Goldboro Gold Project

Environmental Assessment Registration Document Goldboro, Guysborough County, Nova Scotia

Signal Gold Inc.

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→ The Power of Commitment

GHD

120 Western Parkway, Suite 110

Bedford, Nova Scotia B4B 0V2, Canada

T +1 902 468 1248 | **F** +1 902 468 2207 | **E** info-northamerica@ghd.com | **ghd.com**

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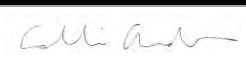
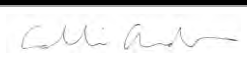
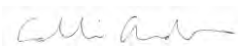
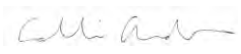
S3	00	Glen Merkley	Callie Andrews		Callie Andrews		13-May-2022
S4	01	Glen Merkley	Callie Andrews		Callie Andrews		1-Jun-2022

Executive Summary

Signal Gold Inc. (Signal Gold), formerly Anaconda Mining Inc., proposes to develop the Goldboro Gold Project (the Project) located near Goldboro, Guysborough County, Nova Scotia (NS). The Project consists of conventional open pit mining operation and a 4,000 tonnes per day (tpd) processing facility based on a combined gravity and leaching circuit using carbon-in-pulp technology. The Project also includes an engineered, fully lined tailings management facility (TMF), three waste rock storage areas (WRSAs), till and organic material stockpiles, and associated infrastructure. The Project and proposed development are supported by the technical report and Feasibility Study (FS) dated January 11, 2022 and titled NI 43-101 Technical Report and Feasibility Study for the Goldboro Gold Project, Eastern Goldfields District, Nova Scotia. In addition to technical studies to support the FS, Signal Gold has, over the last five years, assessed and collected baseline environmental data to support an environmental assessment (EA), undertaken community and Mi'kmaq engagement, and has evaluated the socioeconomic effects of the Project.

This EA Registration Document (EARD) has been prepared to facilitate the Project's review as a Class I Undertaking in accordance with the *Environmental Assessment Regulations* made under the NS *Environment Act.* Through use of the EA process as a planning tool and the extensive experience of Signal Gold's senior management team, Signal Gold has developed and assessed several iterations of the Project layout to reduce potential impact to the environment. The design of the two open pits (East and West Pits), instead of a single larger open pit, was selected to avoid any direct disturbance to both Gold Brook Lake and Gold Brook. Other Project infrastructure has been micro-sited where possible to avoid watercourses, wetlands, blue felt lichen, areas of historic mine tailings, and historic or cultural archaeological resources.

The scope of the Project includes activities associated with construction, operation, and closure. Construction is anticipated to start in late 2023, commissioning in 2025, operations until 2035, and initiation of closure in 2036.

The construction phase will begin with clearing and grubbing the mill area, TMF, and East and West Pit areas. Stripped till and organic material will be stockpiled and utilized for reclamation activities during the closure phase. Non-potentially acid generating (NPAG) waste rock extracted from the East and West Pits will be used for construction of new roads, modification of existing roads, initial construction of the TMF, and general construction. Waste rock not used as a construction material will be stockpiled in the WRSAs. Water management infrastructure, including collection ditches, culverts, settling ponds, and water treatment systems, will be constructed during this period. Employee accommodations will be constructed within the Project Area (PA). The employee accommodations will be equipped with several features to increase the safety and security of employees, contractors, and surrounding communities. At a minimum, the facility will be drug and alcohol free and a key card system will be in place to control access.

During the operations phase of the Project, the East Pit will be mined to a bench floor elevation of approximately -128 metres above sea level (masl) and will operate for eight years. The West Pit will be mined to a bench floor elevation of approximately -184 masl and will operate for 11 years. Three WRSAs will be developed throughout the operations phase as waste rock is extracted from the open pits. Following full extraction of the East Pit (Year 8 of operations), a portion of the waste rock generated during West Pit extraction will be backfilled into the East Pit. The TMF design includes an initial starter embankment followed by subsequent stages of expansion using downstream construction methods throughout the operations phase.

The closure phase will begin with earthworks and demolition activities and will be completed over an approximate three year period to return the PA to a safe, stable, and vegetated state. Progressive reclamation will also be completed during the operations phase to promote early revegetation, assist with erosion and dust control, and minimize the total disturbed footprint. The East and West Pits will be allowed to flood following operations, creating two open waterbodies. The East Pit is expected to be filled in Year 19 and the West Pit is expected to be filled in Year 35. Surface and groundwater monitoring is planned to continue at select locations within the PA throughout the pit filling period and will be terminated once water quality and quantity stabilize, and following consultation with applicable

regulators. Signal Gold is committed to minimizing the environmental impact of the Project and reclaiming the land to ensure safe use in the future following Project activities.

Benefits of the Project

The Project aligns with the goals outlined in the NS Department of Natural Resources and Renewables (NSDNRR) Natural Resources Strategy for NS, including to “support the sustainable development of the Province’s geological resources in order to attract investment, create high-value jobs, and grow the economy”. All phases of the Project will provide direct and indirect employment opportunities, as well as taxation revenue for municipal, provincial, and federal governments, and changes to provincial gross domestic product (GDP). A socioeconomic impact study was completed for the Project and the results of financial analysis are summarized below.

- Over 15 years, Signal Gold will spend approximately $1.7 billion on goods and services.
- Most Project spending will occur in NS, resulting in a $2.1 billion change to provincial GDP.
- Total household income in NS will increase by nearly $1.1 billion because of the Project.
- 538 direct fulltime jobs (325 jobs directly on site) will be created during the two-year construction period.
- Once operational, the Project will provide direct full-time employment for approximately 215 workers annually, in a region where unemployment is 14.2% above the provincial average.
- Over the life cycle of the Project, including construction, operations and closure, the Project has the potential to create 735 new direct and spin-off jobs a year in NS for 15 years.

The Project is estimated to generate $528 million in income and mining taxes at the federal, provincial, and municipal levels from direct and spin-off economic activity. Signal Gold is implementing measures to maximize benefits to the local economy and communities.

Signal Gold has entered into a Community Benefits Agreement with the Municipality of the District of Guysborough (MODG). The Agreement establishes a framework for a long-term relationship between Signal Gold and the MODG over the life of the Project, confirming Signal Gold's commitment to bring sustainable social and economic benefits to the members of the Guysborough community.

Signal Gold and the Assembly of Nova Scotia Mi'kmaw Chiefs (ANSMC) signed a Memorandum of Understanding (MOU) that will govern the process by which the parties will negotiate a Mutual Benefits Agreement regarding the Project. The MOU outlines the process for Signal Gold and the Assembly to establish an Agreement that reflects a desire to build a mutually beneficial relationship that will be sustained for the life of the Project. The first step in the process was to identify and discuss the Mi’kmaq’s environmental concerns regarding the Project.

The land in this area is physically disturbed and fragmented due to timber harvesting, road building, mineral exploration, and past mining activity. The aquatic environment, including Gold Brook Lake, Gold Brook, and contributing watercourses, have been affected by the deposition of tailings from historic mining operations. An environmental benefit to the Project is that Signal Gold will remediate any areas of historic tailings directly within the Project infrastructure footprint. Furthermore, Signal Gold is part of a historic tailings working group for this area with Nova Scotia Lands Inc. (NSLI). NSLI is currently undertaking a Phase I and Phase II Environmental Site Assessment (ESA) and remedial action plan for all historic tailings located on Crown land within the Upper and Lower Seal Harbour Gold Districts, which include the PA.

Engagement

Signal Gold is committed to stakeholder and public engagement. Through its key values of integrity, reliability, responsibility, and respect, Signal Gold has endeavoured to work with the local community, Indigenous groups, non-governmental organizations (NGOs), regulatory agencies, and interested members of the public. Potential effects and mitigation measures were identified throughout this EARD to address concerns identified through consultation and engagement, which was undertaken in accordance with the NS *Environmental Assessment Regulations*. Signal Gold

is committed to maintaining stakeholder engagement throughout the life of the Project, which extends well beyond the EA process.

Signal Gold has engaged with the Kwilmu'kw Maw-klusuaqn Office (KMKNO), as well as community members, staff, and Chief and Council of Paqtnkek, the closest Mi'kmaq community to the Project. The information gathered during engagement with Indigenous groups and organizations help contribute to Government's understanding of any potential adverse impacts of the Project on potential or established Aboriginal or treaty rights, title and related interests, and the effectiveness of measures proposed to avoid or minimize any impacts. Information shared through on-going Mi'kmaq engagement as well as the completion of a MEKS in 2017 has been reflected in the design of the Project. An updated MEKS is in progress pending community interviews and will reflect any new information or considerations related to the Project footprint. Signal Gold's engagement program has been consistent with the NS Proponent's Guide: The Role of Proponents in Crown Consultation with the Mi'kmaq of Nova Scotia.

Public engagement activities have occurred to support the EA process for the Project since early 2017. This includes community and virtual open house events, on-going two-way information sharing with the Community Liaison Committee (CLC) for the Project, and meetings with interested local stakeholders. Signal Gold has held two in-person and one virtual open house events in advance of the submission of the EARD. The open house events were held at the Goldboro Interpretive Centre on October 17, 2019 and April 21, 2022. A virtual open house event occurred on May 3, 2022. Signal Gold has and will continue to meet with local community groups in smaller sessions.

Environmental Effects Assessment

This EARD has been prepared to identify and address potential environmental effects resulting from proposed Project activities. Signal Gold has applied a comprehensive approach to effects assessment by investigating and documenting baseline conditions since 2017 and completing modelling and other analyses to provide conservative, science-based effects predictions. Micro-siting of Project infrastructure has occurred where possible to avoid watercourses, wetlands, blue felt lichen, areas of historic mine tailings, and historic and cultural archaeological resources. Mitigation measures have been proposed to minimize potential adverse effects resulting from Project interactions with Valued Components (VCs). Residual effects, remaining after implementation of mitigation measures, were estimated for each selected VC. The significance of residual effects was determined through an evaluation of magnitude, geographical extent, duration, frequency, and reversibility, as well as through comparison to applicable regulatory criteria. Monitoring and follow-up programs will be implemented to verify the accuracy of predicted effects and determine the degree to which mitigation measures were successful in eliminating, reducing, or controlling those effects.

A summary of the impact assessment completed for each VC is provided below.

Air

Dust generation and air contaminant emissions have the potential to adversely affect human and ecological health. Air emissions estimates and dispersion modelling were completed to predict air contaminant concentrations resulting from the Project. Based on the maximum emissions scenario evaluated in the modelling, the maximum ground level air concentrations of all modelled contaminants are predicted to meet the assessment criteria for all averaging periods at nearby residential receptors and at the Proposed Property Boundary (PPB) for the Project. Project-related GHG emissions were estimated for all planned stationary and mobile fuel combustion sources. Peak annual GHG emissions are estimated to be approximately 0.26% of the reported 2020 GHG total for NS. Predicted residual effects of the Project on air quality and GHGs are considered not significant. Air quality monitoring will occur over the life of the Project to validate model predictions and confirm regulatory compliance. The overall residual effect of the Project on air is assessed as not likely to have significant adverse effects after appropriate mitigation measures have been implemented, including the development and implementation of a Fugitive Dust Best Management Practice Plan.

Light

Changes to ambient light levels have the potential to adversely affect nearby residential receptors as well as fauna and birds. The impact of Project lighting was calculated using the quantities, power output, and efficiencies of

proposed equipment and lighting installations. Project-related light levels calculated at nearby residential receptors were less than the assessment criteria. Predicted residual effects of the Project on light are considered not significant. If complaints are received concerning light trespass, a monitoring program will be developed in consultation with regulators.

Noise

Increases in noise levels have the potential to adversely affect nearby residential receptors and wildlife. Acoustical modelling was completed to estimate the potential impacts of noise sources during Project construction and operations. The model concluded that predicted noise levels produced by the Project will be within the assessment limits specified at nearby residential receptors and at the PPB. Predicted residual effects of the Project on noise are considered not significant. Noise monitoring will occur over the life of the Project to validate model predictions and confirm regulatory compliance.

Geology, Soil and Sediment

Exposed soil and rock have the potential to produce sediment laden runoff, metal leaching, and acid rock drainage (ML/ARD) that can adversely affect the aquatic environment. Geochemical source terms were developed for several material types present in the PA through a series of static and kinetic test programs and were applied in predictive water quality and groundwater contaminant transport modelling completed for the Project. Mine tailings produced from historic mining operations were deposited in Gold Brook and in low-lying areas south of Gold Brook Lake. Historic tailings within the footprint of Project infrastructure will be removed and transported to the TMF for long-term storage and monitoring. Predicted residual effects of the Project on geology, soil, and sediment are both positive and adverse but are not considered significant. Mine rock and tailings will be tested regularly to monitor the ML/ARD potential and inform material handling and storage strategies.

Groundwater Resources

Open pit mining operations have the potential to result in adverse effects to groundwater quantity and quality. Groundwater elevations and quality monitoring has been on-going in the PA since 2017 to establish baseline conditions. A 3D numerical groundwater flow model was developed to estimate potential impacts to the groundwater table elevation and contaminant transport, as well as potential reductions in baseflow contributions to nearby watercourses. Model results indicate the predicted groundwater radius of influence does not reach the nearest residential well. Similarly, predicted contaminant concentrations above potable water criteria do not extend to within 1 km of the nearest residential well. Predicted residual effects of the Project on groundwater resources are considered not significant. Groundwater quantity and quality monitoring will occur over the life of the Project to validate model predictions and confirm regulatory compliance.

Surface Water Resources

Alterations to baseline catchment areas and discharge of mine contact water have the potential to result in adverse effects to surface water quantity and quality. Surface water quantity and quality monitoring has been on-going in the PA since 2017 to establish baseline conditions. A water balance analysis and predictive water quality assessment were completed to evaluate potential impacts to surface water quantity and quality, respectively. Outputs from the groundwater models were used in the surface water models to ensure changes to groundwater were included in the evaluation of effects on surface water resources. Following implementation of proposed water management infrastructure, including water treatment, residual effects to surface water resources are not expected to be significant. Surface water quantity and quality monitoring will occur over the life of the Project to validate model predictions and confirm regulatory compliance.

Wetlands

Infrastructure development, reductions in groundwater and surface water contributions, and discharge of sediment laden runoff have the potential to result in adverse effects to wetlands. Groundwater and surface water model results

were used in the evaluation of Project related effects on wetlands. Project-specific Geographic Information System (GIS) spatial models were developed to quantify direct impacts to wildlife habitat and vegetative communities. An evaluation of the general vegetation communities and habitat was completed using a desktop driven Project Ecological Land Classification (P-ELC). Approximately 96 ha of wetland area is expected to be altered by the Project either through direct impacts resulting from Project infrastructure placement or indirect impacts resulting from changes in hydrology. All altered wetlands require compensation under the Nova Scotia Wetland Conservation Policy. Project infrastructure has been micro-sited where possible to avoid wetlands. Following implementation of mitigation measures including wetland compensation, predicted residual effects of the Project on wetlands are considered not significant. Wetland monitoring will be completed to verify the accuracy of the predicted environmental effects.

Fish and Fish Habitat

Infrastructure development and changes to watercourse flow regimes and water quality parameters have the potential to adversely affect fish and fish habitat. Effects to fish and fish habitat through flow reductions have been assessed using guidance outlined in the Framework for Assessing the Ecological Flow Requirements to support Fisheries in Canada. Groundwater and surface water models were used to support the evaluation of effects on fish and fish habitat by predicting changes to baseflow, stream flow, water levels, and quality parameters. Detailed habitat evaluation included multiple years of fish sample collection and ground-truthing areas proposed for direct impact. This has provided a solid basis for Signal Gold to understand fish usage of habitats within the PA and has allowed for micro-siting of infrastructure away from fish habitat wherever practical. The total area directly and indirectly (flow reductions) impacted by the Project is 26,353 m^2. A Conceptual Fish Habitat Offsetting Plan has been developed using DFO guidance. Following implementation of mitigation measures including fish habitat offsetting, predicted residual effects to fish and fish habitat are not expected to be significant. An Aquatic Effects Monitoring Plan (AEMP) will be implemented.

Terrestrial Environment

Project activities were assessed to determine their effects on the terrestrial environment within the PA, including terrestrial habitat and vegetation, terrestrial fauna, and avifauna, Species at Risk (SAR), and Species of Conservation Interest (SOCI). To quantify impacts to the terrestrial environment, namely, loss of suitable wildlife habitat and vegetation communities, several GIS models and field data were used. These models identified and quantified the abundance and distribution of terrestrial fauna, avifauna habitat, and vegetation communities. The modelling tools used in the terrestrial environment effects assessment include the P-ELC, Terrestrial Fauna Assessment, Avifauna Land Use Assessment, Interior Forest, and Mainland Moose modelling. Residual effects to the terrestrial environment are not expected to be significant. Several monitoring and management plans have been developed to assess the accuracy of the predicted environmental effects and effectiveness of mitigation measures.

Socioeconomic Conditions

Several socioeconomic conditions, including economy, land use, transportation, and human health, have the potential to be affected either positively or adversely by Project activities. Impacts to socioeconomic conditions were estimated using modelling and other analyses, including a viewshed analysis and human health and ecological risk assessment (HHERA). The Project will have beneficial effects for the local and provincial economy. It will produce 325 full-time jobs during the construction phase and 215 direct full-time jobs during the operations phase. The Project is estimated to generate $528 million in income and mining taxes at the federal, provincial, and municipal levels from direct and spin-off economic activity. Signal Gold, which will also spend approximately $1.7 billion on goods and services over the life of the Project and contribute to an increase in provincial GDP of $2.1B, is implementing measures to maximize benefits to the local economy and communities. Signal Gold's approach to employment, procurement, and benefits is based on hiring and buying locally and regionally wherever feasible.

Mining projects have the potential to result in adverse effects on communities including land and resource use conflicts, public safety, and human health. Land use zoning is appropriate to accommodate this development. Signal Gold requires access to Crown and private lands and is in the process of applying for access and negotiating the purchase of certain private lands that fall in the PA. This Project is anticipated to have the following adverse effects:

temporary loss of access to an area used for recreation and commercial activities. Signal Gold is working with other commercial operators with interests in the PA. From a recreational land use perspective, Signal Gold will construct a bypass road around the secured area of the Project to maintain access to Crown lands north of the PA where residents participate in land use and recreational activities. Signal Gold will take measures to minimize effects that could arise from Project traffic and the employee accommodations facility.

Based on the viewshed analysis, there is a low potential for impact to views from most areas surrounding the PA However, prominent Project infrastructure may be visible from lakes and other open areas where vistas have low horizons.

Based on the HHERA, the Project is not predicted to result in any increased risk to human health or ecological receptors compared to baseline conditions.

This Project is expected to make a strong contribution to the economy of Guysborough and NS. Given Signal Gold's commitment to complying with all regulations and following industry best practices for management of socioeconomic issues, residual adverse effects of the Project on socioeconomic conditions are not expected to be significant.

Indigenous Peoples

The Project has the potential to positively affect Indigenous Peoples through employment, training, and procurement. Signal Gold is working with KMKNO on a Mutual Benefits Agreement, which will facilitate access to employment, training, and procurement opportunities, and other community benefits, for the Mi'kmaq of Nova Scotia. Potential adverse Project effects include loss of access to lands used for traditional purposes, and effects on natural resources within the PA (effects on natural resources such as terrestrial and aquatic habitats are discussed in other VC sections). An MEKS was completed for the Project in 2017 (for a regional area that includes the PA), and an update is currently in progress to reflect the results of a second site visit and any new information from consultation. The MEKS indicates the Mi'kmaq have a long-standing relationship with lands in and around Goldboro and some Indigenous people engage in activities such as hunting and fishing within the broader MEKS Study Area. The PA contains no unique habitats and is presently not a primary harvesting area for the Mi'kmaq though it is of possible interest in the future. There is some potential for mining operations to limit Mi'kmaq traditional land and resource use, but the area will become available in the future upon closure. On-going engagement and discussions with the Mi'kmaq of Nova Scotia will aid in minimizing, and where possible, eliminating any effects to traditional land and resource use.

The Project is expected to be beneficial for Indigenous Peoples. Following implementation of applicable mitigation measures and continued engagement and discussions with the Mi'kmaq of Nova Scotia as right holders, the predicted residual adverse environmental effects of the Project on Indigenous Peoples are assessed to be not significant.

Cultural and Heritage Resources

Infrastructure development has the potential to affect cultural and heritage resources through damage or removal of such resources. Four Archaeological Resource Impact Assessments were completed for the Project between 2017 and 2021. Fourteen historic mining artefacts are located within (10) or near (4) the planned footprint of the West Pit. While those within the Pit are likely to be damaged or removed, those outside the excavation can be saved from damage through micro-siting. One object believed to be of historic mining origin will be removed for evaluation. An area of moderate elevated potential for Mi'kmaq and ancestral archaeological resources is within the footprint of the East Pit and four are between the East and West Pits. These areas could be potentially impacted by Project activities. Signal Gold has proactively made changes to the Project footprint to prevent damage or removal of cultural and heritage resources and committed to conducting shovel testing to evaluate areas of moderate potential that may be impacted. Micro-siting will be used to avoid known cultural heritage features. In the unlikely event that archaeological resources not previously identified are encountered, all work in the associated area(s) will be halted. Signal Gold representatives will contact the Coordinator of the Special Places Program of the NS Department of Communities, Culture, Tourism and Heritage to determine a suitable method of mitigation. Residual effects of the Project on cultural and heritage resources are not expected to be significant.

Other Undertakings in the Area

Existing or proposed projects within a30 km radius of the PA were reviewed for potential interactions with the Project. The Maritimes & Northeast Pipeline (M&NP) crosses the western side of the PA. A 40 m offset will be maintained between the M&NP natural gas pipeline and the East and West Pits. Blasting will be completed in accordance with the National Energy Board *Regulations for Pipeline Damage Prevention* and the NS *Blasting Safety Regulations* made under the *Occupational Health and Safety Act*. In addition, Signal Gold has met several times with M&NP representatives to facilitate a cooperative working relationship, coordination of access to the pipeline, and blasting notification procedures.

The Sable Offshore Energy Project liquified natural gas (LNG) plant was located approximately 1.6 km southwest of the PA and was decommissioned in 2020. The proposed Goldboro LNG Project and road realignment would be approximately 1.9 km and 1.4 km southeast of the PA, respectively. If the Goldboro LNG Project intersects temporally with the Project, Signal Gold will establish a working relationship with the proponent and appropriate mitigation measures will be implemented to manage concerns regarding potential increased traffic and a non-resident workforce, particularly during construction.

The proposed Bear Paw Pipeline would intersect the PA, as the proponent intended to use existing infrastructure including the M&NP. The future of this development is uncertain. Attempts have been made by Signal Gold to discuss the Project with Bear Paw representatives. However no response has been received to date. Signal Gold is committed to working with Bear Paw representatives to minimize Project interactions if the Bear Paw project proceeds.

Accidents and Malfunctions

Accidents and malfunctions have the potential to create adverse effects to the environment and worker health and safety. The following accidents and malfunctions were assessed for the Project:

- Structural failures, including open pit slopes, stockpile slopes, settling ponds, and the TMF.
- Accidents, including fuel spills, chemical spills, unplanned explosive events, and mobile equipment accidents.
- Other malfunctions, including failures of the water treatment systems, tailings pipeline, and erosion and sediment controls.

Many accidents and malfunctions are preventable, and their consequences are limited by applying a precautionary approach during planning and design. Through conformance with engineering design standards and implementation of proposed mitigation measures, regular inspection, and emergency response procedures, significant adverse effects are not likely to occur as a result of accidents and malfunctions.

Effects of the Environment on the Project

Signal Gold has considered climate change, extreme weather, slope stability, and earthquakes as environmental conditions/events that could potentially affect Project development.

Climate change is anticipated to result in increased frequency and intensity of extreme weather events, warmer average temperatures, higher sea levels, and more extreme rainfall and flooding events. Modelling completed for the Project incorporated NSECC projections for future climate variables to add contingency to the design of mine water infrastructure. Change factors were also applied to daily temperature and precipitation data using seasonal projections to evaluate potential impacts to the Project's hydrologic model in post closure conditions. Due to the relatively short duration of the Project, and the contingencies added to mine water infrastructure design, climate change is not anticipated to affect the Project.

Extreme weather events may result in either drought or surplus of water conditions. The effects of a drought on the Project may include increased dust and decreased availability of water for Project activities. Potential effects of extreme precipitation include damage to Project infrastructure and production delays in the event the open pits become flooded. Haul roads could also become flooded or eroded and transportation of ore and waste may temporarily be suspended. The emergency overflow spillways connected to the settling ponds were designed to

convey flows resulting from storm events up to and including Hurricane Beth as a design storm. The TMF embankments were designed to provide sufficient storage capacity to temporarily store runoff resulting from the environmental design flood and safely convey runoff resulting from the inflow design flood. Signal Gold will use geotechnical analysis in the final design of Project related infrastructure constructed from waste rock and till, to produce features with appropriate safety factors to reduce the possibility of landslides, slope erosion, and subsidence. Stockpiling organic material may result in short term subsidence creating an uneven landscape. This approach aligns with NSDNRR guidance for reclamation, which indicates that landscapes with variable terrain offer long term stability.

