

ATTACHMENT B WATER MANAGEMENT PLAN



GOOSE MINE

WATER MANAGEMENT PLAN

V.6.0

DATE
June 2026



DOCUMENT HISTORY

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CONTENTS

ACRONYMS AND ABBREVIATIONS	VII
1. INTRODUCTION	1-1
2. SCOPE AND OBJECTIVES	2-1
2.1 Related Plans or Studies	2-2
3. REGULATORY REQUIREMENTS AND COMMITMENTS	3-1
4. ROLES AND RESPONSIBILITIES	4-1
5. PLANNING AND IMPLEMENTATION	5-1
5.1 Physical Setting	5-1
5.1.1 Topography	5-1
5.1.2 Seismicity	5-1
5.1.3 Permafrost and Groundwater	5-1
5.1.4 Climate and Hydrometric Characteristics	5-3
5.2 Mine Development Plan	5-6
5.2.1 Mine Waste Management Summary	5-14
5.2.2 Overburden Management	5-15
5.2.3 Waste Rock Management	5-15
5.2.4 Tailings Management	5-15
5.2.5 Ore Management	5-16
6. WATER MODELLING AND DESIGN CRITERIA	6-1
6.1 Water and Load Balance	6-1
6.2 Hydrotechnical Design Criteria	6-2
6.3 Hydrologic Model	6-5
6.3.1 Catchment Delineation	6-5
6.3.2 Approach	6-5
6.3.3 Return Period Selection	6-5
6.3.4 Interpretation of Results	6-9
6.4 Pond and Pump Sizing	6-9
6.5 Culvert Sizing	6-10
6.6 Diversion Berms and Containment Dams	6-11
7. WATER MANAGEMENT	7-1
7.1 Water Classification	7-1
7.2 Water Management Objectives	7-1
7.3 Water Supply	7-2
7.4 Water Treatment	7-4

7.4.1	Marine Laydown Area Desalination Plant	7-4
7.4.2	Goose Mine Water Treatment Plant	7-4
7.4.3	Sewage Treatment and Disposal	7-7
7.4.4	Potable Water Treatment	7-7
7.5	Effluent Criteria	7-7
7.6	Winter Ice Road	7-8
7.6.1	Winter Ice Road Construction and Use	7-8
8.	WATER MANAGEMENT PHASES	8-1
8.1	Phase 1: Construction	8-1
8.2	Phase 2: Operations	8-2
8.2.1	Lake Dewatering	8-5
8.2.2	Saline Water Pond	8-6
8.2.3	Open Pits and Other Contact Water	8-7
8.2.4	Water Treatment	8-7
8.2.5	Underground Facilities	8-8
8.2.6	Waste Rock Storage Areas	8-8
8.2.7	Ore Stockpile	8-8
8.2.8	Tailings Management Facilities	8-8
8.2.9	Explosives Manufacture and Storage	8-9
8.2.10	Marine Laydown Area	8-9
8.3	Phase 3: Closure	8-9
8.3.1	Culvert Closure	8-9
8.3.2	Berm Closure	8-10
8.3.3	Open Pit Closure	8-10
8.3.4	Underground Facility Closure	8-11
8.3.5	Waste Rock Storage Area Closure	8-12
8.3.6	Ore Stockpile Facility Closure	8-12
8.3.7	Tailings Management Facility Closure	8-12
8.3.8	Saline Water Pond Closure	8-12
8.3.9	Water Treatment Closure	8-13
8.3.10	Marine Laydown Area Closure	8-13
8.4	Phase 4: Post-Closure	8-13
8.5	Water Management – Care and Maintenance	8-14
9.	ENVIRONMENTAL PROTECTION MEASURES	9-1
9.1	General Objectives	9-1
9.2	Water Usage	9-1
9.3	Conservation Measures	9-2
9.4	General Site Runoff	9-3

9.4.1	Sediment and Erosion Control Measures	9-3
9.4.2	Saline Water Management	9-5
9.4.3	Mine Water Runoff Management	9-5
9.5	Acid Rock Drainage / Metal Leaching	9-6
9.6	Borrow Pit and Quarry Development	9-6
9.7	Dust Management	9-7
9.8	Ammonia Management Plan	9-7
10.	MONITORING PROGRAM	10-1
11.	ENVIRONMENTAL REPORTING	11-1
12.	ADAPTIVE MANAGEMENT	12-1
13.	REFERENCES	13-1

LIST OF TABLES

Table 3-1.	Applicable Legislation to Water Management in Nunavut	3-1
Table 5.1-1.	Goose Mine Groundwater Inflows	5-2
Table 5.1-2.	Summary of Mean Hydrologic Inputs	5-4
Table 5.1-3.	Summary of Frequency Analysis for Annual Runoff and Precipitation	5-4
Table 5.1-4.	Climate Change Projections	5-5
Table 5.2-1.	Mine Phase	5-6
Table 5.2-2.	Summary of Mine Schedule	5-8
Table 5.2-3.	Mine Development Sequence	5-8
Table 5.2-4.	Project Phases and Stages	5-13
Table 5.2-5.	Mine Waste Summary	5-14
Table 5.2-6.	Waste Rock Storage Area Summary Information	5-15
Table 6.2-1.	Hydrologic Design Criteria for Formulating Peak Flows	6-3
Table 6.2-2.	Pond (Event and Saline Water) Design Criteria	6-3
Table 6.2-3.	Containment Dams (Event and Saline Water Ponds) and Diversion Berm Design Criteria	6-3
Table 6.2-4.	Culvert Design Criteria	6-5
Table 6.3-1.	Return Period Selection Criteria	6-6
Table 6.3-2.	Level Of Risk For Each Item of Goose Infrastructure and Contributing Catchment Areas	6-7
Table 6.4-1.	Goose Property Pond Capacity and Pumping Rate Summary	6-9
Table 6.5-1.	Goose Mine Culvert Characteristics – Design Storm	6-11
Table 6.6-1.	Diversion and Containment Structure Summary	6-12
Table 7.3-1.	Water Supply Locations and Volumes	7-3
Table 7.3-2.	Milling Rates and Parameters	7-4

Table 7.4-1. Water Treatment Goose Mine	7-6
Table 8.1-1. Summary of Water Management Activities during Phase 1	8-1
Table 8.2-1. Summary of Water Management Activities during Phase 2 – Echo TF (Year 1-Q2 to Year 5-Q1)	8-2
Table 8.2-2. Summary of Water Management Activities during Phase 2 – Umwelt TF (Year 5-Q1 to Year 11-Q4)	8-4
Table 8.2-3. Summary of Water Management Activities during Phase 2 – Llama TF (Year 11-Q4 to 13 Q3)	8-5
Table 8.2-4. Back River Property Tailings Management System Storage Requirements	8-9
Table 8.3-1. Diversion and Containment Berm Breach Schedule	8-10
Table 11-1. Reporting Requirements	11-1
Table 12-1. Water Management Contingency Strategies	12-1

LIST OF FIGURES

Figure 1.1-1 Goose Project Overview	1-2
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LIST OF APPENDICES

Appendix A - Figures

- A-01. Goose Mine Area – Potential Development Area and Layout
 - A-02. Goose Mine Catchments
 - A-03. Phase 2: Operations (Year 1 to Year 13)
 - A-04. Phase 3: Closure (Year 14 to Year 20)
 - A-05. Phase 4: Post-Closure (Year 21+)
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Appendix B - Saline Water Management Plan

Appendix C - Water and Load Balance Report

ACRONYMS AND ABBREVIATIONS

AEMP	Aquatic Effects Management Plan
AN	Ammonium Nitrate
ANFO	Ammonium Nitrate Fuel Oil
ARD	acid rock drainage
B2Gold Nunavut	B2Gold Back River Corp.
CCME	Canadian Council of Ministers of the Environment
DFO	Department of Fisheries and Oceans Canada
ECCC	Environment and Climate Change Canada
FEIS	Final Environmental Impact Statement
LOM	Life of Mine
masl	metres above sea level
ML	Metal Leaching
MLA	Marine Laydown Area
MDMER	Metal and Diamond Mining Effluent Regulations
Mm ³	million cubic metres
WRMP	Waste Rock Management Plan
NH ₃	Ammonia
NIRB	Nunavut Impact Review Board
NPAG	Non-Potentially Acid Generating
NWB	Nunavut Water Board
PAG	Potentially Acid Generating
Project	Goose Project
Sabina	Sabina Gold & Silver Corp. (previous Licensee)
SOP	Standard Operating Procedure
STP	Sewage Treatment Plant
SSWQO	Site-Specific Water Quality Objectives
SWMP	Saline Water Management Plan
SWP	Saline Water Pond
tpd	tonnes per day

TF	Tailings Facility
TSS	Total Suspended Solids
WIR	Winter Ice Road
WL	Type A Water Licence (2AM-BRP1831 Amendment No. 1)
WMP	Water Management Plan or Plan
WRSA	Waste Rock Storage Area
WTP	Water Treatment Plant

1. INTRODUCTION

The Goose Project (Project) is a gold mine owned by B2Gold Back River Corp. (B2Gold Nunavut) within the West Kitikmeot region of southwestern Nunavut. It is situated approximately 400 kilometres (km) southwest of Cambridge Bay, 95 km southeast of the southern end of Bathurst Inlet, and 520 km northeast of Yellowknife, Northwest Territories (Figure 1.1-1). The Project is located predominantly within the Queen Maud Gulf Watershed (Nunavut Water Regulations, Schedule 4).

The Project is comprised of two main areas with an interconnecting approximately 160 km long winter ice road (WIR): Goose Mine (Figure A-01) and the Marine Laydown Area (MLA), which is situated along the western shore of southern Bathurst Inlet. The majority of annual resupply will be completed using the MLA and the WIR interconnecting these sites seasonally when needed.

The Water Management Plan (WMP or Plan) outlines the procedures necessary to manage the quality and quantity of water interacting with Project components throughout the Construction, Operations, Closure and Post-Closure phases of the Project.

The focus of the Plan is to control the inventory of mine water stored on site, and to enhance the separation of saline, contact, and non-contact water. Water management at the Goose Mine entails multiple, codependent components, which include water storage facilities and water conveyance facilities.

The WMP plan is a living document to be updated upon significant changes in related regulatory requirements, engineering design, management reviews, incident investigations, changes to facility operation or maintenance, and environmental monitoring results, best practice updates or other Project -specific protocols once Construction starts through to Project closure activities. Any updates will be filed with the Annual Report submitted under the Type A Water Licence (2AM-BRP1831 Amendment No. 1 Part B, Item 12, and Schedule B).

This update of the WMP focuses on the Goose Mine and on the operations, closure and post-closure phases of the Project. The Construction Phase is completed; information about activities that occurred during the Construction Phase are provided separately, as part of the annual reporting. No updates are required for the MLA. This update is provided to reflect changes in operations with changes in WRSAs and stockpiles, removal of TSF WRSA, updated geochemical criteria for some deposits, and minor adjustments to roles and responsibilities.

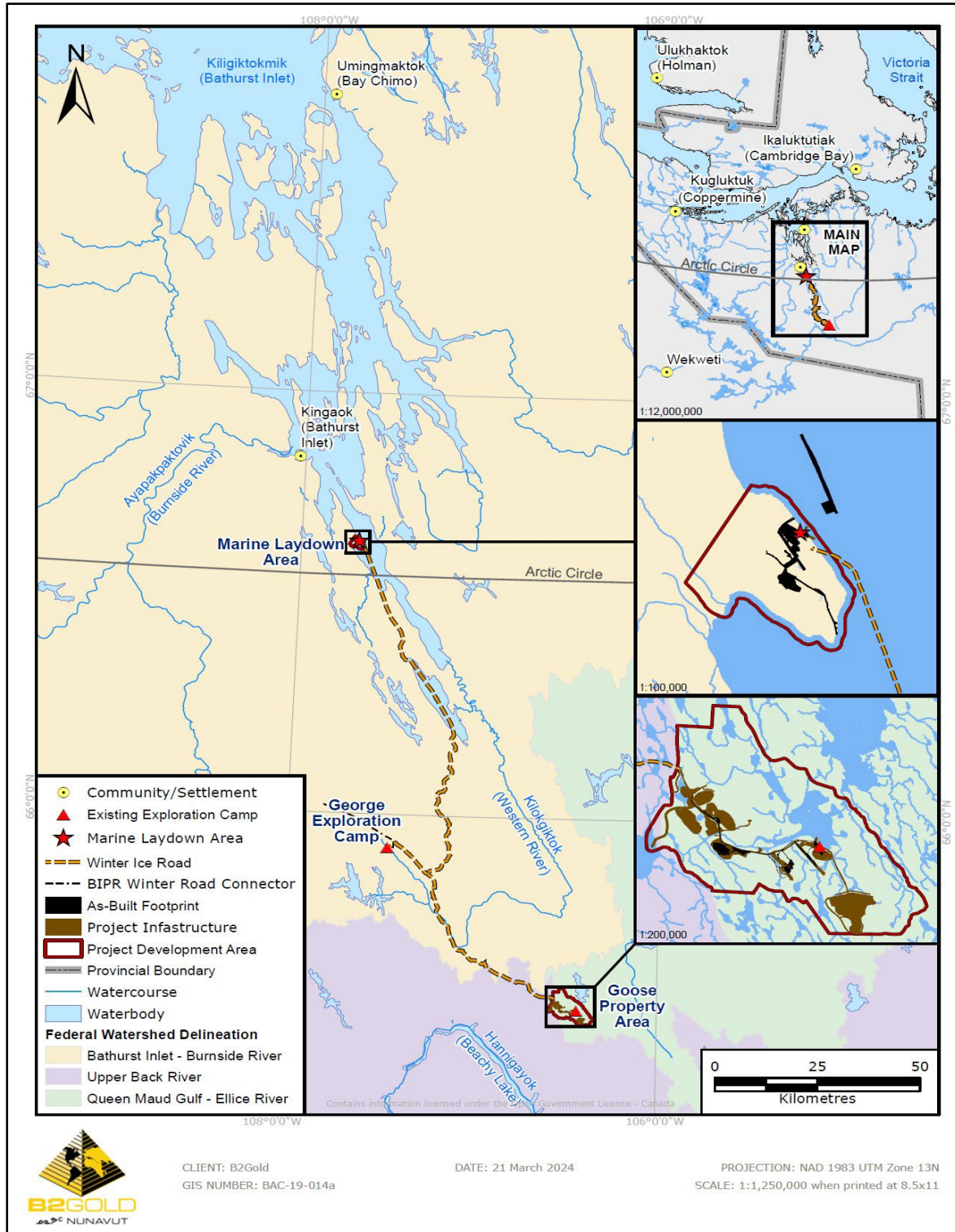


Figure 1.1-1 Goose Project Overview

2. SCOPE AND OBJECTIVES

The WMP is the key document that forms part of B2Gold Nunavut's overall Water Management Program for the Project. The Plan has been written to meet the requirements of the Type A Water Licence (2AM-BRP1831 Amendment No. 1 Part B, Item 13m and Item 13q).

This plan is divided into the following components:

- ◆ Applicable Legislation and Guidelines (Section 3);
- ◆ Roles and Responsibilities (Section 4);
- ◆ Planning and Implementation (Section 5);
- ◆ Water Modelling and Design Criteria (Section 6);
- ◆ Water Management (Section 7);
- ◆ Water Management Phases (Section 8);
- ◆ Environmental Protection Measures (Section 9);
- ◆ Monitoring Program (Section 10);
- ◆ Environmental Reporting (Section 11); and
- ◆ Adaptive Management (Section 12).

This Plan describes the procedures necessary to manage the quality and quantity of water interacting with Project components throughout the Construction, Operations, Closure, and Post-Closure phases of the mine. The Construction Phase is completed. A summary of the main activities that occurred during the Construction Phase are included in the WMP; additional information about the activities that occurred during the Construction Phase are provided separately, as part of the annual reporting.

The key water management objectives for the Project include:

- ◆ Minimizing the impact of mining activities on the aquatic environment surrounding the mining area to the greatest reasonable extent;
- ◆ Managing contact, non-contact, and saline water separately in order to minimize freshwater withdrawal from Goose Lake and Big Lake;
 - ◇ Non-contact water is directed away or around the Project site whenever possible;
 - ◇ Collecting and treating contact water as required to meet Site-Specific Water Quality Objectives (SSWQOs) in the receiving environment;
 - ◇ Saline water is kept separate from contact water;
- ◆ Ensuring settlement of suspended solids prior to discharge to the environment to meet SSWQOs;
- ◆ Monitoring and controlling water flows to reduce risk of erosion;
- ◆ Maintaining water management features in good working order;
- ◆ Documenting all monitoring and maintenance activities associated to water management structures
- ◆ Using BMPs, recognizing the unique constraints of each Project element;
- ◆ Providing a reliable water supply to the Process Plant; and

- ◆ Facilitating mining operations by managing inflows that occur as a result of groundwater or direct precipitation.

The WMP provides a description of the proposed strategies to achieve the objectives, including:

- ◆ A summary of the physical setting at the mine site;
- ◆ A description of mine development;
- ◆ A summary of water treatment and water supply locations and requirements throughout the life of mine (LOM), including sewage disposal facilities;
- ◆ Water quantity thresholds and water quality objectives and discharge criteria;
- ◆ A summary of water management infrastructure design;
- ◆ A description of the water management at the mine site during Construction, Operations, and Closure;
- ◆ A summary of the Water and Load Balance model;
- ◆ A summary of environmental protection measures;
- ◆ A description of the mine site water quality monitoring program; and
- ◆ An overview of mitigation and adaptive management.

The Plan is structured to help ensure that the Project is built as proposed; predicted adverse environmental effects are promptly mitigated; the applied mitigation measures are successful; and relevant regulatory requirements, commitments, laws and regulations are met. It outlines procedures for the reassessment, improvement, or reorientation of the Plan if determined at any point in the Project's Phases that it no longer meets the initial purpose or objective.

Results of monitoring identified in this Plan will be publicly reported and may feed into other ongoing regional initiatives or programs with relevant government organizations, or regional authorities.

2.1 RELATED PLANS OR STUDIES

The WMP should be read in conjunction with the following key Plans, which have been approved for implementation by the Nunavut Water Board (NWB) in accordance with the requirements of the Type A Water Licence (2AM-BRP1831 Amendment No. 1 Part B, Item 13, , and Item 14):

- ◆ Road Management Plan;
- ◆ Saline Water Management Plan;
- ◆ Borrow Pit and Quarry Management Plan;
- ◆ Ore Storage Management Plan;
- ◆ Waste Rock Management Plan;
- ◆ Tailings Management Plan;
- ◆ Landfill and Waste Management Plan;
- ◆ Landfarm Management Plan;
- ◆ Environmental Management and Protection Plan;

- ◆ Aquatic Effects Management Plan;
- ◆ Fish Offsetting Plan;
- ◆ Quality Assurance/Quality Control Plan; and
- ◆ Interim Closure and Reclamation Plan.

The following reports and studies have also informed the development of the WMP:

- ◆ Geochemical Characterization Report (Sabina 2017, Appendix E-3);
- ◆ Tailings Management System Design Report (Sabina 2017, Appendix F-4);
- ◆ Hydrogeological Characterization and Modelling (Sabina 2017, Appendix F-5);
- ◆ Geotechnical Design Parameters Report (Sabina 2017, Appendix F-2);
- ◆ Hydrology Report (Sabina 2015, Appendix V2-7B); and
- ◆ Hydrology Update Memo (SRK 2021).

3. REGULATORY REQUIREMENTS AND COMMITMENTS

The WMP has been prepared to comply with existing regulations and follow the applicable guidelines provided by the federal government and the government of Nunavut.

Specific legislation, regulations, and guidelines related to water management in Canada, and specifically within Nunavut, that B2Gold Nunavut will have to comply with are also summarized in Table 3-1.

The Project is also bound by the requirements of the Back River Project Certificate, No. 007, the Type A Water Licence, 2AM-BRP1831, and various permits, including the land use permits issued by the Kitikmeot Inuit Association for Inuit Owned Land.

The Plan development also considered the Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories issued by the MVLWB and AANDC (MVLWB/INAC/GNWT 2017).

Table 3-1. Applicable Legislation to Water Management in Nunavut

Acts	Regulations	Guidelines
Federal		
<i>Canadian Environmental Protection Act (CEPA; 1999)</i>		
<i>Nunavut Waters and Nunavut Surface Rights Tribunal Act (2002)</i>	Nunavut Water Regulations (2013)	
<i>Territorial Lands Act (1985)</i>	Territorial Land Use Regulations (CRC, c.1524) Northwest Territories and Nunavut Mining Regulations (CRC, c.1516)	Implications of Global Warming and the Precautionary Principle in Northern Mine Design and Closure (BGC 2003)
<i>Fisheries Act (R.S.C., 1985, c. F-14)</i>	Metal and Diamond Mining Effluent Regulations (SOR/2002-222)	Fisheries and Fish Habitat Protection Policy Statement (Department of Fisheries and Oceans Canada (DFO) 2019a) Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat Under the <i>Fisheries Act</i> (DFO 2019b) DFO Measures to Protect Fish and Fish Habitat (DFO 2019c), including those for the Timing Window to Conduct Projects In or Around Water, Sediment Control, and other applicable measures (DFO Standards and Codes of Practice (DFO 2020), including those for End-of-Pipe Fish Protection Screens for Small Water Intakes in Freshwater (also see DFO 1995), Culvert Maintenance, Temporary Stream Crossings, and other applicable standards Fisheries Productivity Investment Policy: A Proponent Guide to Offsetting (2013) Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut (DFO 2010)

Acts	Regulations	Guidelines
		<p>Freshwater Intake End-of-Pipe Fish Screen Guideline (DFO 1995)</p> <p>Method for Determining Available Winter Water Volumes for Small-Scale Projects (April 27, 2020, MVLWB)</p>
Territorial – Nunavut		
<i>Nunavut Environmental Protection Act (1988)</i>	Spill Contingency Planning and Reporting Regulations (R-068-93)	Government of Nunavut (GN) Environmental Guidelines where applicable (various): https://www.gov.nu.ca/environment/information/documents/195%2C184
<i>Public Health Act (2016); Amended 2018</i>	Public Water Supply Regulations (RRNWT. 1999, c.P-23) Public Sewerage Systems Regulations (RRNWT. 1999, c.P-22)	
<i>Mine Health and Safety Act (SNWT (Nu) 1994, c.25)</i>	Mine Health and Safety Regulations (R-125-95)	

4. ROLES AND RESPONSIBILITIES

The General Manager:

- ◆ Has ultimate responsibility for the site and success of the Plan;
- ◆ Approves all relevant policies and documents, auditing, action planning, and the verification process;
- ◆ Ensures safe operation, maintenance, and monitoring of water facilities; and
- ◆ Provides the resources needed for adequate implementation of WMP.

The Operation, geotechnical, EOR, or Engineering Manager:

- ◆ Conducts or directs periodic and documented inspections of embankments, water storage facilities (e.g., tailings storage facility or TSF), water treatment facility, dam inspections, lake dewatering activities, saline water storage, pit flooding, contact water management activities;
- ◆ Provides oversight and technical support of engineering matters and responsibilities;
- ◆ Conducts or directs periodic and documented inspections of embankment, water seepage and drainage systems;
- ◆ Ensures the influx of water into a mine is well understood and is regularly managed by standard operating procedures (SOPs) in operating mine;
- ◆ Reviews inspection results and provide recommendations for engineering improvements as needed;
- ◆ Holds the professional responsibility for the water management facility design; and
- ◆ Conducts dam safety inspection, dam safety reviews.

The Environmental Manager is:

- ◆ Responsible for the implementation of this Plan
- ◆ Ensures compliance with all permit requirements, regulations, policies, guidelines, including environmental concerns, internal and external reporting;
- ◆ Provides expertise for all decisions regarding the protection of the environment;
- ◆ Ensure appropriate monitoring and inspections are performed as required.

5. PLANNING AND IMPLEMENTATION

Water is an essential component of any mine. Understanding the existing physical setting and the overall mine development plan are essential components for the development of an effective WMP for the Project.

5.1 PHYSICAL SETTING

5.1.1 TOPOGRAPHY

The topography of the region is dominated by undulating landscapes of low relief that present in a sequence of smooth, non-linear rises and hollows, and elongated rises and valleys that repeat in a wavelike pattern. Slopes are generally uniform and range between 0 and 5%. Terrain elevation ranges between 300 and 700 metres above sea level (masl) in the region.

Uplands are typically covered by veneers of morainal materials deposited on Precambrian, sedimentary, metamorphic, or intrusive rocks. The thickness of overburden, defined as unconsolidated organic or mineral material, is generally small; thickness is greatest in areas of plains or gentle slopes where it can range from 1 to 37 m (average of 10.8 m). A number of distinct landforms also exist throughout the region, including small and medium sized kettle lakes, eskers, moraines, and boulder fields.

