolved)	mg/L		-	-	-	7.73
Strontium	mg/L		0.152	0.193	0.221	0.190
Sulphur	mg/L		-	-	-	19.6
Tellurium	mg/L		-	-	-	< 0.0010
Thallium	mg/L		0.000021	< 0.000010	0.000014	0.000014
Tin	mg/L		< 0.0050	< 0.0050	< 0.0050	< 0.0050
Titanium	mg/L		< 0.0050	< 0.0050	< 0.0050	< 0.0050
Uranium	mg/L		0.00030	0.00014	0.00039	0.00070
Vanadium	mg/L		< 0.0050	< 0.0050	< 0.0050	< 0.0050
Zinc	mg/L		< 0.0050	< 0.0050	< 0.0050	< 0.0050
WQ08- Radionuclides						
Radium-226	Bq/l		-	-	-	0.047



Notes:

* Pit wall seepage samples (ST-GW-WT-1) could not be collected in January, February, March, April, May, October, November and December 2022 due to accessibility issues related to operations and/or safety concerns.

Water quality samples collected by Agnico Eagle and analysed by analytical laboratory Bureau Veritas. Duplicates water quality results also shown for ST-WT-1, SW-WT-4 and ST-WT-17.

CLIENT



AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION

CONSULTANT



YYYY-MM-DD	2023-02-07
PREPARED	NU
DESIGN	--
REVIEW	JL
APPROVED	JL

PROJECT

2022 GROUNDWATER MONITORING PROGRAM
WHALE TAIL MINE, NUNAVUT

TITLE

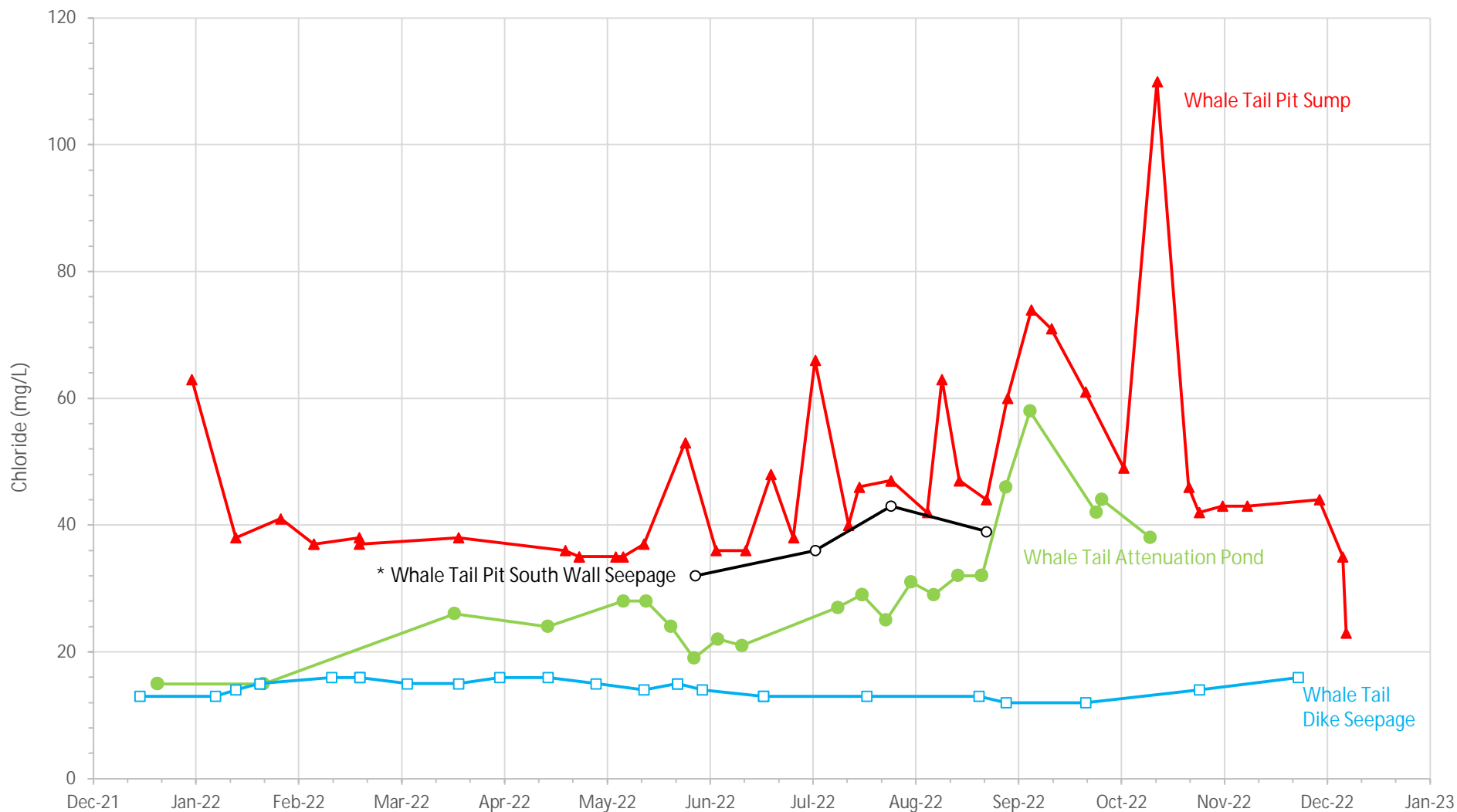
**TOTAL DISSOLVED SOLIDS (TDS) CONCENTRATIONS,
JANUARY TO DECEMBER 2022**

PROJECT No.
22525330

DOC.
548

Rev.
0

FIGURE
E-1



Notes:
Water quality samples collected by Agnico Eagle and analysed by analytical laboratory Bureau Veritas.
Duplicates water quality results also shown for ST-WT-1, SW-WT-4 and ST-WT-17.

CLIENT



AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION

CONSULTANT



YYYY-MM-DD	2023-02-07
PREPARED	NU
DESIGN	-
REVIEW	JL
APPROVED	JL

PROJECT

2022 GROUNDWATER MONITORING PROGRAM
WHALE TAIL MINE, NUNAVUT

TITLE

CHLORIDE CONCENTRATIONS, JANUARY TO DECEMBER 2022

PROJECT No.
22525330

DOC.
548

Rev.
0

FIGURE
E-2

ATTACHMENT F

2022 Whale Tail Groundwater Model Update

TECHNICAL MEMORANDUM

To: Marie-Pier Marcil, Eric Haley (Agnico Eagle) **Date:** Feb 22, 2023
Cc: Angie Arbaiza (Agnico Eagle)
From: Laura-Lee Findlater, Joseph Xu, Justin Bourne (Lorax) **Project #:** A634-8