No significant earthquakes (magnitude >5.0) were recorded in NS between 1600 and 2006. Goldboro does not fall within a designated seismic zone and the closest recorded seismic event in NS in the last 10 years (2012 2022), a magnitude 2.2 earthquake southwest of Truro, was 136 km from the Project. Based on this information, there is little likelihood of earthquakes having an adverse effect on the Project.

Conclusion

This EARD was prepared to identify and address potential environmental effects resulting from the Project. Signal Gold has applied a comprehensive approach to effects assessment by investigating and documenting baseline conditions since 2017 and completing modelling and other analyses to provide conservative, science-based effects predictions. Mitigation measures have been proposed to minimize potential adverse effects resulting from Project interactions with VCs.

The predicted residual effects of the Project on all VCs were assessed to be not significant. Monitoring and follow up programs will be implemented to verify the accuracy of predicted effects and determine if proposed mitigation measures are effective in eliminating, reducing, or controlling those effects, or whether additional mitigation is required.

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Appendices

Acronyms

Acronym	Expanded Use
A	Applicable
AADT	Annual Average Daily Traffic
ABA	Acid Base Accounting
ACCDC	Atlantic Canada Conservation Data Centre
ACWG	Atlantic Canada Wastewater Guidelines
AEMP	Aquatic Effects Monitoring Plan
ALD	Anoxic Limestone Drain
AMO	Abandoned Mine Opening
ANSMC	Assembly of Nova Scotia Mi'kmaw Chiefs
AP	Acid Potential
AQHI	Air Quality Health Index
AQI	Air Quality Index
ARD	Acid Rock Drainage
ATV	All Terrain Vehicle
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
BV	Bureau Veritas
C	Continuous
CCAB	Canadian Council for Aboriginal Business
CCME	Canadian Council of Ministers of the Environment
CCTV	Closed-Circuit Television
CDA	Canadian Dam Association
CEPA	Canadian Environmental Protection Act
CFR	Code of Federal Regulations
CH4	Methane
CIP	Carbon in Pulp
CLC	Community Liaison Committee
CO	Carbon Monoxide
CO2 eq	Carbon Dioxide Equivalent Units
COC	Constituent of Concern
COD	Chemical Oxygen Demand
CORMIX	Cornell Mixing Zone Expert System
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPUE	Catch Per Unit Effort
CSM	Conceptual Site Model

Acronym	Expanded Use
CSP	Corrugated Steel Pipe
CWS	Canadian Wildlife Services
DEM	Digital Elevation Model
DFO	Fisheries and Oceans Canada
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
DQO	Data Quality Objective
DSM	Digital Surface Model
EA	Environmental Assessment
EARD	Environmental Assessment Registration Document
ECCC	Environment and Climate Change Canada
EDF	Environmental Design Flood
eDNA	Environmental Deoxyribonucleic Acid
EEM	Environmental Effects Monitoring
EL	Exploration License
EMP	Environmental Management Plan
EMS	Environmental Management System
EOM	End of Mine
EQS	Environmental Quality Standards
ERT	Emergency Response Transport
ESA	Environmental Site Assessment
ESC	Erosion and Sediment Control
FAA	Fisheries Act Authorization
FHSA	Fish Habitat Study Area
FMEA	Failure Modes and Effects Analysis
FoS	Factor of Safety
FSC	Food, Social and Ceremonial
FS	Feasibility Study
FWAL	Freshwater Aquatic Life
GCDWQ	Guidelines for Canadian Drinking Water Quality
GDP	Gross Domestic Product
GHD	GHD Limited
GHG	Greenhouse Gas
GIS	Geographic Information System
H	High
HADD	Harmful Alteration Disruption and Destruction
HDPE	High-Density Polyethylene
HDS	High-Density Sludge

Acronym	Expanded Use
HHERA	Human Health and Ecological Risk Assessment
HVAC	Heating, Ventilation and Air conditioning
IA	Industrial Approval
IAA	Impact Assessment Act
IAAC	Impact Assessment Agency of Canada
IBC	Intermediate Bulk Container
ICMC	International Cyanide Management Code
ICP-MS	Inductively Coupled Plasma Mass Spectrometry
ICU	Intensive Cyanidation Unit
IDF	Inflow Design Flood
IDZ	Initial Dilution Zone
ILE	Institute of Environment and Labour
IR	Irreversible
KMKNO	Kwilmu'kw Maw-klusuagn Negotiation Office
KP	Knight Piésold Consulting
L	Low
LAA	Local Assessment Area
LCA	Local Catchment Area
LiDAR	Light Detection and Ranging
LNG	Liquified Natural Gas
LPG	Liquified Petroleum Gas
LT	Long-Term
LWD	Large Woody Debris
M	Moderate
MARI	Maritime Archaeological Resource Inventory
MAC	Maximum Acceptable Concentrations
MAD	Mean Annual Discharge
MCBA	Migratory Birds Convention Act, 1994
MDMER	Metal and Diamond Mining Effluent Regulations
MEKS	Mi’kmaq Ecological Knowledge Study
MEL	McCallum Environmental Ltd.
MGS	Membertou Geomatics Solutions
MIHR	Mining Industry Human Resource Council
MK	Mi'kmaw Kina'matnewey
ML	Metal Leaching
MMIW	Missing and Murdered Indigenous Women
MODG	Municipality of the District of Guysborough
MOE	Ontario Ministry of the Environment

Acronym	Expanded Use
MOO	Mineral Opportunity Overlay
MOU	Memorandum of Understanding
MT	Medium-Term
mTPH	Modified Total Petroleum Hydrocarbons
N	Negligible
N2O	Nitrous Oxide
N/A	Not Applicable
NAPS	National Air Pollution Surveillance Network
NB	New Brunswick
NFR	Near Field Region
NOAA	National Oceanic and Atmospheric Administration
NOC	National Occupational Classification
NO_x	Oxides of Nitrogen
NPAG	Non-Potentially Acid Generating
NPR	Net Potential Ratio
NPRI	National Pollutant Release Inventory
NRCAN	Natural Resources Canada
NS	Nova Scotia
NSAQS	Nova Scotia Air Quality Standards
NSDNRR	Nova Scotia Department of Natural Resources and Renewables
NSECC	Nova Scotia Department of Environment and Climate Change
NSEL	Nova Scotia Environment and Labour
NSESA	Nova Scotia Endangered Species Act
NSLI	Nova Scotia Lands Inc.
NSPI	Nova Scotia Power Inc.
NWPA	Navigable Waters Protection Act, 1985 (repealed)
O	Once
O3	Ozone
P	Permanent
PA	Project Area
PAHs	Polycyclic Aromatic Hydrocarbons
PAG	Potentially Acid Generating
PAR	Progressive Aboriginal Relations
PC	Post-Closure
PEA	Preliminary Economic Assessment
P-ELC	Project Ecological Land Classification
PET	Potential Evapotranspiration
PHP	Port Hawkesbury Paper

Acronym	Expanded Use
PID	Parcel Identification
PM	Particulate Matter
PM_{10}	Particulate Matter with aerodynamic diameter of 10 µm or less
$PM_{2.5}$	Particulate Matter with aerodynamic diameter of 2.5 µm or less
PMP	Probably Maximum Precipitation
PPB	Proposed Property Boundary
PPV	Peak Particle Velocity
PR	Partially Reversible
PSS	Pathway Specific Standards
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance / Quality Control
QEMSCAN	Quantitative Evaluation of Minerals by Scanning Electron Microscopy
R	Regular
RAA	Regional Assessment Area
RCMP	Royal Canadian Mounted Police
RE	Reversible
RGWD	Relative Groundwater Depth
ROI	Radius of Influence
ROM	Run of Mine
S	Sporadic
SAR	Species at Risk
SARA	Species at Risk Act
SDS	Safety Data Sheet
SFE	Shake Flask Extraction
SGeMS	Stanford Geostatistical Modeling Software
SMBS	Sodium Metabisulphite
SO_2	Sulphur Dioxide
SOCI	Species of Conservation Interest
SOP	Standard Operating Procedure
SQG	Soil Quality Guideline
SSWQG	Site-Specific Water Quality Guidelines
ST	Short-Term
TC	Transport Canada
TDS	Total Dissolved Solids
TIMA	TESCAN Integrated Mineral Analyser
TMF	Tailings Management Facility
TSP	Total Suspended Particulates
TSS	Total Suspended Solids

Acronym	Expanded Use
UCS	Uniaxial Compressive Strength
UHF	Ultra-High Frequency
US EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
VC	Valued Environmental Component
WAD	Weak Acid Dissociable
WAM	Wet Areas Mapping
WC	Watercourse
WL	Wetland
WESP-AC	Wetland Ecosystem Services Protocol - Atlantic Canada
WRSA	Waste Rock Storage Area
WTS	Water Treatment System
WQG	Water Quality Guidelines
WSS	Wetland of Special Significance
WSP	WSP Global Inc.

Units of Measurement

Unit	Expanded Use
%HA	Percent Highly Annoyed
°C	Celsius
dB	Decibel
dBA	A-weighted Decibel
g	Grams
ha	Hectare
hr	Hour
km	Kilometre
kt	Kilotonne
kV	Kilovolt
kW	Kilowatt
L	Litre
L_{DN}	Day-night Average Sound Level
L_{EQ}	Equivalent Continuous Sound Pressure
m	Metre
M^2	Square Metre
M^3	Cubic Metre
masl	Metres Above Sea Level
mbgs	Metres Below Ground Surface
Mg	Milligram
mm	Millimetre
Mt	Megatonne
mtbr	Metres Below Top of Riser
MW	Megawatt
NP	Neutralization Potential
pphm	Parts per Hundred Million
t	Tonne
tpd	Tonnes per Day
µm	Micrometer
$µg/m^3$	Micrograms per Cubic Metre
V	Volt
yr	Year

1. Introduction

Signal Gold Inc. (Signal Gold), formerly Anaconda Mining Inc., proposes to develop the Goldboro Gold Project (the Project), a 4,000 tonnes per day (tpd) gold mine near Goldboro, Guysborough County, Nova Scotia (NS). The Project is supported by the technical report and Feasibility Study (FS) dated January 11, 2022 and titled "NI 43-101 Technical Report and Feasibility Study for the Goldboro Gold Project, Eastern Goldfields District, Nova Scotia". In addition to technical studies to support the FS, Signal Gold has, over the last five years, assessed and collected baseline environmental data to support an environmental assessment (EA), undertaken community and Mi'kmaq engagement, and evaluated the socioeconomic impacts of the Project. Based on the FS and other information gathered, Signal Gold has decided to proceed with the completion of an EA. Accordingly, this EA Registration Document (EARD) has been prepared to facilitate the Project's review as a Class I Undertaking in accordance with the *Environmental Assessment Regulations* made under the *Nova Scotia Environment Act*.

Through use of the EA process as a planning tool and the extensive experience of Signal Gold's senior management team and its consultants, Signal Gold has developed and assessed several iterations of the Project layout to reduce potential impact to the environment. The design of the two open pits (East and West Pits), instead of a single larger open pit, was selected to avoid any direct disturbance to both Gold Brook Lake and Gold Brook. Other Project infrastructure has also been micro-sited where possible to avoid watercourses, wetlands, blue felt lichen, areas of historic mine tailings, and historic archaeological resources.

1.1 Scope of the Undertaking

The Project consists of conventional open pit mining operation and a 4,000 tpd processing facility based on a combined gravity and leaching circuit using carbon-in-pulp technology. The Project also includes an engineered lined tailings management facility (TMF), three waste rock storage areas (WRSAs), till and organic material stockpiles, and associated infrastructure. Construction start is anticipated in late 2023, commissioning in 2025, operations until 2035, and initiation of closure in 2036.

1.2 Proponent Information

Signal Gold is a gold mining, development, and exploration company, focused in the top-tier Canadian mining jurisdictions of NS and Newfoundland and Labrador (NL). Signal Gold has mining and milling operations in the Baie Verte Mining District in NL, which includes the fully permitted Pine Cove Mill, tailings facility and deep-water port, and associated mines, as well as approximately 15,000 hectares of mineral property. Signal Gold's Executive and Senior Management team has a combined total of over 100 years of relevant experience taking mining projects from inception through exploration to development, production, and reclamation, in Canada and globally. Senior managers have been involved in noteworthy companies such as B2Gold, Iamgold, Mako Mining Corp, Kirkland Lake Gold, Newmarket Gold, Crocodile Gold, Northgate Minerals, Paladin Energy, Aurora Energy, and Hudbay Minerals, among others. Signal Gold's Certificate of Registration under the *Corporate Registration Act* is provided in Appendix A.1.

Signal Gold Inc. Head Office

20 Adelaide Street East, Suite 915
Toronto ON M5C 2T6
Telephone (416) 304-6622
Fax (416) 363-4567
info@signalgold.com

Executive Management Team

Kevin Bullock – President and Chief Executive Officer
Robert Dufour – Chief Financial Officer
Brian Jackson – Project Director
Amanda Abballe – Vice President, Human Resources
Deidre Puddister – Environment, Compliance, and Social Responsibility Manager
Paul McNeill – Vice President, Exploration

Table 1.2-1 provides the corporate contact information for the Project.

I, Kevin Bullock hereby accept responsibility for the content of this Environmental Assessment Registration Document (EARD).

June 1, 2022

Kevin Bullock, President & Chief Executive Officer
KBullock@signalgold.com

Date

Table 1.2-1 Goldboro Project Contacts

Position	Proponent
President and Chief Executive Officer	Kevin Bullock Toronto, ON Phone: (416) 304-6622 Fax: (416) 363-4567 Email: KBullock@signalgold.com
Environment, Compliance, and Social Responsibility Manager	Deidre Puddister St. John's, NL Phone: (709) 689-8086 Email: DPuddister@signalgold.com

A list of consultants who contributed supporting documentation for the preparation of this EARD is provided in Appendix A.2.

1.3 Purpose of the Project

The purpose of the Project is to develop a gold mining operation to extract and process gold ore and ultimately produce and sell gold bullion. The Project will bring economic stimulus to the immediate area and will have regional and provincial benefits. The Project aligns with the goals outlined in the NS Department of Natural Resources and Renewables (NSDNRR) Natural Resources Strategy for NS, including to "support the sustainable development of the Province's geological resources in order to attract investment, create high-value jobs, and grow the economy." (NSDNRR, 2016).

1.4 Benefits of the Project

1.4.1 Socioeconomic Benefits

All phases of the Project will provide direct and indirect employment opportunities, as well as taxation revenue for municipal, provincial, and federal governments, and changes to provincial gross domestic product (GDP). A socioeconomic impact study was completed for the Project in February 2022 (provided in Appendix J.1). The results of financial analysis are summarized below.

- Over 15 years, Signal Gold will spend approximately $1.7 billion on goods and services.
- Most Project spending will occur in NS, resulting in a $2.1 billion contribution to provincial GDP.
- Total household income in NS will increase by nearly $1.1 billion because of the Project.
- 538 direct fulltime jobs (325 jobs directly on site) will be created during the two-year construction period.
- Once operational, the Project will provide fulltime employment for approximately 215 workers annually at the site, in a region where unemployment is 14.2%.
- Over the life cycle of the Project, including construction, operations and closure, the Project has the potential to create 735 new jobs a year in NS for 15 years.

Based on the current plan outlined in the FS, the Project is estimated to generate $528 million in income and mining taxes at the federal, provincial, and municipal levels from direct and spin-off economic activity. More than 80% of tax revenue will be collected by the Province of NS (the Province), supporting important public programs and services such as health care and education, as well as infrastructure including roads, schools, and recreational facilities. Signal Gold, which will also spend approximately $1.7 billion on goods and services over the life of the Project and contribute to an increase in provincial GDP of $2.1B, is implementing measures to maximize benefits to the local economy and communities.. Socioeconomic benefits that will occur as a result of the Project are discussed further in Section 5.105.10.

Signal Gold has entered into a Community Benefits Agreement with Municipality of the District of Guysborough (MODG). The Agreement establishes a framework for a long-term relationship between Signal Gold and the MODG over the life of the Project, confirming Signal Gold's commitment to bring sustainable social and economic benefits to the members of the Guysborough community. Such benefits include:

- Targeted measures for local recruitment and employment at both at the construction and operational stages of the Project by collaborating to assess local labour market training and employment opportunities.
- Working with contractors and suppliers to identify opportunities to hire locally and support businesses activities in the Municipality, including procurement and service opportunities with the Project.
- Contribution of annual grants for community groups, organizations, and community projects within the Municipality.
- Establishment of bursaries for local high school students and the development of co-op work term opportunities students and apprenticeship placements.
- Maintenance of a local operational office within the Municipality and provision of financial incentives for Project personnel to relocate to the region.

Signal Gold and the Assembly of Nova Scotia Mi'kmaw Chiefs signed a Memorandum of Understanding (MOU) that will govern the process by which the parties will negotiate a Mutual Benefits Agreement regarding the Project. The MOU outlines the process for Signal Gold and the Assembly to establish an Agreement that reflects a desire to build a mutually beneficial relationship that will be sustained for the life of the Project. The first step in the process was to identify and discuss the Mi’kmaq’s environmental concerns regarding the Project.

1.4.2 Environmental Benefits

The land in this area is physically disturbed and fragmented due to timber harvesting, road building, mineral exploration and past mining activity. The aquatic environment, including Gold Brook Lake, Gold Brook, and contributing watercourses, have been affected by the deposition of tailings from historic mining operations. An environmental benefit to the Project is that Signal Gold will remediate any areas of historic tailings directly within the Project infrastructure footprint. As well, Signal Gold is part of a historic tailings working group for this area with Nova Scotia Lands Inc. (NSLI). NSLI is currently undertaking a Phase I and Phase II Environmental Site Assessment (ESA) and remedial action plan for all historic tailings located on Crown land within the Upper and Lower Seal Harbour Gold Districts, which include the PA.

Baseline environmental investigations, monitoring plans (e.g., Lichen Management Plan) and offsetting plans for the Project have added to the scientific understanding of the area and improved background data held by the Province. This data will increase the knowledge base of regulators and the public, potentially increasing ecological awareness and promoting conservation of natural ecosystems. Offsetting plans can assist the Province with identifying wetlands and aquatic habitats that are candidate sites for reclamation opportunities. The Project Reclamation and Closure Plan, which requires approval from NSDNRR, will be financially secured with a performance bond held by the Province, prior to the commencement of operations, to ensure there are sufficient funds to reclaim mined areas.

Further discussion of the environmental benefits that will occur as a result of the Project is provided in Section 5.

1.5 Regulatory Overview

The federal, provincial, and municipal regulatory framework outlines requirements for the EA process, the permits required for the construction, operation, and reclamation of the Project, and the conditions under which the Project will operate. The Project was not identified under the *Impact Assessment Act* (IAA) as being a designated project, however, is subject to other federal regulations and guidelines apply. Table 1.5-1 provides an overview of the applicable acts and regulations relevant to the Project. General legislation that may be applicable to the Project is outlined, while key legislation, which directly drives the development of the EARD, is explained in more detail below the listed key legislation sections.

Table 1.5-1 Applicable Regulatory Framework

Legislation	Physical Activity and/or Trigger	Regulatory Authority
Federal		
Fisheries Act	Authorization required for any direct or indirect disturbance of fish or fish habitat.	Fisheries and Oceans Canada (DFO)
Fisheries Act - Metal and Diamond Mining Effluents Regulations (MDMER)	Discharge of deleterious substances into waters frequented by fish.	Environment and Climate Change Canada (ECCC)
Migratory Birds Convention Act – Migratory Birds Regulations	Project activities such as clearing and grubbing with the potential to interact with migratory birds.	ECCC
Species at Risk Act (SARA)	Physical disturbance or destruction of SAR and/or habitat.	DFO/ECCC
Canadian Environmental Protection Act	Pollution prevention measures to protect the environment and human health associated risks.	ECCC
Transportation of Dangerous Goods Act and Regulations	Transportation and use of dangerous goods associated with the Project.	Transport Canada (TC)
Canada Wildlife Act and Regulations	Project activities with the potential to adversely affect wildlife.	ECCC Canadian Wildlife Services (CWS)
Explosives Regulations	Blasting within East and West Pits.	Natural Resources Canada (NRCan)
Provincial		
Environment Act – Environmental Assessment Regulations	EA required due to the construction, operations and decommissioning of a facility that extracts or processes metallic or non-metallic minerals.	Nova Scotia Environment and Climate Change (NSECC)
Environment Act – Activities Designation Regulations	Industrial Approval (IA) is required for the construction, operation or reclamation of a surface mine using explosives and procuring mineral bearing ore. Water approval and/or notifications will be required for any water withdrawal and watercourse or wetland alterations.	NSECC

Table 1.5-1 Applicable Regulatory Framework

Legislation	Physical Activity and/or Trigger	Regulatory Authority
Nova Scotia Endangered Species Act and Regulations	The act prohibits killing, injuring, disturbing, taking or interfering with endangered or threatened species and/or their habitat.	NSDNRR
Mineral Resources Act and Regulations	The Project will require a mineral lease and a bond for mining and the collection of royalties.	NSDNRR
Crown Lands Act	Crown ands lease is required for mining related activities occurring on Crown lands.	NSDNRR
Wildlife Act and Regulations	Prohibits the taking, hunting, killing, or possessing eagles, osprey, falcons, hawks, owls, and any other protected wildlife species.	NSDNRR
Nova Scotia Occupational Health and Safety Act (1996) and Regulations	Provides labour standards for which the Project will operate.	Department of Labour, Skills and Immigration
Municipal		
National Building Code of Canada as administered through the municipal building permit process	Approval for construction and occupation of buildings.	MODG
Guysborough Municipal Planning Strategy – District 7 Planning Area	Industrial facilities and resource extraction are governed by the MODG Planning Strategy and Land Use By-Laws.	MODG

In addition to legislative requirements listed above, there are other relevant guidelines, standards and codes of practice which apply to the Project. These are referenced throughout the EARD.

1.5.1 Environmental Assessment Requirements

A Class I EA is required under the *Environment Act* and *Environmental Assessment Regulations* (B.1.(a)) where the Project includes the extraction and processing of metallic minerals. This subsequent EARD was developed in accordance with the *Environmental Assessment Regulations* (s.9(1A)). Concordance with the EA requirements in the regulation are outlined in Table 1.5-2. Other provincial guidance documents that have been consulted in preparation of this EARD include:

- A Proponent's Guide to Environmental Assessment (NSE, 2001)
- Guide to Preparing an EA Registration Document for Mining Developments in Nova Scotia (NSE, 2002)
- Guide to Considering Climate Change in Environmental Assessment in Nova Scotia (NSE, 2011)
- Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSE, 2005)

Table 1.5-2 EARD Concordance Table with the Environmental Assessment Regulations

Environmental Assessment Regulations Requirement	EARD Section Reference
The name of the proposed undertaking	Section 2.1
The location of the proposed undertaking	Section 2.2
The name, address and identification of the proponent	Section 1.2
A list of contact persons for the proposed undertaking and their contact information	Section 1.2

Table 1.5-2 EARD Concordance Table with the Environmental Assessment Regulations

Environmental Assessment Regulations Requirement	EARD Section Reference
The name and signature of the Chief Executive Officer or a person with signing authority, if the proponent is a corporation	Section 1.2
Details of the nature and sensitivity of the area surrounding the proposed undertaking	Sections 2.2 and 5
The purpose and need for the proposed undertaking	Section 1.3
The proposed construction and operation schedules for the undertaking	Section 2.5
A description of the proposed undertaking	Section 2
Environmental baseline information	Section 5
A list of licences, certificates, permits, approvals and other forms of authorizations that will be required for the proposed undertaking	Section 1.5.2
All sources of public funding for the proposed undertaking	Section 2.7
All steps taken by the proponent to identify the concerns of the public and aboriginal people about the adverse effects or the environmental effects of the proposed undertaking	Section 3
A list of all concerns expressed by the public and aboriginal people about the adverse effects or the environmental effects of the proposed undertaking	Section 3
All steps taken or proposed to be taken by the proponent to address concerns of the public and aboriginal people	Section 5

The *Designated Activities Regulations* detail the types of projects subject to the federal IAA process. Designated projects under the regulations related to mining include:

- The construction, operation, decommissioning and abandonment of a new metal mine or mill with the production capacity or ore input capacity of 5,000 tpd or more.

The Project consists of conventional open pit mining operation with a 4,000 tpd processing facility which is less than the capacity requirements for a project to be designated. The method and rate of mining, and ultimately milling, for the Project is determined by a pit optimization process to create a pit design that most economically constrains the mineral resource. Signal Gold evaluated multiple iterations of the pit design resulting in the current design (proposed Project) that optimized ore extraction, while also avoiding Gold Brook and Bold Brook Lake. Similarly, equipment size and mine schedule are estimated based on the size and geometry of the pits as well as the waste rock and ore tonnes that are required to optimize material handling. A processing rate of 4,000 tpd considered optimal given the constraints of the open pit designs and the geometry of the deposit. Therefore, the Project is not subject to the IAA process.