5.1.2 SEISMICITY

The Goose Project is located in an area of low seismic risk. The peak ground acceleration (PGA) for the area was estimated using seismic hazard calculator from the National Building Code of Canada's website (NRCC 2014a). A PGA value of 0.036g was accounted for in the design, which corresponds to the 1:2,475 year seismic event.

5.1.3 PERMAFROST AND GROUNDWATER

The Goose Mine is in the continuous permafrost region of the Canadian Arctic. While permafrost may extend more than 400 metres below the ground surface (mbgs), it is expected that the underground development will extend below the regional permafrost into unfrozen rock and soil. In addition, Llama Open Pit and Llama Underground will occur underneath lakes associated with open talik. Of the proposed developments, groundwater inflow during Operations is expected at Llama Open Pit, and the Llama, Umwelt, Goose Main, and Echo undergrounds. The other developments (i.e., Umwelt, Echo, and Goose Main open pits) are expected to be fully within permafrost and not intersect unfrozen groundwater. Groundwater may flow through the active layer (i.e., the top 1 to 3 m of overburden) during unfrozen months; however, the volume of flow is likely insignificant in comparison to surface water runoff.

As part of the Goose Project, a groundwater model was completed to predict potential groundwater inflows during mining at the Goose Mine; this model was employed in both the Final Environmental Impact Statement (FEIS) (Sabina 2015) and the Type A Water Licence Application (Sabina 2017). The last groundwater model update to predict revised groundwater inflows was completed in 2022 as part of the 2022 Modification Package (WSP Golder, 2022). For the purpose of the update of the WMP presented

herein, the predictions of groundwater inflows included in WSP Golder (2022) were scaled to reflect the updated mine schedule and depth of mine openings (Appendix C). It was also conservatively assumed that saline groundwater inflows to the underground workings will commence with the start of predevelopment activities. A summary of the estimated annual groundwater inflows is summarized in Table 5.1-1 for the developments extending into unfrozen rock.

Table 5.1-1. Goose Mine Groundwater Inflows

Mine Year*	Predicted Groundwater Inflow (m ³ /day)				
	Umwelt Underground	Llama Open Pit	Llama Underground	Echo Underground	Goose Main Underground
Y1	0	n/a	n/a	n/a	n/a
Y2	130	75	n/a	n/a	n/a
Y3	160	<50	n/a	n/a	n/a
Y4	160	<50	0	n/a	n/a
Y5	170	<50	120	n/a	n/a
Y6	170	<50	110	n/a	n/a
Y7	160		160	n/a	n/a
Y8	140		160	n/a	10
Y9	130		170	<50	50
Y10	130		160	<50	<50
Y11	130		160	<50	<50
Y12			160	<50	<50
Y13				<50	<50

Source: Scenario 1 in Appendix C

*Relationship between Mine Years and Calendar Years is provided in Table 5.2-1

Groundwater inflows predicted by the groundwater model and the scaling presented in Appendix C considered the uncertainty in the assumed hydraulic properties for the bedrock based on the field investigation program results. The Scenario 1 of the groundwater inflows was used as the base case for the Water and Load Balance Model (Appendix C). A sensitivity analysis of the Water and Load Balance Model was completed considering Scenario 2 groundwater inflows. The model sensitivity results showed that the proposed saline water management strategy would remain suitable for the Project. B2Gold Nunavut recognizes that there is a chance that groundwater flows in the mines may be dominated by specific fractures or features that are intercepted. This uncertainty exists for all mining projects and is never completely alleviated until structural geology and hydrogeology data is regularly collected from mining operations. The influx of water into a mine is a normal and well understood phenomenon and is regularly managed by SOPs in operating mines.

B2Gold Nunavut is aware of the uncertainty related to fault zones and will safely and appropriately manage groundwater inflows. Actions may include use of surface and underground exploration information to identify enhanced permeability that may be intercepted, advancing cover and probe drilling (i.e., exploration drainage holes), and interpretation of groundwater pressure and inflow data when high permeability formations are encountered.

5.1.4 CLIMATE AND HYDROMETRIC CHARACTERISTICS

Ongoing baseline meteorological and hydrometric programs have been initiated for the Back River Property since 2004. Detailed climate and hydrometric characteristics are presented in the Hydrology Report and the Meteorological Baseline Report (Sabina 2015, Appendix V27B and V4-3A; updated by SRK 2021).

The meteorological analysis for the Project relied on regional characterization using precipitation data from Environment and Climate Change Canada (ECCC), as Project-specific meteorological data did not present winter precipitation measurements. The analysis estimated an undercatch-adjusted mean annual precipitation of 427 mm and a 24-hour probable maximum precipitation of 285 mm (SRK 2021) for the Goose Mine.

Available site data was correlated to the corresponding monthly temperature data at the Lupin Meteorological Services of Canada station using a linear regression analysis. The resulting synthetic temperature record has an average annual temperature of -10°C. The minimum and maximum average monthly temperatures of -29°C and 11°C occur in January and July, respectively. Channel freeze-up generally occurs in late October or early November, and ice break-up generally occurs in May or early June (Sabina 2015, Appendix V4-3A).

Regional wind speed data are not available near the Project area, so mean monthly values were derived from the measured Goose Mine record. The mean annual wind speed on site is approximately 4.4 m/s, with the wind direction exhibiting strong seasonality. The maximum recorded wind gust during the monitoring period was measured at 30.7 m/s or 111 km/h (Sabina 2015, Appendix V4-3A).

The annual long-term lake evaporation (including sublimation) in the region is about 324 mm (Sabina 2015G); the strongest control on evaporation is net radiation. Annual actual evapotranspiration from the tundra is estimated to be approximately 199 mm.

Hydrometric data are currently being collected at 25 stations in the immediate Project area. Of these stations, the Propeller Lake inflow (i.e., PL-H2) and outflow (i.e., PL-H1) stations were deemed to be the most complete and representative for the Goose Mine. The 2011 monitoring year had the longest continuous record, including spring freshet and late summer flows, and was therefore used in the development of long-term synthetic flow series for the Goose Mine area (SRK 2021).

A regional analysis was conducted using 11 hydrometric stations from the Water Survey of Canada to determine regional hydrologic trends. The Baillie River near the Mouth Water Survey of Canada station (10RA002) was found to be the most comparable regional station to the 2011 local hydrometric station records (i.e., PL-H1 and PL-H2). The 25 years of flow data from Baillie River were corrected to the site, generating a continuous flow record for the Goose Mine. The resultant long-term mean annual runoff for the Project area is 149 mm (SRK 2021).

Table 5.1-2 presents the runoff and total precipitation distributions, evaporation, and air temperature characteristics of the Goose Mine. Table 5.1-3 presents the estimated average and extreme values of annual precipitation and runoff for various return periods at the mine site based on frequency analyses.

Table 5.1-2. Summary of Mean Hydrologic Inputs

Month	Runoff Distribution (%) ^(a)	Precipitation Distribution (%) ^(a)	Evaporation (b)		Air Temperature (°C) ^(b)
			Distribution (%)	Mean (mm)	
January	0.0	4.7	0.0	0	-28.7
February	0.0	4.1	0.0	0	-26.6
March	0.0	5.9	0.0	0.1	-25.1
April	0.0	6.2	1.8	5.9	-15.6
May	4.0	6.4	8.0	25.8	-5.1
June	50.5	9.8	29.8	96.4	5.4
July	19.0	12.5	33.1	107.0	11.4
August	8.7	18.2	20.3	65.8	9.3
September	11.9	11.4	6.9	22.4	2.3
October	5.5	9.7	0.1	0.4	-7.3
November	0.4	6.3	0.0	0	-18.4
December	0.0	4.8	0.0	0	-25.4
Annual	100.0	100.0	100.0	323.8	-10.3

(a) Source: SRK 2021 (precipitation and evaporation adjusted to fix rounding errors); (b) Source: Sabina 2020

Table 5.1-3. Summary of Frequency Analysis for Annual Runoff and Precipitation

Hydrological Condition	Return Period	Annual Runoff (mm) ^(a)	Annual Precipitation (mm) ^{(a) (b)}
Wet	200	269	653
	100	258	628
	50	245	601
	20	227	561
	10	210	527
	5	190	486
Average	-	149	427
Dry	5	112	341
	10	92	306
	20	75	278
	50	56	247
	100	44	227
	200	32	209

(a) SRK 2021; (b) An undercatch factor of 1.61 was applied to account for undercatch errors and precipitation measurements

5.1.4.1 CLIMATE CHANGE

Climate change projections over the Goose Project life were developed in SRK 2021. While most surface water management infrastructure will have a short lifespan and be breached as soon as their effective use has been fulfilled, the WRSAs and pits will remain in perpetuity.

The long-term mean air temperature, precipitation, and windspeed are expected to change over the lifespan of the Goose Project. The change relative to the baseline scenario is summarized in Table 5.1-4.

Table 5.1-4. Climate Change Projections

Period	Change with Respect to Baseline ^(a)		
	Mean Annual Air Temperature	Total Annual Precipitation	Wind Speed
2020s (2011 – 2040)	+2°C	+6%	+2%
2050s (2041 – 2070)	+3.7°C	+11%	+3%
2080s (2071 – 2100)	+5.3°C	+16%	+5%

(a) Source: SRK 2021 and SRK 2015b

5.1.4.2 HYDROLOGY

5.1.4.3 WATERBODY DESCRIPTION

The Goose Project is predominantly located within the Queen Maud Gulf Watershed with a small portion in the Back River Watershed (Nunavut Water Regulations, Schedule 4). The Goose Project is composed of two main areas, the Goose Mine area and the MLA. The WIR connects the two main areas in winter. The majority of proposed infrastructure at the Goose Mine area is within the Queen Maud Gulf Watershed, which flows northwest and enters the ocean on the west side of Bathurst Inlet. The Back River Watershed is located south of the Goose Mine and flows east eventually entering the Arctic Ocean south of Gjoa Haven. The MLA is a narrow strip of land that drains directly to the west side Bathurst Inlet. A list of all waterbodies within the Potential Development Area can be found in Final Environmental Impact Statement (FEIS) Volume 6, Chapter 3 (Sabina 2015).

The Goose Mine is divided by several smaller drainage areas each contributing to the larger, previously described watersheds. These drainage areas are shown on Figure A-02.

5.1.4.4 HYDROLOGICAL PROCESSES

The Goose Project lies within the continuous permafrost zone of the continental Canadian Arctic. The physiography of the region is dominated by vegetated tundra hillslopes with lakes and scattered wetlands. The presence of permafrost is hydrologically influential, as it has very low hydraulic conductivity, and thus acts as a barrier to deep groundwater recharge. This physical restriction tends to increase surface water runoff and decrease infiltration.

Compared to unfrozen regions, permafrost watersheds tend to have higher peak flows and lower baseflows (Kane 1997). Streamflow in the continuous permafrost zone is governed by the Arctic nival regime, where runoff is dominated by high, snowmelt-driven flows in spring (i.e., freshet). Following

freshet, streamflow declines throughout the summer and early fall, with the exception of rare and episodic rainfall-generated runoff (Church 1974).

Channel freeze-up typically occurs between late October and early November. In smaller drainage basins, stream channels typically freeze to their bottom, with zero flow occurring in winter. In larger catchments and larger lake outlets, depth, flow energy, and water turbulence may be sufficient to maintain streamflow and prevent downstream reaches from freezing completely.

Ice begins to form in October and is generally present on lakes until July. Ice depths are typically 1.5 to 2 m and reach maximum depth in February (Fish Offsetting Plan; Sabina 2019a). Shallow water bodies, including most streams in the Goose Project area, generally freeze to bottom over winter.

The maximum daily snowmelt rate was determined to be 28 mm/day (Sabina 2015, Appendix V2-7B). Snowmelt occurs in the month of May and June. The open water season typically starts in July and ends in September; however, there are variations in the length of the open water season year to year (Rescan 2014).

Return period unit peak flows were calculated using the index flood method, and a precipitation-based hydrology model with Soil Conservation Service unit hydrographs and curve numbers. Curve numbers were calibrated for each return period using two smaller regional gauging stations from the Ekati Diamond Mine (Sabina 2015, Appendix V2-7B).

5.2 MINE DEVELOPMENT PLAN

The total mine life of the Project from Construction to the end of Closure is estimated to be approximately 23 years, of which the 3 years of the Construction Phase have been completed. The mine life was divided into four phases as detailed in Table 5.2-1, that provides the mine schedule in both Mine Years and Calendar Years. Mine Years are used throughout the WMP to describe schedule of various events, for consistency with previous versions of the WMP.

Table 5.2-1. Mine Phase

Phase	Description	Start	End	Comment
1	Construction ^(a)	Y-3, (2022) Q1	Y1, (2025) Q2	<i>Site construction completed.</i>
2	Operations – Echo Tailings Facility (TF)	Y1 (2025), Q2	Y5 (2029), Q1	<i>Milling has begun in June 2025 (Y1); mining continues; tailings deposition in Echo TF</i>
	Operations – Umwelt TF	Y5 (2029), Q1	Y11 (2035), Q4	<i>Milling and mining continues; tailings deposition in Umwelt TF</i>
	Operations – Llama TF	Y11 (2035), Q4	Y13 (2037), Q3	<i>Milling continues; tailings deposition in Llama TF</i>
3	Closure	Y14 (2038), Q1 ^(b)	Y20 (2044), Q4	<i>Removal of site infrastructure; pit flooding; continued water treatment</i>
4	Post-Closure	Y21 (2045), Q1	+	<i>Site closed; performance monitoring</i>

(a) Mine Year sequence does not include Year 0; (b) Some closure activities may be initiated in Y13, Q4

The Construction Phase (at both Goose Mine and MLA) have been completed over approximately three years, and included pit excavation and construction of water management structures, as well as pads and roads. Major mine development infrastructure was constructed at both the Goose Mine and the MLA. The design of water management conveyance structures is described in detail in Section 6. For detailed activity descriptions of water management, refer to Section 8.

The major infrastructure at the Goose Mine will include the following:

- ◆ Goose Plant Site (Goose Camp Accommodations and Process Plant);
- ◆ Ore Stockpile;
- ◆ Open pits and underground mine workings (i.e., Echo, Umwelt, Llama, and Goose Main open pits and undergrounds);
- ◆ Tailings management facilities – In pit deposition (i.e., Former Echo Open Pit transitioned to Echo Tailings Facility or TF, former Umwelt Open Pit transitioned to Umwelt TF, and former Llama Open Pit transitioned to Llama TF);
- ◆ Permanent Waste Rock Storage Areas (i.e., Umwelt WRSA, Llama WRSA, Echo / Goose Main WRSA, Umwelt Overflow WRSA);
- ◆ Temporary Waste Rock Storage Stockpiles (i.e. Underground PAG Temporary Stockpile, Temporary NPAG Stockpile)
- ◆ Goose Property All-weather Airstrip;
- ◆ Saline Water Pond (SWP) (i.e., Umwelt Lake, once dewatered);
- ◆ Primary contact water storage pond (i.e., Primary Pond);
- ◆ Goose Main Reservoir (i.e., Goose Main Pit as meromictic lake);
- ◆ Event ponds (i.e., Llama WRSA Pond, Echo / Goose Main WRSA Pond, Plant Site Pond, Ore Stockpile Pond);
- ◆ Freshwater intake systems;
- ◆ Landfarm; and
- ◆ Haul and service roads.

The infrastructure at the MLA includes the following:

- ◆ Industrial area including camp and storage areas;
- ◆ Hazardous waste management area and landfarm;
- ◆ Desalination plant and associated water management infrastructure;
- ◆ Construction laydown area; and
- ◆ Fuel storage and offloading pad.

Four deposits; namely Echo, Umwelt, Llama, and Goose Main, are planned to be mined by both open pit and underground methods. The mining schedule for each deposit is described in Table 5.2-2, with some preproduction activities (e.g., open pit pre-stripping, underground ramp pre-development) occurring before these dates. A total of approximately 18.8 Mt of ore is planned to be mined, at an average milling rate of approximately 1,700 tonnes per day (tpd) in Year 1, increasing to 2,900 tpd in Year 2, 3,700 tpd in

Year 3 and 4,000 tpd starting in Year 4 and to the end of the Operations Phase (Year 13). Open pit mining has begun two years prior to Process Plant commissioning to generate an ore stockpile to feed the Process Plant. The Process Plant will then operate for the approximate 13 years of Operations. The schedule for each open pit and underground mine is provided in Table 5.2-2. Predevelopment activities for the underground mines will commence ahead of the schedule shown in Table 5.2-2.

Table 5.2-2. Summary of Mine Schedule

Mine Operation	Start	End
Open Pit Development		
Echo Open Pit	Started during Construction phase	Y1, Q2
Umwelt Open Pit	Started during Construction phase	Y4, Q1
Llama Open Pit	Y2, Q4	Y6, Q1
Goose Main Open Pit	Y5, Q1	Y9, Q2
Underground Development		
Umwelt Underground Mine	Started during Construction phase	Y11, Q4
Llama Underground Mine ^(a)	Y6, Q2	Y12, Q3
Goose Main Underground Mine ^(a)	Y10, Q2	Y13, Q3
Echo Underground Mine ^(a)	Y10, Q3	Y13, Q2

(a) Start time refers to beginning of mining; predevelopment activities starts generally 1-2 years before start of mining for each underground mine

The Closure Phase will occur over approximately seven years (i.e., Year 14 to Year 20). The majority of the mine workings and water management structures will be decommissioned throughout Closure. The Project will subsequently enter Post-Closure, which will consist mostly of monitoring and adaptive management.

The development sequence for mining and water management activities is summarized in Table 5.2-3, with activity initiations and completions listed, noting that activities continuing until completions are noted. The Construction Phase was completed in Year 1 and is included in Table 5.2-3 for reference only. The activities for Operations, Closure and Post-Closure Phase are also shown in Figures A-03 through A-05. Table 5.2.4 presents the Project phases and stages, along with tailings and waste rock disposal scheduling, and key water management activities for each of the deposits. For detailed descriptions of water management activities, refer to Section 8.

Table 5.2-3. Mine Development Sequence

Mine Year	Mine Development Sequence and Key Activities
-3 to -1	<p>Phase 1: Construction (completed)</p> <ul style="list-style-type: none"> Water intake infrastructure has been constructed at Goose Lake to meet the freshwater demands for domestic, construction, operation, and associated uses, including mining and milling activities.

Table 5.2-3. Mine Development Sequence

Mine Year	Mine Development Sequence and Key Activities
	<ul style="list-style-type: none"> • Construction of Goose Plant Site, Camp area and all-weather roads/crossings and pads. • The Plant Site Pond/Ore Stockpile Pond have been constructed at the Goose Plant Site. • Construction of Primary Pond. • Pre-stripping of Echo Open Pit and Umwelt Open Pit. • Echo Open Pit mining. Waste rock has been placed in Echo WRSA; contact water runoff from Echo WRSA has been collected locally, treated and discharged if necessary to the environment. • Contact water in the Ore Stockpile Pond is pumped to the Primary Pond (when available). • Umwelt Open Pit mining has been initiated, and inflows have been pumped to the Primary Pond. Waste rock has been placed in Umwelt WRSA; contact water runoff from Umwelt WRSA has been collected in Primary Pond. • Umwelt Underground mining has been initiated. • Contact water from the Plant Site has been collected in the area of Plant Site Pond, then released to the environment.
1	<p>Phase 2: Operations – Echo TF (Figure A03 for End of Operations Layout)</p> <ul style="list-style-type: none"> • Approximately 50% Llama Lake has been dewatered to Goose Lake directly (Goose Neck Channel) or pumped to Primary Pond to support initiation of mine operations. • Approximately 50% of Umwelt Lake has been dewatered to Goose Lake to allow for construction of the Saline Water Pond (SWP); water has been conveyed to Goose Lake or pumped to Primary Pond to support initiation of mine operation. • Mining of Echo Open Pit has been completed. • Waste rock placement in Echo WRSA has been completed. • Milling operation in the Process Plant begun (June of Year 1). • The former Echo Open Pit has transitioned into Echo Tailings Facility (Echo TF), an in-pit tailings facility. • Withdrawal from the Primary Pond to supply process plant. • Contact water from the Echo WRSA has been conveyed to Echo TF. • Primary Pond has been collecting contact water across the Goose Mine, including flows collected in the Ore Stockpile Pond, runoff from Umwelt WRSA, and inflows to Umwelt Open Pit. • Runoff from the Plant Site has been collected in the Plant Site Pond, which has been released to the tundra without treatment; if water has been found not suitable for discharge it has been pumped to Primary Pond. • Water from Goose Lake (through the intake structure) has been used to meet the freshwater demands for domestic, construction, operation, and associated uses, including mining and milling activities, as needed.
2	<p>Phase 2: Operations - Echo TF (Figure A03 for End of Operations Layout)</p> <ul style="list-style-type: none"> • Dewatering of Llama Lake will be completed. The majority of the water in Llama Lake will be discharged to Goose Lake after treatment to reduce TSS concentrations; a relatively small portion of the water in the lake will be stored in Umwelt Lake. • Dewatering of Umwelt Lake will be completed. The majority of the water in Umwelt Lake will be discharged to Goose Lake after treatment to reduce TSS concentrations; a relatively small portion of the water in the lake will be kept in the lake. • Mining of Llama Open Pit begins. • Engineered berms are proposed to be constructed around the rim of Echo Open Pit to expand storage capacity for tailings (information regarding these engineered berms will be provided through a subsequent application package) • Waste rock placement in Llama WRSA begins, but only in the area immediately upstream of the pit (Area LD2 in Figure A-2). • NPAG waste rock placement in the Temporary NPAG Stockpile begins. Water from the Temporary NPAG Stockpile is discharged to the environment (if water quality is suitable), or (if water quality is not suitable for discharge) collected locally and pumped to Primary Pond. • Contact water runoff from Llama WRSA is collected at the Llama Open Pit collection berm and pumped to Primary Pond.

Table 5.2-3. Mine Development Sequence

Mine Year	Mine Development Sequence and Key Activities
	<ul style="list-style-type: none"> Construction of the Stage 1 SWP engineered dam is completed. The SWP now occupies the former footprint of Umwelt Lake and Round Lake. Umwelt Underground groundwater inflows are managed locally, or pumped to Umwelt Lake (after lake dewatering is complete). Winter season reclaim from Echo TF begins; summer season supply to Process Plant from Primary Pond continues.
3	<p>Phase 2: Operations - Echo TF (Figure A03 for End of Operations Layout)</p> <ul style="list-style-type: none"> Waste rock placement in Umwelt WRSA is completed. Waste rock placement in Umwelt Overflow WRSA begins Construction of the Stage 2 SWP engineered dam is completed. Saline groundwater inflows in Umwelt Underground and Llama Open Pit are pumped to the SWP.
4	<p>Phase 2: Operations – Echo TF (Figure A03 for End of Operations Layout)</p> <ul style="list-style-type: none"> Mining of Umwelt Open Pit is completed. Predevelopment activities for Llama Underground begins Waste rock placement in Umwelt Overflow WRSA is completed. Placement of PAG waste rock material in the Temporary Underground PAG Stockpile begins Umwelt Open Pit transitions to Umwelt TF and starts to fill with site contact water within its catchment, for storage and use as reclaim in the Process Plant. Excess water from the closure of Echo TF is pumped to Umwelt TF. Construction of non-contact water diversion berm (i.e., Goose Main Pit Diversion Berm) south of Goose Main Pit to divert water away from the pit and into Goose Lake is completed. Construction of Echo/Goose Main WRSA Pond. Saline water collected in the SWP starts to be sent to a reverse osmosis (RO) unit for treatment, with brine effluent deposited back in the SWP and treated water pumped to Umwelt TF. Construction of Llama WRSA containment dams (i.e., Llama WRSA Containment Dam East and West), which create the Llama WRSA Pond.
5	<p>Phase 2: Operations – Umwelt TF (Figure A03 for End of Operations Layout)</p> <ul style="list-style-type: none"> Mining of Goose Main Open Pit begins. Waste rock placement in Echo/Goose Main WRSA begins, including closure cover of Echo TF. Tailings deposition transitions from Echo TF to Umwelt TF. Mill reclaim water during the non-open water season source transitions from Echo TF to Umwelt TF. Contact water from the Echo/Goose Main WRSA is collected in Echo/Goose Main WRSA Pond and pumped to the Primary Pond. Contact water from the Goose Open Pit is pumped to Umwelt TF along with excess water from the Primary Pond. Contact water collected in the Llama WRSA pond is pumped to Primary Pond.
6	<p>Phase 2: Operations – Umwelt TF (Figure A03 for End of Operations Layout)</p> <ul style="list-style-type: none"> Mining of Llama Open Pit is completed. Mining of Llama Underground begins Waste rock placement in Llama WRSA is completed. Waste rock placement in the Temporary NPAG Stockpile is complete; material in the stockpiles will be removed for use as construction material throughout the remainder of the Operations phase. Llama Open Pit transitions to Llama TF and starts to fill with site contact water within its catchment, including contact water from Llama WRSA. If needed to manage water level in SWP, saline water encountered in the underground mines and stored in SWP could also be pumped to Llama TF.