Subject: 2022 Whale Tail Groundwater Model Update

1. Introduction

Agnico Eagle Mines Limited (Agnico Eagle) operates the Meadowbank Complex, a gold operation approximately 110 km north of Baker Lake by road in the Kivalliq District of Nunavut. Ore is mined from the Whale Tail site and processed at the Meadowbank mine site. The Whale Tail mine site is operated under Water Licence No. 2AM-WTP1830.

A numerical groundwater flow and transport model was initially developed in 2016 for Whale Tail Pit project assessment and permitting applications (Golder 2016). The model provided predictions of groundwater inflow and total dissolved solids (TDS) concentrations during operations and closure. The model was updated in 2019 to support the Expansion Project comprising a new underground development (Golder 2019a). The groundwater model update incorporated the revised mine plan and additional hydrogeological and thermal data and analyses compiled since 2016.

In accordance with the mine's Groundwater Monitoring Plan (GWMP), observed groundwater inflow rates are compared to model predictions in the Groundwater Management Monitoring Report appended to the Annual Report each year. In the most recently published Annual Report, WSP Golder (2022) indicates that 2021 winter inflow to the Whale Tail Pit was trending 50% higher than predictions (from Golder 2019a). This triggered a review and update of the groundwater model per the following conditions outlined in Section 5 of the GWMP:

- Groundwater inflow quantity to the mine, based on rolling monthly average of inflow over six consecutive months, is 20% higher than predicted groundwater inflow.

This memorandum briefly summarizes methods and results of the 2022 groundwater model update which comprised the following tasks:

- Rebuilding of the groundwater model to refine mesh in the area of interest and incorporate as-built mine extents;
- Calibration of the groundwater model to 2021 flow and water level data;
- Validation of the groundwater model; and,
- Predictions of future mine operations (2022-2025).