1.5.2 Other Approvals

Following release from the provincial EA process numerous permits, leases, and approvals are required for Project commencement. The notable approvals and permits required for the Project are:

Federal

- DFO *Fisheries Act* Authorization
- Amendment to Schedule 2 of the MDMER

Provincial

- Industrial Approval (IA)
- Water Withdrawal Permit

- Wetland Alteration Permit
- Watercourse Alteration Permit
- Crown Land Lease
- Mineral Lease

2. Project Description

The following sections provide a detailed description of a proposed undertaking including its facilities and operations. Existing conditions and effects assessments are discussed in Section 5.

2.1 Name of the Undertaking

The name of the proposed undertaking is the Goldboro Gold Project.

2.2 Project Location

The Project is located in Goldboro, Guysborough County, Nova Scotia, Canada, approximately 175 km northeast of Halifax, 60 km southeast of the Town of Antigonish, and 1.6 km north of the village of Goldboro (Figure 2.2-1). All-weather Highway 316 links the village of Goldboro to the Town of Antigonish, with connections to Highway 7 (Eastern Shore to Halifax) and Highway 104 (Trans-Canada Highway). The Project can be accessed by Goldbrook Road, a secondary gravel road accessible from Highway 316. The region is known for its historic gold mining, including Goldboro (then referred to as Upper Seal Harbour), Isaacs Harbour, Forest Hill, and Lower Seal Harbour mines. The Project is adjacent to the Maritimes & Northeast Pipeline (M&NP) natural gas pipeline.

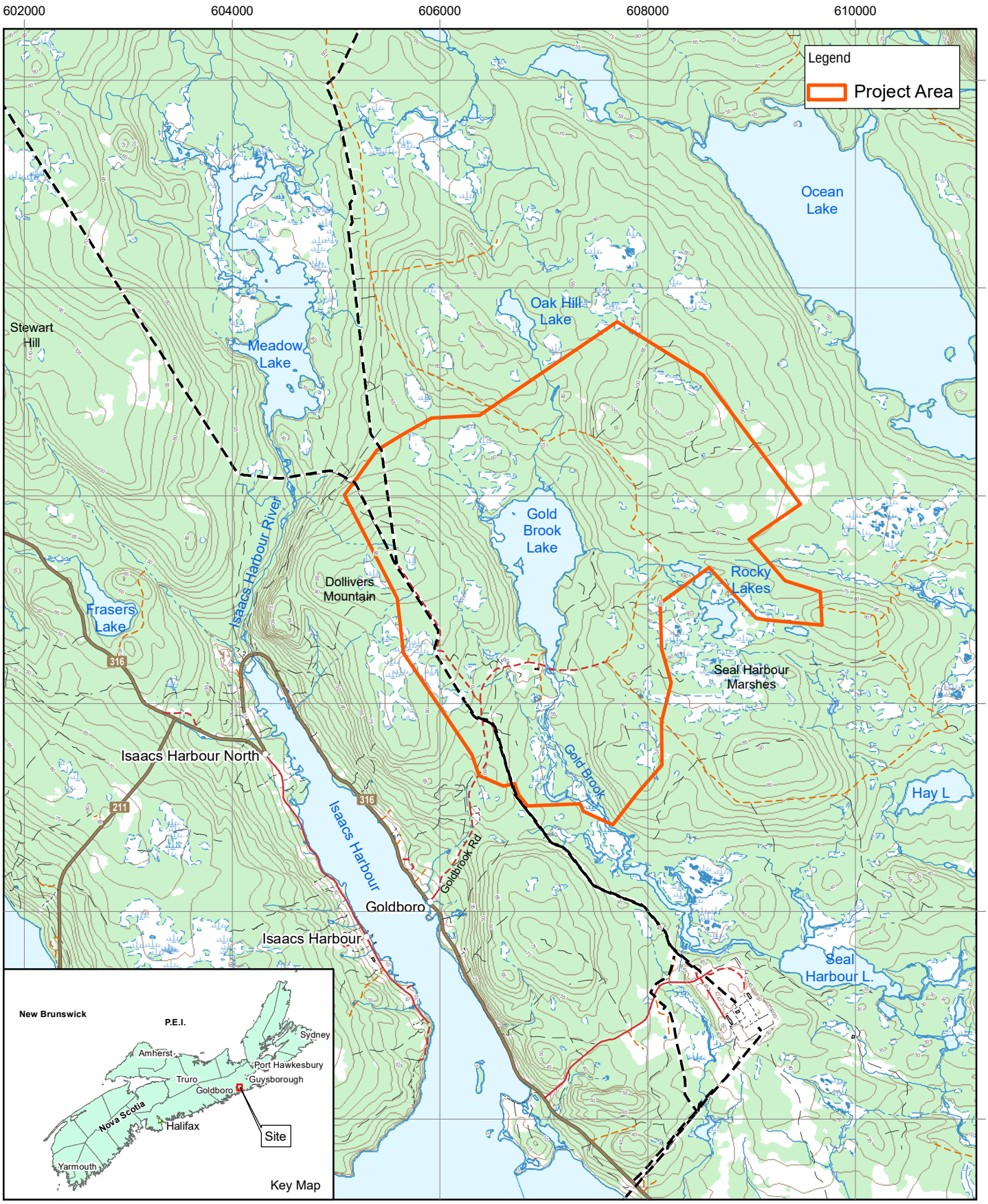
For the purposes of this EA, a Project Area (PA) was defined as the footprint of Project related infrastructure plus a buffer of 100 – 200 m. The PA is centered at coordinates 5007270 m north, 607406 m east (Universal Transverse Mercator (UTM) Zone 20 NAD83) (45° 12’ 38.6” N latitude and 61° 37’ 56.0” W longitude) and is 1,055 hectares (ha) in area.

Land required for Project development is comprised of both private and Crown properties. Private property negotiations and Crown Land Lease Applications are on-going. The majority of infrastructure required for the Project will be located on Crown land (parcel identification (PID) 35094366), a large (38,173 ha), mainly forested tract of land. The Project requires a very small portion (approximately 0.5%) of the total parcel. PID 35094366 is bound by Highway 316 and the Atlantic Ocean to the south and southwest, Guysborough Country Harbour Road to the north, Larry’s River Road to the east, and bordering private lands.

The nearest residence is approximately 850 m southwest of the employee accommodations and 1.4 km from the open pits. The number of residences located within 0.5 km, 1.0 km, 1.5 km, and 2.0 km of proposed Project infrastructure is provided in Table 2.2-1, below.

Table 2.2-1 Distances from Residences

Distance from Nearest Project Infrastructure Component (km)	Number of Residences
0.5	0
1.0	2
1.5	57
2.0	139



Paper Size ANSI A

0 500 1,000 1,500

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: North American Datum of 1983 (CSRS) version 6
Grid: NAD 1983 (CSRS) v6 UTM Zone 20N

GHD

SIGNAL GOLD INC.
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT

PROJECT LOCATION

Project No. 11222385
Revision No. -
Date 31/05/2022

FIGURE 2.2-1

N:\CA\Halifax\Projects\661\11222385\GIS\Maps\Deliverables\RPT03\11222385-RPT03_GIS-HX2.2-1_ProjectLocation.mxd
Print date: 31 May 2022 - 13:33

Data source: GEONOVA, GHD, Anaconda . Created by: jjparks

2.3 Historic and Current Mining Activity

Signal Gold currently holds exploration licence No. 05888 (the EL) through its wholly-owned subsidiary, Goldboro Gold Mines Inc. (formerly Orex Exploration Inc. (Orex)). The EL consists of 37 contiguous claims and covers a total area of approximately 592 ha. The extent of the EL, and other exploration licences in the surrounding area, is shown in Figure 2.3-1.

2.3.1 Exploration and Mining

Gold mineralization within the EL was first discovered in 1862 by Howard Richardson of the Geological Survey of Canada in quartz veins within the Isaac's Harbour anticline. The gold bearing Boston Richardson Belt (slate and quartz) was subsequently discovered by Howard Richardson in 1892. The Richardson Gold Mining Company (Richardson Gold Mining) began production from the belt in 1893 at an average reported grade of 13.03 grams per tonne (g/t) gold milled (the Boston Richardson Mine). Milling recoveries were reported to be in the 50% to 60% range (Nordmin Engineering Ltd. (Nordmin), 2021).

From 1901 to 1905, three gold bearing belts were intersected in the Dolliver Mountain mine, located 2 km west of the Boston Richardson Mine. In 1904, 7,195 t were milled at a grade of 0.87 g/t gold to produce 205 ounces (oz) of gold. In 1905 results were unsatisfactory and mining at Dolliver Mountain mine ceased (Nordmin, 2021).

From 1909 to 1910, the West Goldbrook exploration shaft intersected five gold bearing belts. Three of these were mill tested, but the milling results were considered unsatisfactory, and the mine was abandoned (Nordmin, 2021).

The total gold recovery from 1893 to 1910 within the EL has been estimated at 376,303 t with an average recovered gold grade of 4.11 g/t gold to produce 54,871 oz. However, mill recovery is reported to have been approximately 67%. Operations at the mine continued on a small scale in 1911 and 1912 (Nordmin, 2021).

In 1981, Patino Mines (Québec) Ltd. completed a geophysical program covering the Upper Seal Harbour district. In 1984, Onitap Resources Inc. (Onitap) acquired 37 claims overlying the EL. Between 1984 and 1988, Onitap conducted diamond drilling programs, airborne Very Low Frequency Electromagnetic (VLF-EM) surveys, and surface Induced Polarization (IP) surveys. During this period, several new mineralized belts were discovered (Nordmin, 2021).

Orex acquired the EL from Onitap in 1988. Excepting a period of inactivity from 1996 to 2004, Orex pursued both surface and underground exploration programs, including large amounts of core drilling, metallurgical testing programs, resource estimation programs, and economic assessments of the EL.

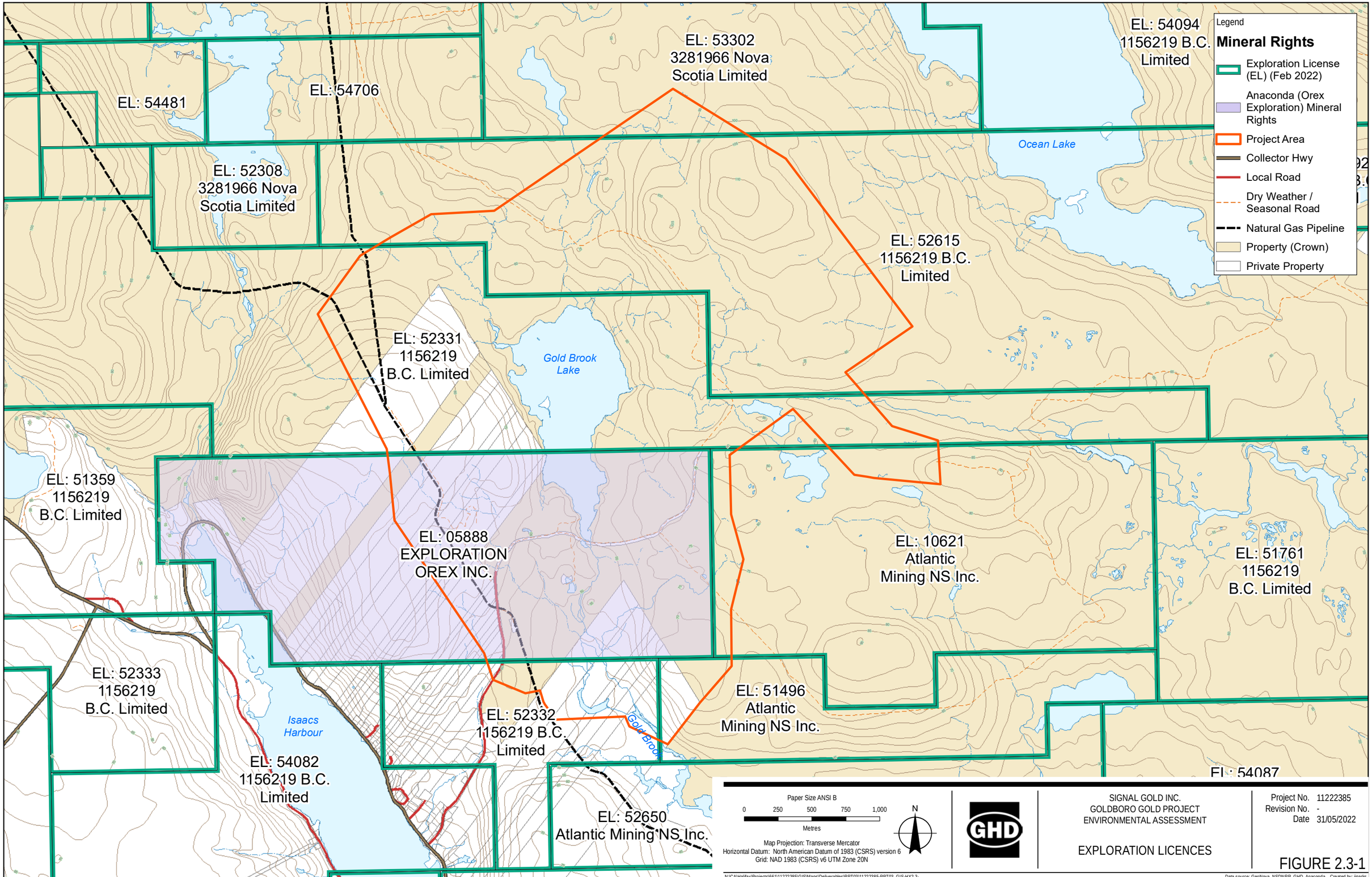
Osisko Mining Corporation (Osisko), under the terms of an agreement with Orex, carried out an extensive core drilling assessment of the EL during the 2010 to 2012 period.

In March of 2017, Signal Gold (formerly Anaconda) acquired control of the EL under the terms of a court approved Plan of Arrangement whereby Golboro Gold Mines Inc. (formerly Orex) became a wholly-owned subsidiary of Signal Gold). Work programs carried out in all years between 2017 to 2021 by Signal Gold primarily focused on expansion and infill drilling of the Goldboro Gold Deposit as well as conducting an underground bulk sample in 2018.

Historic underground mine workings remain within the PA. Most of the entrances to old underground workings and caved portions of the surface overlying these workings have been backfilled or otherwise sealed and should, therefore, not present a risk to animals and humans.

2.3.2 Environmentally Sensitive Remnants of Past Mining Activities

Records indicate that a large portion of the material brought to surface from the historic underground workings was milled at the historic Goldboro mine site. More than 385,000 t of ore are reported to have been crushed from 1893 to 1912 in a stamp mill capable of processing up to 1,800 t per month. The mill produced more than 1,700 kg of gold. Records also show that at least 775 t of arsenical concentrate were produced for shipment to Belgium and Wales. Known areas of historic tailings, historic mine shafts, and stamp mills are shown in Figure 2.3-2.



Paper Size ANSI B

0 250 500 750 1,000

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: North American Datum of 1983 (CSRS) version 6
Grid: NAD 1983 (CSRS) v6 UTM Zone 20N

GHD

SIGNAL GOLD INC.
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT

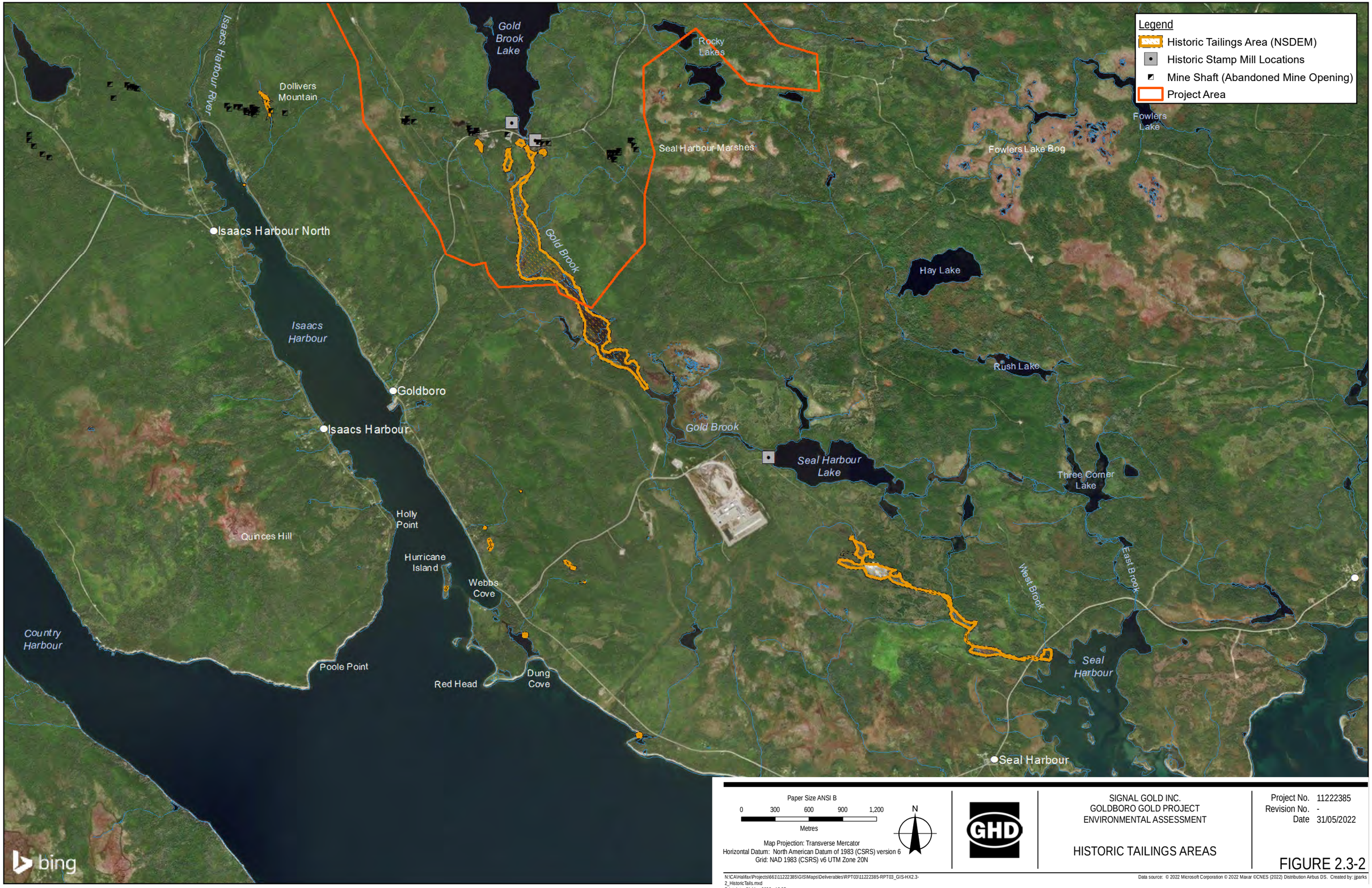
EXPLORATION LICENCES

Project No. 11222385
Revision No. -
Date 31/05/2022

FIGURE 2.3-1

N:\CA\Halifax\Projects\661\11222385\GIS\Maps\Deliverables\RPT03\11222385-RPT03_GIS-HX2.3-1_ExpLic.mxd
Print date: 31 May 2022 - 13:34

Data source: GeoNova, NSDNRR, GHD, Anaconda . Created by: jjparks



Paper Size ANSI B

0 300 600 900 1,200

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: North American Datum of 1983 (CSRS) version 6
Grid: NAD 1983 (CSRS) v6 UTM Zone 20N

GHD

SIGNAL GOLD INC.
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT

HISTORIC TAILINGS AREAS

Project No. 11222385
Revision No. -
Date 31/05/2022

FIGURE 2.3-2

N:\CA\Halifax\Projects\661\11222385\GIS\Maps\Deliverables\RPT03\11222385-RPT03_GIS-HX2.3-2_HistoricTails.mxd
Print date: 31 May 2022 - 13:35

Early gold production utilized a via stamp mill and mainly mercury (Hg) amalgamation (Parsons et al. 2012). Gold concentrate was obtained by gravity methods using Wilfley tables until 1906, after which a bromo-cyanide plant was built. The continued use of gravity methods thereafter is uncertain.

Old foundations suggest the principal mill building was located immediately west of Gold Brook Lake, north of the road. The presence of another mill is suggested based on the location of the tailings areas to the south of Goldbrook Road and Gold Brook Lake. The locations of past waste rock storage and ore storage areas are unknown.

Historically, tailings were deposited into streams and wetland areas with no provisions for containment or control of leachates. Consequently, tailings migrated along Gold Brook. Stream water samples collected downstream of the southernmost historic tailings areas have shown elevated levels of arsenic and iron. The PA has been subject to numerous research activities that are well documented. Sampling by the Geological Survey of Canada in 2012 (Parsons et al. 2012) showed elevated arsenic (As) and mercury (Hg) levels within tailings of the Upper Seal Harbour area. Elevated As and Hg are also present along Gold Brook where tailings from mill processing from 1893 to 1910 were deposited within or adjacent to natural watercourses. The main method of gold extraction was via mercury amalgamation that lead to mercury enrichment within the tailings.

Goldboro Gold Mining Inc. has received an indemnification letter from the Province releasing the company from any liabilities related to the past mining and milling activities if those areas are not disturbed with new or proposed activities. NSLI is currently undertaking a Phase I and Phase II ESA and remedial action plan for all historic tailings located on Crown land within the Upper Seal Harbour Gold District and Lower Seal Harbour Gold District, including the PA. Signal Gold is part of a historic tailings working group with NSLI and has findings of the limited Phase I and Phase II ESA completed for the Project.

In 2018, two underground bulk samples, each weighing approximately 7,000 t, were extracted by Orex. Approximately 4,000 t of the material extracted for processing was stockpiled on site, a portion of which remains in the same area as Signal Gold's current bulk sample stockpile. Signal Gold's bulk sampling program was part of advanced exploration activities undertaken to confirm the geological interpretation of the Goldboro Gold deposit, test for spatial and grade continuity of the mineralized structures, validate key assumptions of the updated Mineral Resource model, and test mining method parameters to optimize the extraction of the mineralized material. The bulk sample was removed from the PA on September 22, 2019. Facilities still located within the PA include mine buildings, underground workings, a flooded mine portal and shaft, the remainder of the bulk sample stockpile (3,100 t) and associated run-off collection system and settling ponds, all subject to an IA (LOA #3963510-B).

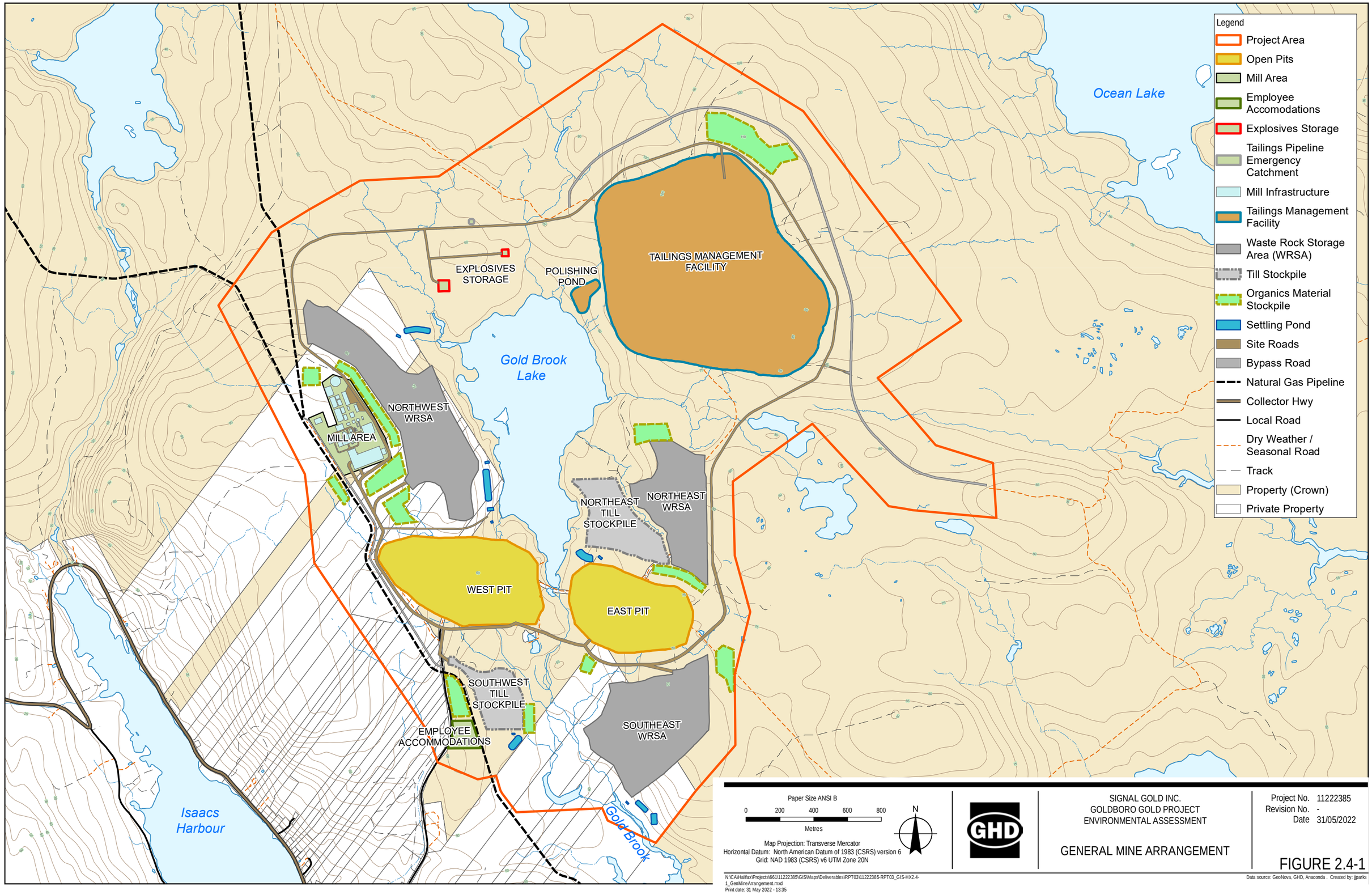
2.4 Project Activities

The mine plan includes two open pits (East Pit and West Pit), an ore processing facility, a TMF, three WRSAs, till and organic material stockpiles, support and administrative buildings, including an employee accommodation building, and associated infrastructure, as shown in Figures 2.4-1 and 2.4-2. The exact locations and sizes of Project infrastructure will be determined at the detailed design stage. Preliminary infrastructure designs are included herein for the purposes of this assessment.