Table 5.2-3. Mine Development Sequence

Mine Year	Mine Development Sequence and Key Activities
7	<p>Phase 2: Operations – Umwelt TF (Figure A03 for End of Operations Layout)</p> <ul style="list-style-type: none"> • Activities continue as per Year 6.
8	<p>Phase 2: Operations – Umwelt TF (Figure A03 for End of Operations Layout)</p> <ul style="list-style-type: none"> • Predevelopment activities for Goose Main Underground and Echo Underground begin. • Waste rock deposition in the Temporary Underground PAG Stockpile is completed. Material in the stockpile will be removed for use as backfill of the underground mines throughout the remainder of the Operations phase
9	<p>Phase 2: Operations – Umwelt TF (Figure A03 for End of Operations Layout)</p> <ul style="list-style-type: none"> • Mining in Goose Main Open Pit is completed. • Waste rock placement in Echo/Goose Main WRSA is completed. • RO treatment ceases and water level in SWP is kept low through pumping to Goose Main Reservoir to provide contingency storage for saline water, as required. • Goose Main Reservoir begins to fill and becomes available to receive saline water. • Freshwater from Goose Lake or Big Lake may be pumped to Goose Main Reservoir to supporting the closure filling. • Saline groundwater encountered in Goose Underground, Umwelt Underground, Llama Underground and in SWP is pumped to Goose Main Reservoir. • SWP is pumped empty, and all saline sediments are removed and placed in Goose Main Reservoir.
10	<p>Phase 2: Operations – Umwelt TF (Figure A03 for End of Operations Layout)</p> <ul style="list-style-type: none"> • Mining of Goose Main Underground and Echo Underground begins. • Saline groundwater from Goose Main Underground and Echo Underground is pumped to the Goose Main Reservoir.
11	<p>Phase 2: Operations – Umwelt/Llama TF (Figure A03 for End of Operations Layout)</p> <ul style="list-style-type: none"> • Mining of Umwelt Underground is completed. • Umwelt Underground is also available for permanent storage of saline water, as required. • Tailings deposition transitions from Umwelt TF to Llama TF.
12	<p>Phase 2: Operations – Llama TF (Figure A03 for End of Operations Layout)</p> <ul style="list-style-type: none"> • Mining of Llama Underground is completed, and Llama Underground becomes available for permanent storage of saline water, as required. • Recirculation treatment of Umwelt TF begins. • Freshwater from Goose Lake or Big Lake may be pumped to Umwelt TF to supporting the closure filling.
13	<p>Phase 2: Operations – Llama TF (Figure A03 for End of Operations Layout)</p> <ul style="list-style-type: none"> • Mining of Goose Main Underground and Echo Underground is completed. • Tailings deposition in Llama TF is completed. • Milling operation in the Process Plant is completed and reclaim water is no longer needed. • Ore Stockpile Pond is decommissioned. • Closure activities may be initiated in Y13 Q4.
14-17	<p>Phase 3: Closure (Figure A04 for End of Closure Layout)</p> <ul style="list-style-type: none"> • Primary Pond discharges by gravity to the SWP (then called Umwelt Treatment Pond). • The Llama containment dams are breached, and Llama WRSA runoff flows by gravity to Llama TF. • Freshwater from Goose Lake or Big Lake is pumped to Umwelt TF, Llama TF and Goose Main Reservoir, as needed. • Recirculation treatment of Llama TF begins. • Llama TF is full and passively discharges to Umwelt Treatment Pond • Water in the Umwelt Treatment Pond is treated prior to discharge to the Environment (PN04). • Echo WRSA Pond is diverted to PN08. • Water from Rascal diversion berm is diverted to expedite filling of Goose Main Reservoir, as required.

Table 5.2-3. Mine Development Sequence

Mine Year	Mine Development Sequence and Key Activities
	<ul style="list-style-type: none"> • Freshwater from Goose Lake or Big Lake pumped to Goose Reservoir is stopped (Year 17). Goose Reservoir is full and passively discharges to the environment (PN05). • Goose reservoir outflows are treated, as required, before discharge to the environment
18-20	<p>Phase 3: Closure (Figure A04 for End of Closure Layout)</p> <ul style="list-style-type: none"> • Recirculation treatment is complete in Umwelt and Llama TF. • Umwelt TF is full and discharge by gravity to Umwelt Treatment Pond. • Water in the Umwelt Treatment Pond is treated prior to discharge to the Environment (PN04). • All remaining water management structures are decommissioned.
21+	<p>Phase 4: Post-Closure (Figure A05 for Post-Closure Layout)</p> <ul style="list-style-type: none"> • Treatment stops • Final decommissioning, including water treatment plants • Monitoring to ensure compliance with regulatory requirements

Note: In Italic activities completed at the time of preparation of this WMP

5.2.1 MINE WASTE MANAGEMENT SUMMARY

This subsection provides a summary of the mine waste management plans. Detailed plans regarding the management of tailings, overburden, and waste rock are presented in the Tailings Management Plan or TMP and the Waste Rock Management Plan or WRMP (2AM-BRP1831 Amendment No. 1 Part F, Item 1).

Table 5.2-5 presents a summary of the estimated tonnages of waste materials that will be produced by the Project. The table also indicates the quantities of waste materials that will be deposited in each waste storage facility, or if the material will be used for another purpose. There are four WRSAs: Umwelt WRSA, Llama WRSA, Echo / Goose Main WRSA and Umwelt Overflow WRSA. The Echo WRSA is located near the Echo Open Pit, and it is renamed the Echo/Goose Main WRSA once mining of Goose Main Open Pit begins and waste rock from this open pit is placed near in the WRSA near the Echo Open Pit.

Two stockpiles will also be constructed near the Primary Pond. The Temporary NPAG Stockpile will be used to temporarily store NPAG waste rock material, that will later be used as construction material throughout the Goose Mine. The Temporary Underground PAG Stockpile will be used to temporarily store PAG waste rock material from Llama Underground; this material will be later removed and used for backfilling Llama Underground.

Overburden and waste rock material removed during mining of Echo Pit was placed in Echo Overburden Stockpile and Echo WRSA, respectively. Details on the material tonnages and volumes removed can be found in the annual reporting.

Table 5.2-5. Mine Waste Summary

Waste Type	Estimated Quantities (Mt)	Source Area and Destination
Overburden	5.3	0.1 Removed from the Umwelt Open Pit and stored in Umwelt Overburden Stockpile.
		1.3 Removed from the Llama Open Pit and stored in the Llama Overburden Stockpile.
		3.9 Removed from the Goose Main Open Pit and stored in a stockpile location to be confirmed.
Waste Rock	100.3	23.2 Removed from the Umwelt Open Pit and stored in Umwelt WRSA.
		2.8 Removed from the Umwelt Open Pit and stored in Umwelt Overflow WRSA.
		29.2 Removed from the Llama Open Pit and stored in the Llama WRSA.
		45.1 Removed from the Goose Main Open Pit and stored in the Echo / Goose Main WRSA.
Tailings	18.8	4.5 Stored in the Echo TF.
		9.9 Stored in the Umwelt TF.
		4.4 Stored in the Llama TF.

5.2.2 OVERBURDEN MANAGEMENT

Overburden will be removed from the surface footprint of the four open pits (quantities as shown in Table 5.2-5) and placed in dedicated stockpiles separately at the Goose Mine or co-disposed with waste rock in the WRSAs. Depending on the physical characteristics of the overburden material, a portion may be used for the construction of site infrastructure, kept for future revegetation studies/efforts, or used for WRSA cover material. Refer to the WRMP (2AM-BRP1831 Amendment No. 1 Part F, Item 1) for more details on overburden.

5.2.3 WASTE ROCK MANAGEMENT

A summary of the location and surface areas of each WRSA is included in Table 5.2-6. Details regarding approximate final waste rock material quantities and source locations are shown in Table 5.2-5. Refer to the WRMP (2AM-BRP1831 Amendment No. 1 Part F, Item 1) for more details on waste rock.

Table 5.2-6. Waste Rock Storage Area Summary Information

Facility	Approximate Location	Surface Area (ha)
Llama WRSA	North of the Llama Open Pit	59
Umwelt WRSA	East of the Umwelt Open Pit	38
Umwelt Overflow WRSA	Northwest of the Umwelt Open Pit	13
Echo WRSA	Southeast of the Echo Open Pit	28
Echo/Goose Main WRSA	Previously Echo WRSA, covering Echo Open Pit	63

5.2.4 TAILINGS MANAGEMENT

Approximately 18.8 Mt of tailings will be produced over the 13-year of Operations Phase. All tailings will be deposited as slurry within open pits to create TFs. Initially, tailings will be deposited in the Echo Open Pit (then called Echo TF), then transition to Umwelt Open Pit and Llama Open Pit once mining operations have ceased in each location (called Umwelt TF and Llama TF, respectively). The Operations Phase is described in three informal stages according to the tailings storage and water management plans, as follows:

- ◆ Echo TF – For the first four years of Operations (i.e., Years 1 to 5), the mined-out Echo Open Pit will be used for tailings deposition;
- ◆ Umwelt TF – From Years 5 to 11, the mined-out Umwelt Open Pit will be used for tailings deposition; and
- ◆ Llama TF – From Year 11 onward, tailings will be disposed in the mined-out Llama Open Pit.

The Echo TF will be covered with waste rock material once tailings deposition is complete. Water covers with a minimum water depth of 5 m will be used for closure of the Umwelt TF and Llama TF.

Refer to the Tailings Management Plan (2AM-BRP1831 Amendment No. 1 Part F, Item 1) for further tailings management details.

5.2.5 ORE MANAGEMENT

There will be one main Ore Stockpile at the Goose Mine located southeast of the Process Plant, and additional temporary stockpiles at the underground laydown's areas (Figure A-01). The Ore Stockpile will contain three sub-stockpiles: low-grade, mid-grade, and high-grade ore. Ore will be processed during the Operations Phase only, and runoff from the Ore Stockpile will be collected in the Ore Stockpile Pond and managed as site contact water. Refer to the Ore Storage Management Plan (2AM-BRP1831 Amendment No. 1 Part F, Item 1) for more details.

6. WATER MODELLING AND DESIGN CRITERIA

The focus of water management is to control the inventory of mine water stored on site, and to enhance the separation of saline, contact, and non-contact water. Water management at the Goose Mine entails multiple, codependent components, which include water storage facilities and water conveyance facilities. Water is stored using ponds (short-term storage) and reservoirs (long-term storage). Ponds are structures with a finite operational life and will be fully decommissioned at Closure once no longer required.

The ponds on site are a combination of event water ponds and short-term (i.e., few years) non-event water ponds. Event ponds are sized with retention capacity for specific design storms and are normally empty or will hold only a nominal amount of water. The non-event ponds on site consist of the SWP for saline water, and the Primary Pond for contact water; these ponds have defined storage capacity. The SWP will remain operational as a storage facility until the transfer of saline water to Goose Main Reservoir is completed. The Primary Pond will assist with the Process Plant start-up as a water source, capture contact water, and provide reclaim water to the Process Plant during Operations phase.

Long-term (i.e., permanent) water storage facilities are denoted as reservoirs, and include the three pit lakes (i.e., Llama, Umwelt, and Goose Main). Note the three pits are also considered tailings facilities as Llama TF and Umwelt TF will permanently hold tailings as well as act as long-term water storage, and Echo TF will permanently hold tailings.

Sumps in each of the open pits will be used to collect water during active mining, which may later be conveyed to an alternative reservoir via pipeline in accordance with the WMP.

Diversions are engineered structures that maintain separation between contact and non-contact water. These structures are constructed for the Operations phases of the Goose Project and are completely decommissioned during Closure.

6.1 WATER AND LOAD BALANCE

The Water and Load Balance model (the Model) was used as a tool to analyze water management options and confirm that the selected water management strategy meets the water management objectives during the life of the Project (the Water and Load Balance Report is attached as Appendix C).

The Model results showed that there is sufficient capacity on site to store tailings, contact water, and saline water for the Project life. The volume of water collected was also confirmed to be adequate to support the water demands for the Process Plant when supplemented by freshwater from Goose Lake and Big Lake while staying within their maximum consumption limits. Water treatment is expected to be required during the operations phase (not at mine start up) to manage saline water inventory before final repository location (Goose Main Reservoir) becomes available. With the support of treatment during late Operations and Closure, concentrations in discharge from the mine site to Goose Lake are predicted to be below Metal and Diamond Mining Effluent Regulations discharge limits.

The Model for the Project was developed using the GoldSim® software package (version 14) (GoldSim Technology Group 2024). The model was run on a daily time step for Year 1 to Year 41 of the Project. This run length was chosen as it allows the model to run until conditions in the pits and predictions nodes approach steady-state conditions. The model was used to:

- ◆ Support sizing of the non-event ponds and reservoirs;
- ◆ Confirm availability of reclaim water to supply process plant throughout the Operations phase;
- ◆ Confirm Goose Mine freshwater requirements are met while remaining within the withdrawal limits from Goose Lake and Big Lake; and
- ◆ Identify water treatment requirements throughout the Operations and Closure phases to meet water quality guidelines downstream of the discharge points from the Goose mine.

The Water and Load Balance Report (Appendix C) includes a detailed description of the model assumptions, framework, inputs and results, and an overview of the model limitations and sensitivity analysis. This report also provides details on the main mine components relevant to the water quality predictions, including the mine plan, open pits, underground mines, WRSAs, Ore Stockpile, and water reservoirs. Flowsheets for each phase of the Project, including Operations and Closure, are presented in Appendix C. The flowsheets depict the water management strategy that will be implemented for the Project, cumulative volumes, and change in storage over the various phases of the mine life. For additional information, refer to the Water and Load Balance Report (Appendix C).

The Model will be reviewed periodically to reflect changes in operations and/or technology and results will be submitted for review with the Annual Report in accordance with the Type A Water Licence (2AM-BRP1831 Amendment No. 1 Part E, Item 16 and Part B, Item 2) as an appendix to the approved WMP.

6.2 HYDROTECHNICAL DESIGN CRITERIA

The hydrotechnical design criteria for the Project include a combination of best management practices (BMPs) and specified criteria based on engineering and operational judgement and/or constructability considerations. Four classes of design criteria were considered: Table 6.2-1 presents the hydrologic design criteria used to formulate peak flows; Table 6.2-2 presents the design criteria used for sizing of pond infrastructure; Table 6.2-3 presents containment dam and diversion berm design criteria, and Table 6.2-4 presents culvert design criteria.

Table 6.2-1. Hydrologic Design Criteria for Formulating Peak Flows

Item	Value	Unit	Source
SCS Curve Number (Waste Rock)	84	-	George (2008)
SCS Curve Number (Natural Ground)	72-89	-	Sabina (2015), Appendix V2-7B
SCS Curve Number (Pit Walls)	92	-	George (2008)
Critical Snowmelt Month	June	-	Sabina (2015), Appendix V2-7B
June Average Snowmelt Rate	28	mm/day	Sabina (2015), Appendix V2-7B
Rainfall Distribution	Type I	-	USDA (1986)
Minimum Time of Concentration	10	minutes	Engineering Judgement

SCS = Soil Conservation Service (currently Natural Resources Conservation Service)

Table 6.2-2. Pond (Event and Saline Water) Design Criteria

Item	Value	Unit	Source/Comments	
Event Ponds	Event Return Period	10-100	Years	BMP. See Table 6.4-1
	Minimum Dewatering Requirement	2	days	Operational consideration
	Storage Requirement	24-hour total rainfall volume + snowmelt	m ³	BMP
	Minimum Freeboard	0.5	m	Engineering Judgement
SWP	Storage Volume	Stage 1: 1.1 Stage 2: 1.9 Stage 3: 3.7 (if needed)	Mm ³	95th percentile volume from Water and Load Balance Model (Sabina 2015, Appendix V2-7B; and Appendix C)
	Minimum Freeboard	1.0 – 1.3	m	SWP Freeboard Memo (Sabina 2017, Appendix A of Appendix F-1)

Table 6.2-3. Containment Dams (Event and Saline Water Ponds) and Diversion Berm Design Criteria

Item	Value	Unit	Source/Comments	
Diversion Berm Design ^(a)	Event Return Period	10-100	Yrs	BMP
	Conveyance Capacity	24-hour total rainfall volume + Snowmelt	m ³ /s	BMP
	Manning's Roughness	0.035	-	For minor natural stream with stones and weeds (Chow 1994)
	Minimum Slope	0.005	m/m	BMP
	Upstream Side Slopes	2:1	(H:V)	Constructability consideration
	Downstream Side Slopes	1.5:1	(H:V)	Engineering judgement
	Berm Top Width - minimum	4	m	Constructability consideration
	Minimum Berm Height	2	m	Constructability consideration and for foundation permafrost preservation.
Minimum Berm Freeboard	0.5	m	Engineering judgement and to allow for adequate time for maintenance if / as required	

Event Pond Containment Dam Design	Minimum Dam Height	2	m	Constructability consideration
	Bedding Material Thickness around Geosynthetic Clay Liner (GCL)	0.5	m	Engineering judgement
	Liner Tie-Back Length (without liner anchor trench)	3	m	Engineering judgement
	Liner Tie-Back Length (with anchor trench)	1	m	Engineering judgement and based on pull out calculations
	Upstream Side Slope (Ponded Water Level >4m) - minimum	3:1	(H:V)	Constructability consideration
	Upstream Side Slope (Ponded Water Level <4m)	2:1	(H:V)	Constructability consideration
SWP Containment Dam Design	Downstream Side Slopes	2:1	(H:V)	Stability and permafrost requirement
	Bedding Material Thickness around GCL	0.5	m	Engineering judgement
	Dam Top Width	8	m	Constructability consideration
	Minimum Dam Height	2	m	Constructability consideration
	Upstream Side Slope	3:1	(H:V)	Constructability consideration
	Downstream Side Slope - minimum	2:1	(H:V)	Engineering Judgement
	Liner Tie-Back Length (without liner anchor trench)	3	m	Engineering judgement
	Liner Tie-Back Length (with anchor trench)	1	m	Engineering judgement and based on pull out calculations
	Key Trench Tie-in Depth - minimum	2.2	m	May be adjusted / deepened to 3m in areas where massive ice encountered in the foundation (Sabina 2017, Appendix C of Appendix F-1)

- (a) *The Llama Open Pit Collection Berm will have the same characteristics of the diversion berm; however, its function will be to intercept runoff and seepage from the Llama WRSA for immediate pumping to Primary Pond or Llama WRSA Pond (i.e. significant ponding is not expected to occur). As Llama Open Pit provides containment downstream of the collection berm, the Llama Open Pit collection berm will not be lined.*

Table 6.2-4. Culvert Design Criteria

Item	Value	Unit	Source
Event Return Period	50 to 100 ^(a)	Years	BMP; SRK (2014)
Conveyance Capacity	24-hour total rainfall volume	m ³ /s	BMP; SRK (2014)
Maximum Velocity during Average June flow for Fish Passage	1.5	m/s	SRK (2014)
Manning's Roughness for culverts with cobble stone base	0.040	-	Chow (1994)
Manning's Roughness for culverts without cobble stone base	0.024	-	Chow (1994)

(a) Event return period for culverts will be based on a location specific risk assessment. Wherever practical, a 100-year design event will be adopted (and will be required for high risk culvert locations) and a minimum 50-year design event will be used for all culverts.

6.3 HYDROLOGIC MODEL

Hydrologic modelling was completed to appropriately design and size the water management infrastructure, including ponds and pumps, and to verify that the diversion structures were sufficiently sized to manage the specified design storm events.

6.3.1 CATCHMENT DELINEATION

The Goose Mine was delineated into catchments associated with each open pit (or TF), WRSA, event pond, and diversion. Areas were also incorporated into the Model (Appendix C) to allow for developing predictive flow and water quality estimates.

Catchments were delineated in AutoCAD (AutoDesk) and Global Mapper™ (Blue Marble Geographics) using available LiDAR topography. Once delineated, the catchment characteristics, including average slope, total area, and head differential, were calculated in Global Mapper. Catchments are presented in Figure A-02, and in Table 6.3-2.

6.3.2 APPROACH

Instantaneous peak flows and volumes for design storm events were generated in HEC-HMS software (US Army Corps of Engineers) using the design criteria summarized in Table 6.2-1 along with catchment areas presented in Table 6.3-2. Peak flows derived for a rain-on-snow event were used to size the water management infrastructure, and the required storage volumes were determined based on the total snowmelt and rainfall accumulation over a 24-hour period. Resultant rainfall depths are summarized in Table 6.3-1.

6.3.3 RETURN PERIOD SELECTION

The return period was selected for each structure based on the qualitative level of risk associated with the potential overtopping or breaching of the structure, whether it was an event pond, open pit, or diversion. Three levels of risk were selected for the Project, with an associated return period (Table 6.3-1). The risk was determined using engineering judgement, taking into consideration the

human health and safety, environmental, reputational, and economic consequences of the specified failure events.

Table 6.3-1. Return Period Selection Criteria

Level of Risk	Type of Facility	Return Period	24-hour total rainfall volume + snowmelt ^(a) (mm)
Low	Non-contact water diversions Pit sumps	10	44.4
Medium	Contact water diversions Contact water event ponds with additional water infrastructure downstream Culverts on all-weather road away from primary infrastructure or not connected to other water management infrastructure systems	50	64.2
High	Contact water event ponds without downstream water infrastructure Culverts connected to water management infrastructure or near ponds, diversions or puts.	100	73.4

(a) From SRK Hydrology Report (Sabina (2015), Appendix V2-7B) and increased based on the regional climate change work.

Infrastructure which has the potential to overtop/breach and discharge to the downstream environment was assigned a “High Risk”. At the Goose Mine, this includes the Llama WRSA Pond, Ore Stockpile Pond, SWP, and Echo / Goose Main WRSA Pond. The Goose Mine infrastructure and corresponding risk level is listed in Table 6.3-2, as well as the associated catchment areas. The culverts are assigned a risk rating (typically at medium risk and above) based on their connection to other water management elements.

For any structure that is classified as a ‘dam’, the Canadian Dam Association (CDA 2013, 2014) standards must be applied and therefore override the return period selection criteria outlined in Table 6.3-1. Structures that classify as a dam includes the Llama WRSA Containment Dam (East and West), Ore Stockpile Containment Dam, SWP Containment Dam, the Primary Pond Containment Dam, and Echo/Goose Main Containment Dam.