Areas where the 2022 groundwater model assumptions/parameterization differ from the 2019 groundwater model are discussed below. No transport simulations were undertaken under this mandate.

2. Numerical Methods

The 2022 groundwater model has been updated using the finite element modeling software FEFLOW (v.7.2) (DHI, 2022) which is the same modeling platform used to develop the 2019 groundwater model (Golder 2019a). The updated groundwater model domain covers similar lateral extents as the 2019 groundwater model except for a slight truncation of the model domain along the southwest margin. The model domain is divided into 35 layers of thickness ranging from 2 m to 80 m. The horizontal mesh size varies from approximately 12.5 m near the mine site to 25 m in more distal areas. Overall, the 2022 model has higher discretization than the 2019 model.

The 2022 groundwater model utilizes an updated permafrost distribution simulated by Golder which incorporated temperature data from more recent underground drillholes and expanded coverage into the northeast end of Kangislulik Lake (Golder 2021a) (Figure 1). The position of open and closed taliks did not change markedly between the 2021 thermal model and the 2019 version used to inform the 2019 groundwater model (Golder 2019b). The position of the closed talik extending into Whale Tail Pit was manually adjusted in the 2022 groundwater model to more accurately reflect temperature profiles measured from thermistors installed along the Whale Tail Pit south wall in 2020 (Figure 1).

Groundwater simulations were undertaken for current conditions and future operations. Mine extents for current operations (October 2021 and January 2022) were provided by Agnico Eagle. BBA Consultants provided end-of-year snapshots for 2022 through 2025 for future operations simulations. The model was run in steady-state mode for 2021 and 2022 simulations. For years 2023 through 2025, the model was run transiently to quantify groundwater released from aquifer storage to the underground.

For all 2021 through 2025 model runs, specified head boundary conditions of 155.5 m asl and 142 m asl were applied to the Whale Tail South Basin and Whale Tail Attenuation Pond, respectively. Of note, the top of the model domain has incorporated topographic data and Whale Tail Lake bathymetric data. The specific head boundary conditions were applied across multiple layers as dictated by lake depth. In contrast, the 2019 groundwater model assumed a uniform ground surface elevation of 148 m asl with specified head boundary conditions for the Whale Tail Lake and Attenuation Pond applied to the top layer only.



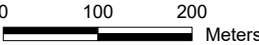
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

LEGEND

- Vibrating Wire Piezometer/Thermistor
- Westbay Installation
- Wall Seepage
- Sump (Flow and Water Quality)
- Drillhole Trace

Coordinate System: NAD 1983 UTM Zone 14N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

1:8,000



DATE SAVED: Jan 31, 2023

DRAWN BY: GM

REVIEWED: LF

VERSION: 1

CLIENT:



AGNICO EAGLE



PROJECT:

2022 Whale Tail
Groundwater Model
Update

TITLE:

Whale Tail Pit Monitoring Stations
Informing Groundwater Model

PROJECT #:

A634-8

FIGURE:

1

3. Model Calibration and Validation

The 2022 groundwater model calibration benefitted from operational data not available for the 2019 model. Mining of the Whale Tail Pit, combined with prior dewatering of the north Whale Tail Lake basin, has served as a large-scale hydraulic stress upon which hydraulic parameters can be estimated.

The calibration data include 2021 average winter pumping rates from the Whale Tail Pit sump (Table 1) and November 2021 groundwater pressures measured at Westbay AMQ16-262 (Figure 1, Table 2). The groundwater model was calibrated in a steady-state simulation using the October 2021 pit extents, noting that the underground mining extents were limited to frozen ground and not interacting with the groundwater system. Since pit extents for earlier snapshots in 2021 were not readily available, the flow target used to calibrate the model was an average of flows measured between January-March and October-December 2021. This equated to an average target flow rate of 2059 m³/d.