The Project includes the following three primary phases:

- Construction
- Operations
- Closure

This section provides a description of activities to be carried out during each phase, information on the location of each activity, expected outputs, and an indication of each activity's magnitude and scale. The information provided in this section is drawn from several sources, the principal source being the FS. The FS was prepared in 2021 by Nordmin with support from Optimize Group Inc. (Optimize), Lorax Environmental (Lorax), Ausenco Engineering Canada Inc. (Ausenco), Knight Piésold Ltd. (KP), and GHD Limited (GHD). Not all of the information presented in the FS is included herein, in an effort to focus on components deemed to be relevant to the EARD.



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Map Projection: Transverse Mercator
Horizontal Datum: North American Datum of 1983 (CSRS) version 6
Grid: NAD 1983 (CSRS) v6 UTM Zone 20N

SIGNAL GOLD INC.
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT

GENERAL MINE ARRANGEMENT

Project No. 11222385
Revision No. -
Date 31/05/2022

FIGURE 2.4-1

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Print date: 31 May 2022 - 13:35

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Metres

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Map Projection: Transverse Mercator
Horizontal Datum: North American Datum of 1983 (CSRS) version 6
Grid: NAD 1983 (CSRS) v6 UTM Zone 20N

GHD

SIGNAL GOLD INC.
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT

MILL AREA

Project No. 11222385
Revision No. -
Date 31/05/2022

FIGURE 2.4-2

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2.4.1 Construction

2.4.1.1 Overview

Pre-stripping material from the two open pits will occur during the construction phase, however there will be some overlap between construction and operation. Non-potentially acid generating (NPAG) waste rock from the pits will be used as a construction material for building roads, pads, and the TMF.

As the pit areas are being stripped, the proposed mill area will also be stripped and prepared to the design level. The mill area is a major piece of infrastructure and will be constructed simultaneously with the pit and roads. Other key areas that must be constructed include:

- Laydown areas for equipment.
- Truck shop.
- Run of Mine (ROM) stockpile pad.
- WRSA pads.
- Till and organic material stockpile pads.
- Water control structures such as effluent ditches and settling ponds.

The timing for the development of the TMF will be aligned with the mill area construction. The TMF area will be stripped of organic material and overburden to provide a solid base for the containment area to be built upon. The TMF will be constructed as a paddock style, single cell facility located on a side hill northeast of Gold Brook Lake. The TMF embankments will be constructed using NPAG waste rock from open pit mining operations. The embankment will be constructed of zoned earth fill and rockfill (i.e., finer materials at the core of the embankment with coarser materials upstream and downstream) with a geosynthetic lining system installed along the TMF basin floor and on the upstream face of the perimeter embankments to minimize seepage exiting the facility.

Organic material stripped from construction/extraction areas will be stored separately in stockpiles to be used as a base for revegetation once reclamation of an area becomes possible. This material will be stockpiled to avoid moving it multiple times. This will have the least impact upon microorganisms within the soil and facilitate the regrowth of vegetation to stabilize the stockpiles.

NPAG waste rock from the pits, if not immediately used as construction material for roads, berms, pads, or the TMF, will be stored in the WRSAs. Land beneath the WRSAs will be stripped of organic material and overburden to avoid over consolidation and maintain slope stability.

The central, east, and southeast (initial) settling ponds will be constructed prior to any clearing or grubbing in those areas. All Project water will be directed towards the settling ponds (via an expanding network of surface water ditches or via pumping) prior to discharge into Gold Brook Lake and Gold Brook.

2.4.1.2 Roads

Haul roads will be built to withstand frequent heavy traffic between the proposed open pits, ROM stockpile, and TMF. At 16.5 m width and with a grade of no greater than 10%, the haul roads will be wide enough to accommodate two trucks passing between the open pits and ROM stockpile. The road to and from the TMF will be 11 m wide for one-way traffic by haul trucks.

Service roads other than those used by haul trucks will be approximately 8 m wide and less resistant to heavy loads. The location of the new buildings and infrastructure areas were selected to maximize the use of the existing Goldbrook Road and other access roads in the PA. The current layout of Goldbrook Road will intercept the proposed open pits and will therefore be realigned and offset at least 30 m from the open pits. Approximately 510 m of Goldbrook Road will require widening, including clearing and grubbing, grading, and granular refilling. An estimated 3,200 m of roads will also be required within the PA. In addition, an estimated of 5,500 m of new public access roads will also be constructed to maintain public access to the adjacent areas beyond the PA.

2.4.1.3 Site Preparation

Preparation of the PA includes vegetation removal, organic material stripping and storage, excavation, backfilling, grading, constructing drainage ditches, and finishing surfaces to provide slopes and collect surface water. Areas requiring clearing and earthworks include roads, the ROM stockpile pad, WRSA pads, till and organic material pads, the mill area, the employee accommodations area, and explosives storage pads. The PA is predominantly forested, with small diameter trees and underbrush. All organic material cleared will be stockpiled for reclamation efforts. Any aggregate construction material required will be crushed to the appropriate size from rock material in the open pits during the pre-stripping phase. The rock will be processed at a mobile screening station.

2.4.1.4 Electrical Power Supply and Distribution

Power for the Project is anticipated to be provided from a nearby Nova Scotia Power 25 kV distribution line installed along Highway 316. A 1.6 km tap line would be installed along a new right of way to the mill area main substation. Nova Scotia Power Inc. (NSPI) would upgrade their existing distribution system as necessary to be able to provide the additional power required. The construction of the distribution line is the responsibility of NSPI and NSPI will obtain all necessary approvals and permits. Signal Gold will be responsible for obtaining any easements or licenses required for right of way construction. Peak power demand for the Project is estimated to be 10 megawatts (MW), with the average demand estimated to be 7.5 MW. A network of 13.8 kV overhead distribution lines would be installed in the PA to provide power sourced from the main substation.

2.4.1.5 Communication System

Cellular service is currently available in the PA, as is internet, but will need to be extended to the mill area. Ultra high frequency (UHF) radio will be used in the pits and TMF, with a base station at the guardhouse.

2.4.1.6 Buildings and Facilities

The following buildings and facilities will be constructed within the PA:

- Process plant
- Truck shop / wash facility
- Fuel storage facility
- Propane storage facility
- Explosive storage magazine
- Emulsion transfer tank
- Warehouse and laydown areas
- General office building
- Plant office building
- Mine dry building
- Core storage and core yard
- Emergency response transport (ERT) facility
- Helipad
- Hazardous waste storage facility
- Employee accommodations
- Wastewater treatment plants
- Potable water treatment plant

The locations of proposed buildings and facilities are shown in Figures 2.4-1 and 2.4-2.

Most buildings in the PA will be located within the mill area, on a prepared granular pad to the northwest of the West Pit. This section of land gently slopes uphill to the west. The process plant, specifically the conveyor next to the ROM stockpile, will be closest to the open pits. These buildings are intended to be pre-engineered steel structures.

The employee accommodations will be modular buildings with a capacity of 350 beds during the construction phase and 175 beds during the operations phases. Reducing the capacity of the employee accommodations will result in some units being removed following the construction phase. The trailers will have a central kitchen/dining area and a portion will be converted to a recreation area after the construction phase is complete. The employee accommodations area will be equipped with several features to increase the safety and security of employees, contractors and surrounding communities. The facility will be drug and alcohol free, a key card system will be in place to access the kitchen and sleeping quarter facilities, and employees will only be able to access the trailer for the room where they will be staying. Closed-circuit television (CCTV) will also be installed throughout the public areas such as the kitchen/dining room and hallways. Other safety features will be added as design discussions advance.

The mill area infrastructure pad will house the process plant, ROM stockpile, main switchyard and supporting ancillary buildings. The mill area and employee accommodations area will be outfitted with exterior lighting in high traffic areas to facilitate safe work at night. The general office building will be a pre-engineered steel building and will provide office and cubicle space for 30 personnel. The adjacent plant office will provide office space for 10 personnel.

The mine dry building will be a pre-engineered steel building that contains a total of 175 lockers for the mine and mill personnel. The dry building includes locker rooms, showers, and laundry.

The truck shop will be a pre-engineered steel building that houses three vehicle repair bays and serviced by a bridge crane. Space for a welding fabrication area is proposed for miscellaneous maintenance requirements. A bay for the truck wash is planned at the north end of the building with a containment wall for any runoff to be collected. Both truck shop and truck wash areas are equipped with a floor drain system complete with oil water separators. Oil collected in the oil water separator will be pumped out and disposed of at a licensed external facility. A second-floor mezzanine is proposed for storage of materials or for expansion into future office space.

The plant office facility will be a modular building and will include a lunchroom, washrooms, mine dry, and first-aid station. The building will be equipped with heating, ventilation and air conditioning (HVAC), and will be located in close proximity to the process plant.

The mill workshop will provide space for general maintenance and servicing of small equipment for the process plant, such as pumps, motors, and mobile equipment. The building will be equipped with HVAC and be located in close proximity to the process plant.

The laboratory will be a containerized building on pre-cast concrete blocks. The laboratory will house equipment for typical mine and plant assays as well as office space. The laboratory will be located in close proximity to the process plant.

The reagents storage warehouse will be a fabric building and will provide space for short-term storage of reagents for use in the process plant. It will be located in close proximity to the main reagents building.

An ERT facility will be located in the centre of the mill area. This building will house a two-vehicle garage for the ERT and a medical examination room to treat any medical emergencies. A helipad on the north side of the mill area is proposed in the case of a medical evacuation, or for helicopter arrivals to the PA.

A warehouse is planned for storage of spare parts, tools, equipment, and consumables. Exterior laydown and storage areas are planned for rock cores and staging equipment and materials. An area to the northwest of the mill area has been reserved for hazardous waste storage; this will be used to store waste such as oil barrels, soil or materials contaminated with fuel, and chemical containers before being removed from the PA and disposed of at external facilities. The hazardous waste storage area will include secondary containment and will be managed in accordance with the Nova Scotia *Dangerous Goods Management Regulations*.

Two separate wastewater treatment plants are proposed to service the employee accommodations and buildings/facilities in the mill area. One wastewater treatment plant is proposed northeast of the employee

accommodations, and one is proposed northeast of the process plant. A potable water treatment plant and water storage tank will also be located northeast of the process plant.

The process plant buildings are described in Section 2.4.1.7. Fuel, propane, and explosives storage facilities are described in Sections 2.4.1.9 through 2.4.1.11.

2.4.1.7 Process Plant

2.4.1.7.1 Process Plant Buildings

The process plant will be comprised of the following separate buildings:

- Mill building (grinding and gravity)
- Main reagents building
- Gold room

The buildings will be supported on reinforced concrete footings and are complete with concrete slab on grade. To account for winter conditions, building roof and wall cladding will have fibreglass blanket insulation complete with vapour barrier. Overhead cranes will be available for equipment servicing in the process plant. Propane fuel will be used for all building heating systems.

The mill building will be a pre-engineered structure with an overheard crane including a ground floor, one major mill operating floor, and multiple equipment access platforms. The various equipment will be accessed by purpose-built mezzanine platforms for maintenance, service, and sampling. The mill building will contain the ball mill, cyclone feed hopper/pumps, cyclone cluster and trash screen, as well as dedicated areas for the gravity circuit equipment, acid wash column, the elution column, and regeneration equipment.

The reagent facility will be a fabric building, with an overhead crane, and will contain the reagent mixing tanks, and dosing tanks (where applicable). The reagent profile consists of cyanide, lime, sodium hydroxide, hydrochloric acid, carbon, copper sulphate, sodium metabisulphite, ferric sulphate, flocculant, and antiscalant. Where possible totes of reagents will be used directly, to conserve space and tankage. Each set of compatible reagents will be located within curbed containment areas to prevent incompatible reagents from mixing. Reagent storage tanks will be equipped with level indicators, instrumentation, and alarms to ensure spills do not occur during normal operation. Sumps and sump pumps will be provided for spillage control.

The gold room, a pre-engineered building, will house the pregnant solution tank, electrowinning cells, sludge filters, furnace, drying oven, and vault.

Exterior process facilities include:

- Primary crusher modular structure
- Secondary and tertiary crushing modular structures
- Three leach tanks
- Six carbon-in-pulp tanks
- Two detoxification tanks
- Arsenic precipitation tank

The tanks will be accessed by purpose-built mezzanine platforms and walkways to facilitate servicing, sampling, and maintenance. An area crane will provide access to screens, tanks, pumps, and agitators for the carbon-in-pulp, detoxification and arsenic precipitation tanks. Removal and reinstallation of the leach tank agitators will be accomplished via a mobile crane. The tailings will be directed to a tailings thickener located outdoors before being pumped to the TMF.

2.4.1.8 Security

A security office and guardhouse will be provided at the public entrance to the PA near the employee accommodations area to restrict access to the haul roads and pit areas. This structure will have offices for security guards and a security system for monitoring personnel coming to and leaving the PA. The security structure will be staffed continuously. Perimeter fencing will be built around the mill area, explosive storage areas and other sensitive areas as required.

An estimated of 5,500 m of new public access roads will be constructed to maintain public access to the adjacent areas beyond the PA.

2.4.1.9 Fuel Storage and Fill Station

A cardlock diesel fuel station will be installed in the mill area to refuel haul trucks. The station will be located just off the main haul road, near the truck shop. The station will consist of two double-walled 100,000 L fuel storage tanks, each outfitted with secondary containment, high flow suction dispensers, fuel cardlock system, and environmental monitoring system. In addition to the leak detection instruments that make up the environmental monitoring system, the dispensing data can be used to reconcile fuel consumption with the delivery quantities and the fill level of the tank to ensure no fuel is unaccounted for. The maximum safe capacity of the storage tanks will allow for 190,000 L of diesel fuel to be stored.

Fuel storage tanks will be installed according to manufacturer specifications and regulatory requirements. Delivery will be on an as needed basis and will comply with the suppliers permitting. Spill kits will be available at a nearby storage/fueling station and all mobile equipment will have spill kits installed. Disposal of used spill kits will follow the procedures in the safety data sheet (SDS) sheet and applicable legislation.

2.4.1.10 Propane Storage

A storage and distribution system for liquefied petroleum gas (LPG) will be required to provide heating fuel for the surface infrastructure and process buildings, as well as provide fuel to the process plant for the operation of the furnace and kiln in the gold room and carbon elution areas. A 68,137 L LPG storage tank will be installed. The storage requirements were determined using the calculated heating loads of the surface infrastructure buildings, including the general office, plant office, mine dry, warehouse, truck shop, core storage, and ERT facility. LPG will be distributed from the storage tank to the buildings via buried piping. Vaporizers will be located near the buildings to supply propane gas to the equipment.

2.4.1.11 Explosives Storage

The explosives storage pad will be located north of Gold Brook Lake. The necessary size of this magazine will abide by the *Nova Scotia Blasting Regulations* as well as the Canadian Federal *Explosives Regulations* regarding quantity-distance requirements and construction parameters.

All blasting materials will be kept secured in appropriately sized explosive magazines provided by the explosives supplier. The magazines will be located on surface, at a safe distance from buildings and other infrastructure, to comply with the blast materials storage permit limits. Delivery will be weekly or on an as needed basis and will comply with the suppliers permitting. Management and use of the magazines will comply with the requirements of the explosives license. Therefore, once secured, only designated individuals will be able to access the blasting materials. Designated persons will have authority to carry and use the key, after undergoing background checks. Transportation of blasting materials will be completed under the NS *Blasting Safety Regulations,* as well as the Canadian Federal *Explosives Regulations*.

2.4.2 Operations

2.4.2.1 Mining Overview

This Project will consist of two open pits mined using conventional mining methods. Waste rock generated will require the development of three WRSAs, to the northwest, northeast, and southeast of the pits. Waste rock is to be segregated according to three classifications: potentially acid generating (PAG), further segregated into PAG1 and PAG2 (as described in Section 5.4), and NPAG. PAG1 waste rock is to be deposited in the TMF. NPAG and PAG2 waste rock will be deposited in the WRSAs. Following full extraction of the East Pit (approximately Year 8), a portion of the waste rock generated during West Pit extraction will be backfilled into the East Pit. NPAG waste rock material will be used in road, pad, and tailings embankment construction, reducing the footprint required for the WRSAs.

2.4.2.2 Production Forecast

The Project will include two open pits with a proposed milling rate of 4,000 tpd. The mine production schedule is detailed in Table 2.4.1. The year (YR) ranges included below begin with operations in YR 1. The construction phase is anticipated to last between 18 and 24 months and is described as YR -1.

Table 2.4-1 Mine Production Schedule

Pit Area	Material	Units	Total	Year Range
East	ROM	kilotonnes (kt)	5,468	YR -1 to 8
	Waste Rock	kt	44,813	YR -1 to 8
	Overburden	kt	2,756	YR -1 to 3
	Historic Tailings	kt	46	YR -1 to 1
West	ROM	kt	10,331	YR 1 to 11
	Waste Rock	kt	73,681	YR 1 to 11
	Overburden	kt	4,767	YR 1 to 7
	Historic Tailings	kt	125	YR 2 to 7

2.4.2.3 Mine Equipment

The mining equipment selected for the Project is summarized in Table 2.4-2.

Table 2.4-2 Mining Equipment

Equipment	Max. Quantity Per Year
Major Mining Equipment	
90t haul truck	14
40t haul truck	5
4.5 m^3 excavator	1
8 m^3 excavator	3
Primary drill	4
Track dozer	4
Wheel dozer	1
Grader	2

Table 2.4-2 Mining Equipment

Equipment	Max. Quantity Per Year
Ancillary Equipment	
Blast crew truck	1
Blaster's truck	1
Skid steer	1
Air Trac – secondary drill	1
Loader – medium	1
Water truck	1
Snow plow	1
Utility excavator	1
Utility loader	1
Maintenance field and service trucks	4
Fuel/lube truck	1
Float truck	1
Crane	1
Tire handler	1
Forklift	2
Light vehicles	7
Crew buses	2
Ambulance, fire truck	2
Light vehicles – owner team	10
Portable light towers	5 - 10
Dewatering pumps	9

2.4.2.4 Mine Operations Personnel

Personnel requirements for operations will depend upon the selected mining contractor and the type of equipment fleet utilized. The estimate provided in Table 2.4-3 is based on the anticipated equipment fleet required to achieve the production schedule. A combination of rotational schedules is envisioned. The majority of operations and maintenance crews are assumed to be 12 hours per day, seven days per week.

Table 2.4-3 Estimated Open Pit Mining Personnel

Activity	YR-1	YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	Y10	YR11
Drill and blast crew	8	12	12	12	16	20	16	16	20	16	12	12
Loading and hauling operators	16	36	48	48	63	79	52	67	65	63	52	52
Support operators	23	29	29	29	29	32	29	29	29	23	23	23

Table 2.4-3 Estimated Open Pit Mining Personnel

Activity	YR-1	YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	Y10	YR11
Operations supervision	4	4	4	4	4	4	4	4	4	4	4	4
Mine maintenance	11	17	19	19	23	27	21	23	25	21	19	19
Mine management	2	2	2	2	2	2	2	2	2	2	2	2
Mine technical team	2	2	2	2	2	2	2	2	2	2	2	2
Owner's technical team	9	9	9	9	9	9	9	9	9	9	9	9
Health and Safety	3	3	3	3	3	3	3	3	3	3	3	3
Total estimated open pit mining	78	114	128	128	151	178	138	155	169	143	126	126

2.4.2.5 Open Pits

Conventional open pit mining methods will be used for the Project, from which a total of 142 million tonnes (Mt) of combined ore, non-ore bearing waste rock, and overburden will be extracted. Open pit mining was selected taking into account the deposit's size, shape, orientation, and proximity to the surface. In addition, the design of the pits considered the proximity to both Gold Brook Lake and Gold Brook to avoid any direct disturbance. Drilling, blasting, loading, and hauling will be used to mine the open pit material within the East Pit and West Pit.

Open pit mining will generally consist of the following processes:

- Stripping and stockpiling organic material from area to be mined
- Marking planned drill holes and requisite depths to reach planned bench
- Drilling marked drill plan
- Loading and blasting completed drill holes
- Mucking out completed blast via excavators loading haul trucks
- Hauling ore to the ROM stockpile and waste rock to the WRSAs
- Preparing area for next blast

Clearing, grubbing, grading, and stockpiling of till and organic material in the pit area will be conducted progressively prior to accessing bedrock for mining purposes, to avoid erosion. All till and organic material will be stored in stockpiles for use in reclamation and construction of berms, impoundments, roads, and/or general grading. Stockpile locations can be viewed on Figure 2.4-1. Once organic material and till have been removed, drilling and blasting will be used to mine ore and non-ore bearing waste rock, as well as establish benches along rock walls.

Drilling and blasting will be used to access the ore. Previous exploration drilling has mapped the location of ore-bearing material. Geotechnical investigations conducted in summer/fall of 2017, 2019, and 2021 formed the base for the open pit design. Further grade control drilling will be undertaken to confirm any local variation in ore distribution allowing blast patterns to be executed to maximize production of ore and minimize production of non-ore bearing waste rock. All blasting activities will be conducted by a licensed contractor or operator.

Ore and waste rock will be loaded into haul trucks for transport out of the pits. It is envisaged that ROM will be loaded directly into the process plant crusher hopper but there will be a need for a ROM stockpile to allow for stoppages, for stockpiling in the pre-production period, and possibly some blending. NPAG and PAG2 not used for construction or backfill will be stockpiled at its final disposal point, managed, and reclaimed in place.

At completion, the West Pit will measure approximately 1,025 m along its east-west axis, 520 m along its north-south axis, and have a depth of approximately 250 m. The East Pit will measure approximately 775 m along its east-west axis, 410 m along its north-south axis, and have a maximum depth of approximately 190 m. The current open pit design is displayed in Figure 2.4-1 and the design and operating details are displayed in Tables 2.4-4 and 2.4-5.

Table 2.4-4 Ultimate Pit Design, Pit Contents (Nordmin, 2021)

Rock Category	Tonnes
ROM Mined	
East Pit	5,468,300
West Pit	10,330,600
ROM Total	15,798,900
Waste Material Mined	
NPAG rock	107,539,400
PAG1 rock	10,721,000
PAG2 rock	234,100
Till	7,522,800
Organic material	563,400
Historic tailings	170,200
Total	126,750,900
Total Material Mined	142,549,800

Table 2.4-5 Ultimate Pit Design, Approximate Pit Dimensions (Nordmin, 2021)

Item	Goldboro Pit
Length	West Pit – 1,025 m East Pit – 775 m
Width	West Pit – 520 m East Pit – 410 m
Depth	West Pit – 250 m East Pit – 190 m

2.4.2.6 Blasting

Blasting will always be performed by qualified persons, as defined in the *NS Blasting Regulations.* Standard operating procedures will be established for blasting to minimize risk to personnel and equipment. These will include an area clearing procedure, posting of signage and barricades at all access points, pre-blast alarms and warnings, and verbal communication between the blaster and predesignated muster leaders accounting for all personnel prior to blasting occurring.

Appropriate blast designs for open pit mining will be developed to limit blasting impacts (vibration, fly-rock and overpressure). All appropriate information for each blast will be documented including hole-depth and the quantity of explosive used, blast timing, and monitoring data.