TABLE 6.3-2. LEVEL OF RISK FOR EACH ITEM OF GOOSE INFRASTRUCTURE AND CONTRIBUTING CATCHMENT AREAS

INFRASTRUCTURE	CATCHMENT ID	CATCHMENT AREA (KM ²)	LEVEL OF RISK	TYPE OF WATER	PUMPED INFLOW	PUMPED OUTFLOWS	EMBANKMENT	DOWNSTREAM WATER INFRASTRUCTURE
Umwelt Open Pit Sump	UP	0.06	Low	Contact Water	None	Primary Pond	No	N/A
	UP1	0.22						
	UCP2	0.04						
	UWD1	0.25						
Primary Pond Containment Dam (Primary Pond)	PRMYPND	0.31	Medium	Contact Water	Echo WRSA Pond and Llama WRSA Pond	Process Plant	Yes	SWP and Umwelt Open Pit
	UWD2	0.15						
	LWD1	0.16						
	UCP1	0.07						
Llama Diversion/Collection Berms	LD2 (collection berm)	0.69	Low	Contact Water	None	Primary Pond or Llama WRSA Pond	Yes	Llama Lake Reservoir/Llama Open Pit
	LL	0.27		Non-Contact Water				
Llama WRSA Containment Dam West and East (Llama WRSA Pond)	LCP	0.15	High	Contact Water	None	Primary Pond	Yes	Llama Lake Reservoir/Llama Open Pit
	LWD2	0.10						
	LD1	0.13						
Llama Open Pit Sump	LP	0.15	Low	Saline Water	None	Saline Water Pond	No	SWP
	LP1	0.18						
Ore Stockpile Pond Containment Dam (Ore Stockpile Pond)	OP OD1	0.02 0.12	High	Contact Water	None	Echo TF or Umwelt TF	Yes	None
SWP Containment Dam (SWP)	SWP1	1.64	High	Saline Water	Llama Open Pit and Underground	Water Treatment	Yes	None

TABLE 6.3-2. LEVEL OF RISK FOR EACH ITEM OF GOOSE INFRASTRUCTURE AND CONTRIBUTING CATCHMENT AREAS

INFRASTRUCTURE	CATCHMENT ID	CATCHMENT AREA (KM ²)	LEVEL OF RISK	TYPE OF WATER	PUMPED INFLOW	PUMPED OUTFLOWS	EMBANKMENT	DOWNSTREAM WATER INFRASTRUCTURE
Echo Open Pit Sump	EP ECWR1	0.10 0.38	Medium	Contact Water	None	Echo WRSA Pond	None	Echo WRSA Pond
Goose Main Containment Dam (Echo/Goose Main WRSA Pond)	ECPND ECP1 ECWR1	0.21 0.09 0.38	High	Contact Water	None	Umwelt TF	None	None
Echo Diversion Berm	ECUS	0.64	Medium	Non-Contact Water	None	None	None	Echo Open Pit and Echo / Goose Main WRSA Pond
Goose Main Open Pit Sump	GP1	0.31	Low	Contact Water	None	Umwelt TF	None	None
Goose Main Diversion Berm	GOOSE2 GOOSE3	0.47 2.80	Low	Non-contact Water	None	None	None	Goose Main Open Pit

6.3.4 INTERPRETATION OF RESULTS

The resultant peak instantaneous flows and 24-hour storage volumes were used to size water management infrastructure. Peak flows were used to size culverts and diversion structures, and total storm volumes were used to size water management event ponds and pumping rates.

Since all diversions are constructed as berms as opposed to excavations into existing ground, the minimum berm height defines the conveyance configuration. In all cases, the 2 m minimum berm height (Table 6.2-3) was greater than the design flow depth and freeboard, and therefore governed the design requirements.

6.4 POND AND PUMP SIZING

Table 6.4-1 summarizes the pond capacities and associated pumping rate requirements for the Goose Property. The location of each of the ponds is illustrated on Figure A-01. A summary of the pond capacity and pumping rate are shown in Table 6.4-1. B2Gold Nunavut is committed to providing detailed design to NWB at least 60 days prior to construction in accordance with the Type A Water Licence (2AM-BRP1831 Amendment No. 1 Part D, Item 2).

Table 6.4-1. Goose Property Pond Capacity and Pumping Rate Summary

Description	Design Return Period	Required Capacity (m ³)	Available Capacity (m ³) ^(a)	% Full	Dewatering Duration (days)	Pumping Rate (m ³ /s)
Umwelt Open Pit Sump	10	18,000	N/A	N/A	2	0.10
Primary Pond	50	109,500	414,000	26%	23	0.06
Llama WRSA Pond ^(b)	100	20,000	26,000	77%	2	0.11
Llama Open Pit Sump	10	12,000	N/A	N/A	2	0.07
Ore Stockpile Pond	100	25,000	40,000	63%	2	0.15
SWP ^(c)	N/A	1,700,000	1,900,000	90%	N/A	0.15
Echo Open Pit Sump	50	5,000	N/A	N/A	2	0.03
Echo / Goose Main WRSA Pond ^(b)	100	48,000	65,100	74%	10	0.06
Goose Main Open Pit Sump	10	20,000	N/A	N/A	2	0.11

(a) Pit sump actual capacities are defined by the open pit design, and as a result are always larger than the required capacity.

(b) Final storage capacity and pumping rate for each structure will be provided together with the detailed design.

(c) Pond size and dewatering rate from SWP are based on water balance results. Pond size is based on the 95th percentile maximum ponded water volume and dewatering is assumed to occur over two open water seasons. (SRK 2020) Value for Stage 2 of SWP is provided; design of SWP is on-going and will be designed to satisfy its required capacity.

The approved event ponds were sized for the 24-hour storm design criteria (Table 6.3-1) and conservatively assume dewatering pumps are not operating over the storm duration. The pumping rate for each pond was set to allow dewatering the pond in 2 days (Table 6.2-2) to allow for quick re-establishment of storage capacity after large storm event. The dewatering duration was increased beyond the 2 days only for the ponds that have an available capacity significantly larger than the minimum required capacity. This additional available capacity will allow for managing storm events that may occur during the longer pond dewatering period. From a practical operational perspective, the maximum design pumping rate was set at 0.15 m³/s.

As described in the design criteria outlined in Table 6.2-2, all collection ponds will be sized with sufficient freeboard contingency to provide both operational flexibility and accommodate large flows. Further refinements to the design will be completed during detailed engineering and will be captured in an updated version of this plan prior to construction.

6.5 CULVERT SIZING

There are five proposed culvert crossing locations at the Goose Mine: one crossing through the airstrip and four crossings through the all-weather roads. Two types of culverts are considered for the all-weather roads and airstrip:

- ◆ Non-fish-bearing crossings; and
- ◆ Fish-bearing crossings.

The non-fish-bearing crossings will consist of corrugated steel pipe and are currently designed with a diameter of either 1.2 m or 2.5 m, depending on the associated design flow. The fish-bearing crossings will be sized to keep maximum water velocities below 1.5 m/s for the average June flow such that they do not present a velocity barrier to migrating Arctic Grayling. In addition, all culverts, will meet the 0.3 m criteria for maximum water depth above the top of culvert. The fish-bearing culverts will be embedded at depth and a thin layer of streambed material will be placed to promote fish passage and habitat suitability. The design characteristics for the culverts are presented in Table 6.5-1; Figure A-01 shows the culvert locations in plan view. Typical details of the culverts are unchanged from previous version of the WMP.

Some of the culverts have been installed during the construction phase, with design details provided ahead of construction. For the culverts still to be installed, B2Gold Nunavut will provide the detailed engineering drawings and report 60 days in advance of construction, pursuant to the requirements of the Type A Water Licence (2AM-BRP1831 Amendment No. 1 Part D, Item 2). B2Gold Nunavut notes that fish-bearing crossings are subject to appropriate Department of Fisheries and Oceans Canada (DFO) processes.

Refer to Section 9.4 for additional information on environmental protection measures related to culvert installations and stream crossing or diversions.

Table 6.5-1. Goose Mine Culvert Characteristics – Design Storm

Culvert Description		Goose Culvert	Gander Pond Culvert	Goose Airstrip Culvert	Echo Culvert	Goose Neck Culvert
Culvert ID		C1	C2	C3	C4	C5
Characteristics	Slope (%)	1.0	3.6	1.0	1.5	3.5
	Diameter (m)	2.5	2.5	2.5	1.2	2.5
	Culvert Shape	Circ.	Circ.	Circ.	Circ.	Circ.
	Number of Barrels	2	2	2	1	1
	Culvert Material	CSP	CSP	CSP	CSP	CSP
	Embedment	0	0.4	0	0	0
100 Year Event	Total Discharge	19.27	9.64	18.82	1.99	10.47
	Culvert Inlet	100	100	100	100	100
	Headwater	102.27	101.89	102.23	101.4	102.39
	Water Depth	0	0	0	0.26	0
	Invert Control	2.27	1.49	2.23	1.32	2.39
	Outlet Control	1.31	0	0.23	1.46	1.01
	Normal Depth (m)	1.18	0.98	1.17	1.20	1.06
	Critical Depth (m)	1.41	1.21	1.4	0.77	1.10
	Outlet Depth (m)	1.20	0.99	1.18	0.77	1.47
	Tail Water Depth	0.82	0.54	0.83	0.06	0.12
	Outlet Velocity	4.14	4.21	4.12	2.58	5.03
	Tail Water	2.34	1/8	2.27	0.64	0.49

6.6 DIVERSION BERMS AND CONTAINMENT DAMS

Two types of berms will be constructed to support water management across the Project area:

- ◆ Unlined non-contact water diversion and collection berms; and
- ◆ Lined contact water containment dams and berms

All diversion and collection (only one north of Llama Open Pit) berms will be constructed directly onto the tundra surface with NPAG run of mine or run of quarry material that contains sufficient fines to contain and convey water.

All containment dams and berms will also be constructed with run of mine or run of quarry material; in addition, all lined structures will contain a geosynthetic clay liner (GCL) that will be tied into the active permafrost layer if the operational head is less than 4 m, and into permafrost if the operational head is greater than 4 m. Additional design criteria are summarized in Table 6.2-3. Table 6.6-1 summarizes the containment and diversion structures, in terms of their purpose and whether or not they require a liner. All diversion and containment structures will consider the design criteria presented in Table 6.2-3. Typical details of the diversion berms and containment dams are unchanged from previous version of the WMP.

Further refinements to the designs will be completed during detailed engineering and will be captured in an updated version of this plan prior to construction.

Table 6.6-1. Diversion and Containment Structure Summary

Structure	Lining Details	Notes
Llama Open Pit Diversion/Collection Berms	Unlined	Divert (or partially diverts) upstream non-contact runoff. Minimize non-contact water volumes entering Llama Open Pit and assists with general water management at the pit. The Llama Open Pit collection berm will intercept runoff from Llama WRSA for pumping to Primary Pond of Llama WRSA Pond
Llama WRSA Containment Dams (West/East)	Lined	Contains runoff from Llama WRSA into Llama WRSA Pond.
Primary Pond Containment Dam	Lined	Contains contact water in the Primary Pond to the east, alignment along haul road. Designed to Canadian Dam Association (CDA 2013, 2014) standards.
SWP Containment Dam	Lined	South section of dam containing saline water, around former Umwelt Lake footprint / outlet of former Umwelt Lake. Will be designed to Canadian Dam Association (CDA 2013, 2014) standards.
Ore Stockpile Pond Containment Dam	Lined	Contains contact water from the Ore Stockpile. Designed to Canadian Dam Association (CDA 2013, 2014) standards.
Echo Diversion Berm	Unlined	Diverts (or partially diverts) non-contact runoff away from the Echo / Goose Main WRSA.
Echo/Goose Main Containment Dam	Lined	Contains runoff from Echo / Goose Main WRSA into Echo / Goose Main WRSA Pond. Will be designed to Canadian Dam Association (CDA 2013, 2014) standards.
Goose Main Diversion Berm	Unlined	Diverts non-contact runoff around Goose Main Open Pit.
Rascal Berm	Unlined	Redirects flow in the Rascal Lake catchment away from the Goose Main Open Pit and into Gander Pond catchment.

As described in the Geotechnical Design Parameters Report (Sabina 2017, Appendix F-2), permafrost soils are sensitive to damage if they are altered in any way. Therefore, excavation into permafrost soils will be avoided as much as practical. The diversions and containment structure designs are presented in the WMP Figures (Figure A-01). If diversion structures result in water flowing and/or ponding over previously dry areas, it is possible that permafrost degradation may result due to the additional heat source imparted from the water. If the underlying soils are ice-rich, the subsequent differential settlement resulting from ice melting may be notable. This differential settlement may result in increased localized ponding that might affect the natural drainage. These potential occurrences will be monitored, and if permafrost degradation is observed, clean overburden soil or NPAG material will be placed to manage and stabilize the settlement.

7. WATER MANAGEMENT

Many water management considerations and design criteria apply throughout the LOM. Sections 5 and 6 outline those considerations; this section provides details on the specific plans that occur during different phases of the mine life.

7.1 WATER CLASSIFICATION

Site water at Goose Mine is categorized into three types:

- ◆ **Contact water:** surface water that is impacted by / contacts mine workings (runoff over waste rock, ore stockpiles, open pits, tailings, etc.);
- ◆ **Non-contact water:** surface water that is not impacted by / does not contact mine workings; and
- ◆ **Saline water:** groundwater that flows into open pit and underground workings.

Each type of water is managed separately throughout each Project phase, to the extent practicable. Contact water is contained within event ponds and tailings management facilities and is conveyed on site via berms and pumped pipelines. Non-contact water is diverted off site through berms and culverts.

Saline water is pumped out of the underground workings, as well as Llama Open Pit, and temporarily stored in the SWP (previously Umwelt Lake), with Llama TF (when available) as a contingency storage location. The final repository for saline water generated at the Goose Mine will be Goose Main Open Pit (then called Goose Main Reservoir) once mining is complete. B2Gold Nunavut commits to continue looking for alternative strategies/locations for temporary storage of saline water, before pumping it to the Goose Main Reservoir, including the exhausted underground working.

The MLA does not require any pond or diversion infrastructure for water management purposes and remains in the same condition for both the Construction and Operations phases. A desalination plant produces domestic and industrial water, and greywater will be discharged to the tundra.

7.2 WATER MANAGEMENT OBJECTIVES

The key water management objectives for the Project include:

- ◆ Minimizing the impact of mining activities on the aquatic environment surrounding the mining area to the greatest reasonable extent;
- ◆ Managing contact, non-contact, and saline water separately in order to minimize freshwater withdrawal from Goose Lake and Big Lake;
 - ◇ Non-contact water is directed away or around the Project site whenever possible;
 - ◇ Collecting and treating contact water as required to meet Site-Specific Water Quality Objectives (SSWQOs) in the receiving environment;
 - ◇ Saline water is kept separate from contact water;
- ◆ Provided settlement of suspended solids prior to discharge to the environment to meet SSWQOs;
- ◆ Monitoring and controlling water flows to reduce risk of erosion;

- ◆ Maintaining water management features in good working order;
- ◆ Documenting all monitoring and maintenance activities associated to water management structures
- ◆ Using BMPs, recognizing the unique constraints of each Project element;
- ◆ Providing a reliable water supply to the Process Plant; and
- ◆ Facilitating mining operations by managing inflows that occur as a result of groundwater or direct precipitation.

7.3 WATER SUPPLY

Water intake structures will be constructed in Goose Lake and Big Lake to supply domestic, industrial, and process make-up water.

The selected locations for these intakes are deep and close to shore. The structures will consist of PVC pipe installed on a rockfill base within the lake to keep the pipe above the lake bottom and the intakes will be screened. The proposed freshwater intake structure locations are presented in Figure A-01 (typical intake design is unchanged from previous version of the WMP). Rock armouring will protect the pipeline from ice scour. Water intakes will be equipped with screens to prevent the entrainment or impingement of fish in accordance with current DFO requirements.

High-density polyethylene pipelines will convey freshwater from the intakes at Goose and Big lakes to dedicated pumphouses for the Process Plant, Goose Camp, and other operational uses. A potable treatment plant will be constructed at the end of the domestic supply pipeline.

The water intake structures are temporary as they will only be used throughout the LOM. The water intake structures in Goose Lake are completed and have been used in Year 1 to support initiation of mine operations. The water intake structures at Big Lake will be constructed in Year 3, if needed.

Construction of these intakes will involve in-water works. To limit disruption to aquatic resources, the following practices will be implemented:

- ◆ Only NPAG armour rock that is free of sediment will be placed in the water during construction to minimize acid generation and turbidity;
- ◆ Work will be isolated using silt curtains;
- ◆ Work will be carried out during calm water periods to minimize any turbidity effects due to the re-suspension of sediment; and
- ◆ Total suspended solids and turbidity levels will be monitored throughout construction and work will be delayed if TSS levels and turbidity become too high.

In-water blasting is not planned for the construction of the water intakes.

At Closure, all pumphouses will be drained, decommissioned, and landfilled. All pipelines will be cut at the shoreline, decommissioned, and landfilled. The pipelines extending into the water, along with the surrounding rock armour and rock bases, will be left in place and capped at the substrate so not as to disturb the in-water environment. Additional design details will be provided in future updates to this plan. For additional information, refer to the Fish Offsetting Plan (Sabina 2019a) Section 4.0 and 5.2.1.1.

The intake locations and consumption rates during the various Project phases are summarized in Table 7.3-1.

Table 7.3-1. Water Supply Locations and Volumes

Water Source	Total Water Use as per Type A Water Licence ^(a) [m ³ /yr]
Total Water Use: Goose Lake	608,700
Total Water Use: Big Lake	273,750
Total Water Use: MLA	110,000
Total Water Use: Dewatering	1,400,000
Total Water Use: Winter Ice Road	2,025 m ³ /km

(a)2AM BRP1831 Amendment No. 1 Part E Item 3, Item 4, and Item 5.

During the life of the Project, water consumption requirements from Goose Lake include 1,500 m³/day of freshwater year-round and an additional 400 m³/day during the open water season for a total of 1,900 m³/day (Table 7.3-1). For Big Lake, water consumption requirements include 750 m³/day of freshwater year-round for the life of the Project. Water from both of these sources will be utilized for domestic, construction, operation, and associated uses, including mining and milling (2AM-BRP1831 Amendment No. 1 Part E, Item 3). No water use is required for hydrostatic testing of Goose Mine and MLA fuel tanks at the respective fuel storage areas. Tanks will be commissioned using non-destructive examination techniques (e.g., tank x-ray, vacuum testing of tank floors, and air testing of fittings); this testing will be completed in accordance with API650 (API 2013).

Llama Lake and Umwelt Lake have been partially dewatered in Year 1. Dewatering will be completed in the open water season of Year 2. Additional information on lake dewatering is provided in Section 8.2.1. Some of the volume of the Year 1 dewatering was used to water start-up requirements for the Goose Mine.

Tailings production rate and tailings characteristics are provided in Table 7.3-2. Based on the milling parameters (Table 7.3-2), the tailings slurry will result in 3,580 m³/day and 5,730 m³/day of water and 1,790 m³/day and 2,860 m³/day of solids for a 2,500 tpd and 4,000 tpd production rate, respectively. The volume of water entrained in the tailings voids is a function of the void ratio and tailings dry density, which is approximately 980 m³/day and 1,570 m³/day for a 2,500 tpd and 4,000 tpd production rate, respectively.

Supernatant water included in the tailings slurry will be directed towards the active tailings management facility and eventually used as reclaim at a rate of 1,410 m³/day for a 2,500 tpd production rate and 2,260 m³/day for a 4,000 tpd production rate. Freshwater required for milling production is 486 m³/d for all production rates.

All water will be withdrawn, distributed, and directed via pumped pipelines.

Table 7.3-2. Milling Rates and Parameters

Parameter	Value
Average Production Rate	2,500 – 4,000 tpd
Specific Gravity of Tailings	3.1 tonne/m ³
Tailings Dry Density	1.4 tonne/m ³
Void Ratio ^(a)	1.2
Slurry Percent Solids – Year 1	46%
Slurry Percent Solids – Year 2 to end of Operations	58%
Ore Moisture Content	3%

(a) The void rate was calculated based on material properties.

7.4 WATER TREATMENT

Water treatment is required throughout the mine life for various water uses and constituent reductions. The following sections describe the various types of water treatment.

7.4.1 MARINE LAYDOWN AREA DESALINATION PLANT

Freshwater requirements at the MLA are met using a desalination plant, drawing ocean water from Bathurst Inlet. The plant operates using RO or similar process and discharges brine to Bathurst Inlet as a product of the desalination process.

Discharge of brine water from the desalination plant will meet the Canadian Council of Ministers of the Environment (CCME) salinity guideline for the protection of marine life and will not cause the salinity of the receiving environment to fluctuate by more than 10% of the natural expected salinity (CCME 2015). The desalination plant is designed with a maximum intake flow rate of 33 m³/h and a maximum discharge rate of 30 m³/h; therefore, only a small portion of intake water will be desalinated. Assuming the freshwater plant product has a salinity of zero, the discharge from the plant is predicted to be no more than 10% more saline, and therefore within the CCME salinity guideline at the point of ocean discharge. The discharged effluent is expected to mix in the receiving environment and is not expected to be detectable beyond the outfall. Consumption rates at the MLA during the various Project phases are summarized in Table 7.3-1.

7.4.2 GOOSE MINE WATER TREATMENT PLANT

Treatment to reduce TSS concentration will be required at Goose Mine during the final dewatering of Llama Lake and Umwelt Lake. Year-round recirculation treatment of the Umwelt and Llama TFs will also be required during the Operations and Closure phases, until discharge criteria have been met. In addition, a WTP (reverse osmosis plant) will be required between Year 4 and Year 9 of Operations to treat saline water collected in the SWP. If possible, the same WTP will be used during each phase of the Project, and upgraded as required; otherwise, additional WTPs will be installed at the Goose Mine to meet water treatment requirements.

During Year 2, the dewatering of Llama Lake and Umwelt Lake will be completed. It is assumed that approximately 80% of the water left in Llama Lake (40% of the total original lake volume) and 50 % of the water left in Umwelt Lake (40% of the total original lake volume) will require to be treated for TSS before discharging to the Goose Lake. If TSS is higher than expected, a greater percentage of water will be treated. Any treatment sludge generated will be disposed of in Umwelt WRSA or the SWP.

Treatment is inactive during Operations until mining of the Umwelt Open Pit is complete in Year 4; at this time saline water from the SWP is treated with an RO as of a treatment rate of 5,000 m³/day, with brine effluent deposited back in the SWP and treated effluent pumped to the Umwelt TF. This treatment is expected to continue until Year 9 when Goose Main Open Pit becomes available to receive water. Seasonal treatment only (summer months only) is expected to be sufficient to manage water levels in SWP, except potentially in the first year of treatment when greater volume of water is in SWP. However, need for year-round treatment will be further investigated ahead of completing the design of the treatment plant.

In Year 12, recirculation treatment of tailings water contained in the Umwelt TF begin. Recirculation treatment of tailings water contained in Llama TF begins in Year 15. The primary constituents to be removed in treatment from the tailings facilities are metals, phosphorus, nitrogen species (nitrite, nitrate, total ammonia and cyanide), and suspended solids. Recirculation water treatment in Llama TF and Umwelt TF will continue into Closure until discharge limits have been achieved. The treatment is proposed to be year-round at a flow rate of approximately 5,000 m³/day from both Umwelt and Llama TFs, for a total of 10,000 m³/day, to achieve Metal and Diamond Mining Effluent Regulations (MDMER) limits at PN04 when pit flooding occurs. Treated effluent will be recirculated back into Umwelt and Llama TFs to aid in pit flooding. In the years when no treatment occurs, all mine effluent will be stored in the active tailings management facility and used as reclaim water (from Umwelt TF only) for the Process Plant, as required.

During the Closure Phase, overflow water from the Llama and Umwelt reservoirs will also be treated (if needed) before arrival at PN04, via the Umwelt Treatment Pond, to achieve MDMER limits at this location. This overflow is seasonal and will see the greatest flow rates during freshet. The primary constituents to be removed in treatment include metals major ions and nitrogen species (nitrite, nitrate, total ammonia and cyanide).

Treatment for the Goose Main Reservoir before discharge to Goose Lake (via PN05), if needed, will begin during closure (estimated in Year 17) and continue until the start of Post-Closure. Treatment is currently not predicted to be necessary to meet MDMER limits at PN05. Treatment within in Goose Main Reservoir, with treated water being sent back to the Goose Main Reservoir, can also be considered to improve water quality in this reservoir prior to reaching its capacity, if required.

The WTPs will be modular, can be relocated, and combined as necessary to achieve the appropriate water treatment at different phases of the Project. Table 7.4-1 summarizes the water treatment activities at Goose Mine throughout the LOM.

Table 7.4-1. Water Treatment Goose Mine

Source	Discharge Location	Period Start	Period End	Flow Rate (m3/d)	Parameter	Comment	Approximate Treated Volume (m ³)
Llama Lake	Goose Lake (via Umwelt Lake)	Yr2, Q2	Yr2, Q3	10,800	TSS	80% of remaining lake volume after Y1 dewatering, open water season	452,000 ^(a)
Umwelt Lake	Goose Lake	Yr2, Q2	Yr2, Q3	10,800	TSS	50% of remaining lake volume after Y1 dewatering, open water season	60,000 ^(a)
SWP	Umwelt TF	Yr4, Q3	Yr9, Q2	Variable (0 – 5,000)	Total Dissolved Solids	Brine effluent to SWP, treated effluent pumped to Umwelt TF	3,075,000 ^(b)
Umwelt and Llama TF	Umwelt and/or Llama TF	Yr12, Q1	Yr20, Q4	10,000	Metals (Arsenic, chromium, copper, iron, selenium), and nitrogen species	Recirculation of treated water back into Umwelt and Llama TF, year-round	26,458,000 ^(b)
Umwelt Treatment Pond	Goose Lake (via PN-4)	Yr18	Yr20	Variable (0 – 65,000)	Ammonia and arsenic	Treatment of water collected in Umwelt Treatment Pond	1,554,000 ^(b)
Goose Main Reservoir	Goose Lake (via PN05)	Yr 18	Yr20	5,000	Metals, phosphorus, nitrogen species	Not predicted to be required	0 ^(c)

Note: Flow rates for water treatment plant to be further refined at detailed design stage.