Table 1:
Volumes Pumped from the Whale Tail Pit Sump (2020-2021)

Month	Total Pumped Volume ¹ (m ³)	Average Daily Pumping Rate (m ³ /day)
Oct-20	57,836	1,866
Nov-20	44,744	1,491
Dec-20	57,945	1,869
Jan-21	62,721	2,023
Feb-21	43,703	1,561
Mar-21	71,320	2,301
Apr-21	48,680	1,623
May-21	49,484	1,596
Jun-21	126,825	4,228
Jul-21	121,399	3,916
Aug-21	135,056	4,357
Sep-21	124,540	4,151
Oct-21	74,035	2,388
Nov-21	75,828	2,528
Dec-21	48,161	1,554
Jan-March , Oct-Dec 2021 Average		2,059

Notes:

1. 2020 volumes from Golder (2021b), 2021 volumes from WSP Golder (2022).

Table 2:
Simulated and observed November 2021 freshwater elevations at Westbay AMQ16-626

Port	Port Position (m bgs)	Port Position (m asl)	Water Level Elevation (m asl)		Residual (Simulated-Observed) (m)
			Observed ¹	Simulated	
6*	257.9	-103.4	147.6	146.61	-0.99
5	289.7	-124.8	148.2	147.16	-1.04
4	326.3	-171.8	150.1	147.95	-2.15
3	356.2	-201.7	150.0	148.31	-1.69
2	411.7	-257.2	149.8	149.50	-0.30
1	455.9	-301.4	150.0	150.05	0.05

Notes:

mbgs = metres below ground surface (vertical down from surface); m asl = metres above sea level; -- = not measured

*Port 6 is suspected to be located within or near the cryopeg, which may influence measured hydraulic head (WSP Golder 2022).

1. Estimated freshwater hydraulic heads compute from November 2, 2021 pore pressure measurements. Reported in WSP Golder (2022).

Bedrock hydraulic conductivity was adjusted until the average pit inflow rate and Westbay water levels were reasonably approximated, based on modeler professional judgement. The 2022 calibrated hydraulic conductivity distribution is shown in Figure 2 with parameters listed in Table 3. Through the calibration process, it was found that the difference in water levels measured between Westbay ports supported the use of anisotropy in bedrock hydraulic conductivity values, hence the two lines representing horizontal (K_h) and vertical hydraulic conductivity (K_v) in Figure 2. Both lines represent the Base Case hydraulic conductivity distribution determined in the 2022 groundwater model update. The ratio of horizontal to vertical hydraulic conductivity ranges from 2.5-fold to 10-fold (Table 3). The 2019 groundwater model assumed isotropic hydraulic conductivity ($K_h=K_v$). The Upper Case hydraulic conductivity distribution from 2019 is also shown in Figure 2.

Both the 2019 and 2022 models simulate a trend of decreasing hydraulic conductivity with depth and do not differentiate between lithological units (*i.e.*, hydraulic conductivity for the layer is uniform across the model domain). In addition, neither model version simulates enhanced permeability zones as hydraulic testing information at the time of model development had not indicated widespread occurrence of such features.

The 2022 groundwater model simulates a 2021 Whale Tail Pit winter inflow rate of 2,058 m³/d, which essentially matches the observed average winter flow rate target of 2,059 m³/d (<0.05% difference). Simulated water levels at Westbay AMQ16-262 agree within 2.2 m of observed values. (Table 2). For this time period, flows reporting to the Whale Tail Pit sump are approximately 30% derived from the Whale Tail Attenuation Pond and 70% derived from moderately deep groundwater (10 m to approximately 200 m) draining the Whale Tail South

Basin. No groundwater originating from deeper bedrock (>200 m) is simulated to report to the Whale Tail Pit sump. The 2019 groundwater model predicted a higher proportion of flow (~80%) originating from the attenuation pond.