Initial pre-blast surveys for structures and well conditions will be completed by a qualified third-party consultant, prior to the start of blasting activities. Selected structures will be inspected for any existing damage or issues and documented appropriately. A 40 m offset will be maintained between the M&NP natural gas pipeline and the pits. Blasting will be completed in accordance with the National Energy Board *Regulations for Pipeline Damage Prevention* and the NS *Blasting Safety Regulations* made under the *Occupational Health and Safety Act*.

2.4.2.7 Loading and Hauling

The method and rate of mining at the Project is determined by a pit optimization process to create a pit design that most economically constrains the mineral resource using all available engineering parameters. This involves multiple pit design iterations and results in an optimized pit for the Project and a calculation of ore and waste tonnes. Similarly, equipment and haul units are estimated based on the size and geometry of the pit and the number of waste and ore tonnes that are required to optimize the mine schedule. The sizes of the loading fleet and haul trucks have been estimated based on the operating hours required to achieve the production schedule, calculated by cycle times, and estimates of the equipment's rated capacities and productivities.

The fleet of equipment for loading and hauling to support a 4,000 tpd operation will consist of a front-end loader type of excavator and a hydraulic excavator are proposed for waste rock handling, and a backhoe type excavator is proposed for ore handling. The haul units proposed range from a single fleet of ~63t haul trucks to a combination fleet of ~90t rigid frame trucks with ~40t articulated haul trucks typical for a project of this size.

2.4.2.8 Processing

Mined material will be transported to a ROM stockpile located close to the primary crusher for the processing circuit. From here, it will be loaded into the primary crusher with a front-end loader style piece of equipment, which will maintain a steady feed rate to the start of the processing circuit.

2.4.2.8.1 Process Plant

The process plant will be located west of Gold Brook Lake and northeast of the West Pit. The mill building will house the ball mill, cyclone feed hopper/pumps, cyclone cluster and trash screen, as well as dedicated areas for the gravity circuit equipment, acid wash column, the elution column, and regeneration equipment. The reagent building will contain the reagent mixing tanks and dosing tanks (where applicable). The crushing, leach-adsorption, cyanide detoxification, and arsenic precipitation sections will be located outdoors. The exact locations and sizes of Project infrastructure will be determined at the detailed design stage. Preliminary infrastructure designs are included herein for the purposes of this assessment.

The process plant design for the Project is based on a flow sheet with unit operations that are well proven and widely used. The proposed flow sheet uses conventional processes for:

- Crushing/grinding
- Gravity/leach/adsorption
- Desorption/electrowinning/refining
- Cyanide destruction/arsenic precipitation

A process flow diagram is shown in Figure 2.4-3.

2.4.2.8.2 Crushing Circuit

ROM ore will be transported from the pits to the process plant by haul trucks. The ROM bin will be fitted with a static grizzly feeder to keep large oversize rocks from blocking the primary crusher. A vibrating grizzly feeder ahead of the primary jaw crusher will be used to screen out fine material and feed the jaw crusher. The primary crusher product will combine with the grizzly feeder undersize and conveyed to a secondary screen. Screen oversize will be fed to a secondary cone crusher and the secondary crushed product fed to the tertiary screen. The tertiary crusher will operate in closed circuit with a tertiary screen. The combined undersize from both the secondary and tertiary screens will be conveyed to the mill feed stockpile. The mill feed stockpile will be equipped with two belt feeders to regulate material into the ball mill via a feed conveyor. Each feeder will be capable of feeding the plant at design capacity independently.

The material handling and crushing circuit will include the following key equipment:

- ROM bin

- Vibrating grizzly
- Fixed rock breaker
- Primary jaw crusher
- Secondary screen
- Secondary cone crusher
- Tertiary screen
- Tertiary shorthead cone crusher
- Crushed ore reclaim belt feeders
- Conveyors
- Metal detection and rejection

Crushing circuit product will be conveyed to a covered ROM stockpile. The covered ROM stockpile will be designed to have a live capacity of 12 hours or 2,000 t. The presence of a covered ROM stockpile will ensure that the processing plant can operates independently of the mining and crushing activities and provides a more stable feed to the grinding circuit.

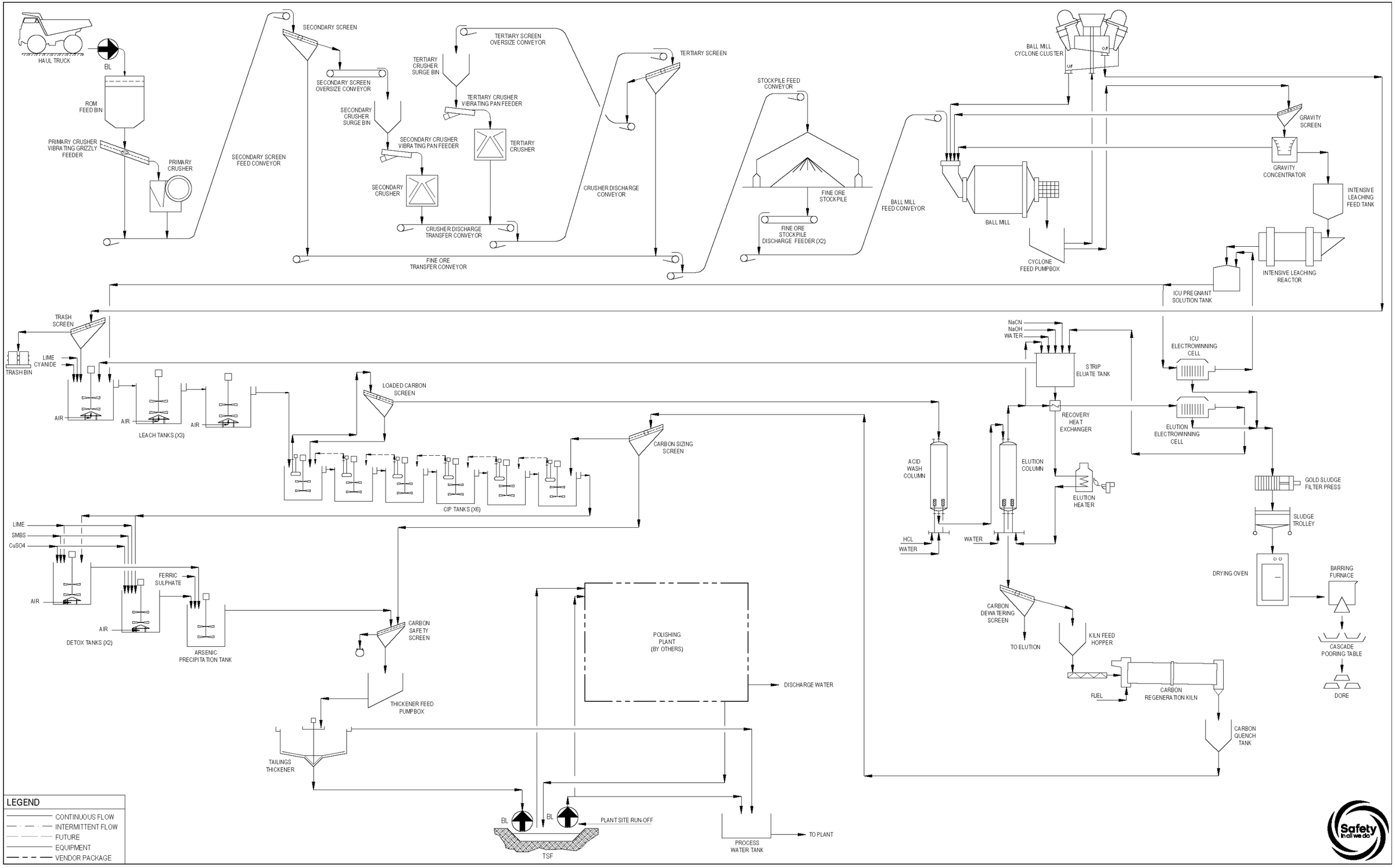


Figure 2.4-3 Process Flow Diagram

2.4.2.8.3 Grinding Circuit

The grinding circuit will consist of a ball mill in a closed circuit with hydrocyclones. Mill feed from the stockpile will be reclaimed by two belt feeders. The feeders will transfer the mill feed onto the ball mill feed conveyor, which discharges ore directly into the ball mill feed chute. Process water will be added to the ball mill feed chute to create a slurry in the ball mill. The mill feed chute will also receive oversized material from the gravity scalping screen and the underflow from the hydrocyclone cluster. The mill will be operated in closed circuit where the product will be discharged into a common pumpbox with independent pumps for both the hydrocyclone cluster and the gravity circuit. The mill discharge includes a trommel for scat removal. Ground material that is too coarse will be classified by the hydrocyclone and will report back to the ball mill for further size reduction.

The cyclone cluster will be configured to achieve a target design cyclone overflow product sizing of 80% passing of 100 µm. Leach testing showed that this product size is sufficient to achieve design recoveries of gold. The cyclone cluster will have pneumatically actuated valves that allow automated feed pressure control as well as manually actuated isolation valves for maintenance.

Process water will also be added to the cyclone feed pumpbox to obtain the appropriate density prior to pumping to the cyclones. Cyclone overflow will be sent to a trash screen prior to the leaching circuit to remove any large detritus that may accumulate in the leach tanks. The ball mill cyclone pumpbox will also be equipped with a second pump to discharge slurry to the gravity concentration circuit where gravity gold will be concentrated and treated.

The grinding circuit will include the following key equipment:

- 3,500 kilowatt (kW) ball mill with a single pinion drive
- Cyclone feed pumpbox
- Classification cyclones
- Cyclone feed pump, gravity feed pump
- Trash screen

2.4.2.8.4 Gravity Recovery

The gravity circuit will be fed from a dedicated pump on the cyclone feed pumpbox, with all tails and oversize stream recollected and pumped back to the ball mill feed. A side stream of ball mill discharge will be pumped to the gravity sizing screen and the screen undersize will be fed to a centrifugal gravity concentrator. A batch of concentrate will be produced every 45 minutes and fed to the intensive cyanidation unit (ICU) holding tank. The gravity tails are fed back to the ball mill by gravity.

Gravity concentrate will be fed to the ICU cone. Process water will be fed to the cone for approximately 30 minutes to deslime the contents. The ICU solution tank contains sodium hydroxide, sodium cyanide, and leach aid diluted in freshwater. The reagent mixture will be pumped through the bottom of the ICU cone producing a fluidized bed. Overflow will be returned to the solution tank. The pregnant leach solution will be pumped to the gold room for electrowinning and refining. The barren solids will be pumped back to the cyclone feed pumpbox.

2.4.2.8.5 Leach Adsorption

The leach adsorption circuit will consist of three leach tanks and six carbon in pulp (CIP) tanks. Trash screen undersize will flow to a pumpbox and then to the leach circuit. Barren solution from electrowinning cells will be periodically transferred to the leach circuit. The leach and CIP tanks will have a total circuit residence time of 36 hours at 44% solids weight percentage density.

Hydrated lime slurry will be added to adjust the operating pH to the desired set point of 10.5 to 11 and cyanide solution will be added to the first leach tank. Fresh/regenerated carbon from the carbon regeneration circuit will be returned to the last tank of the CIP circuit and advanced counter-currently to the slurry flow by pumping slurry and carbon. Slurry from the last CIP tank will flow to the cyanide detoxification tanks.

The intertank screen in each CIP tank will retain the carbon while allowing the slurry to flow to the downstream tank. This counter-current process will operate until the gold loaded onto carbon in the lead tank reaches its target concentration and is sent to acid wash. Recessed impeller pumps will be used to transfer slurry between the CIP tanks and from the lead tank to the loaded carbon screen mounted above the acid wash column in the elution circuit.

The leach and carbon adsorption circuit will include the following key equipment:

- Leach feed pump
- Leach tanks and agitators, 100 kW agitator
- CIP tanks and agitators, 15 kW agitator
- Loaded carbon screen
- Intertank carbon screens
- Carbon sizing screen

2.4.2.8.6 Cyanide Destruction

CIP tailings at 44% solids will flow by gravity to the cyanide destruction tanks, which operate in parallel. The water used for acid rinse and carbon transfer will also be included in the feed to detoxification circuit. As a result, the percentage solids in the feed to the detoxification circuit is estimated to be closer to 43% solids.

The tanks will provide a total residence time of approximately 120 minutes to reduce weak acid dissociable cyanide (CNWAD) concentration from 100 mg/L to less than 0.5 mg/L. Total cyanide (CNTOT) is expected to be 0.5 milligrams per litre (mg/L) due to limited iron species present in the leach feed.

Cyanide destruction will be undertaken using the sulphur dioxide (SO_2)/air method. The reagents required are air, lime, copper sulphate, and sodium metabisulphite (SMBS). Each cyanide destruction tank will be equipped with air addition points and an agitator to ensure that the reagents are thoroughly mixed with the tailings slurry.

The detoxification tanks will feed the arsenic precipitation tank via gravity flow.

The main equipment in this area will include:

- Cyanide destruction tanks and agitators, 30 kW agitator

2.4.2.8.7 Arsenic Precipitation

Arsenic is naturally associated with in-situ ore at Goldboro and will be treated by precipitation and the addition of ferric sulphate at a design ratio by weight of 8:1 iron to arsenic in solution. The arsenic precipitation tank will provide a residence time in excess of the design value of 10 minutes for the reaction to occur. Tailings from the arsenic precipitation tank will flow by gravity to the carbon safety screen to ensure no carbon is lost to tailings. The screen oversize (recovered carbon) will be collected in a bin for return to the CIP circuit. The screen undersize will be pumped to the tailings thickener.

The main equipment in this area will include:

- Arsenic precipitation tank and agitator, 30 kW agitator
- Carbon safety screen

2.4.2.8.8 Tailings Thickening

Detoxified tailings slurry will flow from the arsenic precipitation tank to the carbon safety screen where any carbon in slurry will be screened out. Tailings slurry will be pumped to the tailings thickener where it will be dewatered to obtain an underflow density of 60% solids. The overflow from the thickener will be recycled to the process water tank while the underflow will be pumped to the TMF via approximately 4.3 km of pipeline. Flocculant will be added to the thickener feed to improve the solids settling rate.

The main equipment in this area will include:

- High-rate thickener
- Overflow tank for process water storage
- Final tailings pumps

2.4.2.8.9 Carbon Acid Wash, Elution, and Regeneration

Prior to gold elution, loaded carbon will be treated with a weak hydrochloric acid solution to remove calcium, magnesium, and other salt deposits that could render the elution less efficient or become baked on in subsequent steps and ultimately foul the carbon.

Loaded carbon from the loaded carbon recovery screen will flow by gravity to the acid wash column. Entrained water will be drained from the column and the column refilled from the bottom up with the hydrochloric acid solution. Once the column is filled with the acid, it will be left to soak, after which the spent acid will be rinsed from the carbon and discarded to the cyanide destruction tank.

The acid washed carbon will be then hydraulically transferred to the elution column for gold stripping.

The main equipment in this area will include:

- Acid wash carbon column – 3 t capacity
- Hydrochloric acid feed pump
- Spent solution discharge sump pump

The gold stripping (elution) circuit will use the Pressure Zadra process.

A high cyanide, caustic solution will be recirculated through a pressure elution column at 140 °C to strip the precious metals from the carbon. The precious metal rich solution from the column will exchange heat with barren solution going to the column. Cooled rich solution will then flow through electrowinning cells to deposit the gold and silver on the cathodes before the solution is recycled back to the elution column.

The stripping circuit will include the following key equipment:

- Carbon elution column
- Strip solution heater (propane fired) with heat exchangers
- Strip eluate, and pregnant solution tanks

After completion of the elution process, stripped carbon will be hydraulically transferred from the elution column to the eluted carbon dewatering screen. The screened carbon will be fed into the kiln feed hopper then metered into the carbon regeneration kiln.

Gold is recovered from the electrowinning cells and smelted to produce doré bars in the secure and supervised gold room.

2.4.2.9 Stockpiles

The Project will require stockpiling of waste rock, till, organic material, and ROM. These are discussed in the following sections.

2.4.2.9.1 Material Stockpiles

Waste rock generated from the Project will require development of three WRSAs, to the northwest, northeast, and southeast of the pits. Following full extraction of the East Pit (Year 8), a portion of the waste rock generated during West Pit extraction will be backfilled into the East Pit. Two till stockpiles are also proposed to the southwest and northeast of the pits, and 12 organic material stockpiles are proposed in various locations throughout the PA.

Stockpile size requirements are provided in Table 2.4-6. The storage capacity has been designed to accommodate waste rock generated from the open pit operations.

Table 2.4-6 Material Stockpiles Storage Capacities

Area	Comment	Weight (Mt)	Top Elevation (m)
NW WRSA	Waste rock from West Pit, Year 4 to Year 8	24.08	150
NE WRSA	Waste rock from East Pit, Years 5 to 8	15.87	145
SE WRSA	Waste rock from East Pit and West Pit, Year -1 to 5	30.02	165
East Pit backfill	Waste rock from West Pit, Year 8 to Year 11 (following completion of East Pit)	21.07	N/A
NE till stockpile	Till from East and West Pits, Year -1 to Year 3	1.89	110
SW till stockpile	Till from East and West Pits, Year 2 to Year 7	2.88	95

The WRSAs will be located in proximity to the pits to minimize haul distances. To prepare the areas, topsoil will be removed and stockpiled in an organic material stockpile area for long-term storage and later use during reclamation. The foundation will be prepared to address any geotechnical concerns.

Waste rock will be end dumped from the haul trucks forming lifts. Trucks will dump near, but at a safe distance from, the edge of the lift. Lifts will be constructed such that the final WRSAs have an overall slope angle that does not require rework at closure, thus reducing reclamation costs. A 27° overall reclaimed slope was assumed in the design.

Where possible, waste rock material would be used in road construction, pad construction, and tailings embankments, thus reducing the footprint required for the WRSAs.

2.4.2.9.2 Run of Mine Stockpile

It is envisaged that ROM will be loaded directly into the processing plant crusher hopper but there will be a need for a ROM stockpile to allow for stoppages, for stockpiling in the pre-production period, and possibly some blending. The ROM stockpile will have a maximum capacity of 80,000 t and will be located in the mill area, southeast of the process plant. A pre-crushed ROM stockpile with a maximum capacity of 10,000 t will also be located in this area.

2.4.2.10 Tailings Management Facility

Once gold has been recovered from the material fed to the process plant, tailings will be pumped from the plant into the TMF. The tailings will first be passed through cyanide and arsenic neutralization/removal circuits in the process plant to decrease the hazardous potential of the tailings as much as possible prior to deposition in the TMF. When the tailings enter the TMF, sediment will naturally separate from the water retained with it.

The TMF will be constructed as a paddock style, single cell facility located on a side hill northeast of Gold Brook Lake as shown in Figure 2.4-1. It is anticipated 16.2 Mt of tailings and 10.5 Mt PAG1 waste rock will be deposited in the TMF. Tailings and PAG1 waste rock would be transported to the TMF independently and placed in separate locations within TMF basin. Following placement, the PAG1 waste rock will become inundated with ongoing thickened tailings slurry deposition and water. This will maintain both the tailings and the PAG1 waste rock below a water cover and in a saturated state. Maintaining these PAG waste materials within the long-term saturated zone in the TMF will prevent the onset of acid rock drainage (ARD) conditions and help reduce metal leaching (ML) from the PAG1 material.

Historic tailings directly impacted by mining or Project infrastructure will be excavated and placed in the TMF. Historic tailings generated by past mining operations are well mapped and understood through delineation programs completed by the Geological Survey of Canada, Signal Gold, WSP Global Inc. (WSP), and GHD. Signal Gold considered the presence of historic tailings in the design of the Project and made efforts to avoid these areas where possible. The total surface area of the historic tailings that will be directly disturbed by Project infrastructure is less than 1.8 ha or less than 1% of the PA. The TMF embankment will be constructed of zoned earthfill and rockfill (i.e., finer materials at the core of the embankment with coarser materials upstream and downstream) with a geosynthetic lining system installed along the TMF basin floor and on the upstream face of the perimeter embankments to minimize seepage exiting the facility.

The TMF design includes an initial starter embankment followed by subsequent stages. TMF stages will be expanded using downstream construction methods throughout the operations phase.

2.4.2.11 Tailings Water Management

The primary water management objectives for the TMF are as follows:

- Maximize the recycling of process water and runoff water from the TMF to the plant site.
- Provide temporary containment of the environmental design flood (EDF) within the TMF basin and safe conveyance of the inflow design flood (IDF) from the TMF during operations.
- Maintain a minimum water cover (2 m) over the deposited tailings throughout operations.

Inflows to the TMF basin will be temporarily stored before being reclaimed for use in the process plant by a floating pump barge. Water reclaiming, treatment, and release will be conducted such as to always maintain a 2 m minimum water cover over the deposited tailings surface.

The estimated runoff volumes from the EDF (1 in 200 year, 72-hour storm event) and IDF (24-hour Spring probable maximum precipitation (PMP) plus the corresponding melt of the 1 in 100 year snowpack) were used to determine the storage volume and corresponding wet freeboard depth required within the TMF to manage each event. The estimated peak flows for the IDF were used to design the emergency overflow spillways.

2.4.2.11.1 Seepage Collection System

A seepage collection system consisting of drains and pumps will be used to collect seepage from the TMF. Drains will be installed in the foundation along the upstream toe of the TMF embankment to collect potential seepage below the embankment and safely direct it to the nearest downstream seepage collection sump, located adjacent to the downstream toe of the embankment.

Water collected in the seepage collection sumps will be transferred back into the TMF using a pump-back system. If the collected water is suitable for release to the environment (i.e., meets the discharge criteria), then it may be discharged to the downstream receiving environment.

2.4.2.11.2 Tailings Management Facility Water Treatment System

Based on the predictive water quality analysis completed for the Project, described in Section 5.6 and Appendix F.7, active water treatment is anticipated to be required to reduce metals, cyanide, and nitrogen series in effluent discharged from the TMF. The TMF WTS discussed below is an example of technology that has been demonstrated as effective in treating the predicted constituents of concern (COCs) for Project effluent. The water treatment technologies implemented for the Project will be decided during the detailed design phase.

The conceptual TMF WTS designed for the Project includes three main sections. First, residual cyanide compounds will be removed through an oxidation process by adding sodium chlorite dioxide. A reaction tank will provide enough retention time and proper mixing for an efficient oxidation. The initial TMF supernatant water predictions (KP, 2022) show more than 95% of the cyanide will present in Weak Acid Dissociable (WAD) forms which are oxidizable by proposed technique. In the second step, a high-density sludge (HDS) process will be utilized for metal precipitation. Lime will be added to increase the pH to desire setpoint in order to precipitate metals in their hydroxide forms in a rapid mixing tank. Ferric sulphate then will be added as coagulant in order to co-precipitate arsenic to reduce its concentration to the acceptable levels. A flocculant (polymer) will be added to accelerate the precipitation of generated fine suspended particles and create larger flocs. The generated sludge as the results of adding lime, coagulant and flocculant will be fed into a slow-mixing tank (flocculation tank) to contact the particles to a flocculant and properly agglomerate all precipitates and promote an efficient settling in the clarifier. Then the mixed slurry will be fed into a clarifier for sludge settling and clarification. The settled sludge from the bottom of the clarifier then will be recycled back to the initial part of the process. To do this, the sludge from the clarifier bottom is pumped to a lime/sludge slow mixing tank where sufficient mixing is provided for capturing newly generated suspended solids. The wasted sludge will be pumped into the TMF. The third part of the conceptual TMF WTS includes a biological nitrification/denitrification to address ammonia, nitrate and nitrite exceedances. The water will be conditioned before feeding into the biological

unit. The biological treatment unit will be divided into two sections: anoxic and aerated. This configuration will provide an environment for nitrification and denitrification which will be needed in order to remove ammonia and nitrate/nitrite compounds below discharge limits.

The effluent of the conceptual TMF WTS will be stored in a polishing pond for further clarification before discharging into Gold Brook Lake. The polishing pond is further discussed in Section 2.4.2.11.3. The process flow chart for the conceptual TMF WTS is presented in Figure 2.4-4.