- (a) Based on volume remaining in the lake after initial dewatering that occurred in Year 1; actual total volume to be treated may be different based on inflows/outflows that will occur between the two stages of dewatering
- (b) Volume estimation based on the average climate scenario, total volume to be treated may be different based on climate conditions.
- (c) Adaptive mitigation strategy only; treatment is not expected to be required.

7.4.3 SEWAGE TREATMENT AND DISPOSAL

7.4.3.1 GOOSE MINE SEWAGE TREATMENT AND DISPOSAL

Sewage at the Goose Mine will be treated using a package Sewage Treatment Plant (STP), such as a Membrane Bioreactor or similar. The STP will be located in the Goose Plant Site area (Figure A-01), and during the Construction phase and Closure phase (i.e., when all tailings management facilities are not available), treated sewage effluent will be discharged to the tundra west south-west of the Goose Plant Site. This treated effluent will be land discharged to maximize attenuation distance prior to entering an outflow watercourse from Fox Lake and ultimately entering Goose Lake. Off-specification treated sewage during upset conditions will be discharged to the closest collection pond. Any discharges of sewage effluent from the collection pond will need to meet the applicable discharge criteria. In-pond treatment by coagulation can be applied if required as a contingency. Refer to the Landfill and Waste Management Plan (2AM-BRP1831 Amendment No. 1 Part F, Item 1) for details on STP treated effluent volumes.

In Operations, effluent will be discharged to the active tailings management facility. During Post-Closure, the Goose Mine Camp will convert to Pacto or incinerating toilets and effluent discharge will not be necessary. If STP effluent meets discharge requirements during Operations, B2Gold Nunavut may choose to discharge on land consistent with Construction phase STP effluent management. See the Landfill and Waste Management Plan (2AM-BRP1831 Amendment No. 1 Part F, Item 1) for information on sludge disposal.

7.4.3.2 MARINE LAYDOWN AREA SEWAGE MANAGEMENT

In February 2026, B2Gold Nunavut has submitted a notice of modification to NWB under Part G of 2AM-BRP1831 (B2Gold Nunavut, 23 February 2026) for replacing the existing MLA Pacto toilet-based system with conventional toilet facilities and a STP, similar to that currently in use at the Goose Mine. The NWB has approved this modification through the Motion No. 2026-A1-006, dated April, 2026 as required by Part G, Item 2 of the 2AM-BRP1831 License. The system will also be capable of receiving and effectively treating the MLA's greywater, providing centralised treatment of domestic wastewater generated by the MLA camp and accommodation facilities.

7.4.4 POTABLE WATER TREATMENT

Public water supply of potable water is regulated under the *Public Health Act* and Public Water Supply Regulations administered by the Government of Nunavut. B2Gold Nunavut may use chlorination, ozone treatment, and/or UV to ensure potability of water. Regular test work of water quality will be conducted to ensure potable water meets Canadian drinking water standards. B2Gold Nunavut will meet all regulatory requirements around the management of potable water.

7.5 EFFLUENT CRITERIA

The effluent criteria applicable to the Project are outlined in the Type A Water Licence (2AM-BRP1831 Amendment No. 1) and the MDMER. These regulatory instruments outline the locations, parameters, timing and frequencies at which various effluent discharges must be sampled and reported. This sampling includes sampling of runoff, seepage, dewatering, discharges to land, greywater and treated

sewage effluent, as well as all other discharges to the receiving environment. The MDMER requirements become applicable upon triggering of the MDMER.

At least 120 days prior to the discharges of effluent from monitoring program stations BRP-58a to BRP-58xx (TBD) directed to Goose Lake, B2Gold Nunavut will file an Effluent Discharge Plan in accordance with the Type A Water licence (2AM-BRP1831 Amendment No. 1 Part F, Item 16).

7.6 WINTER ICE ROAD

Overland winter access to the Project is possible between approximately December through May each season. Annually, in early December, preparation for the WIR linking the MLA to the Goose Mine will be undertaken. Once the WIR is ready for traffic, the equipment, materials, fuel, and supplies staged at the MLA will be transported by trucks over the WIR to the Goose Mine. It is expected that the transfers will occur annually between approximately January and April.

7.6.1 WINTER ICE ROAD CONSTRUCTION AND USE

WIR construction will adhere to the following guidelines based on DFO Operational Statements:

- ◆ Use existing trails or WIRs wherever possible as access routes to limit unnecessary clearing of additional vegetation and prevent soil compaction;
- ◆ Construct approaches and crossings perpendicular to the watercourse wherever possible;
- ◆ Construct ice bridge and snow fill approaches using clean, compacted snow and ice to a sufficient depth to protect the banks of the lake, river, or stream;
- ◆ Install sediment and erosion control measures before starting work to prevent the entry of sediment into the watercourse. Inspect the installed control measures regularly during the course of construction and decommissioning activities and make all necessary repairs if damage occurs;
- ◆ Operate machinery on land or on ice, and in a manner that minimizes disturbance to the banks of the lake, river, or stream;
- ◆ Ensure that the intakes are sized and adequately screened to prevent debris blockage and fish mortality;
- ◆ Crossings do not impede water flow at any time of the year;
- ◆ When the crossing season is over and where it is safe to do so, create a v-notch in the centre of the ice bridge to allow it to melt from the centre, and to also prevent blocking fish passage, channel erosion and flooding. Compacted snow should be removed from snow fills prior to the spring freshet;
- ◆ Stabilize any waste materials removed from the work site to prevent them from entering the lake, river, or stream. This could include covering spoil piles with biodegradable mats or tarps; and
- ◆ The site should be stabilized using effective sediment and erosion control measures. In areas with permafrost, care should be exercised to ensure these measures do not cause thawing or frost heave.

Water withdrawal for the construction of WIRs will also adhere to the following DFO guidelines taken from the *Protocol for Winter Water Withdrawal from Ice-Covered Waterbodies in the Northwest Territories and Nunavut* (DFO 2010):

- ◆ In one ice-covered season, total water withdrawal from a single waterbody is not to exceed 10% of the available water volume;
- ◆ In cases where there are multiple users withdrawing water from a single waterbody, the total combined withdrawal volume is not to exceed 10% of the available water volume; and
- ◆ Only waterbodies with a minimum unfrozen water thickness of 1.5 m under ice should be considered for water withdrawal.

Water for the WIR will be drawn from various sources along the WIR alignment. The supply locations and consumption rates will be provided at least 60 days prior to water withdrawal. Consistent with the Project terms and conditions Nunavut Impact Review Board (NIRB; 2017), B2Gold Nunavut will provide bathymetry, depth, and location of proposed water withdrawal sites, volumes to be extracted, anticipated water level decreases, and fish habitat features within each waterbody proposed to be used for winter water withdrawal in support of the annual construction of the WIRs. If additional waterbodies are required, B2Gold Nunavut will provide all required information on the additional proposed lakes prior to the use of the waterbodies.

In addition, B2Gold Nunavut will implement all applicable DFO BMPs to avoid and mitigate serious harm to fish as a result of the construction, operation, and decommissioning of WIRs, and from under ice water withdrawals. These BMPs include adequately screening the water intakes pipes to prevent impingement and entrainment of fish.

8. WATER MANAGEMENT PHASES

Water management throughout the mine life is described in a series of phases:

- ◆ Phase 1: Construction (Year -3 to Year -1);
- ◆ Phase 2: Operations (Year 1 to Year 13);
- ◆ Phase 3: Closure (Year 14 to Year 20); and
- ◆ Phase 4: Post-Closure (Year 21 +).

The Construction phase is completed. A brief description of the activities that occurred during the Construction phase is included in this section, with additional details presented under separate covers, as part of the annual reporting.

The Operations, Closure and Post-Closure phases are illustrated in Figures A-03 through A-05, as well as the flow diagrams attached to Appendix C. The Operations phase (Phase 2) is subdivided into three stages; each stage represents the duration of tailings deposition in each Tailings Facility (TF). The three stages are:

- ◆ Echo Open Pit (Echo TF) (Year 1, Q2 to Year 5, Q1);
- ◆ Umwelt Open Pit (Umwelt TF) (Year 5 Q1, to Year 11, Q4); and
- ◆ Llama Open Pit (Llama TF) (Year 11, Q4 to Year 13, Q3).

The following subsections describe the water management details of each phase.

8.1 PHASE 1: CONSTRUCTION

The Construction phase is completed. A summary of the key water management activities during Phase 1 are included in Table 8.1-1. Further details on the water management infrastructure and activities that occurred during the Construction phase are provided under a separate cover, as part of the annual reporting for the Project.

Table 8.1-1. Summary of Water Management Activities during Phase 1

Mine Year	Water Management Activities
-3 to -1	<ul style="list-style-type: none"> • Water intake infrastructure has been constructed at Goose Lake to meet the freshwater demands for domestic, construction, operation, and associated uses, including mining and milling activities. • Construction of Goose Plant Site, Camp area and all-weather roads/crossings and pads. • The Plant Site Pond/Ore Stockpile Pond have been constructed at the Goose Plant Site. • Construction of Primary Pond. • Pre-stripping of Echo Open Pit and Umwelt Open Pit. • Echo Open Pit mining. Waste rock has been placed in Echo WRSA; contact water runoff from Echo WRSA has been collected locally, treated and discharged if necessary to the environment. • Contact water in the Ore Stockpile Pond is pumped to the Primary Pond (when available). • Umwelt Open Pit mining has been initiated, and inflows have been pumped to the Primary Pond. Waste rock has been placed in Umwelt WRSA; contact water runoff from Umwelt WRSA has been collected in Primary Pond.

Table 8.1-1. Summary of Water Management Activities during Phase 1

Mine Year	Water Management Activities
	<ul style="list-style-type: none"> • Umwelt Underground decline and mining have been initiated. • Contact water from the Plant Site has been collected in the area of Plant Site Pond, then released to the environment.

8.2 PHASE 2: OPERATIONS

A summary of the key water management activities initiation and completion during Operations (Phase 2) are included in Table 8.2-1 to Table 8.2-3. The tables divide Operations into three stages, based on the active tailings management facility at the time. Further details of the water management infrastructure and activities are included in the subsections that follow and are depicted in Figure A-03 (end of Operations Phase layout), as well as the flow diagrams attached to Appendix C.

Table 8.2-1. Summary of Water Management Activities during Phase 2 – Echo TF (Year 1-Q2 to Year 5-Q1)

Mine Year	Water Management Activities
1	<p>Phase 2: Operations – Echo TF (Figure A03 for End of Operations Layout)</p> <ul style="list-style-type: none"> • <i>Approximately 50% Llama Lake has been dewatered to Goose Lake directly (Goose Neck Channel) or pumped to Primary Pond to support initiation of mine operations.</i> • <i>Approximately 50% of Umwelt Lake has been dewatered to Goose Lake to allow for construction of the Saline Water Pond (SWP); water has been conveyed to Goose Lake or pumped to Primary Pond to support initiation of mine operation.</i> • <i>Mining of Echo Open Pit has been completed.</i> • <i>Waste rock placement in Echo WRSA has been completed.</i> • <i>Milling operation in the Process Plant begun (June of Year 1).</i> • <i>The former Echo Open Pit has transitioned into Echo Tailings Facility (Echo TF), an in-pit tailings facility.</i> • <i>Withdrawal from the Primary Pond to supply process plant.</i> • <i>Contact water from the Echo WRSA has been conveyed to Echo TF.</i> • <i>Primary Pond has been collecting contact water across the Goose Mine, including flows collected in the Ore Stockpile Pond, runoff from Umwelt WRSA, and inflows to Umwelt Open Pit.</i> • <i>Runoff from the Plant Site has been collected in the Plant Site Pond, which has been released to the tundra without treatment; if water has been found not suitable for discharge it has been pumped to Primary Pond.</i> • <i>Water from Goose Lake (through the intake structure) has been used to meet the freshwater demands for domestic, construction, operation, and associated uses, including mining and milling activities, as needed.</i>
2	<ul style="list-style-type: none"> • Dewatering of Llama Lake will be completed. The majority of the water in Llama Lake will be discharged to Goose Lake after treatment to reduce TSS concentrations; a relatively small portion of the water in the lake will be stored in Umwelt Lake. • Dewatering of Umwelt Lake will be completed. The majority of the water in Umwelt Lake will be discharged to Goose Lake after treatment to reduce TSS concentrations; a relatively small portion of the water in the lake will be kept in the lake. • Mining of Llama Open Pit begins.

Mine Year	Water Management Activities
	<ul style="list-style-type: none"> • Engineered berms are proposed to be constructed around the rim of Echo Open Pit to expand storage capacity for tailings (information regarding these engineered berms will be provided through a subsequent application package). • Waste rock placement in Llama WRSA begins, but only in the area immediately upstream of the pit (Area LD2 in Figure A-2). • NPAG waste rock placement in the Temporary NPAG Stockpile begins. Water from the Temporary NPAG Stockpile is discharged to the environment (if water quality is suitable), or (if water quality is not suitable for discharge) collected locally and pumped to Primary Pond. • Contact water runoff from Llama WRSA is collected at the Llama Open Pit collection berm and pumped to Primary Pond. • Construction of the Stage 1 SWP engineered dam is completed. The SWP now occupies the former footprint of Umwelt Lake and Round Lake. • Umwelt Underground groundwater inflows are managed locally, or pumped to Umwelt Lake (after lake dewatering is complete). • Winter season reclaim from Echo TF begins; summer season supply to Process Plant from Primary Pond continues.
3	<ul style="list-style-type: none"> • Waste rock placement in Umwelt WRSA is completed. • Waste rock placement in Umwelt Overflow WRSA begins. • Construction of the Stage 2 SWP engineered dam is completed. • Saline groundwater inflows in Umwelt Underground and Llama Open Pit are pumped to the SWP.
4	<ul style="list-style-type: none"> • Mining of Umwelt Open Pit is completed. • Predevelopment activities for Llama Underground begins • Waste rock placement in Umwelt Overflow WRSA is completed. • Placement of PAG waste rock material in the Temporary Underground PAG Stockpile begins • Umwelt Open Pit transitions to Umwelt TF and starts to fill with site contact water within its catchment, for storage and use as reclaim in the Process Plant. • Excess water from the closure of Echo TF is pumped to Umwelt TF. • Construction of non-contact water diversion berm (i.e., Goose Main Pit Diversion Berm) south of Goose Main Pit to divert water away from the pit and into Goose Lake is completed. • Construction of Echo/Goose Main WRSA Pond. • Saline water collected in the SWP starts to be sent to a reverse osmosis (RO) unit for treatment, with brine effluent deposited back in the SWP and treated water pumped to Umwelt TF. • Construction of Llama WRSA containment dams (i.e., Llama WRSA Containment Dam East and West), which create the Llama WRSA Pond.
5	<ul style="list-style-type: none"> • Mining of Goose Main Open Pit begins. • Waste rock placement in Echo/Goose Main WRSA begins, including closure cover of Echo TF. • Tailings deposition transitions from Echo TF to Umwelt TF. • Mill reclaim water during the non-open water season source transition from Echo TF to Umwelt TF. • Contact water from the Echo/Goose Main WRSA is collected in Echo/Goose Main WRSA Pond and pumped to the Primary Pond. • Contact water from the Goose Open Pit is pumped to Umwelt TF along with excess water from the Primary Pond. • Contact water collected in the Llama WRSA pond is pumped to Primary Pond.

Note: In Italic activities completed at the time of preparation of this WMP

Table 8.2-2. Summary of Water Management Activities during Phase 2 – Umwelt TF (Year 5-Q1 to Year 11-Q4)

Mine Year	Mine Development Sequence and Key Activities
5	<ul style="list-style-type: none"> • See Table 8.2-1; overlap year between Echo TF and Umwelt TF
6-7	<ul style="list-style-type: none"> • Mining of Llama Open Pit is completed. • Mining of Llama Underground begins • Waste rock placement in Llama WRSA is completed. • Waste rock placement in the Temporary NPAG Stockpile is complete; material in the stockpiles will be removed for use as construction material throughout the remainder of the Operations phase. • Llama Open Pit transitions to Llama TF and starts to fill with site contact water within its catchment, including contact water from Llama WRSA. If needed to manage water level in SWP, saline water encountered in the underground mines and stored in SWP could also be pumped to Llama TF.
8	<ul style="list-style-type: none"> • Predevelopment activities for Goose Main Underground and Echo Underground begin. • Waste rock deposition in the Temporary Underground PAG Stockpile is completed. Material in the stockpiles will be removed for use as backfill of the underground mines throughout the remainder of the Operations phase
9	<ul style="list-style-type: none"> • Mining in Goose Main Open Pit is completed. • Waste rock placement in Echo/Goose Main WRSA is completed. • RO treatment ceases and water level in SWP is kept low through pumping to Goose Main Reservoir to provide contingency storage for saline water, as required. • Goose Main Reservoir begins to fill and becomes available to receive saline water. • Freshwater from Goose Lake or Big Lake may be pumped to Goose Main Reservoir to supporting the closure filling. • Saline groundwater encountered in Goose Underground, Umwelt Underground, Llama Underground and in SWP is pumped to Goose Main Reservoir. • SWP is pumped empty, and all saline sediments are removed and placed in Goose Main Reservoir.
10	<ul style="list-style-type: none"> • Mining of Goose Main Underground and Echo Underground begins. • Saline groundwater from Goose Main Underground and Echo Underground is pumped to the Goose Main Reservoir.
11	<ul style="list-style-type: none"> • Mining of Umwelt Underground is completed. • Umwelt Underground is also available for permanent storage of saline water, as required. • Tailings deposition transitions from Umwelt TF to Llama TF.

Table 8.2-3. Summary of Water Management Activities during Phase 2 – Llama TF (Year 11-Q4 to 13 Q3)

Mine Year	Mine Development Sequence and Key Activities
11	<ul style="list-style-type: none"> • See Table 8.2-2; overlap year between Umwelt TF and Llama TF
12	<ul style="list-style-type: none"> • Mining of Llama Underground is completed, and Llama Underground becomes available for permanent storage of saline water, as required. • Recirculation treatment of Umwelt TF begins. • Freshwater from Goose Lake or Big Lake may be pumped to Umwelt TF to supporting the closure filling.
13	<ul style="list-style-type: none"> • Mining of Goose Main Underground and Echo Underground is completed. • Tailings deposition in Llama TF is completed. • Milling operation in the Process Plant is completed and reclaim water is no longer needed. • Ore Stockpile Pond is decommissioned. • Closure activities may be initiated in Y13 Q4.

8.2.1 LAKE DEWATERING

Llama Lake and Umwelt Lake will need to be dewatered to allow mining operations. The fish-out program has already been completed (see annual reporting for details). For additional information related to conservation and mitigation measures implemented during the fish-out program, refer to Section 9.3.

Llama Lake, which has a natural capacity of 1.13 Mm³, will be dewatered to allow mining of the Llama Open Pit. Approximately 50% of Llama Lake volume has been dewatered during the summer months of Year 1. The majority of the volume was dewatered directly to Goose Lake, with a portion used to support initiation of mine operations and development of initial water cap in Echo TF. The remaining volume of Llama Lake will be dewatered in Year 2. It is anticipated that approximately 80% of the remaining volume in Llama Lake (40% of the original lake volume) will have TSS concentrations in excess of allowable discharge limits. A modular Water Treatment Plant (WTP) for suspended solids removal will be used to treat this portion of the remaining lake volume (Table 7.4-1). It has also been assumed that the bottom 20 % of the remaining water volume (10% of the original lake volume) will have TSS concentrations too high for the WTP to treat; this water and will be stored on site in Umwelt Lake, and then the SWP.

Once Llama Lake dewatering is complete, lake bottom sediments within the Llama Open Pit boundaries will be excavated and placed in the Umwelt WRSA footprint, as needed.

Umwelt Lake, which has a natural capacity of 0.24 Mm³, will also need to be dewatered to allow construction of the SWP. Approximately 50% of Umwelt Lake volume has been dewatered during the summer months of Year 1. The majority of the volume was dewatered directly to Goose Lake, with a portion used to support initiation of mine operations and development of initial water cap in Echo TF. The remaining volume of Umwelt Lake will be dewatered in Year 2. It is anticipated that approximately 50% of the remaining volume in Llama Lake (25% of the original lake volume) will have TSS concentrations in excess of allowable discharge limits. A modular Water Treatment Plant (WTP) for suspended solids removal will be used to treat this portion of the remaining lake volume (Table 7.4-1). It has also been assumed that the bottom 50 % of the remaining water volume (25% of the original lake

volume) will have TSS concentrations too high for the WTP to treat; this water and will be kept in Umwelt Lake, and then the SWP.

Dewatering will continue to be undertaken in accordance with the Type A Water Licence (2AM-BRP1831 Amendment No. 1 Part E, Item 4 and Item 14).

8.2.2 SALINE WATER POND

Umwelt Lake will be dewatered to construct the Saline Water Pond (SWP). At the time of construction of SWP, water left in Umwelt Lake will be limited to the high TSS water from lake dewatering (if any). The SWP containment dams will be constructed in two stages. The Stage 1 SWP Containment Dam will be constructed in Year 2 (available to receive water in Q1 of Year 3) to a storage capacity (at maximum operating water elevation) of approximately 1.1 Mm³; the Stage 2 SWP Containment Dam will be constructed in Year 3 (completion expected in Q1 of Year 4) to a storage capacity (at maximum operating water elevation) of approximately 1.9 Mm³ at maximum operating water elevation). The design of the Stage 2 SWP Containment Dam will be refined during detailed engineering and B2Gold Nunavut will provide the detailed engineering drawings 60 days in advance of construction of this SWP stage. Some storage capacity for saline water may be available within Umwelt Lake before the completion of the Stage 1 Containment Dam, depending on the actual volume of high TSS water encountered during the dewatering of Llama and Umwelt lakes. Refer to Section 5.1.3 for more information on potential saline water inflows during mining at the Property.

Saline water from the Umwelt, Llama, Echo and Goose Main undergrounds, as well as the Llama Open Pit, will be collected and pumped to the SWP. Management of saline water will rely on SWP during the early years of Operations. Once the Umwelt Open Pit mining is complete and the pit is available to receive water and tailings in Year 4 Q3, saline water from the SWP will be treated by an RO unit, with brine effluent deposited back into the SWP and treated effluent pumped to the Umwelt TF. Once Goose Main Open Pit mining is complete, saline water at the Project will be transferred to the Goose Main Open Pit (then called Goose Main Reservoir) for permanent storage. In the event of insufficient storage within the SWP before the Goose Main Reservoir is available, saline water can be transferred to the Llama Open Pit once pit mining is completed Year 5, or Umwelt Underground, when the void spaces within the exhausted underground workings will be available.

B2Gold Nunavut has identified the following adaptive management strategies to reduce the total amount of water reporting to the SWP:

- ◆ Construction of diversion berms around the SWP to reduce the non-contact runoff from undisturbed ground reporting to SWP;
- ◆ Snow removal from the frozen surface of the SWP to reduce the amount of water reporting to SWP during freshet;
- ◆ Use of evaporators during summer months to remove a portion of the water in SWP;
- ◆ Continue exploring options to expand the SWP capacity and increase robustness of the saline water management strategy at the site (B2Gold Nunavut has initiated preliminary design of a Stage 3 SWP).

B2Gold Nunavut will continue evaluating these strategies and will implement them, as required, if higher than expected saline groundwater inflows are encountered.

To manage saline groundwater and minimize potential associated impacts, a Saline Water Management Plan (SWMP) is provided in Appendix C of the WMP.

8.2.3 OPEN PITS AND OTHER CONTACT WATER

During Operations, precipitation will accumulate in the open pits, which will be collected using sumps. From the sumps water will be pumped across the Goose Mine site, eventually discharging to the Primary Pond (main location) and/or the active TF. From Primary Pond and the active TF, contact water will be used as reclaim water in the Process Plant. Under normal operating conditions, the Primary Pond and the active TF (except for Llama TF) will be the main source of reclaim water to the Process Plant during the open water season and winter season, respectively. Llama Open Pit is the exception as this pit is expected to have saline water inflows through the talik; this saline groundwater and meteoric inflows will be pumped to the SWP. Saline water is expected to be present throughout the Llama TF period, therefore Llama TF is not expected to be used to provide reclaim water.

After mining of open pits is complete, the open pits will be used for tailings and contact water storage. For the first approximately four years of Operations (i.e., Year 1 to Year 5 Q1), the mined-out Echo Open Pit will be used for tailings deposition. From Year 5 Q1 to Year 11 Q4, tailings deposition will occur in Umwelt TF. The Echo TF will then be covered with waste rock as part of the Echo/Goose Main WRSA development. From Year 11 Q4 onward, tailings will be disposed in the Llama TF. Umwelt TF will remain a source of reclaim water for the process plant until end of operations. Umwelt and Llama TF will fill up with water in the later stages of operations and closure.