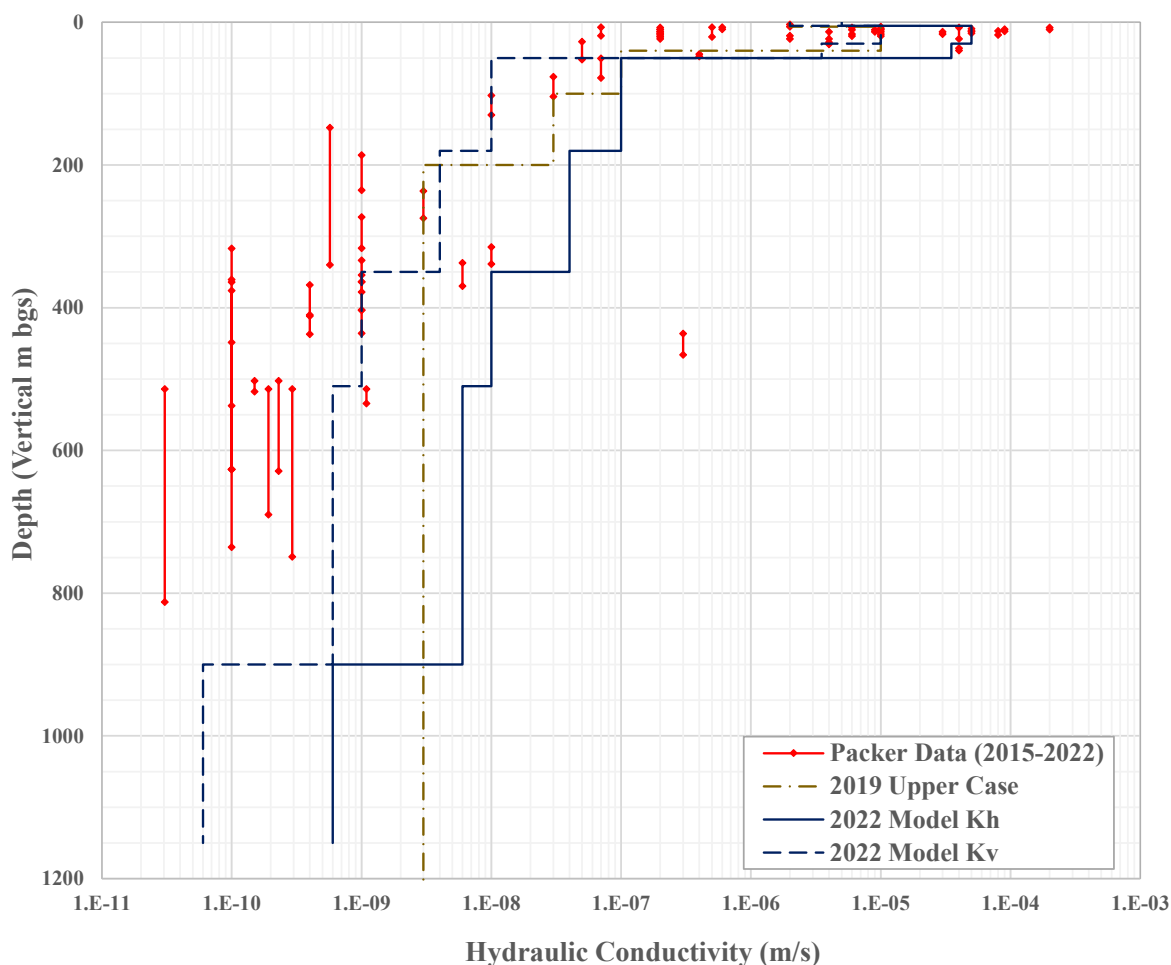


Figure 2: Simulated hydraulic conductivity distribution used in the 2019 and 2022 groundwater models.

4. Model Validation

The 2022 groundwater model was validated against four different data sources:

- i. Flow rates measured from a drillhole advanced near the Whale Tail Pit Seep #1 (ST-WT-GW-1) in November 2021;
- ii. January 2022 Whale Tail Pit sump flow rates;
- iii. Baseline water levels collected at Westbay AMQ16-262; and
- iv. August 2021 water levels collected from vibrating wire piezometers (VWPs) installed along the south wall of the Whale Tail Pit.

Table 3:
Calibrated hydraulic parameters from the 2022 groundwater model

Depth (mbgs)	2019 Model EA/Upper Case ¹	2022 Model				
	K (m/s)	K _h (m/s)	K _v (m/s)	K _h :K _v	Sy (-)	Ss (m ⁻¹)
2-6 (Overburden)	2.E-06	5E-06	2E-06	2.5	0.001	1E-04
6 – 30	1.E-05	5E-05	1E-05	5	0.01	1E-005
30 – 40	1.E-005	3.5E-05	3.5E-06	10	0.01	1E-05
40 – 50	1.E-07				0.01	1E-05
50 – 100	1.E-07	1E-07	1E-08	10	0.0006	1E-06
100 – 180	3.E-08				0.0006	1E-06
180 - 200	3.E-08	4E-08	4E-09	10	0.0006	1E-06
200 - 350	4.E-09				0.0006	1E-06
350 - 510	4.E-09	1E-08	1E-09	10	0.0006	1E-06
510 - 900		6E-09	6E-10	10	0.0006	1E-06
900 - 1150		6E-10	6E-11	10	0.0006	1E-06