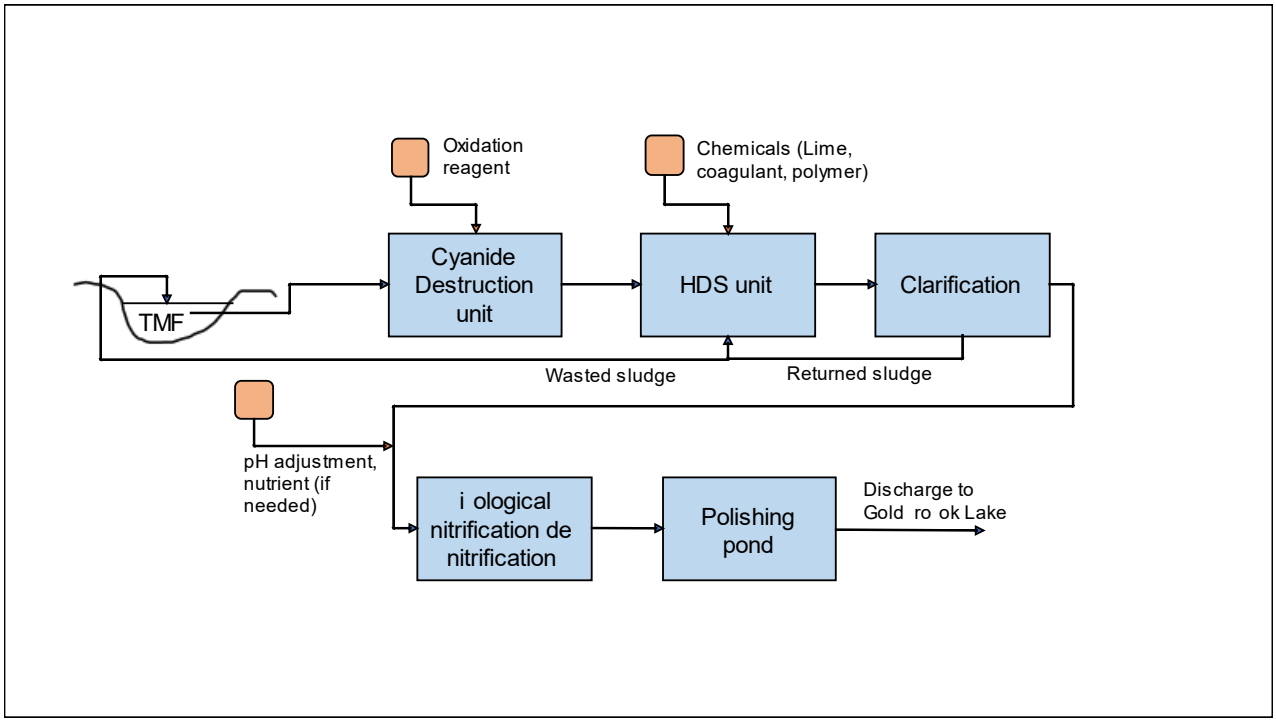


Figure 2.4-4 TMF WTS Process Flow Chart

Further detail on conceptual water treatment technologies for the Project is provided in the Impacted Water Treatment Systems memo in Appendix F.9.

2.4.2.11.3 Polishing Pond

A lined polishing pond will be constructed southwest of the TMF to store water for the TMF WTS operations. The polishing pond has been designed to store approximately 20,000 m^3 of water, which is equivalent to roughly four days of TMF WTS discharge capacity plus some extra capacity contingency.

The polishing pond has been designed to meet the Canadian Dam Association (CDA) Technical Guidelines for Mining Dams (CDA, 2013; CDA, 2019) and includes freeboard and design earthquake ground motion considerations to minimize operational risks. The polishing pond has been identified as having a Dam Hazard Classification of Significant based on the foreseeable consequences.

The polishing pond embankment will be constructed in one stage as a zoned rockfill dam. The bulk fill within the embankment will consist of NPAG material, sourced from the open pits. The zoned embankment will be constructed with filter graded materials consisting of a liner bedding layer and one filter/transition zone (processed mine rock).

2.4.2.12 Reagents and Consumables

Reagents will be stored in a fabric building located in the mill area. Each set of compatible reagents will be located within curbed containment areas to prevent incompatible reagents from mixing. Reagent storage tanks will be

equipped with level indicators, instrumentation, and alarms to ensure spills do not occur during normal operation. Sumps and sump pumps will be provided for spillage control.

2.4.2.12.1 Lime

Hydrated lime will be delivered and stored in a mixing/storage tank. The solid reagent will discharge into the tank and be slurried in process water to achieve the required dosing concentration of 25% solids. The slurried lime will be pumped through a ring main with distribution points at leaching, and in cyanide destruction. Hydrated lime slurry will be used to adjust the operating pH of the first leach tank in the leach-adsorption circuit.

2.4.2.12.2 Sodium Cyanide

Sodium cyanide will be delivered in bags, which will be lifted using a frame and hoist, into the sodium cyanide bag breaker on top of the mixing/storage tank. The solid reagent will discharge into the tank and be dissolved in freshwater to achieve the required dosing concentration of 20% sodium cyanide. After the mixing period is complete, cyanide solution will gravitate to the cyanide storage tank. Sodium cyanide will be delivered to the leach circuit and elution circuit with dedicated dosing pumps.

2.4.2.12.3 Copper Sulphate

Copper sulphate pentahydrate will be delivered in solid crystal form in small bags and stored in the warehouse. Freshwater will be added to the agitated copper sulphate mixing tank. A pallet of bags will be lifted using a frame and hoist, and periodically a single bag will be placed on the copper sulphate bag breaker on top of the tank. The solid reagent will fall into the tank and be dissolved in water to achieve the required dosing concentration of 20% copper sulphate weight by volume.

Copper sulphate solution will be transferred by gravity to the copper sulphate storage tank. Copper sulphate will be delivered to the cyanide detoxification circuit using the copper sulphate dosing pump. An extraction fan will be provided over the copper sulphate bag breaker/mixing tank to remove reagent dust that may be generated during reagent addition/mixing.

2.4.2.12.4 Sodium Metabisulphite

SMBS will be delivered in the form of solid flakes in bulk bags and stored in the warehouse. Freshwater will be added to the agitated SMBS mixing tank. Bags will be lifted using a frame and hoist into the SMBS bag breaker on top of the tank. The solid reagent will fall into the tank and be dissolved in water to achieve the required concentration of 20% SMBS weight by volume. After the mixing period is complete, SMBS solution will be transferred to the SMBS storage tank. SMBS will be delivered to the cyanide detoxification circuit using the SMBS dosing pump. An extraction fan will be installed over the SMBS mixing tank to remove SO_2 gas that may be generated during mixing. The SMBS mixing area will be ventilated using the SMBS area roof fan.

2.4.2.12.5 Caustic Soda

Sodium hydroxide (caustic soda) will be delivered in intermediate bulk containers (IBCs) as a 50% caustic solution and stored adjacent to the elution circuit until required. During winter months, the reagent concentration will be adjusted to prevent it from freezing in the IBCs. Dosing pumps will automatically deliver reagent to the required locations (i.e., elution circuit, electrowinning and cyanide mixing) to ensure the dosing requirements are met.

2.4.2.12.6 Hydrochloric Acid

Hydrochloric acid will be delivered in IBC as a solution and stored adjacent to the elution circuit until required. Hydrochloric acid will be mixed with freshwater (inline) to achieve the required 3% concentration. Hydrochloric acid will be delivered to the acid wash circuit using the hydrochloric acid dosing pump.

2.4.2.12.7 Ferric Sulphate

Ferric sulphate solution will be delivered in IBCs as a 60% solution. Ferric sulphate will be delivered to the arsenic precipitation tank via dosing pump.

2.4.2.12.8 Flocculant

Powdered flocculant will be delivered in bulk bags. A self-contained mixing and dosing system will be installed, including a flocculant storage hopper, flocculant blower, flocculant wetting head, flocculant mixing tank, and flocculant transfer pump. Powdered flocculant will be loaded into the flocculant storage hopper using the flocculant hoist. Dry flocculant is pneumatically transferred into the wetting head, where it will be contacted with water.

Flocculant solution will be diluted to a concentration of 0.50% flocculant and agitated in the flocculant mixing tank for a pre-set period. After a pre-set time, the flocculant will be transferred to the flocculant storage tank using the flocculant transfer pump. Flocculant will be dosed to the tailings high-rate thickener using variable speed helical rotor style pump. Flocculant will be further diluted just prior to the addition point via in-line mixer.

2.4.2.12.9 Activated Carbon

Activated carbon will be delivered in solid granular form in bulk bags. When required, the fresh carbon is introduced to the carbon quench tank, or directly to the CIP tanks.

2.4.2.12.10 Antiscalant

Antiscalant will be delivered as a solution in IBCs and stored until required. Antiscalant will be dosed neat, without dilution. Positive displacement dosing pumps deliver the antiscalant to reduce the formation of scale in the elution and electrowinning circuits equipment as needed.

2.4.2.12.11 Gold Room Smelting Fluxes

Borax, silica sand, sodium nitrate, and soda ash are delivered as solid crystals/pellets in bags or plastic containers and stored in the warehouse until required.

2.4.2.13 Cyanide Management

Signal Gold is a participating company in the International Cyanide Management Code (ICMC) Program. The ICMC is an industry voluntary program for cyanide producers and cyanide consumers such as mining companies. It focuses on the safe management of cyanide and cyanidation mill leach solutions and tailings. Companies that adopt the ICMC must have their mining operations, that use cyanide, audited by an independent third party to determine the status of ICMC implementation. Those operations that meet the ICMC requirements can be certified and a unique trademark symbol can be utilised by the certified operation. Audit results are made public to inform stakeholders of the status of cyanide management practices at the certified operation.

The goals of the ICMC are to improve management of cyanide used in gold mining and assist in the protection of human health and reduction of environmental effects. The ICMC is structured along nine principles each with standards of practice. The principles are in sequence:

1. Production
2. Transportation
3. Handling and Storage
4. Operations
5. Decommissioning
6. Worker Safety
7. Emergency Response
8. Training

9. Dialogue

Preliminary plant layout designs were developed for the Project FS. The design of cyanide facilities is aligned with the guidelines of the ICMC.

To have the Project certified under the ICMC, Signal Gold will have three years to meet the standard. This includes purchasing cyanide from certified producers and using certified cyanide transporters. The tailings dam is to be inspected annually by a professional engineer who will attest to its condition. Being a signatory to the ICMC requires that the operation be subject to an independent audit once a year.

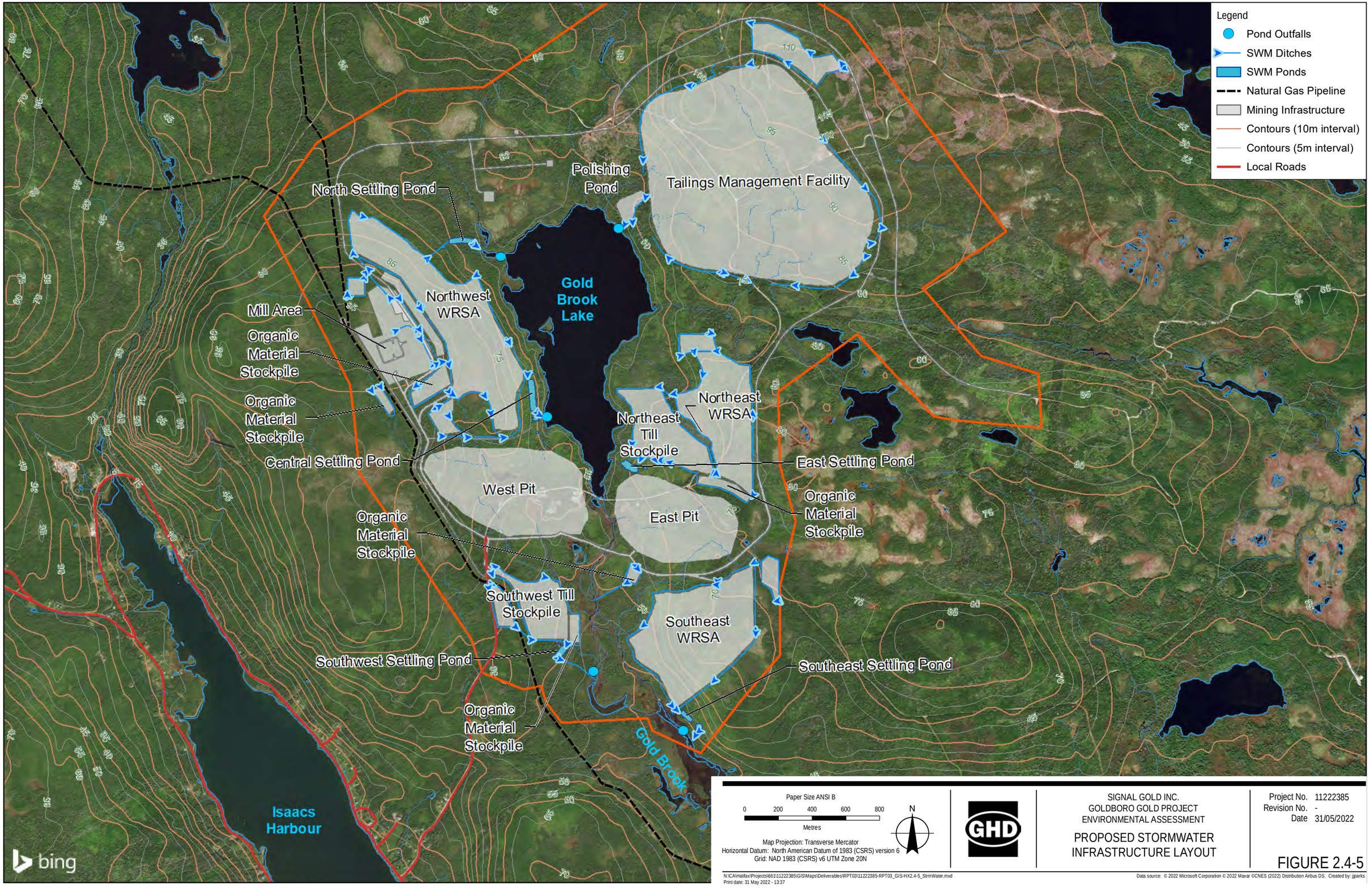
2.4.2.14 Hazardous and Dangerous Goods Management

All hazardous materials and dangerous goods within the PA will be managed and accounted for under the applicable regulations, including the NS *Dangerous Goods Management Regulations*. All persons involved in handling or usage of hazardous materials and dangerous goods will be required to complete adequate training. Safety data sheets will be available, and the locations of such materials will be identified in the Emergency Response Plan. All hazardous materials and dangerous goods storage will require regular inspection, completed by a qualified person.

An area in the northwest of the mill area has been reserved for hazardous waste storage; this will be used to store waste such as oil barrels, soil or materials contaminated with fuel, and chemical containers before being removed from the PA and disposed of at external facilities. Other buildings and facilities within the mill area could also contain hazardous materials, including the truck shop, wastewater treatment plant, and process plant.

2.4.2.15 Water Management

Water management infrastructure will include water treatment systems, collection ditches, settling ponds, a freshwater distribution network, dewatering pumps for the East and West Pits, and a sewage system. The proposed stormwater infrastructure layout is shown in Figure 2.4-5.



Paper Size ANSI B

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Metres

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Map Projection: Transverse Mercator
Horizontal Datum: North American Datum of 1983 (CSRS) version 6
Grid: NAD 1983 (CSRS) v6 UTM Zone 20N

GHD

SIGNAL GOLD INC.
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT

PROPOSED STORMWATER INFRASTRUCTURE LAYOUT

Project No. 11222385
Revision No. -
Date 31/05/2022

FIGURE 2.4-5

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2.4.2.15.1 Collection Ditches and Culverts

Proposed mine water management infrastructure consists of a series of surface water ditches and culverts collecting all stormwater runoff at the Project. The surface water ditches include contact water ditches, which collect runoff from all mine infrastructure, and clean water ditches. Clean water (e.g., runoff from the outside TMF embankment) will be collected from areas that do not come in contact with mine waste. Clean surface water ditches will collect storm water runoff from the TMF embankment, which will be constructed from NPAG rockfill, and direct it away from the PA. Culverts will be dispersed throughout the PA to convey stormwater below mine infrastructure (i.e., haul roads). The contact water ditches drain to one of five settling ponds located across the PA.

Contact water ditches will be lined with a high-density polyethylene (HDPE) liner, underlain by geotextile, followed by a layer of sand and a layer of riprap to prevent infiltration of stormwater into the surficial groundwater and protect the ditch from erosion. The outlet of the effluent ditch into the receiving watercourse will be lined with an HDPE liner followed by a layer of sand and a layer of riprap to prevent erosion. Detailed outlet design will be determined during later design stages.

Each culvert will include a riprap apron on the upstream and downstream sides to prevent erosion around the inlet and outlet. The outlet riprap aprons will be designed to include an energy dissipation basin to minimize velocities in the downstream ditch, reducing the potential for erosion. The energy dissipation basin is to be lined with riprap specifically sized to withstand culvert exit velocities and reduce flow velocity downstream of the culvert.

2.4.2.15.2 Settling Ponds

Five settling ponds will be constructed to collect and treat contact water prior to discharging to Gold Brook Lake and Gold Brook. Settling ponds will be constructed during the construction phase prior to WRSA development. Ponds will continue to be constructed during the operations phase when new WRSAs and stockpiles are constructed. The location of settling ponds is shown in Figure 2.4-5.

The north settling pond is to receive mine contact water from a portion of the northwest WRSA, mill area, and several till and organic material stockpiles. The central settling pond is to receive mine contact water from the remaining portion of northwest WRSA, mill area, West Pit, and several till and organic material stockpiles. The north settling pond will treat the stormwater runoff and waste rock seepage for Total Suspended Solids (TSS) and arsenic using coagulants, prior to discharge to Gold Brook Lake. The central settling pond will treat the stormwater runoff, seepage from the waste rock, and West Pit dewatering product for TSS and arsenic using coagulants prior to discharge to the water treatment system.

Similarly, the east settling pond will receive runoff from the northeast WRSA, East Pit, and organic material stockpiles and be treated for TSS and arsenic using coagulants, prior to being pumped to the water treatment system in the northwest quadrant associated with the central settling pond.

The southeast settling pond will receive runoff from the southeast WRSA and organic material stockpile. The runoff and seepage are to be treated for TSS and arsenic using coagulants before discharge to an engineered wetland to treat for nitrates and nitrites. The wetland will discharge to Gold Brook. The southwest settling pond will receive runoff from organics and till stockpiles and will discharge directly to Gold Brook once treated for TSS.

Due to the use of coagulants, filter berms are not proposed as they would quickly become clogged with sediment, requiring a high level of maintenance and potentially impact performance. Energy dissipater baffles will be used at the inlet of the ponds to reduce the inflow velocity and enlarge the flow path, enhancing the settling of suspended solids. The settling ponds will have side slopes of 3:1. The length to width ratio for each settling pond will be maximized to the extent possible within the site constraints.

To further mitigate and reduce the risk of adverse impacts to fish and fish habitat downstream of the settling ponds, all pond outlet structures will be equipped with emergency shut-off valves that can be closed if any water quality parameter exceedances are triggered. The ponds will be designed with enough freeboard to accommodate the inflow while the shut-off valves are closed. To this end, each pond will be designed with enough capacity to hold the runoff volume generated by the 5-year 24-hour storm event plus 5% climate change factor, with the emergency shut-off valves closed (emergency operating conditions). In the event pond capacity is reached during an emergency shut-off,

the impacted water will be pumped, or collected in a vacuum truck, and transported to the nearest settling pond with available capacity, or to the nearest open pit where it will be held until settling pond capacity becomes available. During an emergency shut-off at the central settling pond or the east settling pond, excess water from the ponds will be conveyed over the emergency spillways into the open pits. From there it will be pumped back into the ponds using the pit dewatering system once capacity becomes available. During an emergency shut-off at either of the south ponds or at the northwest settling pond, the weather forecast will be monitored, and the ponds will be drained (into the central or northeast ponds) ahead of any storm event expected to be greater than a 5-year storm (98.4 mm). This will minimize the risk of unauthorized discharge to the environment.

The ponds will be lined with an HDPE liner, underlain by geotextile. A layer of sand will be placed on top of the HDPE liner to protect against punctures and a layer of riprap on top of the sand layer. The riprap is to act as ballast to prevent the liner from being impacted by buoyancy forces of the nearby groundwater as well as provide erosion protection.

2.4.2.15.3 Water Treatment System

Mine contact water will be managed to meet the following regulatory discharge requirements prior to discharge to the natural environment:

- *Metal and Diamond Mining Environmental Regulations* (MDMER) Objectives
- Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (WQG) for the Protection of Freshwater Aquatic Life (FWAL)
- NS Tier I Environmental Quality Standards (EQS) for Surface Water
- Site-specific criteria (based on background data)

Based on the predictive water quality analysis completed for the Project, described in Section 5.6, active water treatment is anticipated to be required throughout the operations phase and in the first two years of the closure phase (Years 12 and 13) to remove metals, nitrogen series, and cyanide from effluent. Passive water treatment methods are proposed for Years 14 through 18 for removal of metals.

The treatment systems presented below are examples of technology that has been demonstrated as effective in treating the predicted COCs for Project effluent. The water treatment technologies implemented for the Project will be decided during the detailed design phase. The TMF WTS concept is presented in Section 2.4.2.11.2.

The conceptual central settling pond WTS will include a lime and coagulant dosing unit ahead of the settling pond. Metals including arsenic will precipitate in their hydroxide form and with the help of the coagulant (co-precipitation) within the settling pond. A flow measurement unit (flume) will measure the influent flow and will control chemical dosing pumps. The chemically dosed water then will pass through a mixing channel before entering the settling pond. The settling pond will include two parts: the initial settling pond which will capture the bulk of solids followed by the second pond which will provide enough retention time for settling of the finer particles.

In the next step, the effluent in the central settling pond will be conditioned by adjusting its pH (and adding nutrition, if needed) and will feed into a biological treatment system for nitrate/nitrite removal. The effluent of the biological treatment unit will flow into a polishing pond for clarification and final polishing. The effluent of the polishing pond then will be discharged into the Gold Brook Lake. A simplified process flow chart for the conceptual WTS at the central settling pond is presented in Figure 2.4-6.

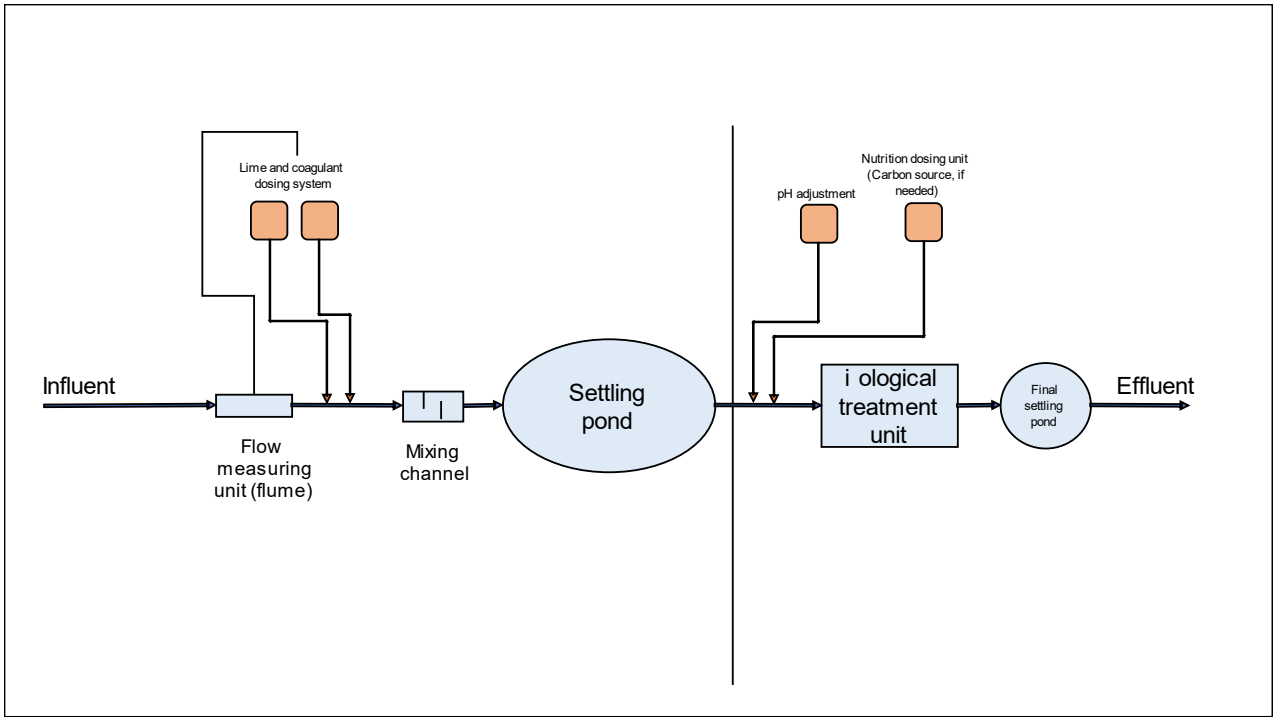

Figure 2.4-6 Conceptual Central Settling Pond WTS

In the conceptual north and southeast settling pond WTSs, lime will be dosed ahead of the settling ponds to increase the pH in order to precipitate exceeded metals in their insoluble hydroxide form. Coagulant will be also added to accelerate precipitation of formed fine particles during higher flow events and help further reduction of exceeded elements through co-precipitation. A flow monitoring unit installed ahead of the settling ponds will control chemical dosing pumps. The chemically dosed impacted water then will pass through a mixing unit and will discharge into the settling ponds. The ponds will be divided into primary and secondary sections. The primary section will serve to accumulate the precipitated sludge. The secondary sections will be larger and requires a long retention time to allow for further settling of fine particles and clarification. The effluent of the settling ponds will be dosed with acid for pH adjustment and then will pass through engineered wetlands for final polishing before discharging to the environment. An engineered wetland is selected as the alternative polishing step for both the north and southeast settling ponds due to the lower flow and available space. The effluent of the engineered wetland at the north settling pond will flow into Gold Brook Lake, and the effluent of the engineered wetland at the southeast settling pond will flow into Gold Brook. A simplified flow chart for the conceptual WTSs at the north and southeast settling ponds is presented in Figure 2.4-7.