Starting in Year 9 after mining of Goose Main Open Pit is complete, the volume of contact water generated at the Property not required for reclaim water will be pumped to Goose Main Reservoir for permanent storage and to support closure filling of the reservoir. Saline water will also be pumped to Goose Main Reservoir for permanent storage. Recirculation treatment of contact water contained in the Umwelt and Llama TFs is expected to begin in Year 12 and Year 15, respectively, to reduce contaminant concentrations ahead of the Closure and Post-Closure phases.

8.2.4 WATER TREATMENT

A water treatment plan (WTP) will be operational in the open water season at the Goose Property during the second stage of dewatering of Llama and Umwelt Lakes that will occur in Year 2. The purpose of water treatment during lake dewatering is the removal of TSS, as discussed in Section 8.2.1.

Water treatment is inactive during Operations until mining of the Umwelt Open Pit is completed in Year 4, at which point saline water from the SWP is treated with an RO unit, with treated effluent pumped to the Umwelt TF and brine effluent deposited back in the SWP. This treatment will allow for additional storage capacity for saline water in SWP for the remainder of the Operations Phase. Seasonal treatment only (summer months only) is expected to be sufficient to manage water levels in SWP, except potentially in the first year of treatment when greater volume of water is in SWP. However, need for year-round treatment will be further investigated ahead of completing the design of the treatment plant.

Starting in Year 12 and Year 15, respectively, the Umwelt TF and Llama TF water is recirculated through treatment year-round to reduce metals, nitrogen species, major ions and suspended solids loading in

these facilities. Recirculation treatment in Umwelt and Llama TF, based on a treatment rate of approximately 5,000 m³/day for each pit, is expected to continue to end of Closure Phase.

8.2.5 UNDERGROUND FACILITIES

Average groundwater inflows into the underground workings during the Operations Phase have been estimated for Umwelt, Llama, Echo, and Goose Main undergrounds, as well as Llama Open Pit (See Section 5.1.3, Table 5.1-1). Saline groundwater inflows encountered over the LOM will be pumped to the SWP, or Goose Main Reservoir once available starting Year 9, to create a meromictic lake.

8.2.6 WASTE ROCK STORAGE AREAS

During the Operations Phase, drainage from the WRSAs at the Goose Mine will be monitored and pumped to Primary Pond or active TF (as described in Section 8.2.3), ultimately providing water for reclaim at the Process Plant. Shallow groundwater around the WRSAs prior to freeze back will ultimately report to the event ponds (sometimes via sumps), which are situated at the local topographic low points. The containment dams around each pond will be lined with geosynthetic materials (liners) which will be keyed into bedrock where possible. If bedrock is not practical, the liners will be keyed into the permafrost foundation.

8.2.7 ORE STOCKPILE

During Operations, drainage from the Ore Stockpile will be collected in the Ore Stockpile Pond, which will be pumped to the active TF or Primary Pond.

8.2.8 TAILINGS MANAGEMENT FACILITIES

The tailings management strategy is based on the principle of maximizing the use of open pits for tailings storage. Tailings will be stored in the mined-out Echo, Umwelt, and Llama open pits as soon as mining is completed, and the pits are available for tailings deposition (Table 8.2-4).

Tailings will be deposited in Echo TF until Year 5 Q1; after this time, Echo TF will be covered with waste rock as part of the Echo/Goose Main WRSA.

Umwelt and Llama TFs will be partially (60% and 26%, respectively) filled with tailings, with the remaining pit volume filled with contact water. Evaluation of the tailings amounts that will be deposited in Umwelt TF and Llama TF will be refined during detailed engineering, and these changes will be provided in future updates to the WMP. Umwelt TF will be the main source of reclaim water during the winter season for the Operations Phase after completion of Echo TF.

Starting in Year 9, contact water not being used as reclaim water will remain in Umwelt TF, Llama TF, or be pumped to Goose Main Reservoir to support filling of the pits. Tailings disposal will continue in Llama TF. Recirculation treatment will begin (if needed) for the Umwelt and Llama TFs in Year 12 and Year 15, respectively, for the remainder of Operations and into Closure.

Table 8.2-4. Back River Property Tailings Management System Storage Requirements

Location	Period (Quarter and Year)	Tailings (Mm ³)
Echo TF	Y1, Q2 to Y5, Q1	3.2
Umwelt TF	Y5, Q1 to Y11, Q4	7.0
Llama TF	Y11, Q4 to Y13, Q3	3.1
Total Project	Y1, Q2 to Y13, Q3	13.4

8.2.9 EXPLOSIVES MANUFACTURE AND STORAGE

Pre-packaged explosives delivered by air or WIR will be used early in Construction until an ammonium nitrate (AN) facility is constructed at the Goose Property. AN for fuel oil (ANFO) production will be delivered to the mine site in shipping containers.

An explosives truck wash facility will be constructed and operated at the AN Facility. Wash water from this facility may be high in ammonia, suspended solids, and/or metals. This wash water will be treated at the AN Facility in an evaporator. Alternatively, the truck wash water will be transported to a water management pond for treatment or discharge as appropriate.

The Goose Mine is planning to transition from ANFO to emulsion (Figure A-01 for location of proposed Emulsion Plant). Details about this transition will be provided in future updates of the WMP.

8.2.10 MARINE LAYDOWN AREA

Water management strategies at the MLA will continue as current during the Operations Phase (Year 1 to Year 13) (Figure A-03).

8.3 PHASE 3: CLOSURE

Operations end in Year 13 Q3 and Closure begins in Year 14, for a total duration of 7 years (i.e., ends Year 20). Some closure activities may begin in the last quarter of Year 13. Water management during the Closure Phase relates to ongoing camp operation, passive and active filling of open pits, runoff control from WRSAs, recirculation treatment within the Umwelt and Llama TFs, treatment of water in Umwelt Treatment Pond and potentially in Goose Main Reservoir. These activities will continue to be implemented until the contact water in the flooded open pits and runoff from the WRSAs meet -site-specific discharge limits and receiving water quality objectives. At that point, passive discharge to the environment will be possible. Water management infrastructure and activities are depicted in Figure A-04, as well as the flow diagrams attached to Appendix C.

Further details regarding the Closure and reclamation activities are presented in the Interim Closure and Reclamation Plan (2AM-BRP1831 Amendment No. 1 Part J, Item 1).

8.3.1 CULVERT CLOSURE

Culverts will be removed from all-weather roads and the natural drainage restored. Roads will otherwise remain intact to ensure preservation of permafrost and facilitate long-term site access for monitoring and inspection.

8.3.2 BERM CLOSURE

During the Closure period, the diversion and containment structures will be breached to restore natural drainage and allow runoff to naturally support filling of the open pits. A general layout of the water management infrastructure that will be breaching is provided in Figure A-04 and A-05. Preliminary details on conditions to support breaching of individual diversions and containment structures are provided in Table 8.3-1.

Berm closure is not expected to significantly impact the water quality of site runoff water. All runoff is expected to meet the site runoff quality standards as indicated in the Licence. Water quality monitoring will occur at strategic locations throughout Closure to identify whether water quality criteria are being met.

Breached diversion structures will remain in place during and beyond the Post-Closure Phase. Collection ponds will have been breached, liners removed and landfilled, and the breaches re-contoured and armoured (if necessary) to allow for passive runoff.

Table 8.3-1. Diversion and Containment Berm Breach Schedule

Mine Year	Water Management Structure	Closure Timeline	Closure Strategy
14-20	SWP Containment Dam and Berms	Closure	Decommissioned water collected in SWP (now Umwelt Treatment Pond) is suitable for direct discharge to the environment.
	Primary Pond Containment Dam	Closure	All Primary Pond flows conveyed to the restored Umwelt Lake (formerly SWP). Umwelt WRSA capped and freeze back promoted.
	Ore Stockpile Pond Containment Dam	Closure	Ore Stockpile Pond is dewatered after removal of the Ore Stockpile. Runoff from the area will report to Goose Lake.
	Llama WRSA Containment Dams and Llama Open Pit Diversion/Collection Berms	Closure	Drains Llama WRSA Pond into Llama TF when open pit mining is complete, and Closure begins. Allow Llama TF to flood. Llama WRSA capped and freeze back promoted.
	Echo / Goose Main WRSA Containment Dam and Echo Diversion Berm	Closure	Echo / Goose Main WRSA Pond is dewatered upon completion of mining operations. Runoff from the area will report to Goose Lake. Echo / Goose Main WRSA capped and freeze back promoted.
	Goose Main Diversion Berm and Rascal Berm	Closure	Breached upon completion of Operations, allowing Goose Main Reservoir to flood.

8.3.3 OPEN PIT CLOSURE

The open pits, with exception to Echo Open Pit which is covered with waste rock, will be filled with water from reporting catchments as well as active filling with freshwater from Goose Lake (as required), thereby allowing both contact and non-contact water to fill the pits. Pit water will be monitored to ensure it meets applicable discharge criteria and then be allowed to overtop into nearby watercourses.

The Water and Load Balance Report presented in Appendix C provides a summary of the average monthly water quality concentrations at the time of flooding and the average open water long-term steady state conditions at the downstream prediction nodes of the flooded open pits. These predictions are compared to MDMER discharge limits. With the support of recirculation treatment within the Umwelt and Llama TFs, treatment of the Umwelt Treatment Pond effluent and treatment in the Goose Main Reservoir, all parameters in each pit lake facility are expected to meet MDMER limits at the time of flooding, and long-term steady state conditions are expected to meet CCME guidelines or SSWQOs as appropriate. As required, water treatment will continue into the Closure Phase until water quality guidelines are met.

Llama Open Pit (or Llama Reservoir), which was already partially flooded by the operation of Llama TF, will be further flooded as all Llama diversion berms will be breached, as well as active filling with freshwater from Goose Lake as required. Runoff from the Llama WRSA will also be routed to Llama TF. The Llama TF will overtop under average hydrologic conditions within the Closure Phase and discharge into Goose Lake via Umwelt Lake (formerly the SWP). Recirculation treatment in Llama TF will continue year-round until water quality objectives are met.

Umwelt Open Pit (or Umwelt Reservoir), which was already partially flooded by the operation of Umwelt TF, will be allowed to continue to fill with catchment water, as well as active filling with freshwater from Goose Lake as required. Umwelt Reservoir will be breached at the north end and will overtop into Goose Lake via Umwelt Lake (formerly the SWP) within the Closure Phase under average hydrologic conditions.

Goose Main Open Pit (or Goose Main Reservoir), which was already partially flooded with supernatant water and saline water collected at the Goose Mine during Operations, will be allowed to fill with catchment water after berms are breached. Goose Main Reservoir will be breached at the east side and overtop into Goose Lake once water quality objectives have been met, which is expected to occur within the Closure Phase with the support of active filling with freshwater from Goose Lake under average hydrologic conditions. The freshwater cap above the saline water will promote formation of a meromictic lake.

Pit lake water quality monitoring will be conducted to ensure water meets discharge criteria prior to pit overtopping and passive discharge. In the unlikely event that the water in any of the pit lakes is not suitable for discharge, the pit lake water will be batch-treated to address remaining water quality impairments. B2Gold Nunavut intends to implement five years of post-closure water quality monitoring for each open pit to ensure that water quality objectives are met. If closure objectives have not been met in this five-year monitoring period, B2Gold Nunavut will extend monitoring beyond the stated 5-year Post-Closure monitoring period. Additional details of the above proposed monitoring are included in the ICRP (2AM-BRP1831 Amendment No. 1 Part J, Item 1).

As described in Section 8.2.6, Echo Open Pit will be filled with tailings and covered with waste rock as part of the Echo/Goose Main WRSA.

8.3.4 UNDERGROUND FACILITY CLOSURE

Saline groundwater encountered during Operations will be permanently stored in the Goose Main Reservoir. Vent raises and the underground portals will be capped with concrete and waste rock,

respectively. The underground mines will be backfilled with waste rock material and/or flooded with natural runoff/groundwater.

8.3.5 WASTE ROCK STORAGE AREA CLOSURE

During Operations, potentially acid generating (PAG) material in WRSAs will be progressively covered with NPAG material during the development of each facility. Progressive reclamation will consist of a 5-m cap of NPAG waste rock to promote the aggradation of permafrost into the WRSAs so that the PAG rock remains frozen. The majority of WRSA closure activities will occur during Operations, and minor NPAG covering activities will occur during the Closure Phase. Permafrost aggradation into the WRSAs will be monitored during placement and once the WRSAs are closed.

Once the WRSA runoff consistently meets the site-specific contact water discharge criteria following completion of WRSA operations, the WRSA ponds and diversion structures will be breached and removed, and the final post-closure discharge will be established. Five years of post-closure water quality monitoring from the WRSAs will take place to confirm water quality objectives are being met.

8.3.6 ORE STOCKPILE FACILITY CLOSURE

Milling of all remaining stockpiled material will be completed in Year 13. The Ore Stockpile Pond Containment Dam will be breached and runoff from the area will be restored to its natural drainage, directed towards Goose Lake. Five years of post-closure water quality monitoring will be conducted in the area to confirm runoff meets water quality objectives.

8.3.7 TAILINGS MANAGEMENT FACILITY CLOSURE

No tailings deposition or milling will occur during the Closure Phase. The final closure measures for each tailings facility (i.e., Echo TF, Umwelt TF, and Llama TF) are described in Section 8.3.3, Open Pit Closure.

8.3.8 SALINE WATER POND CLOSURE

During operations, the remaining contact water in SWP will be removed and pumped to Goose Main Open Reservoir. The top 1 to 2 m layer of sediments underlying the original footprint of Umwelt Lake is also planned to be excavated and placed into Goose Main Reservoir or Llama TF. It is expected that this removal may start as early as Year 9, when Goose Main Reservoir becomes available. If the removal will occur at opening of Goose Main Reservoir, the sediments will be placed in Goose Main Reservoir. If the removal is delayed to later stages of operations or into closure the removed sediments will be placed in Llama TF. The excavation and storage of this sediment have been included into the Water and Load Balance model. The remaining chloride in the porewater of the sediments underlying the original footprint of Umwelt Lake is assumed to diffuse upwards into Umwelt Lake within the first year of flow being re-established.

The proposed depth of sediment excavation was determined by a chloride diffusion model that calculated the concentration of chloride in the porewater of the sediment underlying the SWP over time, based on the predicted chloride concentration in the SWP water itself (Sabina 2015, Appendix V2-7H). Should the chloride concentration at first 2 m of depth be higher than the long-term CCME guideline,

additional sediment underlying the original footprint of Umwelt Lake will be excavated and placed in Llama TF.

Water treatment is expected to be required in the Umwelt Treatment Pond when it receives water from Llama TF and Umwelt TF. When water treatment in Umwelt Treatment Pond is no longer needed, the SWP Containment Dam will be breached allowing Umwelt Lake to re-establish. No further water management activities at the SWP will occur during Closure. Water quality monitoring will occur during Closure and first five-year period of Post-Closure to confirm water quality objectives are being met.

8.3.9 WATER TREATMENT CLOSURE

Once water treatment is completed at the Project, the WTPs and all associated pipelines will be dismantled, cleaned, and disposed of in the landfill. All WTP will be decommissioned once runoff water quality at designated control points has met the required closure criteria (i.e., Water Licence and MDMER discharge limits).

Recirculation water treatment will be required in Umwelt and Llama TFs, and water treatment before discharge is expected to be required in Umwelt Treatment Pond. Water treatment in Goose Main Reservoir is not expected to be required but will be implemented if required. All water treatment is expected to terminate by end of Closure phase. Should additional treatment be required to meet water quality objectives, B2Gold Nunavut would continue the water treatment into the Post-Closure Phase during the open water season in Umwelt TF and/or Llama TF, or from the Umwelt Treatment Pond and Goose Main Reservoir. Once objectives have been confirmed by water quality sampling, all pumping and piping infrastructure, as well as the WTP itself, will be dismantled and landfilled. Any sludge produced from water treatment during the Closure Phase will also be landfilled.

8.3.10 MARINE LAYDOWN AREA CLOSURE

Water management strategies at the MLA will remain consistent during the Closure Phase (Year 14 to Year 20).

The MLA will require minimal closure with the respect to water management as the site does not require ponds or other diversion infrastructure for water management purposes. Decommissioned roads and pads, which will be constructed using geochemically suitable material, will be designed to have runoff as dispersed sheet flow to minimize channelized flow.

Refer to the Interim Closure and Reclamation Plan (2AM-BRP1831 Amendment No. 1 Part J, Item 1) for discussion on other closure aspects of the MLA.

8.4 PHASE 4: POST-CLOSURE

Water management activities during the Post-Closure Phase at the Goose Property are presented in the flow diagrams in Appendix C and are depicted in Figure A-05. All water management structures are decommissioned during Closure. The Goose Airstrip Culvert crossing will be removed, and the Goose Airstrip will be decommissioned.

Water management strategies at the MLA will remain consistent during the Post-Closure Phase (Year 21+).

8.5 WATER MANAGEMENT – CARE AND MAINTENANCE

Temporary closure (also termed Care and Maintenance) is defined as the cessation of mining and processing operations for a finite period of time with the intention of resuming operations upon resolution of the cause of cessation (MVLWB/AANDC 2013). Care and Maintenance activities will depend on the phase at which cessation of operations takes place. For more details, refer to the Interim Closure and Reclamation Plan (2AM-BRP1831 Amendment No. 1 Part J, Item 1).

Monitoring will take place and continue as outlined in Section 10 at whatever phase cessation occurs. Key surface water infrastructure will be maintained through Care and Maintenance to ensure proper operation. Depending on the stage at which temporary closure occurs, the water level in the active tailings management facility at the time may need to be monitored as there will be a net buildup of water due to precipitation inflows and no water reclaim for processing. Should temporary closure occur for an extended period of time (i.e., two or more years), it may be necessary to begin pumping from the active tailings management facility and treating the excess water for discharge.

9. ENVIRONMENTAL PROTECTION MEASURES

9.1 GENERAL OBJECTIVES

The purpose of environmental protection measures for site water management is to eliminate or reduce Project effects on water quality.

The main objectives of B2Gold Nunavut's water management strategies are to:

- ◆ Minimize the amount of water that contacts mine ore and wastes, which ultimately reduces the volume of water requiring management;
- ◆ Appropriately manage all contact water and discharges to protect local aquatic resources; and
- ◆ Implement water conservation and recycling to maximize water reuse and minimize the use of natural waters.

Protection measures may include the planning and design of engineered structures, the application of control technologies, the implementation of BMPs, and specific requirements from regulatory authorizations. Monitoring of the protection measures and adaptive management are also an integral part of effective environmental protection measures.

Pending further direction from the NWB, B2Gold Nunavut is committed to maintain a WMP designed to meet the above main objectives. The WMP includes monitoring that demonstrates that contact water (runoff and shallow groundwater) from the ore storage and WRSAs is adequately captured and managed consistent with the WRMP (2AM-BRP1831 Amendment No. 1 Part F, Item 1).

9.2 WATER USAGE

The following protection measures will be applied to water usage:

- ◆ Freshwater intake and discharge pipelines will be designed to limit erosion and sedimentation, protect against freezing, and accommodate peak flows;
- ◆ Controlled construction of the engineered intake and discharge pipelines will ensure minimal changes in turbidity and resuspension of sediment;
- ◆ All material used in construction will be clean, free of sediment, and geochemically stable; and
- ◆ All intake and discharge pipelines will be screened in accordance with the *Freshwater Intake End-of-Pipe Fish Screen Guideline* (DFO 1995). The water withdrawal rate will be controlled such that fish do not become impinged on screens.

Water will be recycled to the maximum extent possible. The most significant water recycling activities will be within the tailings management facilities. The Echo TF, Umwelt TF, and Llama TF will store both tailings solids and supernatant water. The supernatant water will include contact water from the open pits and WRSAs. Water will be recycled and form the main source of reclaim water for the Process Plant.

9.3 CONSERVATION MEASURES

Long-term water usage has been closely evaluated; the focus has been on identifying maximum water use, while protecting fish and fish habitat. Short-term use will be required for various Project activities (e.g., WIR construction, dust suppression). Potential short-term water sources will be evaluated in advance to determine if these sources will be adequate for the activity in accordance with the DFO (2010) winter water withdrawal guidelines, including:

- ◆ Total water withdrawal from a single waterbody will not exceed 10% of the available water volume; and
- ◆ Only waterbodies with a minimum unfrozen water thickness of 1.5 m under ice will be considered for water withdrawal.

B2Gold Nunavut is committed to minimize and mitigate impacts to fisheries. For fish-bearing crossings, B2Gold Nunavut will implement all applicable DFO BMPs to avoid and mitigate serious harm to fish as the result of water crossing construction, operation, and decommissioning for all fish-bearing water crossings. These measures will include, but are not limited to, appropriate design of water crossings to facilitate fish passage at both high and low flows; timing windows that incorporate spawning, incubation, and hatch times for all species using watercourses; sediment and erosion control; protection of riparian vegetation; and other forms of bank stabilization.

B2Gold Nunavut will ensure that all Project infrastructure in watercourses is designed and constructed in such a manner that this infrastructure does not unduly prevent or limit the movement of water in fish-bearing streams and rivers, unless otherwise authorized by DFO. In addition, unless otherwise directed by DFO, B2Gold Nunavut's monitoring program for culverts on fish-bearing watercourses during the Construction, Operations, and Closure phases will include measures to ensure that barriers to fish passage do not form over time as a result of crossing damage due to ice blockage, flooding, or movement of debris; all of which may occur at freshet. Detailed design drawings and an updated monitoring program for culverts on fish-bearing watercourses will be produced prior to construction.

B2Gold Nunavut anticipates, and has confirmed with the DFO, that an update is necessary to the existing DFO Letter of Advice (18-HCAA-00971) to reflect planned in-water works related to the MLA Shoreline Pad Extension. B2Gold Nunavut will also prepare an application addressed to Transport Canada to ensure any in-water works will not substantially interfere with navigation as required under the *Navigation Protection Act* (Sabina 2020). A full as-built drawing will also be completed once the Shoreline Pad Extension has been constructed at the MLA.

B2Gold Nunavut will continue to engage DFO, the Kitikmeot Inuit Association, and other interested parties during the regulatory phase on the design, construction, and operation of adequate fish passage to permit migration of Arctic Grayling from Goose Lake to natural spawning and rearing habitat located in upper Rascal Stream East, which is located south of the Project airstrip. Any additional information required to ensure the design of the fish passage will be completed prior to significant construction activities at the Goose Property. Specifically, B2Gold Nunavut will provide annual monitoring updates regarding the Rascal Stream Fish Passage that enables parties to determine its effectiveness.

In alignment with dewatering activities in Llama and Umwelt lakes, a fish-out program was completed ahead of initiation of dewatering. The fish-out program followed the DFO's *General Fish-Out Protocol for*

Lakes and Impoundments in the Northwest Territories and Nunavut (Tyson et al. 2011). Additional details are provided in the annual reporting.

9.4 GENERAL SITE RUNOFF

Collected water, snowmelt, or runoff that meets the applicable water licence criteria will be discharged to land, and where possible at a minimum setback of 31 m from a waterbody. To protect the freshwater environment during construction and decommissioning activities, the Project will minimize runoff and the transport of material into freshwater by the following planning and design measures:

- ◆ WRSAs will be confined to the local watersheds where the deposits are located to the extent practicable to limit potential effects on water quality in local drainage areas;
- ◆ Infrastructure will be located, whenever feasible, on competent bedrock or appropriate base material that will limit permeability and the transport of potentially lower quality water into the active layer and ultimately to the freshwater environment;
- ◆ Footprint areas of Project components will be minimized to the extent practicable, such as locating infrastructure nearer to the central location of Project sites around the deposits; and
- ◆ The landscape will be reclaimed as soon as feasible to minimize erosion potential.

At select water crossings, pumping or siphoning may be employed to facilitate the transfer of water from one side of the structure to the other side. Pumping can also serve as a temporary solution during freshet or prior to a culvert installation.

9.4.1 SEDIMENT AND EROSION CONTROL MEASURES

Surface water will be managed within the Project footprint such that sediment-laden runoff is minimized, intercepted, and/or treated prior to entering downstream receiving waters or mine process facilities. Effective sediment control depends on the isolation of easily erodible, disturbed ground surfaces.

Measures will be implemented to reduce the quantity of runoff where the mobilization of sediments cannot be eliminated. Sediment-laden water will be captured and routed to sediment basins.