Notes:

K= hydraulic conductivity, Sy = specific yield, Ss = specific storage

1. Per Golder (2019a)

4.1 ST-WT-GW-1 Drillhole Flow Rates

In an effort mitigate an ice wall which forms seasonally at the ST-WT-GW-1 seepage face, Agnico Eagle advanced an inclined borehole from the pit floor to concentrate the seepage. The borehole was drilled on October 21st, 2021, and flow rates measured on November 2nd and 8th, 2021 (Table 3, Figure 1). The drillhole was incorporated into the updated groundwater model and a steady state flow rate of 1,010 m³/d was simulated. The simulated value agrees within 10% observed values.

Table 4:
W hale Tail Pit South Wall Flowing Drillhole Data

Borehole ID		ST-WT-GW-1 (DH1)
Drilled Date		October 21, 2021
Northing	m	7,255,424.88
Easting	m	606,877.59
Collar Elevation	m asl	140.91
Azimuth/Dip	degrees	180/30
Length	m	58.30
Flow Rate Nov 2, 2021	m ³ /d	936
Flow Rate Nov 8, 2021	m ³ /d	1,080

4.2 January 2022 Pit Inflow Rates

The January 2022 Whale Tail Pit extents were incorporated into a steady-state run of the updated groundwater model. The model simulated 2,354 m³/d inflow to Whale Tail Pit, about 6% higher than the observed flow rate of 2,226 m³/d.

4.3 Baseline Water Levels

Baseline water levels were measured at Westbay AMQ16-262 in November 2018, prior to the onset of lake dewatering and mining activities (Table 4). The updated groundwater model was configured to simulate baseline conditions with Whale Tail Lake occupying its pre-mine limits at an elevation 153 m. Simulated and observed water level elevations for Westbay AMQ16-262 are provided in Table 4 and agree within 0.31 m of observed levels.

Table 5:
Simulated and observed baseline freshwater elevations at Westbay AMQ16-626

Port	Port Position (m bgs)	Port Position (m asl)	Water Level Elevation (m asl)		Residual (Simulated-Observed) (m)
			Observed ¹	Simulated	
6*	257.9	-103.4	154.0	153.69	-0.31
5	289.7	-124.8	--	153.64	N/A
4	326.3	-171.8	153.6	153.52	-0.08
3	356.2	-201.7	153.4	153.43	0.03
2	411.7	-257.2	152.9	152.93	0.03
1	455.9	-301.4	152.5	152.71	0.21

Notes:

mbgs = metres below ground surface (vertical down from surface); m asl = metres above sea level; -- = not measured

*Port 6 is suspected to be located within or near the cryopeg, which may influence measured hydraulic head (WSP Golder 2022).

1. Estimated freshwater hydraulic heads compute from November 9, 2018 pore pressure measurements. Reported in WSP Golder (2022).

4.4 Whale Tail Pit South Wall VWPs

A series of thermistor strings nested with vibrating wire piezometers (VWPs) were installed along the south wall of the Whale Tail Pit in 2020 (Figure 1). These instruments collected water level data between June 2020 and August 2021 (Table 6) and were decommissioned thereafter on account of pit expansion. The water level in most piezometers dropped by several meters over the period of record on account of mining of the Whale Tail Pit. The water levels in the piezometers track closely with that of the Whale Tail Attenuation Pond but also respond to blasting in the pit (WSP Golder 2022).