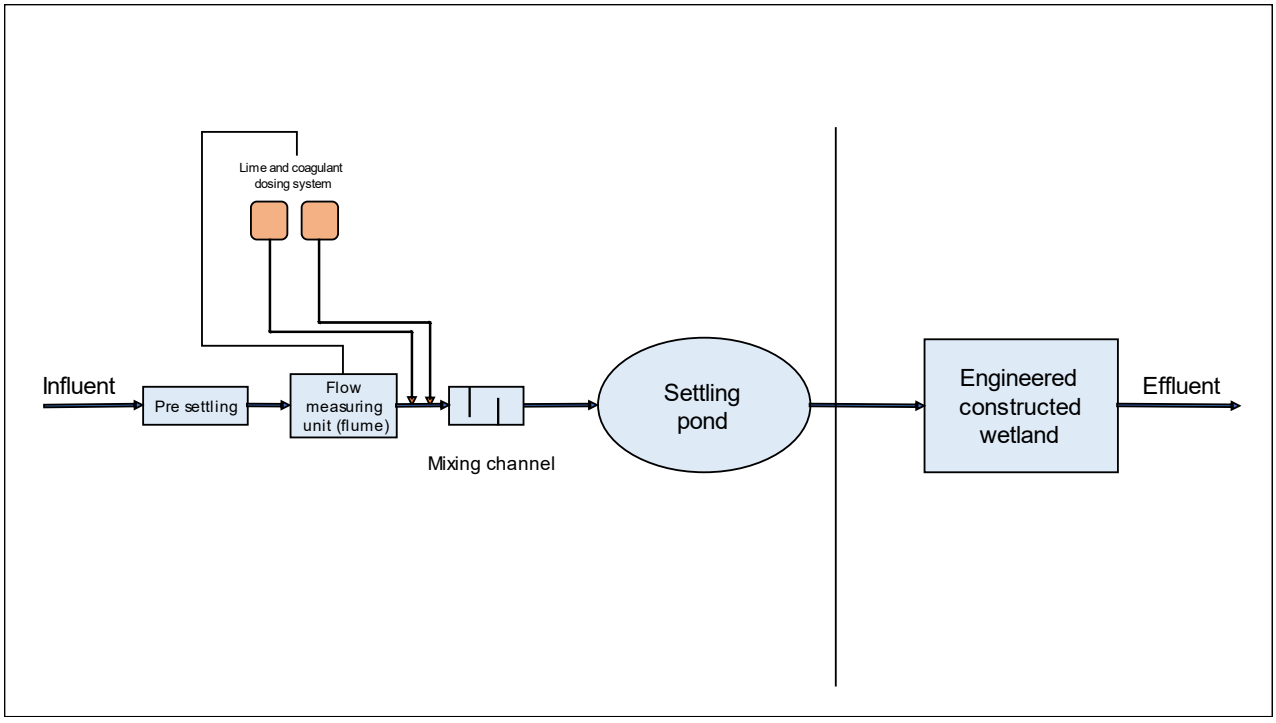

Figure 2.4-7 Conceptual North and Southeast Settling Pond WTS

Further detail on conceptual water treatment technologies for the Project is provided in the Impacted Water Treatment Systems memo in Appendix F.9.

2.4.2.15.4 Discharge Points

Five discharge points are proposed within the PA during the operations phase of the Project as indicated in Table 2.4-7, below.

Table 2.4-7 Discharge Locations – Operations Phase

Discharge Location	Receiving Waterbody
TMF	Gold Brook Lake
North Settling Pond	Gold Brook Lake
Central Settling Pond	Gold Brook Lake
Southeast Settling Pond	Gold Brook
Southwest Settling Pond	Gold Brook

The TMF, north settling pond, central settling pond, and southeast settling pond discharge points are the final discharge points for the Project as defined in the MDMER. The southwest settling pond is to receive surface water runoff from the southwest till stockpile and an organic material stockpile and will be monitored for compliance with CCME, NS Tier 1 EQS, and SSWQGs. Monitoring for MDMER compliance will occur during operations and is not a requirement for a recognized closed mine (MDMER, 2022). Water quality monitoring conducted in the closure phase will include comparison to CCME, NS Tier 1 EQS, and SSWQGs.

During the closure phase, the TMF and WRSAs will be covered and vegetated, and the till and organic material stockpiles will be removed and used for reclamation activities. Runoff from the reclaimed TMF and WRSAs will continue to be collected in the settling ponds indefinitely.

The north settling pond is to receive runoff from a portion of the northwest WRSA, the mill area, and several till and organic material stockpiles. This pond will begin discharging to Gold Brook Lake in the construction phase and will continue discharging indefinitely.

During operations, the central settling pond will receive the East and West Pits dewatering water, as well as runoff from the northwest WRSA, northeast till stockpile, and organic material stockpiles. The central settling pond will discharge to Gold Brook Lake in the construction and operations phases. During the closure phase the central settling pond will discharge to the West Pit.

The southeast settling pond will receive runoff from the southeast WRSA and an organic material stockpile. This pond will begin discharging to Gold Brook in the construction phase and will continue discharging indefinitely.

The southwest settling pond will receive runoff from the southwest till stockpile and an organic material stockpile. The southwest settling pond will begin discharging to Gold Brook Lake in the construction phase and will continue be decommissioned/reclaimed following removal of the till and organic material stockpiles in the closure phase.

The East and West Pits will discharge water to Gold Brook Lake once they have finished filling with water. The East Pit is expected to be filled by Year 19, and the West Pit is expected to be filled by Year 35.

Water quality at four discharge points will be monitored for MDMER compliance during the Project's operations phase: TMF, north settling pond, central settling pond, and southeast settling pond. MDMER compliance criteria are only applicable for operational mines; water quality monitoring conducted in the closure phase will include comparison to CCME, NS Tier I EQS, and SSWQGs.

2.4.2.15.5 Erosion and Sediment Control Measures

Erosion control measures in the contact water ditches and settling ponds are to be maintained during operations including replacement of riprap, restoration of check dams if damaged, and general visual inspection of the ditches and settling ponds. Sediment buildup could occur in the collection ditches, therefore contact water ditches should be inspected regularly and cleaned out as needed to ensure sediment does not build up within the ditches or travel directly into the settling pond, reducing the available storage volume of the settling pond itself. Runoff collection ditches that are not lined with HDPE are to be hydroseeded.

Further detail on erosion and sediment control measures proposed for the Project is provided in the Erosion and Sediment Control Plan in Appendix F.10.

2.4.2.15.6 Pit Dewatering

The progressive development of the open pits will result in increasing water infiltration from precipitation and groundwater inflows. As the pit deepens and increases in footprint, it will be necessary to control water inflow through construction of in-pit dewatering systems such as drainage ditches, sumps, pipelines, and pumps.

2.4.2.15.7 Water Conveyance and Distribution

Water supply infrastructure includes:

- One intake structure
- Two booster stations
- One transmission watermain from Gold Brook Lake to the mill freshwater tank and to the potable water treatment plant
- Distribution piping to supply potable water to the mill area and employee accommodations

A transmission watermain from Gold Brook Lake to the process plant buildings will provide a freshwater source to support process operations and potable water, hence the watermain was estimated based on the potable and process water demands (22 m^3/h).

2.4.2.15.8 Freshwater

Freshwater will be pumped from Gold Brook Lake and stored in a freshwater storage tank. Freshwater will be used for all purposes requiring clean water with low dissolved solids and low salt content, primarily as follows:

- Gland water for pumps
- Reagent make-up
- Elution circuit make-up
- Freshwater will be treated and stored in the potable water storage tank for use in safety showers and other similar applications
- Fire water for use in the sprinkler and hydrant system
- Cooling water for mill motors and mill lubrication systems (closed loop)

The process plant is expected to require 7 m^3/h of freshwater with an additional 33 m^3/h made up of either freshwater or from other influent water sources such as runoff accumulated in the TMF.

Freshwater demands were incorporated into the water balance analysis completed for the Project as discussed in Section 5.6.5.2.

2.4.2.15.9 Process Water

Overflow from the final tailings thickener will be reused for process water requirements. Mine wastewater, mill contact water and freshwater will provide any additional make-up water requirements.

2.4.2.15.10 Potable Water

Gold Brook Lake was selected as the source water for potable water, and the treatment requirements were established based on the Canadian Drinking Water Guidelines. A potable water treatment unit will be designed in accordance with the *Atlantic Canada Guidelines for the Supply, Treatment, Storage, Distribution and Operation of Drinking Water Supply Systems* (Environment Canada, 2004).

Potable water demands were incorporated into the water balance analysis completed for the Project as discussed in Section 5.6.5.2.

2.4.2.15.11 Fire Water

The process plant buildings and structures will be equipped with fire detection and protection systems. The system will consist of portable fire extinguishers, smoke detectors, manual pull stations, alarm strobes/sounders and hose stations. Automated fire sprinkler systems will be provided around select areas of the mill.

The process plant area will have a fire water reticulation system consisting of fire water storage, a fire water pump station (including backup diesel-powered pump), and perimeter fire water piping with hydrants.

2.4.2.15.12 Sewage System

Two separate wastewater treatment plants will service the employee accommodations and mill area. Sewage flow rates as well as treatment requirements were adopted from the *Atlantic Canada Wastewater Guidelines Manual for Collection, Treatment and Disposal* (Environment Canada, 2006). Two containerized sewage wastewater treatment units will be installed. Treated wastewater from the employee accommodations wastewater treatment plant will be directed to the southwest settling pond. The mill area wastewater treatment plant will discharge to the central settling pond.

2.4.3 Closure

Reclamation and Closure Plan requirements are governed by the NS *Mineral Resources Act*. The Reclamation and Closure Plan is a living document that will be updated throughout the Project to reflect changing conditions. Signal Gold will continue to engage with form Rights Holders, local residents and the community, MODG, regulators and

other stakeholders on the Plan. Signal Gold is committed to minimizing the environmental impact of the Project and reclaiming the land for future use to ensure that land is safe following Project activities. A Conceptual Reclamation and Closure Plan was prepared for the Project and is provided in Appendix B.1.

The general concept for reclaiming the PA will be to remove all buildings, infrastructure, and facilities that can be dismantled. Till and organic material stockpiles will be used in reclaiming the PA. All other infrastructure including the East and West Pits, WRSAs, and TMF (including ditching and settling ponds) will be contoured to blend with the natural landscape and re-vegetated. The TMF will be capped with a dry cover. The open pit shorelines will be developed to a 5:1 slope and the pits allowed to refill. Shorelines will be revegetated to the predicted water edge to reduce erosion and the nearshore allowed to naturally revegetate. Soils, vegetation, and wildlife baseline data will be used as guidelines for the design, completion, and evaluation of surface reclamation. Final surface reclamation will blend affected areas with adjacent undisturbed lands to re-establish plant life and present a natural appearance. Surface reclamation efforts will strive to limit soil erosion by wind, water, sedimentation, and re-establish natural drainage patterns. As areas are reclaimed, access to the PA will be granted where and when it is safe to do so. While the pits are filling, Signal Gold will ensure that the area is properly demarcated and restricted to mitigate any safety risks.

Signal Gold is committed to working with local community groups, Mi'kmaq of Nova Scotia, and other interested parties to explore reforestation opportunities during active reclamation. This includes exploring opportunities like partnerships with Forests Without Borders or similar groups, to help facilitate accelerated maturity of the habitat during the closure phase.

Monitoring will be undertaken during the closure phase with maintenance and remedial action taken, as required, to ensure that the results of reclamation are sustainable. Some areas of the PA will be subject to a progressive reclamation approach, thereby reducing the efforts needed at the time of closure and minimizing revegetation timeframes for some areas.

2.4.3.1 Buildings and Built Infrastructure

The Reclamation and Closure Plan includes removal of buildings, structures, and equipment from the PA, including piping, and structural steel. Equipment and piping will be safely drained of all process materials prior to dismantling. Concrete foundations will be demolished and removed to a depth of 0.5 m below grade; concrete below this elevation will be left in-situ and covered.

All other surface structures and equipment will be evaluated for appropriate post-closure re-use, sale, or disposal. Buildings and equipment will be decommissioned, decontaminated (as necessary), dismantled, and either salvaged or disposed of in an appropriate off-site disposal facility. A New Glasgow facility has been identified as a suitable hazardous waste disposal site for any concrete or equipment that has been contaminated with fuel, oils, or other chemicals. All surface concrete will be demolished including slabs on grade, containment walls, foundation walls, and building piers to a depth of 0.5 m below grade. The graded surface areas will be covered with 0.5 m of soil from the organic material stockpiles. The area will then be hydroseeded to promote plant growth and to stabilize the soil against erosion. The haul and access roads will remain in place for access to the open pits and TMF throughout closure monitoring.

2.4.3.2 East and West Pits

The East and West Pits will be allowed to flood creating two open waterbodies with a shallow water wetland border and aquatic habitat. The shorelines will be graded to 5:1 to allow for egress. It is anticipated that the final lake elevations will be similar to that of the elevation of nearby Gold Brook Lake. As described in Section 5.6, the East Pit will be filled in Year 19, which is 11 years after it begins to fill with water, and the West Pit will be filled in Year 35, which is 24 years after it begins to fill with water. The East and West Pits will discharge water to Gold Brook Lake once they are filled.

2.4.3.3 Tailings Management Facility

Reclamation and Closure of the TMF will be based on the following general goals and objectives:

- Reclamation goals and objectives will be considered during the design of the TMF.
- Reclamation goals and objectives will be periodically updated during construction and operations.
- Progressive reclamation will be implemented wherever possible.
- Upon cessation of operations, the TMF will be decommissioned and reclaimed to allow for future land use as guided by local regulators.
- Reclamation and closure construction will be designed to meet long-term physical and chemical stability objectives.

The Conceptual Reclamation and Closure Plan includes encapsulating the tailings and PAG waste rock with a closure cover during the final years of operation and active closure (approximately two years). This will maintain the tailings and PAG material in a saturated state to prevent the onset of ARD conditions. Small collection ditches will be constructed on the cover to route precipitation runoff from the cover and minimize erosion.

Generally, the closure work will consist of decommissioning and dismantling of all tailings delivery and distribution pipework, all reclaimed water pipelines and the pump barge, all seepage recycle pipework and pumps, assuming that the seepage water meets water quality objectives and removal of the tailings supernatant water (including the water cover and operating cover).

A closure cover over the tailings and PAG1 material will be a combination of a geosynthetic reinforcement layer, NPAG waste rock (nominal 2 to 3 m thick), till (0.45 m thick), and topsoil (0.15 m thick). The NPAG waste rock cover will be placed over the PAG material during the final years of operations.

Small riprap lined collection ditches will be constructed to minimize erosion. Vegetation will be planted or allowed to naturally occur on the cover soil to improve aesthetics and erosion protection.

2.4.3.4 Waste Rock Storage Areas

All WRSAs will be completed by Year 8 of operations and will be progressive reclaimed in order to minimize the infiltration and/or oxidation of the waste rock. During construction and operations, the WRSA side slopes will be recontoured to a closure configuration. Benches will be left between each lift to allow for a final overall slope from toe to crest. Geotechnical investigations of the WRSA slopes will confirm the long-term stability for the planned slope geometry.

The re-sloping of the final lift, placement of a soil cover and revegetation treatments will be completed following end of operations. Surface water run-off from the WRSAs will continue to be directed towards the settling ponds. The north and southeast settling ponds will remain functional until the water quality is stable and meets applicable guidelines.

2.4.3.5 Water Management

Based on the predictive water quality analysis completed for the Project, described in Section 5.6, active water treatment is anticipated to be required to remove metals and cyanide from effluent in the first two years of the closure phase (Years 12 and 13). Active water treatment methods are described in Section 2.4.2.15. Passive water treatment methods are proposed for Years 14 through 18 and will be applied at the TMF, north settling pond, and southeast settling ponds.

Passive anoxic limestone drains (ALDs) are assumed to provide sufficient treatment for each settling pond overflow present during Years 14 through 18. The ALDs involve the burial of limestone in oxygen-depleted trenches. An ALD consists of a trench containing limestone encapsulated in an impermeable liner that will be covered with clay or compacted soil. Surrounding the limestone with an impervious liner helps maintain anoxic conditions in the drain. The cap also prevents water infiltration and helps prevent carbon dioxide from escaping. Prior to the development and installation of an ALD, influent water must be characterized to ensure effective system design, including an assessment of seasonal variations. In addition to flow rate, important influent characteristics include dissolved oxygen

(DO) content, acidity and alkalinity, and contaminant concentrations. Limestone used in ALDs is usually in the form of pebbles or rocks, with a particle spectrum ranging from 4 to 10 cm. Small-size particles provide more surface area for more rapid dissolution and alkalinity generation, while the larger-size particles will dissolve more slowly and provide system longevity and maintain distributed water movement through the drain. The pits overflow water will convey into these trenches. ALDs will generate alkalinity and will increase the water pH which will precipitate metals such as zinc. Each drain will be followed by an aerated cascade at its end followed by a settling/polishing pond to remove precipitated/oxidized metals before discharge to the environment.

2.5 Project Schedule

Preparation and construction for the Project is anticipated to begin in late 2023 and will continue into 2024. Project timelines are discussed throughout this EARD according to a numbered year system, where the construction phase is described as Year -1 and the operations phase begins in Year 1. The planned project schedule is summarized in in Table 2.5-1 and described below.

Table 2.5-1 Planned Project Schedule

Activity/Milestone		Planned Schedule
Construction		Years -2 and -1
Operation	East Pit extraction	Years 1 through 8
	West Pit extraction	Years 1 through 11
Closure		Years 12 through 35

Construction

The construction phase will begin with clearing and grubbing the area of the East and West Pits, the mill area, and TMF area. Vegetation clearing will comply with nesting bird directives from the NSDNRR, NSECC and ECCC. Stripped till and organic material will be stockpiled and utilized for reclamation activities during and at the end of the Project.

A berm will be constructed, to final reclamation specifications, to provide a physical barrier around the perimeter of the East and West Pits for safety and noise reduction during mining activities. Waste rock extracted from the East and West Pits will be used for construction of new roads, modification of existing roads, initial construction of the TMF and general construction. Waste rock not used as a construction material will be stockpiled in the WRSAs. ROM material mined from the pits will be stockpiled to be used for commissioning the mill and will provide the initial production for the Project.

Water management infrastructure, including collection ditches, culverts, settling ponds, and treatment systems, will be constructed during this period.

Completion of upgrades to the local power grid and set up of on-site electrical infrastructure will be targeted for 2023 to align with the mill area construction schedule and development.

Employee accommodations will be modular buildings with a capacity of 350 beds during the construction phase and 175 beds during the operations phases. The trailers will have a central kitchen/dining area and a portion will be converted to a recreation area after the construction phase is complete. The employee accommodations will be a dry facility (drug and alcohol free).

All other development work, construction and commissioning of operational facilities, including buildings, communications, fuel storage, and water and wastewater treatment plants, will be completed in this period. During the construction phase, there may be some flexibility in the schedule relative to seasons and weather conditions.

Operations

The Project will operate as an open pit mine including two open pits. The East Pit will be mined to a bench floor elevation of approximately -128 metres above sea level (masl) and will operate for eight years. The West Pit will be mined to a bench floor elevation of approximately -184 masl and will operate for 11 years.

Three WRSAs will be developed throughout the operations phase as waste rock is extracted from the open pits. Following full extraction of the East Pit (approximately Year 8), a portion of the waste rock generated during West Pit extraction will be backfilled into the East Pit. The TMF design includes an initial starter embankment followed by subsequent stages. TMF stages will be expanded using downstream construction methods throughout the operations phase.

Progressive reclamation will be completed during the Project whenever possible to promote early revegetation, assist with erosion and dust control, and minimize the total disturbed footprint.

Closure

Earthworks and demolition activities will take place over approximately three years following production to return the PA to a safe, stable, and vegetated state. Active water treatment is proposed for the first two years of the closure phase (Years 12 and 13). Passive water treatment methods are proposed for Years 14 through 18 and no water treatment is anticipated following Year 18. The East and West Pits will be allowed to flood during this phase, creating two open waterbodies. The East Pit is expected to be filled in Year 19 and the West Pit is expected to be filled in Year 35. Surface and groundwater monitoring is planned to continue at select locations within the PA throughout the pit filling period and will be terminated once water quality and quantity stabilize and following consultation with applicable regulators.

2.6 Environmental Management Approach

Signal Gold is committed to implementing management programs and procedures to mitigate and reduce potential environmental impacts associated with the Project. These procedures will be applied to mitigate environmental risks and monitor the effectiveness of the controls during the life of the Project through its Environmental Management System (EMS). The EMS is aligned with NSDNRR's approach to responsible mine development.

An Environmental Management Plan (EMP) was developed for the Project as part of the EMS. The EMP is provided in Appendix B.2. The EMP is intended to be a living document that ensures that the Project will be reflective of legislative, environmental responsibilities and is sensitive to any changes that might arise during its implementation. At a high level, the EMP describes the plan to protect and mitigate/manage/minimize any negative environmental effects throughout the Project. The EMP provides the overall framework for management practices. Specific component EMPs and monitoring plans are/will be developed, based on potential Project related effects, will be updated with any additional requirements through this EA process or subsequent permit requirements. Table 2.6-1 presents management and monitoring plans developed for the Project. Plans are discussed further in Section 5.

In addition to the EMP and monitoring programs, all personnel and contractors working on the Project will undertake a Project specific orientation that will be developed by Signal Gold. Orientation and continuous training will ensure that all personnel are aware of Signal Gold's environmental commitments, policies and procedures.

Signal Gold will continue to engage with the Mi'kmaq of Nova Scotia and incorporate Traditional Knowledge into environmental monitoring programs where appropriate and as determined by the Mi'kmaq First Nations.

Table 2.6-1 Environmental Management and Monitoring Plans

Management Plan	Summary	EARD Location
Hazardous Materials Handling Plan	Outlines procedures for storage and handling of hazardous or potentially hazardous substances. Will include measures to mitigate health, safety and environmental risks associated with transportation, storage, use and disposal of hazardous materials.	In development

Table 2.6-1 Environmental Management and Monitoring Plans

Management Plan	Summary	EARD Location
Fugitive Dust Best Management Practice Practices Plan	Provides details about best management practices to control potential fugitive dust emissions, as well as planned strategies for dealing with potential fugitive dust issues.	Appendix D.3
Erosion and Sediment Control Plan	Provides measures and best management practices for mine water infrastructure to minimize erosion and protect nearby waterbodies from sedimentation. Identifies erosion and sediment control measures to be established including location, design, and construction sequencing for each measure.	Appendix F.10
Historic Tailings Management Plan	Outlines the approach to assess, remediate, and monitor areas of historic tailings directly and indirectly impacted by the Project. Material from areas with direct disturbance of historic tailings will be disposed of in the lined TMF.	Appendix E.2
ML/ARD Management Plan	Provides the handling and monitoring strategies for waste rock, ore, overburden and tailings produced during construction and operations of the Project. The plan is intended to minimize the impacts associated with ML/ARD on water quality in the receiving environment.	Appendix E.4
Wildlife Management Plan	Provides strategies reduce human-wildlife interactions, promote safety of wildlife and site personnel and to provide best management practices for vegetation control.	Appendix I.5
Lichen Management Plan	A Lichen Management Plan was developed to monitor for potential Project related effects on observed Species at Risk (SAR) and Species of Conservation Interest (SOCI) lichens. The plan describes proposed mitigations, adaptive management strategies as well as the translocation efforts to be undertaken to reduce the impacts to SAR/SOCI lichens.	Appendix I.4
Wetland Compensation Plan	A preliminary Wetland Compensation Plan was developed to identify compensation options for the loss of wetland habitat via direct and indirect impacts related to the Project. The plan has identified between 130 to 190 ha of potential primary compensation options and another 29 ha of secondary options.	Appendix G.3
Fisheries Offsetting Plan	A preliminary Fisheries Offsetting Plan was developed to demonstrate offsetting options for any unavoidable losses of fish habitat as a result of the Project. A multi-step review process was undertaken to identify potential offsetting concepts in priority watersheds and incorporating DFO guidance.	Appendix H.3
Traffic Management Plan	Identifies anticipated Project traffic activity, schedule and transportation needs based on movement of personnel, equipment, and supplies. Will be prepared prior to mobilizing equipment to the PA and will be implemented for all phases of the Project to mitigate any identified risks. Will be communicated to all affected parties and will include the following: driver training, competency assurance, and vehicle selection and maintenance, at a minimum. A Risk Assessment on equipment/vehicle movement for each area potentially impacted by the Project will be prepared in conjunction with contractors.	In development
Water Monitoring Plan	Includes groundwater quality and elevation monitoring at a network of wells and surface water quality/ quantity monitoring at a network of surface water stations. Monitoring will be completed within the PA to evaluate potential impacts of mining operations on surrounding groundwater and surface water resources. The results of monitoring will be used to inform adaptive water management practices to mitigate any adverse impacts that may result from the Project.	Appendix F.11

2.7 Project Funding

Signal Gold will fund the Project through a comprehensive project financing package, which will include a mix of equity and debt and other forms of financing, as appropriate to the Project. It is not anticipated that provincial or federal funding will be required for this Project.