Sediment and erosion management and control during initial and ongoing construction activities may involve establishing contact water collection ditches/berms, constructing sediment ponds, limiting land disturbance to a practicable minimum, reducing water velocities across the ground through surface texturing and re-contouring, and progressively rehabilitating and stabilizing disturbed land surfaces to minimize erosion.

Exposed landscape surfaces will be protected by the installation of covering material such as riprap, aggregate, or rolled erosion control products. Runoff flow may be controlled by a combination of measures, including:

- ◆ Texturing/grading of slopes to slow runoff and reduce effective slope length;
- ◆ Synthetic permeable barriers and/or fibre rolls to reduce runoff velocities and retain sediments; and
- ◆ Check dams, gabions, and energy dissipation structures to reduce flow velocities in channels.

- ◆ Sediment levels in runoff will be minimized by intercepting sediment before it reaches the freshwater environment. In addition to measures aimed at controlling runoff flow, the quantity of transported material in runoff may be controlled by measures including:
- ◆ Preserving riparian zones that trap sediment and reduce flow velocities;
- ◆ Installing synthetic permeable barriers, fibre rolls, and/or silt fences as required;
- ◆ Installing check dams, gabions, and sediment basins to reduce flow velocities and encourage sediment deposition;
- ◆ Maintaining and repairing any machinery prior to use that has the potential to result in a fluid release or leak; and
- ◆ Locating fuel transfer and maintenance activities greater than 31 m from a watercourse or waterbody, except for approved activities near water.

B2Gold Nunavut will implement the following mitigation and management measures for erosion and sediment controls, as well as the following bank stabilization measures:

Mitigation by Erosion and Sediment Control

- ◆ The area of landscape disturbance will be minimized, and restoration will occur as soon as possible to minimize erosion potential.
- ◆ Silt fences will be used in areas of cuts and excavations, downslope from exposed or erodible areas, to prevent sedimentation of waterbodies.
- ◆ Effective erosion and sediment control measures will be installed before starting work to prevent sediment from entering the waterbody.
- ◆ Site isolation measures (e.g., silt boom or silt curtain) will be used to contain suspended sediment where in-water work is required.
- ◆ Regular inspection and maintenance of erosion and sediment control measures and structures will be conducted during construction.

Mitigation by Shoreline/Bank Re-vegetation and Stabilization

- ◆ Clearing of riparian vegetation will be kept to a minimum to avoid disturbance to the riparian vegetation and prevent soil compaction.
- ◆ If replacement rock reinforcement/armouring is required to stabilize eroding or exposed areas, appropriately sized, clean rock will be installed at a similar slope to maintain a uniform bank/shoreline and natural stream/shoreline alignment.
- ◆ Exposed landscape surfaces will be protected, where possible, by the installation of covering material like riprap, aggregate, or rolled erosion control products.
- ◆ Decommissioning of the roads will involve restoring natural drainages and stabilizing any slopes where there is potential for erosion; stabilization measures may require pulling back of side-cast fills on locally steep slopes or buttressing and/or re-contouring of steepened slopes using NPAG material.

A TSS-turbidity relationship will be developed, where needed, either from historical site data (if sufficient TSS-turbidity data are available to create a statistically supported relationship), experimentally, or during

construction activities (in which case, the use of Turbidity in place of TSS would only be possible once a relationship had been established; until that time, compliance would only be verifiable through TSS concentrations). The methodology to be used will depend on the activity site, the amount of historical data available, and the planned work. In all situations, regression analysis will be used to identify site-specific statically significant relationships (equations) relating turbidity to TSS to allow the derivation of TSS from in-field measurements of turbidity. TSS will be monitored during in-water construction against criteria presented in Section 7.5. Should monitoring indicate that TSS has surpassed 80% of these criteria, additional mitigation measures will be implemented (such as a temporary reduction in, or cessation of, the activity, or the use of additional mitigation).

9.4.2 SALINE WATER MANAGEMENT

The SWMP is included as an Appendix B to the WMP and provides details related to the management of saline groundwater in compliance with the Type A Water Licence (2AM-BRP1831 Amendment No. 1 Part B, Item 13m).

The SWMP provides a description of saline water management for the Project, outlines the procedures required to manage the quantity and quality of saline groundwater interacting with Project components throughout the mine life, and characterization of saline water inflows into the underground mine workings. The SWMP also includes monitoring of thermal conditions, monitoring of saline water at the Goose Mine, mitigation measures designed to address the potential for higher-than-predicted volumes of saline water inflows into open pit and undergrounds, and potential water treatment and disposal methods.

In summary, the saline water management strategy consists of collecting saline water from Llama Open Pit and the underground mine workings, and temporarily storing this groundwater in a dedicated storage facility, the SWP. The saline water collected in the SWP is treated with an RO unit and then used for reclaim in the Process Plant. Once Goose Main Pit mining is completed, saline water encountered will be transferred to Goose Main Reservoir for permanent storage. In the event of insufficient storage in the SWP before transfer to Goose Main Reservoir, saline water can be transferred to the Llama TF once active in Year 6, or Umwelt Underground, when the void space within the underground will be available. Additional details can be found in Appendix B.

9.4.3 MINE WATER RUNOFF MANAGEMENT

Environmental protection measures will be implemented to manage mine water runoff, including:

- ◆ Collection of all mine water runoff through use of diversions, collection ditches/berms, and pipelines;
- ◆ Recycling of mine contact water to the extent possible at the Goose Mine;
- ◆ Treatment of mine contact water prior to discharge to the environment during Construction, Operations, and Closure;
- ◆ Land discharge of mine contact water where possible, rather than direct discharge to surface waters; and

- ◆ Passive discharge of mine contact water during the Post-Closure Phase, provided discharge criteria are met.

At the Goose Mine, these measures will be achieved by collecting all mine contact water from open pits, ore stockpiles, and WRSAs. Water collected will be recycled for use in the Process Plant. At Closure, pit lakes will be equipped with spillways (where required) and allowed to overtop and discharge to the environment once monitoring confirms discharge limits have been achieved. In the unlikely event that mine water runoff from pit lakes and WRSAs do not meet discharge criteria, runoff from these areas will be directed to a central location for further treatment.

Diversion structures will be required around Llama, Goose Main, and Echo open pits to divert non-contact water away from mining areas. This strategy will reduce the total amount of contact water generated by the Project. Mine water runoff management has been optimized based on the plans as outlined in Section 6 of the original application (Sabina 2017). The management strategies will continue to evolve and will be finalized during detailed design.

9.5 ACID ROCK DRAINAGE / METAL LEACHING

The WMP and the WRMP (2AM-BRP1831 Amendment No. 1 Part F, Item 1) will be periodically updated as new geochemical information becomes available. The management and mitigation measures will include protocols for identification of appropriate quarry and borrow pit material for construction to minimize potential effects related to acidic rock drainage (ARD) or metal leaching (ML).

Goose Mine workings and waste rock represent a moderate ARD/ML potential. Low to moderate bulk neutralization potential (NP) contents could result in acidic drainage after a lag time of 14 to 20 years. Interaction with the deposit material and air/water could result in runoff/drainage exhibiting concentrations of arsenic and copper greater than MDMER limits. This plan has been designed to minimize exposure time of the mine workings and waste rock to air/water wherever possible to ensure the exposure time is less than the expected lag time.

9.6 BORROW PIT AND QUARRY DEVELOPMENT

Plans to develop aggregate sources, as well as the identified environmental protection measures and monitoring plans, are described in the Borrow Pits and Quarry Management Plan (2AM-BRP1831 Amendment No. 1 Part D, Item 1). The following summarizes the environmental protection measures identified to minimize impacts to water during borrow area and quarry planning and development:

- ◆ Maintain a setback distance of 31 m from creeks and streams (2AM-BRP1831 Amendment No. 1 Part D, Item 16);
- ◆ Preserve vegetative buffers to limit impacts on water quality;
- ◆ Use berms and ditches to direct runoff away from the excavation;
- ◆ Slope rock quarry floors so that water is diverted to a sump within the quarry or adjacent to the quarry boundaries where it can be monitored prior to release;
- ◆ Sample accumulated water within water collection areas for TSS, oil and grease, and ammonia -nitrogen;

- ◆ Apply sediment and erosion control measures such as those described in Section 9.4.1;
- ◆ Use dust skirts on conveyors and apply dust suppression measures as identified in the Air Quality Monitoring and Management Plan (Sabina 2019b);
- ◆ Monitor for ground ice during excavation of borrow areas;
- ◆ Monitor and address any subsequent settlement from ground ice to maintain positive drainage and avoid the ponding of water (which can further exacerbate thawing); and
- ◆ Routinely inspect the effectiveness of water management structures.

B2Gold Nunavut will maintain an appropriate setback distance between Project quarries and fish-bearing or permanent waterbodies, or implement appropriate mitigation measures, as required to prevent ARD/ML into such waterbodies.

These environmental protection measures are described further in the Borrow Pits and Quarry Management Plan (2AM-BRP1831 Amendment No. 1 Part D, Item 1). Individual quarry development plans and SOPs will be prepared by the contractor before extraction activities commence.

9.7 DUST MANAGEMENT

Dust from ore stockpiles and WRSAs is not expected to be substantial; however, dust will be monitored and managed to the extent reasonable. Crushing and screening operations will be conducted with equipment designed to mitigate dust dispersion. In the unlikely event that an unacceptable amount of dust is generated from end-dumping or front-loading during stockpiling and transferring operations, additional dust mitigation measures will be applied as identified in the WRMP (2AM-BRP1831 Amendment No. 1 Part F, Item 1). A nominal amount of water has been requested for dust suppression if needed (Table 7.3-1).

9.8 AMMONIA MANAGEMENT PLAN

AN will be used in large quantities by the Project. ANFO is the main explosive mixture to be used for mining at the Project. Ammonium nitrate will be delivered by sealift in solid form in tote bags within seacans. These bags will be protected from the elements to prevent contact with water during transport and storage. The seacans will be placed on a laydown pad at the Goose AN Facility. Water from the AN Facility truck wash will be collected and treated in an evaporator or transported to a water management pond for treatment or discharge as appropriate.

Ammonia concentration predictions for all sources were incorporated in the Water and Load Balance model; these sources include blasting residues associated with waste rock, Process Plant/tailings contributions, and camp wastewater. Ammonia, nitrate, and nitrite concentrations as a result of blast residue were derived from methods described by Ferguson and Leask (1998). These methods calculate the annual release of total AN as nitrogen based on the powder factor, fraction of ammonium nitrate in ANFO, the fraction of nitrogen content in AN, and the residual nitrogen remaining. Additional details on the assumptions are presented in the Water and Load Balance Report (Appendix C).

Adherence to BMPs for AN storage and handling will reduce risk of AN spillage; however, AN and/or ANFO may be spilled during handling or during use in the open pit or underground areas. Spill locations

would generally be limited to single storage bags within the AN Facility or seacans in the storage pad areas. These areas will be inspected regularly according to operating procedures. Spill prevention and response actions will include the following:

- ◆ Establish and use SOPs for handling and working around storage areas;
- ◆ Ensure proper containers are used for the storage and transport of explosives and AN;
- ◆ Restrict access to authorized and trained personnel;
- ◆ Conduct regular inspections of storage areas, containers, and transport vehicles with frequency driven by activity levels;
- ◆ Clean up dry AN according to established to minimize likelihood of nitrates entering watercourses;
- ◆ Manage and limit contact of AN and ANFO with snow and water, with particular anticipation of spring thaw/freshet period; and
- ◆ Properly dispose of spill material and any impacted rock pad material, which could include placing this material within a blast pattern prior to initiation.

More detailed spill response procedures for AN and explosives will be provided with the explosive's supplier Emergency Response Assistance Plan. An Emergency Response Assistance Plan will be prepared by the explosive's supplier for the transportation of explosives to all storage sites for the Project as required by the Transportation of Dangerous Goods regulations. For detailed information related to spill response for potential explosives, refer to the Spill Contingency Plan (2AM-BRP1831 Amendment No. 1 Part H, Item 1).

For specific water quality monitoring related to ammonia management refer to Section 10

10. MONITORING PROGRAM

The three types of monitoring proposed for mine development are:

- ◆ Environmental Monitoring locations as per Type A Water Licence (2AM-BRP1831 Amendment No. 1 Schedule I); which further refines three forms of general monitoring into:
 - ◇ Regulated discharge monitoring (i.e., set by legislation or authorization requiring specific discharge/effluent criteria to be met for compliance);
 - ◇ Verification monitoring (i.e., internal operation management monitoring); and
 - ◇ General monitoring (i.e., NWB general monitoring requirements set in Type A Water Licence [2AM-BRP1831 Amendment No. 1 Schedule I]);
- ◆ Performance Measurement Monitoring; which tracks performance of mitigation measures implemented, identifies environmental changes in the receiving environment, and validates environmental effects predictions; and
- ◆ Design Support Monitoring; which is site-specific field monitoring required to support detailed engineering designs and confirm modelling assumptions.

All three types of monitoring will be used at the Project. The sum of all three types of monitoring will provide sufficiently robust data to support decisions in water management.

The proposed general water monitoring program station locations provided in the Type A Water Licence (2AM-BRP1831 Amendment No. 1 Schedule I). Additional information supporting the general water monitoring plan can be found in the General and Aquatic Effects Monitoring Program documents accepted by the NWB under Part B, Item 14, which includes the Environmental Management and Protection Plan, Aquatic Effects Management Plan, and the Quality Assurance/Quality Control Plan.

The Aquatic Effects Management Plan is a comprehensive monitoring program that considers -Project related effects on the aquatic environment and is harmonized in consideration of MDMER requirements. Where appropriate, all monitoring will be undertaken using established methods and defined Quality Assurance/Quality Control Plan and in accordance with the Type A Water Licence (2AM-BRP1831 Amendment No. 1 Part I, Item I).

B2Gold Nunavut will also have in place an internal inspection plan to monitor activities and mine components that could adversely affect the use of water or the deposit of waste into water. B2Gold Nunavut's internal due diligence plan for inspections is provided in the Environmental Management and Protection Plan (2AM-BRP1831 Amendment No. 1 Part I, Item 1), and this due diligence plan will be completed for each mine component or activity, including all earthworks or facilities constructed for the use, storage, treatment, and/or disposal of water, and/or waste into water.

Further, B2Gold Nunavut's proposed monitoring program for culverts on fish-bearing watercourses during the Operations and Closure phases will include measures to ensure that barriers to fish passage do not form over time as a result of crossing damage due to ice blockage, flooding, or movement of debris.

In addition, B2Gold Nunavut has completed the commitment to collect additional baseline water quality data to characterize the lakes and streams within the freshwater aquatic environment prior to

Construction, and B2Gold Nunavut has used this data to update the Water and Load Balance model to account for potential seasonal variation (2AM-BRP1831 Amendment No. 1 Part E, Item 16).

Results collected under the general monitoring program outlined in the Licence will be included in the monthly and annual reports required by the Licence. Results will be compared to applicable Water Licence criteria. The MDMER-related results will be reported as required under the MDMER requirements

11. ENVIRONMENTAL REPORTING

Internal reporting structures will provide the framework so monitoring results can be reviewed, instances of non-compliance with the WMP can be identified, and subsequent corrective action can be undertaken in a timely manner. Items of non-compliance with applicable permits, licences, and authorizations will be reported to the respective agency as outlined in those authorizations.

External reporting of B2Gold Nunavut’s monitoring results and performance against this management plan will be in accordance with the following permits, licenses, approvals, and authorizations requirements (Table 11-1).

Table 11-1. Reporting Requirements

Regulatory Instrument	Responsible Agency	Information to be Reported	Frequency	Compliance Inspections
Project Certificate	NIRB	Terms and conditions relevant to water management	Annually	A NIRB Monitoring Officer will inspect the site against the Project Certificate annually
Type A Water Licence	NWB	Water licence reporting requirements, including those identified in this plan	Monthly (General Monitoring requirements); Detailed results in Annual Report	A NWB inspector will inspect the site
Authorization for HADD of fish habitat under the Fisheries Act	DFO	Specified in the authorization – focused on protection of fish habitat	Annually	A DFO s officer may inspect the site periodically to determine compliance
MDMER	ECCC	Effluent quality and toxicology; sediment, benthics, fish population data	Monthly reporting of effluent quality and receiving water quality; annual reporting	
AEMP	NWB	To be determined – possibly inclusive of water and sediment quality and freshwater biota	As prescribed in the AEMP; Detailed results in Annual Report	The AEMP will be submitted to the NWB and reviewed by other relevant agencies including DFO and ECCC

12. ADAPTIVE MANAGEMENT

The mine design, including the water management design, has been carefully prepared taking into consideration the vast database of site characterization data gathered for the Project, coupled with rigorous engineering analysis. Where data was limited, conservative assumptions were consistently applied. Notwithstanding, a key element of monitoring as outlined in Section 10 is to verify that mitigation measures in relation to water management activities are being implemented and are achieving their intended outcomes. Adaptive management will be employed where mitigation is not achieving the intended result. Alternative mitigation measures may be identified at a later time and will be reflected in updates to this plan and related management plans.

Possible water management scenarios and the potential contingency strategies are outlined Table 12-1.

Table 12-1. Water Management Contingency Strategies

Possible Scenario	Contingency Strategy
While dewatering Llama and Umwelt lakes to Goose Lake, the concentration of TSS may be higher than the expected 50% volume requiring treatment before discharge.	Treat a greater percentage of the water from Llama and Umwelt lakes. Additional contingencies described below.
Seepage from any of the contact berms or other dams on site occurs.	Repairs to the berms/dams may be required. Alternatively, seepage collection berms may need to be constructed and return pumps may be required.
Saline inflows into the mine workings are greater than expected.	Additional storage locations will need to be identified, blending of saline water with other contact water may be investigated, or treatment to desalinate the water may be required. See SWMP Section 7 for additional details.
Waste rock leaches a greater concentration of metals or other constituents than expected.	Additional settlement time or water treatment may be required.
The results of water quality monitoring (WMP, Appendix B) or the Aquatic Effects Monitoring Program (AEMP) shows non-compliance.	Identify the issue (e.g., contact water not collected by contact berms, seepage through contact berms, ineffective treatment) and develop a strategy to improve treatment or reduce the release of mine water.

Checking and corrective action will occur during dewatering through the evaluation of continuous flow data and daily TSS and turbidity data. Results of the monitoring program will be reviewed by the Environmental Team, and water quantity and quality trends will be updated on a time scale relevant to the dewatering activity. If the dewatering activity will take two weeks or less, then data will be updated daily. If dewatering will take longer, then a more appropriate time scale may be used (e.g., every 3 days or weekly). This program will allow early detection of changes in water quality and implementation of corrective actions, if required. If trigger levels or thresholds are approached or exceeded, dewatering activities will be suspended

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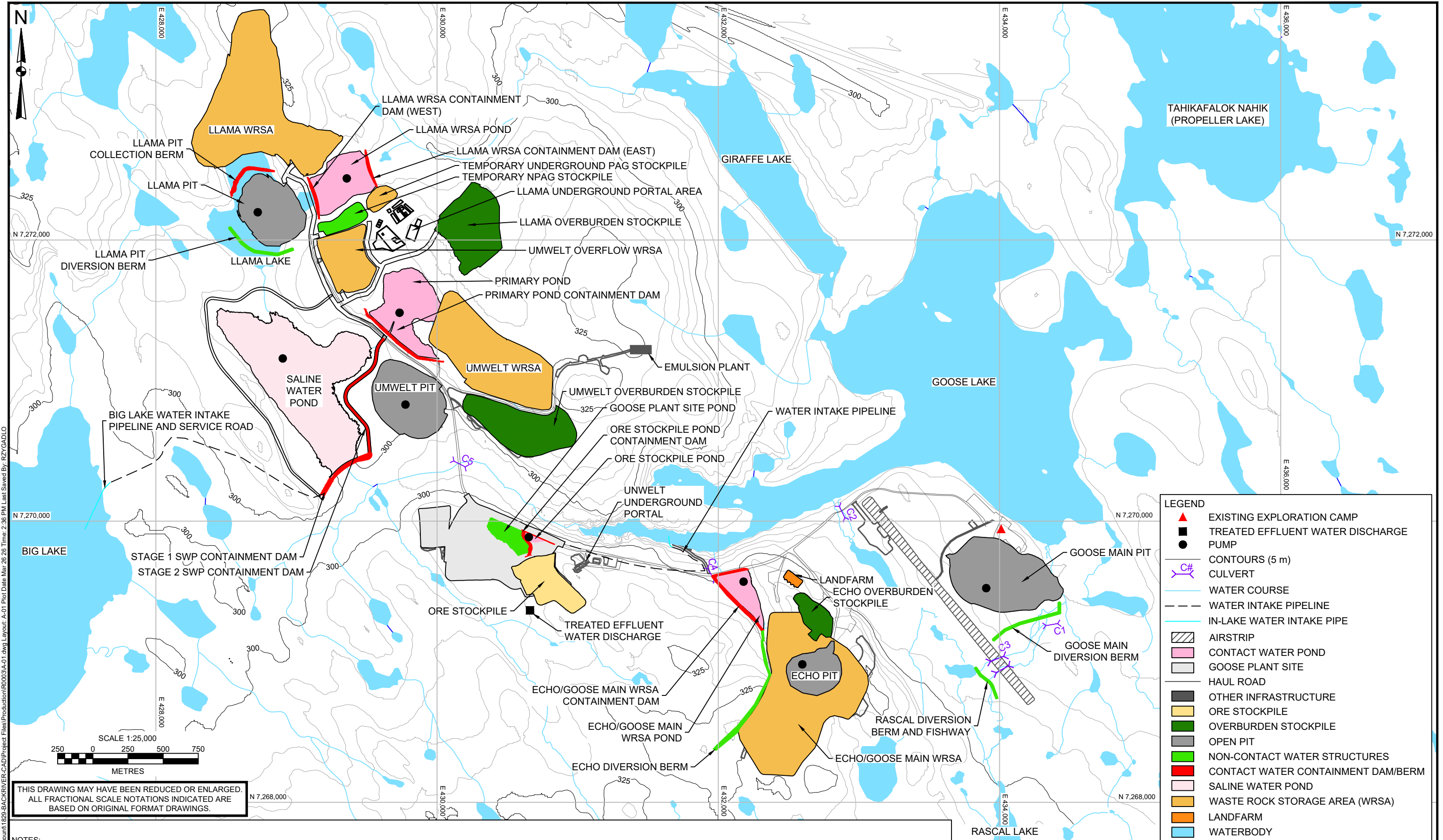
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APPENDIX A FIGURES



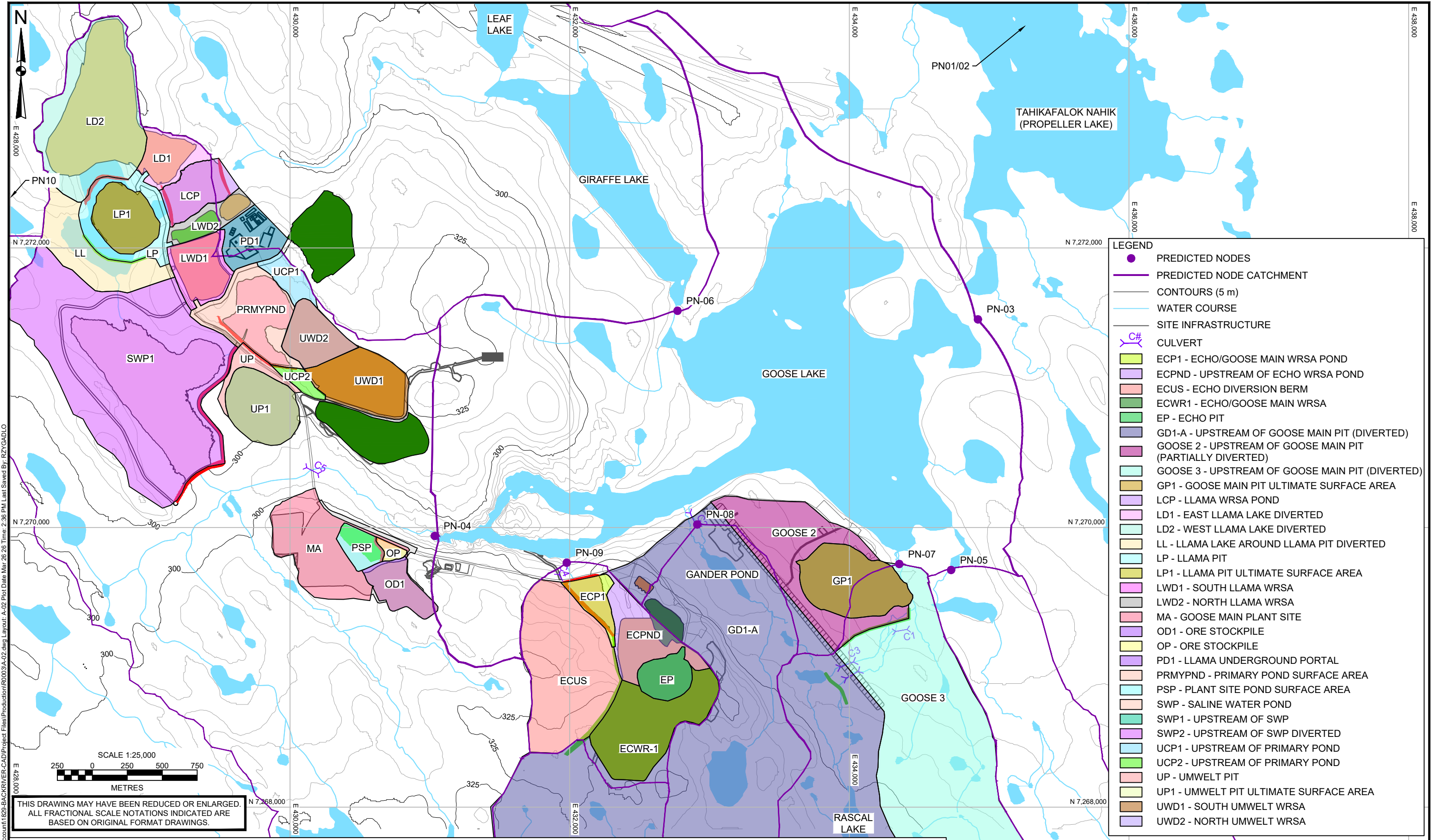
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THIS DRAWING MAY HAVE BEEN REDUCED OR ENLARGED.
ALL FRACTIONAL SCALE NOTATIONS INDICATED ARE
BASED ON ORIGINAL FORMAT DRAWINGS.