Table 6:
Simulated and observed water levels at Pit South Wall VWP

Sensor	Collar Co-ordinates (m UTM)		Collar El. (m asl)	Dip	Az.	Approx. Sensor Depth ¹ (v m bgs)	Sensor Elevation (m asl)	August 2022 Water Level Elevation	Simulated October 2022 Water Level Elevation (m asl)	Residual (Simulated- Observed) (m asl)
	Easting	Northing								
DH3_PZ	607,016	7,255,140	147.6	90	0	20.8	126.89	129.22	134.54	5.32
DH6_PZ	607,058	7,255,184	147.8	90	0	22.8	124.99	134.89	134.45	-0.44
DH10_PZA	607,142	7,255,272	150.7	90	0	22.2	128.50	136.34	135.82	-0.52
DH11_PZA	607,156	7,255,287	151.2	50	0	108.8	42.47	131.37	130.04	-1.33
DH11_PZB	607,156	7,255,287	151.2	50	0	91.9	59.32	134.17	130.33	-3.84
DH11_PZC	607,156	7,255,287	151.2	50	0	76.6	74.64	133.63	130.66	-2.97
DH11_PZD	607,156	7,255,287	151.2	50	0	14.6	136.69	136.98	136.19	-0.79
DH12_PZA	607,168	7,255,294	151.9	50	0	16.6	135.31	137.46	136.73	-0.73
DH12_PZB	607,168	7,255,294	151.9	50	0	14.6	137.38	137.48	136.76	-0.72
DH12_PZC	607,168	7,255,294	151.9	50	0	11.9	140.06	139.00	136.80	-2.20
DH13_PZA	n/a	n/a	145.4	90	0	103.2	40.80	128.00	120.14	-7.87
DH13_PZB	n/a	n/a	145.4	90	0	63.2	80.80	135.24	123.18	-12.06
DH14_PZA	n/a	n/a	130.8	90	0	79.5	53.50	109.41	97.10	-12.31
DH14_PZB	n/a	n/a	130.8	90	0	54.5	78.50	108.34	101.52	-6.82

Notes:

n/a = not available, v m bgs = vertical metres below existing ground surface, m asl = metres above sea level
Wells in red were used to adjust shallow permafrost depth in 2022 groundwater model.

Observed August 2021 and simulated October 2021 water levels for the VWPs are provided in Table 6. In comparing the simulated and observed water levels, it should be noted that the August measurements occur during a high flow period while the groundwater model simulates a low flow period. Thus, the comparison is not truly a model validation, rather it is an independent check that the model is reasonably approximating water levels in this area. The simulated water levels are predominantly lower than the observed values, which is to be expected given the disparate flow seasons represented.

5. Model Predictions (2022-2025)

Simulated Whale Tail Pit and underground dewatering rates for future operations are provided in Table 7 and Table 8, respectively. Upper case predictions from the 2019 groundwater model are shown for reference. Overall, groundwater inflows to Whale Tail Pit are predicted to stabilize in 2023 as pit expansion is limited to frozen ground. Conservatively, neither the 2019 nor 2022 groundwater models simulate permafrost aggradation into the Whale Tail Pit south wall during this time, although experience at Meadowbank suggests that this is a possibility.

The 2022 groundwater model predicts pit inflow rates that are essentially double the 2019 Upper Case estimates (Table 7). This is attributed to a variety of factors, including higher hydraulic conductivity values (particularly K_h) used in the 2022 model over the upper 200 m interval (Figure 2); differences in pit representation on account of a higher resolution mesh in the 2022 model, adjustments to the depth of the closed talik in the pit (Section 2) and differences lake boundary condition implementation between the two models (Section 2).

The proportion of pit inflow derived from the Whale Tail South Basin and Attenuation Pond also differs between the 2019 and 2022 models (Table 7). The 2022 model predicts that most flow to the pit (~65-67%) is derived from the Whale Tail South Basin, which the 2019 model predicted to contribute 15% or less flow to the pit. Of the total flow the 2022 model predicts to report to the pit, 10% of this travels from the Whale Tail South Basin to the Attenuation Pond then onto the pit. This flow component is included in the portion of flow originating from the Whale Tail South Basin (columns 5 and 6 of Table 7). Using 2025 as an example, of the 2,438 m³/d that is derived from the Whale Tail South Basin, 375 m³/d (10% of 3,750 m³/d) total pit inflow first reports to the Whale Tail Attenuation Pond, and then travels to the pit.

The underground dewatering rates predicted by 2022 groundwater model are generally lower than those predicted by the 2019 groundwater model (Table 8). This difference is attributed to a combination of factors, including lower vertical hydraulic conductivity and higher mesh refinement used in the 2022 model as well as modifications to the mine plan.

**Table 7:
Simulated Whale Tail Pit Inflow for Future Operations (2022-2025)**

Year	2022 Groundwater Model - Base Case					2019 Groundwater Model – Upper Case ²				
	Whale Tail Pit Inflow	Inflow from Whale Tail Attenuation Pond		Inflow From Whale Tail South Basin ³		Whale Tail Pit Inflow	Inflow from Whale Tail Attenuation Pond		Inflow From Whale Tail South Basin	
	(m ³ /d) ¹	%	m ³ /d	%	m ³ /d	m ³ /d	%	m ³ /d	%	m ³ /d
2022	3,070	33%	1,013	67%	2,057	1,360	81%	1,102	9%	122
2023	3,740	35%	1,309	65%	2,431	1,360	82%	1,115	12%	163
2024	3,750	35%	1,313	65%	2,438	1,350	82%	1,107	14%	189
2025	3,750	35%	1,313	65%	2,438	1,350	82%	1,107	15%	203

Notes:

1. Year 2022 simulated as a steady-state run using the end of year snapshot. All other years simulated in transient runs using end of year snapshots; inflow values represent and average of the year and include release from storage.
2. Per Golder (2019a).
3. Approximately 10% of the inflow to Whale Tail Pit travels from the Whale Tail South Basin to the Whale Tail Attenuation Pond and then on to the pit. This flow is included in the percentage/flow rate originating from the Whale Tail South Basin.

Table 8:
Simulated Whale Tail Underground Inflow for Future Operations (2022-2025)

Year	Underground Inflow (m ³ /d)	
	2022 Groundwater Model – Base Case ¹	2019 Groundwater Model – Upper Case ¹
2022	10	250
2023	30	420
2024	60	410
2025	290	340

Notes:

1. Year 2022 simulated as a steady-state run using the end of year snapshot. All other years simulated in transient runs using end of year snapshots; inflow values represent an average of the year and include release from storage.
2. Per Golder (2019a).

6. Summary

The Whale Tail groundwater model was updated in 2022 to improve model performance against observed winter inflows to the Whale Tail Pit. The model update comprised refinement of the model mesh and incorporation of an updated permafrost surface determined by the 2021 thermal model update and observations from thermistors installed along the pit the south wall in 2020. The model was calibrated to winter 2021 flows (January-March and October-December) and November 2021 Westbay water levels while simulating the October 2021 as-built mine extents. The model essentially reproduces observed flows (2,058 m³/d) and reasonably simulates Westbay water level data. The data supported the use of anisotropy in hydraulic conductivity, with Kh exceeding Kv by 2.5 to 10 times. In contrast, the 2019 groundwater model utilized isotropic hydraulic conductivity (Kh = Kv).

The 2022 model was validated against flow rates measured at a drillhole advanced near pit seep ST-WT-GW-1 in November 2021, January 2022 pit inflow rates (simulated with January 2022 pit extents) and baseline Westbay water levels. Model performance was also checked using open water season water levels at Whale Tail Pit south wall VWPs. The model provided acceptable results for all validation metrics.

The model predicts that open pit dewatering rates will stabilize around 3,750 m³/d in 2024 while underground inflow rates are predicted to climb from 10 m³/d in 2022 to 290 m³/d in 2025. Flow reporting to the Whale Tail Pit is mostly derived the Whale Tail South Basin with the Whale Tail Attenuation Pond providing the balance of the flow. This is a reversal from the 2019 groundwater model which found the majority of flow to Whale Tail Pit originated from the Whale Tail Attenuation Pond. The differences in flow predictions between the 2019 and 2022 models can be attributed to a number of factors including the updated hydraulic conductivity distribution, refinements in model mesh and mine plan implementation, closed talik position in Whale Tail Pit, and differences in implementation of lake boundary conditions.

7. Closure

This memorandum has been prepared Lorax Environmental Services Ltd. (Lorax) for the exclusive use of Agnico Eagle. If any clarification or additional information is required, please contact the undersigned.

Yours very truly,

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PERMIT TO PRACTICE	
LORAX ENVIRONMENTAL SERVICES LTD.	
Signature	
Date	<u>Feb 22, 2023</u>
PERMIT NUMBER: P 1487	
NT/NU Association of Professional Engineers and Geoscientists	

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