NOTES:

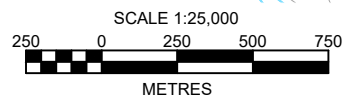
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "GOOSE PROJECT, WATER MANAGEMENT PLAN", AND DATED MARCH 2026.
3. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS DEPARTMENT OF NATURAL RESOURCES CANADA MODIFIED BY GOLDER. CONTOUR INTERVAL IS 5 m.
4. FOOTPRINT DATA RECEIVED BY B2GOLD ON DECEMBER 12, 2025 AND JANUARY 7, 2026.
5. COORDINATE SYSTEM IS UTM NAD 83 ZONE 13.
6. BGC PREPARED THIS DRAWING FOR THE EXCLUSIVE USE OF BGC'S CLIENT IDENTIFIED ON THIS DRAWING. UNLESS BGC AGREES OTHERWISE IN WRITING, THIS DRAWING MUST NOT BE MODIFIED OR USED FOR ANY PURPOSE OTHER THAN THE SPECIFIC PURPOSE FOR WHICH BGC GENERATED IT. BGC SHALL HAVE NO LIABILITY FOR ANY DAMAGES, INJURY, OR LOSS ARISING FROM ANY UNAUTHORIZED USE OR MODIFICATION OF THIS DRAWING. THIRD PARTIES USE OR RELY UPON THIS DRAWING AT THEIR OWN RISK.

SCALE: 1:25,000	CLIENT: B2GOLD NUNAVUT	PROJECT: GOOSE PROJECT, WATER MANAGEMENT PLAN
DATE: MAR 2026		TITLE: GOOSE MINE AREA - POTENTIAL DEVELOPMENT AREA AND LAYOUT
DRAWN: AA		PROJECT No.: 1829001
REVIEW: ZMM		DWG No.: A-01
APPROVED: PC		



LEGEND

- PREDICTED NODES
- PREDICTED NODE CATCHMENT
- CONTOURS (5 m)
- WATER COURSE
- SITE INFRASTRUCTURE
- C# CULVERT
- ECP1 - ECHO/GOOSE MAIN WRSA POND
- ECPND - UPSTREAM OF ECHO WRSA POND
- ECUS - ECHO DIVERSION BERM
- ECWR1 - ECHO/GOOSE MAIN WRSA
- EP - ECHO PIT
- GD1-A - UPSTREAM OF GOOSE MAIN PIT (DIVERTED)
- GOOSE 2 - UPSTREAM OF GOOSE MAIN PIT (PARTIALLY DIVERTED)
- GOOSE 3 - UPSTREAM OF GOOSE MAIN PIT (DIVERTED)
- GP1 - GOOSE MAIN PIT ULTIMATE SURFACE AREA
- LCP - LLAMA WRSA POND
- LD1 - EAST LLAMA LAKE DIVERTED
- LD2 - WEST LLAMA LAKE DIVERTED
- LL - LLAMA LAKE AROUND LLAMA PIT DIVERTED
- LP - LLAMA PIT
- LP1 - LLAMA PIT ULTIMATE SURFACE AREA
- LWD1 - SOUTH LLAMA WRSA
- LWD2 - NORTH LLAMA WRSA
- MA - GOOSE MAIN PLANT SITE
- OD1 - ORE STOCKPILE
- OP - ORE STOCKPILE
- PD1 - LLAMA UNDERGROUND PORTAL
- PRMYPND - PRIMARY POND SURFACE AREA
- PSP - PLANT SITE POND SURFACE AREA
- SWP - SALINE WATER POND
- SWP1 - UPSTREAM OF SWP
- SWP2 - UPSTREAM OF SWP DIVERTED
- UCP1 - UPSTREAM OF PRIMARY POND
- UCP2 - UPSTREAM OF PRIMARY POND
- UP - UMWELT PIT
- UP1 - UMWELT PIT ULTIMATE SURFACE AREA
- UWD1 - SOUTH UMWELT WRSA
- UWD2 - NORTH UMWELT WRSA



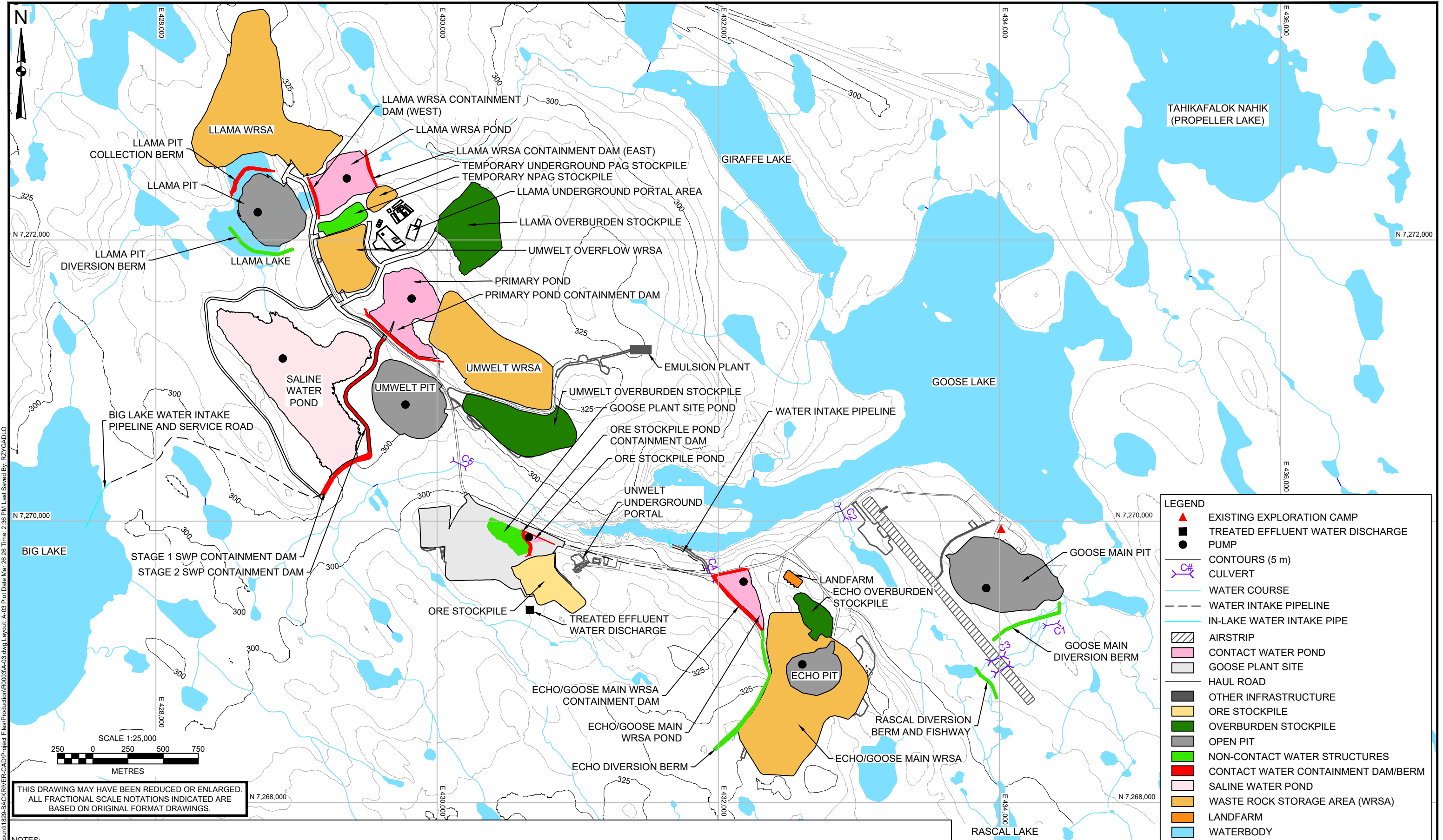
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ALL FRACTIONAL SCALE NOTATIONS INDICATED ARE
BASED ON ORIGINAL FORMAT DRAWINGS.

NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "GOOSE PROJECT, WATER MANAGEMENT PLAN", AND DATED MARCH 2026.
3. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS DEPARTMENT OF NATURAL RESOURCES CANADA MODIFIED BY GOLDER. CONTOUR INTERVAL IS 5 m.
4. FOOTPRINT DATA RECEIVED BY B2GOLD ON DECEMBER 12, 2025 AND JANUARY 7, 2026.
5. COORDINATE SYSTEM IS UTM NAD 83 ZONE 13.
6. BGC PREPARED THIS DRAWING FOR THE EXCLUSIVE USE OF BGC'S CLIENT IDENTIFIED ON THIS DRAWING. UNLESS BGC AGREES OTHERWISE IN WRITING, THIS DRAWING MUST NOT BE MODIFIED OR USED FOR ANY PURPOSE OTHER THAN THE SPECIFIC PURPOSE FOR WHICH BGC GENERATED IT. BGC SHALL HAVE NO LIABILITY FOR ANY DAMAGES, INJURY, OR LOSS ARISING FROM ANY UNAUTHORIZED USE OR MODIFICATION OF THIS DRAWING. THIRD PARTIES USE OR RELY UPON THIS DRAWING AT THEIR OWN RISK.

SCALE:	1:25,000	CLIENT:	B2GOLD NUNAVUT	PROJECT:	GOOSE PROJECT, WATER MANAGEMENT PLAN		
DATE:	MAR 2026			TITLE:	GOOSE MINE CATCHMENTS		
DRAWN:	AA			PROJECT No.:	1829001	DWG No.:	A-02
REVIEW:	ZMM			APPROVED:	PC		

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LEGEND

- ▲ EXISTING EXPLORATION CAMP
- TREATED EFFLUENT WATER DISCHARGE
- PUMP
- CONTOURS (5 m)
- X# CULVERT
- WATER COURSE
- WATER INTAKE PIPELINE
- IN-LAKE WATER INTAKE PIPE
- AIRSTRIP
- CONTACT WATER POND
- GOOSE PLANT SITE
- HAUL ROAD
- OTHER INFRASTRUCTURE
- ORE STOCKPILE
- OVERBURDEN STOCKPILE
- OPEN PIT
- NON-CONTACT WATER STRUCTURES
- CONTACT WATER CONTAINMENT DAM/BERM
- SALINE WATER POND
- WASTE ROCK STORAGE AREA (WRSA)
- LANDFARM
- WATERBODY

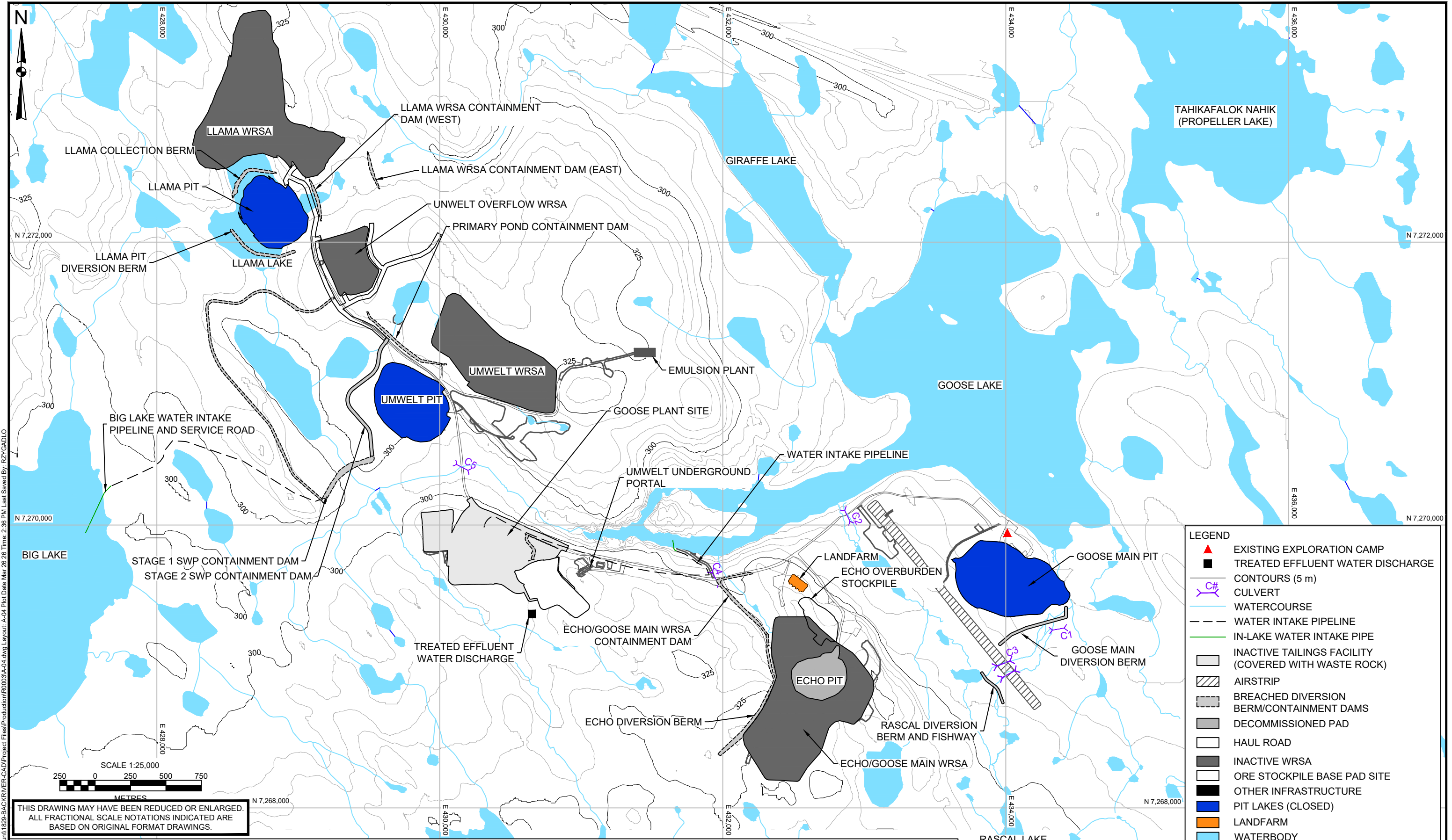
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3. HYDROGRAPHY DATA OBTAINED FROM GEOGRAPHS DEPARTMENT OF NATURAL RESOURCES CANADA MODIFIED BY GOLDER. CONTOUR INTERVAL IS 5 m.
4. FOOTPRINT DATA RECEIVED BY B2GOLD ON DECEMBER 12, 2025 AND JANUARY 7, 2026.
5. COORDINATE SYSTEM IS UTM NAD 83 ZONE 13.
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SCALE:	1:25,000	CLIENT:	B2GOLD NUNAVUT
DATE:	MAR 2026		
DRAWN:	AA		
REVIEW:	ZMM		
APPROVED:	PC	PROJECT:	GOOSE PROJECT, WATER MANAGEMENT PLAN
		TITLE:	PHASE 2 - OPERATIONS (YEAR 1 TO YEAR 13)
		PROJECT No.:	1829001
		DWG No.:	A-03

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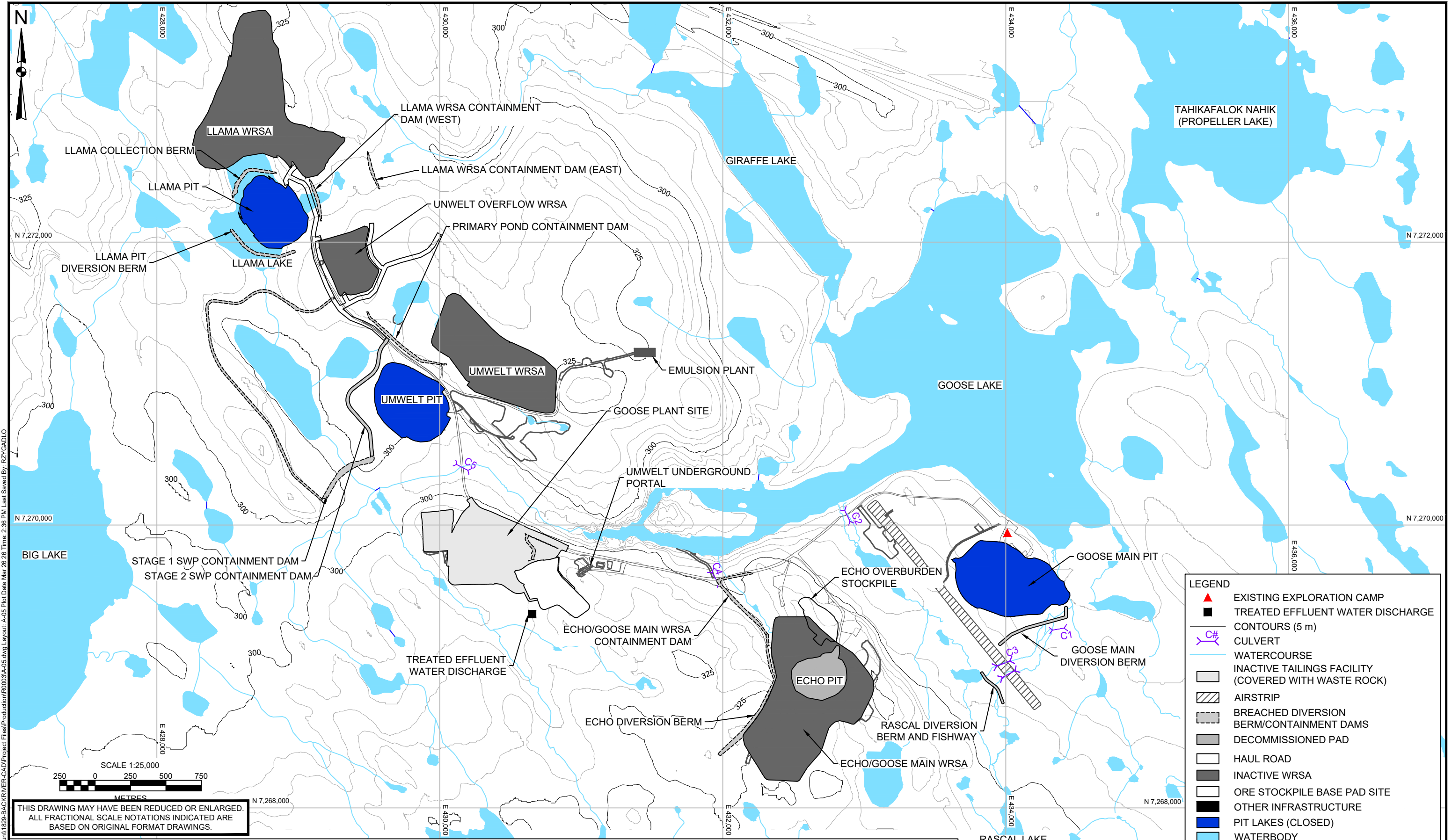


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NOTES:
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 2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH B2GOLD'S REPORT TITLED "GOOSE PROJECT, WATER MANAGEMENT PLAN", AND DATED MARCH 2026.
 3. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS DEPARTMENT OF NATURAL RESOURCES CANADA MODIFIED BY GOLDER. CONTOUR INTERVAL IS 5 m.
 4. FOOTPRINT DATA RECEIVED BY B2GOLD ON MARCH 21, 2025.
 5. COORDINATE SYSTEM IS UTM NAD 83 ZONE 13.
 6. BGC PREPARED THIS DRAWING FOR THE EXCLUSIVE USE OF BGC'S CLIENT IDENTIFIED ON THIS DRAWING. UNLESS BGC AGREES OTHERWISE IN WRITING, THIS DRAWING MUST NOT BE MODIFIED OR USED FOR ANY PURPOSE OTHER THAN THE SPECIFIC PURPOSE FOR WHICH BGC GENERATED IT. BGC SHALL HAVE NO LIABILITY FOR ANY DAMAGES, INJURY, OR LOSS ARISING FROM ANY UNAUTHORIZED USE OR MODIFICATION OF THIS DRAWING. THIRD PARTIES USE OR RELY UPON THIS DRAWING AT THEIR OWN RISK.

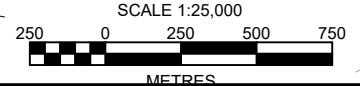
LEGEND	
	EXISTING EXPLORATION CAMP
	TREATED EFFLUENT WATER DISCHARGE
	CONTOURS (5 m)
	CULVERT
	WATERCOURSE
	WATER INTAKE PIPELINE
	IN-LAKE WATER INTAKE PIPE
	INACTIVE TAILINGS FACILITY (COVERED WITH WASTE ROCK)
	AIRSTRIP
	BREACHED DIVERSION BERM/CONTAINMENT DAMS
	DECOMMISSIONED PAD
	HAUL ROAD
	INACTIVE WRSA
	ORE STOCKPILE BASE PAD SITE
	OTHER INFRASTRUCTURE
	PIT LAKES (CLOSED)
	LANDFARM
	WATERBODY

SCALE: 1:25,000	CLIENT: B2GOLD NUNAVUT	PROJECT: GOOSE PROJECT, WATER MANAGEMENT PLAN
DATE: MAR 2026		TITLE: PHASE 3 - CLOSURE (YEAR 14 TO YEAR 20)
DRAWN: AA		PROJECT No.: 1829001
REVIEW: ZMM		FIG No.: A-04
APPROVED: PC		



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NOTES:
 1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
 2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH B2GOLD'S REPORT TITLED "GOOSE PROJECT, WATER MANAGEMENT PLAN", AND DATED MARCH 2026.
 3. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS DEPARTMENT OF NATURAL RESOURCES CANADA MODIFIED BY GOLDER. CONTOUR INTERVAL IS 5 m.
 4. FOOTPRINT DATA RECEIVED BY B2GOLD ON MARCH 21, 2025.
 5. COORDINATE SYSTEM IS UTM NAD 83 ZONE 13.
 6. BGC PREPARED THIS DRAWING FOR THE EXCLUSIVE USE OF BGC'S CLIENT IDENTIFIED ON THIS DRAWING. UNLESS BGC AGREES OTHERWISE IN WRITING, THIS DRAWING MUST NOT BE MODIFIED OR USED FOR ANY PURPOSE OTHER THAN THE SPECIFIC PURPOSE FOR WHICH BGC GENERATED IT. BGC SHALL HAVE NO LIABILITY FOR ANY DAMAGES, INJURY, OR LOSS ARISING FROM ANY UNAUTHORIZED USE OR MODIFICATION OF THIS DRAWING. THIRD PARTIES USE OR RELY UPON THIS DRAWING AT THEIR OWN RISK.



SCALE:	1:25,000
DATE:	MAR 2026
DRAWN:	AA
REVIEW:	ZMM
APPROVED:	PC

CLIENT:	B2GOLD NUNAVUT

PROJECT:	GOOSE PROJECT, WATER MANAGEMENT PLAN	
TITLE:	PHASE 4 - POST - CLOSURE (YEAR 21+)	
PROJECT No.:	1829001	FIG No.:
		A-05