All Project-related costs will be borne by Signal Gold.

2.8 Alternative Means of Carrying Out the Project

The Guide to Preparing and EA Registration Document for Mining Developments in NS suggests that proponents include a section on the considerations of alternatives that describes other methods of carrying out the undertaking and justification for the selected approach. The following section outlines the alternatives for the Project.

2.8.1 Alternative Methods

Alternative methods are functionally different means to meet the need and to achieve the purpose of the Project. Alternative means differ from alternatives in that they represent the various technical and economically feasible ways that a project can be carried out, and which are within the proponent's scope and control.

Signal Gold has conducted an alternative means analysis for the following Project components:

- Mining methods
- Ore extraction methods
- Ore processing methods
- Ore processing locations
- Energy Source
- Water Supply and Management
- Waste rock management
- Tailings storage

The determination of the preferred approach is based on technical and financial feasibility, and environmental and socioeconomic effects of the alternative method described for each option. Factors considered for each alternative method are outlined in Table 2.8-1.

Table 2.8-1 Factors Considered for the Alternatives Assessment

Factor Evaluated	Description
Technical Feasibility	- Proven safe and effective/efficient technology for the selected activity. - Feasibility of the technology considering site-specific information. - Technology aligns with the applicable regulatory requirements and guidelines.
Economic Feasibility	- Economically feasible considering the capital and operating costs forecasted for the Project. - Costs align with the Project schedule and expenditures.
Environmental and Socioeconomic Considerations	- Consideration of the potential environmental and socioeconomic effects on a VC. - Consideration of the applicable regulatory requirements and guidelines.
Preferred Option	- The preferred alternative method based on the evaluation of the technical and economic feasibility and the environmental and social considerations of each alternative assessed. - The preferred method is carried forward in this EARD.

The following sections provide a qualitative review of the alternatives based on Signal Gold's operational experience in other jurisdictions as well as the experience and knowledge of the EA Study Team.

2.8.1.1 Mining Methods

Potential alternatives mining methods are open-pit (ramp access) and underground (decline or shaft). These alternatives were assessed considering the deposit is geologically (spatially)-fixed and project infrastructure is constrained by Gold Brook Lake, Gold Brook and the M&NP natural gas pipeline..

2.8.1.1.1 Preferred Approach – Open Pit

Open pit mining requires the removal of overburden (topsoil, till) and non-ore bearing waste rock, following by the benches into the deposit with an inclined roadway. The design of the two open pits (East and West Pits), instead of a single larger open pit, was selected to avoid any direct disturbance to both Gold Brook Lake and Gold Brook. Open pit mining methods are the most common and best suited when:

- Shallow ore deposits at or near the surface that are covered by shallow overburden.
- Large deposits with a uniformly distributed ore body or scattered randomly distrusted pockets.
- High tonnage, low grade deposits which are not economical using underground mining methods.
- Open pit mining projects are typically less expensive to operate, provide better grade recovery and require less capital to develop a project. However, open pit mining generally involves a larger footprint to accommodate the waste rock generated.

2.8.1.1.2 Alternatives Assessed - Underground

Underground mining typically requires the construction of a vertical, underground shaft or a decline from surface to a targeted depth into the ore body. Horizontal tunnels are then driven from the shaft ore a decline at strategic intervals to access the ore body. Underground mining methods are the most common and best suited when:

- Ore deposit is at a considerable depth below surface.
- Smaller ore bodies which are higher in grade.
- Disseminated ore bodies that are easily traceable underground.
- Underground mining projects are higher in capital and operating costs with typically lower mine production rates. Underground mines may be more vulnerable to changes in market conditions due to the higher operating costs. Unlike open pits, underground mining projects require a smaller footprint and waste rock generated is typically used for backfill.

2.8.1.2 Ore Extraction Methods

The potential alternative methods for ore extraction include drilling and blasting, and rock breaking methods.

2.8.1.2.1 Preferred Approach - Drilling and Blasting

Drilling and blasting is generally accepted as the most efficient method of breaking large volumes of rock. Drilling and blasting will generate noise and vibration however, blast designs are intended to minimize the noise and vibration. Noise and vibration generated during the blasts are typically short duration. Noise and dust generated from drilling is typically significantly less than what is associated with rock breaking.

2.8.1.2.2 Alternatives Assessed - Rock Breaking

Rock breaking or ripping, involves the use of heavy equipment that breaks the rock by inserting hardened metal teeth or prongs into fractures or planes of weak within the rock. Rock breaking creates continuous significant noise. Due to the extremely hard nature of the ore and host rock in the vicinity of the Project, rock breaking is not considered to be economically, technically, or environmentally feasible.

2.8.1.3 Ore Processing Methods

The potential alternative methods for ore processing include gravity/CIP processing or gravity/flotation with either intense cyanidation or smelting of the flotation concentrate. Heap Leaching was evaluated for processing of low-grade ore.

2.8.1.3.1 Preferred Approach - Gravity/CIP Processing

The gravity/CIP processing methodology is described in Section 2.4.2.8 represents the conventional processing option. This methodology includes crushing, grinding, gravity, CIP, desorption/electrowinning/refining, and cyanide destruction/arsenic precipitation. It is the preferred processing option for this type of deposit in Canada and is used worldwide in almost all major gold mining/processing operations. The preferred processing approach has been proven to be efficient and safe at multiple projects. The metallurgy is supported by multiple test work programs carried out by Base Met Labs in Kamloops, BC, which demonstrated strong metallurgical performance and increased gold recoveries and efficiencies when compared with the alternate approach. Pairing gravity with CIP helps create an efficient gold recovery process and reduces the required capacity of the leach circuit.

2.8.1.3.2 Alternatives Assessed - Gravity/Flotation

Gravity/flotation with either intense cyanidation or off-site refining of the flotation concentrate is an alternative methodology for processing. Flotation would not create a final gold bullion for sale, it would require additional processing and treatment after flotation. This multi-stage process is not typical, inherently more complex than conventional leaching processing and commercially unattractive with no perceived advantage. This multi-stage process could potentially be undertaken off site with the concentrate transported to an existing leach plant for contract treatment. Indicative costs, including freight, determined from this exercise show this option to be commercially unattractive. This has proven to be a less successful alternative at other projects in Canada.

The flotation concentrate could potentially also be sold and transported to a smelter to recover the gold depending on the quality of the concentrate. Estimated costs, including freight and treatment, confirms that this option is commercially unviable, and with substantial resultant off-site value adding and reduced benefits to NS.

Environmental effects are generally similar in both alternatives.

2.8.1.3.3 Alternatives Assessed – Additional Processing of Low-Grade Ore

Heap Leaching of low-grade ore (0.3 to 0.6 g/t gold) was evaluated by Research and Productivity Council (RPC) in New Brunswick (NB), by analyzing low grade composites in order to perform the necessary bench tests. RPC determined that over a 60-day retention period, 43.5% of the gold could be extracted if the material was broken down to a top size fraction of 1”, and an average grade of 0.59 g/t gold. The recovery decreased significantly larger sized material and at lower grades. Due to the small size fraction requirement, which would require a substantial crushing and classification circuit, it was determined that Heap Leaching was not economical. This technology requires additional chemicals and water for processing which could potentially result in additional impacts to surface water resources, wetlands, fish and fish habitat. This option was not selected due to the economical feasibility and environmental considerations.

2.8.1.4 Ore Processing Locations

The potential alternatives for ore processing locations include construction of facilities within the PA and ship the concentrate to Signal Gold’s facility in Pine Cove, NL.

2.8.1.4.1 Preferred Approach - Proposed Location within PA

Ore processing for the Project is proposed to occur within the PA. The ore processing required at Goldboro would include two-stage crushing, single-stage ball milling, centrifugal gravity, leaching and CIP, and tailings deposited in a lined on-site TMF. This is the most economically feasible option and would confine all Project related infrastructure to within the Gold Brook Lake area.

2.8.1.4.2 Alternatives Assessed - Processing at the Pine Cove Facility

An alternative option considered for full processing of ore at Goldboro was to ship a concentrate from Goldboro to Signal Gold's Pine Cove Facility in NL. In this scenario, the ore would be processed at the PA first using a gravity circuit to produce a gravity concentrate and then using a flotation circuit to produce a flotation concentrate. Both the gravity and flotation concentrates would be shipped to Pine Cove by water conveyance. Prior to shipping the flotation concentrate would be thickened and filtered to facilitate transportation to Pine Cove.

At the Pine Cove mill, the flotation concentrate would be fed into a regrind circuit to achieve target liberation before being subjected to cyanide leach in the existing leaching circuit. Final collection of gold would be by Merrill Crowe followed by pressure filtration to collect the high-grade precipitate which would then be refined onsite in a crucible furnace. Cyanide levels in the waste stream would be treated in the mill using the proven SO2-Air process prior to mixing with the larger volume flotation circuit wastes and mine water from Pine Cove ore. The levels of cyanide in effluent discharged to the environment from the tailings disposal facility would be well below the federal regulated concentrations. Arsenic levels in the tailings stream will be treated in the mill with the addition of ferric-sulfate prior to discharging into the tailings facility and mixing with the other tailings, which will ensure that the arsenic stays in a solid state for long term storage.

To facilitate processing of ore from the Project at the Pine Cove facility modifications would be required to the mill including equipment to feed the flotation concentrate to the existing regrind and cyanide leach circuits, and additional tailings treatment equipment for arsenic removal. The gravity concentrate would be further concentrated by tabling at site prior to being refined in the existing crucible furnace.

This scenario was originally considered in 2018 but subsequent processing of mineralization from Goldboro at the Pine Cove facility through a combination of gravity and floatation did not produce high recoveries and was considered unfavourable due to the significant resource growth at Goldboro since 2018. This option could potentially result in additional impacts to air quality, noise from increased truck traffic, and impacts wetlands, fish and fish habitat.

2.8.1.5 Energy Source

The potential alternatives for energy sources for the Project include:

- Tie-in to the existing electrical power grid
- Diesel power generators
- Natural gas
- Renewable energy sources

2.8.1.5.1 Preferred Approach - Tie-in to the Existing Electrical Power Grid

Power for the Project is anticipated to be provided from a nearby NSPI 25 kV distribution line installed along Highway 316. A 1.6 km tap line would be installed along a new right of way to the mill area main substation. Peak power demand for the Project is estimated to be 10 MW, with the average demand estimated to be 7.5 MW. A network of 13.8 kV overhead distribution lines would be installed in the PA to provide power sourced from the main substation. Back up diesel-powered generators will be available during power outages to ensure key Project components are still functional.

A permanent grid tie-in could potentially affect the wetlands, terrestrial flora and fauna due to disturbances caused by constructing the distribution line.

2.8.1.5.2 Alternatives Assessed

Diesel-Powered Generators

The Project would require 10 MW worth of generator capacity. The fuel consumption for a generator of that size would be approx. 500 to 600 gal per hour of diesel. Based on the diesel costs, this would result in costs approx. 4 times

higher than anticipated electrical costs. The use of diesel-powered generators for the Project could potentially affect the atmospheric environment, surface water, wetlands, fish and fish habitat, and habitat and flora.

Natural Gas

The M&NP Liquid Natural Gas (LNG) pipeline crosses the western side of the PA. There is an opportunity for the Project to tie-in to the existing pipeline. Signal Gold evaluated this option however the costs associated with this option were approx. 6 times higher than the capital costs associated with connecting to the existing electrical grid. In addition, the payback period for the tie in was calculated to be 14 yrs which is greater than the LOM of 11 yrs. A permanent tie-in could potentially affect the wetlands, terrestrial flora and fauna due to disturbances caused by constructing the distribution line.

Renewable Energy

Renewable energy sources (wind, solar) are considered technically feasible but would not be economically feasible or practical due to the short duration of the Project. Buying power from NSPI can benefit from the sources of renewable generation available in the province or beyond. The environmental effects associated with a renewable energy source would depend on the renewable energy technology used; however, air emissions would likely be reduced.

2.8.1.6 Water Supply and Management

Alternatives for the water supply and management for the Project includes pumping from an intake structure in Goldboro Lake or the installation of groundwater wells. The Project will require water for processing, dust suppression, fire protection, and employees' needs.

2.8.1.6.1 Preferred Approach – Gold Brook Lake

Water use on the Project will be limited to water required for processing, vehicle wash down, fire protection, domestic water usage (e.g., showers, sanitary), and dust control when needed. Potable drinking water treatment unit will be installed near the mill and will be piped to the employee accommodations. Two on-site sanitary system will serve the maintenance shop, warehouse, and office as well as the employee accommodations.

Most of the process water will be supplied by recycling the water from the TMF. Make-up water from Gold Brook Lake will supplement the recycled water for the process plant as needed. As designed, effectively 100% of the process water will be recycled and recirculated back into the mill circuit. Raw water drawn from Gold Brook Lake, will be pumped by a single duty submersible water pump to a combination of raw water and firewater reserve storage tank.

Gold Brook Lake has sufficient supply to meet the water requirements of the Project. Withdrawing water was carried forward in the effects assessment detailed in Section 5.6.

2.8.1.6.2 Alternatives Assessed - Groundwater Wells

Groundwater was considered as a source. The source was not considered sustainable based on the hydraulic conductivity observed during the groundwater monitoring well installation program and on the type of bedrock geology in the area (low yield).

No other alternatives for water supply and surface water management were considered to be technically or environmentally feasible. Analysis of alternatives considered transportation of potable water to the Project that could affect the atmospheric environment. If all required water were transported to the Project, a greater volume of emissions would be generated during the transport of water.

2.8.1.7 Waste Rock Management Facilities

Alternatives for the waste rock management for the Project includes:

- Proposed WRSA layout including disposal of PAG1 in the TMF and in the East Pit
- In pit disposal of waste rock

2.8.1.7.1 Preferred Approach – Current Project Layout

The preferred approach for mine waste rock management includes the on-site management using three WRSAs, disposal of PAG1 in the lined TMF and in-pit disposal of waste rock once the East Pit is completed. The location of the WRSAs were selected to avoid impacts to SAR and watercourses where possible. A total of 67 Mt of waste rock will be stored in the WRSA with 21.1 Mt used as backfill for the East Pit. A total of 10.5 Mt of PAG1 will be stored in the TMF. All WRSA locations will be cleared and grubbed with organics and till removed and stored in separate stockpile locations to be used during reclamation. Waste rock will be used for site construction including roads, TMF embankment and the ROM pad. The WRSAs will be reclaimed by re-sloping, placement of till and organics followed by recontouring and revegetation.

2.8.1.7.2 Alternatives Assessed

Backfilling of the open pits with waste rock would eliminate the permanent WRSAs as described above. However, the WRSAs would still need to be constructed for the Project and the material would require re-handling to place back in the pits at closure. This alternative would not reduce the overall footprint of the Project. Such re-handling would result in additional emissions due to equipment use for haulage and would be cost prohibitive for the overall viability of the Project. Backfilling is technically feasible but not economically viable. Environmental effects are generally similar in both alternatives, however additional atmospheric effects are associated with the backfill alternative due to the extensive equipment use associated with re-handling the waste rock.

2.8.1.8 Tailings Storage

Signal Gold's preferred tailings storage option (thickened tailings slurry with PAG1 waste rock co-placement at the location shown on Figure 2.4-1) to DFO and ECCC representatives, who have determined that a regulatory amendment to Schedule 2 of the MDMER will be required. ECCC, with guidance provided by DFO and based on currently available data, determined that the TMF will directly overprint on streams that are considered to be waters frequented by fish. MEL was contracted by Signal Gold, with technical input from KP, to undertake an alternatives assessment for mine waste disposal, pursuant to a potential regulatory amendment of Schedule 2 of the MDMER. A multiple accounts analysis (MAA) following the methodology outlined in the Guidelines for the Assessment of Alternatives for Mine Waste Disposal (Environment Canada, 2011; as modified 2016) was used to examine and compare different storage options from the perspective of potential effects. Sensitivity analyses were subsequently conducted to test the robustness of the MAA. This Assessment of Alternatives Report is still being finalized at the time of EARD submission and will be submitted to ECCC as per the guidelines. This section includes a synopsis of the findings of this alternatives assessment.

2.8.1.8.1 Open Pit Disposal

Exhausted open pits provide a stable tailings impoundment area without the requirement for additional constructed dams. Typically, open pits allow for subaqueous disposal in climates or hydrological situations where a water surplus will lead to pit filling and creation of a pit lake. Subaqueous tailings disposal is a proven and successful disposal method that can effectively isolate the mine waste and mitigate the potential effects of ML/ARD.

Due to pit geometry and sequencing for the Project, the majority of the storage capacity available in the open pits would be unavailable until late in the mine life schedule. Using the open pits for tailings impoundment is potentially further complicated by the need to have sufficient supernatant storage above the tailings to account for high precipitation events/periods. Even if one of the open pits could be utilized for tailings storage, only a small portion of the overall tailings stream could be directed to the open pit during the life of mine, necessitating a surface impoundment. The use of the open pits for storage of tailings was thus eliminated from further consideration in the MAA.

2.8.1.8.2 Tailings Storage Technologies

The physical and geochemical properties of the tailings impact the feasibility of the various tailings management technologies. Finer grained tailings are less viable for filtration than coarser grained tailings. Similarly, tailings that are

PAG and may be susceptible to ARD are best suited for conventional or thickened slurry discharge, as the saturated tailings inhibits oxygen ingress and impedes oxidation. In addition to the physical and chemical characteristics of the tailings, tailings storage solutions also need to consider project specific requirements such as site conditions, key operating strategies, and closure considerations. Tailings technologies considered in this study include:

- Conventional Slurry Tailings
- Thickened Slurry Tailings
- Paste (ultra-thickened) Tailings
- Filtered Tailings
- Tailings and Waste Rock Co-Disposal

These tailings technologies were evaluated to determine the most suitable tailings management strategy for the Project based on site-specific characteristics and closure considerations as detailed below:

- Goldboro receives an estimated 1,409 mm of precipitation annually and has an average annual potential evapotranspiration of about 468 mm meaning the TMF will operate in a surplus water balance and water will need to be removed from the TMF pond throughout the operational years. It is expected that water within the TMF will be reclaimed and used to process the ore.
- There is PAG1 waste rock that will require management. The preferential management strategy is to co-place the PAG1 waste rock with any PAG tailings and keep them saturated throughout operations and post-closure by allowing tailings, supernatant, and runoff to fill the waste rock voids, cover the waste rock, and prevent the onset of ARD. A water cover will be maintained over the entire PAG tailings surface and within the PAG1 waste rock throughout operations.
- Closure considerations should include completing progressive reclamation activities to the greatest possible extent during operations to meet environmental objectives and regulations. Minimize post-closure monitoring and periodic maintenance requirements and reduce required closure construction by creating a landform that will blend into the local topography and shed regulation-compliant runoff to the environment.
- Thickened tailings disposal techniques are preferred as the additional process step at the process plant reduces soluble components (such as arsenic, cyanide, copper, ammonia, etc.) from reporting to the tailings facility and minimizes the pumping requirements for tailings and water reclaim (Ausenco, 2022).

Conventional Slurry Tailings

Conventional subaqueous (saturated) or sub-aerial (beach) tailings storage involves permanent surface impoundment using both natural topographic features and construction and operation of containment structures (dams). Tailings are not dewatered but are piped and deposited directly in the impoundment. Conventional slurry tailings are discharged from the mill at < 50% solids (by weight). The tailings may be pumped by centrifugal pumps, flow by gravity, or a combination thereof. Slurry is discharged through off-takes (spigots) along the embankments or around the perimeter of the TMF to optimize basin filling and control the location of the supernatant pond. Segregation occurs in the tailings, with coarser particles settling out near the discharge points to form tailings beaches, while finer-grained particles are transported further. Supernatant water and runoff are reclaimed for processing. This is the most common tailings storage methodology used for open pit mines in similar climates and topographies throughout Canada.

Conventional slurry tailings disposal is well suited to project sites that operate with a surplus water balance and for facilities that contain PAG or metal leaching (ML) waste materials that require saturation to prevent adverse chemical reactions. Conventional slurry tailings disposal entails the most attention to water management and would require additional pumping and water reclaim.

Thickened (Partially Dewatered) Tailings

Thickened tailings production involves using dewatering systems to increase the solids content of the tailings to 50 to 70%. Similar to conventional tailings, thickened tailings require impoundment dams for containment, but can be advantageous in situations where a steeper tailings beach is achievable such as a natural slope draining towards a

downstream impoundment dam. In this case, more tailings can be stored with less dam volume, as opposed to developing a flatter deposited tailings profile, ultimately reducing the TMF footprint. The storage of thickened tailings requires the construction of a dewatering system however reduces soluble components and the need for additional pumping and treatment at the tailings facility or water management ponds.

Paste (Ultra-Thickened) Tailings

Paste tailings are produced by partial dewatering of the tailings to produce a thick slurry of toothpaste-like consistency, with a 67 to 70% solids composition, which can then be transported by pipeline. Paste tailings, sometimes combined with cement, are commonly used in underground mines as backfill support and are not common surface storage. Paste tailings are not self-supporting and an impoundment for the paste tailings, as well as an impoundment for process water, would be required. The storage of paste tailings would involve the construction of a paste plant which would utilize a dewatering filter press system for a portion of the tailings and a high-capacity thickener for the remainder. The use of tailings as paste backfill to augment underground mine workings stability is ideal as it has virtually no adverse human or environmental effect. The use of tailings in paste backfill can help improve the long-term stability of underground workings, but is much more costly, for purely disposal purposes, compared with use of a surface impoundment with good natural containment. As the Project is an open pit operation, and the cost of constructing and operating a plant would be very high, and together with the operating pumping costs, would most likely render the Project uneconomical. For these reasons, this approach is not considered a technically or economically viable tailing storage option.

Filtered (Dry Stack) Tailings

Dry stacking of tailings involves dewatering tailings with vacuum or pressure filters to produce a relatively dry tailings (typically > 70% solids content) and placing the dry tailings in a storage area using trucks or conveyers. This tailings storage method is most beneficial in areas of flat topography and dry climate where water conservation is critical, areas where permafrost encapsulation is possible, or areas of high seismic activity where use of tailings dams is not supported. In general, the method relies on the tailings remaining dry in order to be self-supporting, and the use of filtered tailings have an advantage over conventional slurry tailings, as the tailings are dewatered at the plant site and no large tailings pond, positioned over tailings is required.

These site conditions (arid climate, high arctic permafrost, or high seismic activity) are not applicable to the Project, and the PAG1 waste rock co-storage under a water cap would not be feasible.

Tailings and Waste Rock Co-Disposal

Co-disposal is the mixing of tailings with waste rock into a single storage facility. The mixing of tailings with the waste rock promotes the filling of voids and maximizes the density of the stored material. Co-disposal can be referred to based on the point in the waste stream where mixing occurs: co-mingling (mixed before placement), co-placement (placed separately) or co-deposition (layering).

When tailings are co-mingled, the tailings are typically dewatered to the point of a paste or filtered tailings prior to mixing with the mine rock. Co-mingling of tailings with mine rock not only has many of the same operational complexities as paste or filtered tailings, but additional complexity is introduced via the mixing process. Co-mingling of the two waste streams may result in the need for a larger facility, or multiple facilities, to contain the increased waste volume.

The preferred tailings storage option will provide storage for PAG tailings and PAG1 waste rock. Co-placing the PAG1 waste rock with the tailings prevents the onset of ARD by allowing tailings, supernatant, and runoff to fill the waste rock voids, cover the waste rock, and keep it saturated throughout operations and post-closure.

Based on the available information, sub-aqueous (below water surface) deposition of thickened slurry PAG tailings with frequent rotational discharge is a recommended strategy to maintain the tailings and PAG1 waste rock in a saturated condition and prevent the onset of conditions that could lead to ARD. A water cover will be maintained over the entire PAG tailings surface and within the PAG1 waste rock throughout operations.

Sub-aqueous deposition of thickened slurry PAG tailings with the co-placement of PAG1 waste rock within the TMF is the preferred storage technique.

2.8.1.8.3 Tailings Storage Locations

The ore deposit is located south of Gold Brook Lake with the planned infrastructure surrounding the lake to the east and west. The Project facilities are located within the drainage area of Gold Brook or its tributaries. The landscape around Goldboro is characterized by undulating topography, coastal direct watersheds, wetlands and woodlands dissected by lakes and streams.

Thirteen potential tailings storage locations were initially identified for the alternatives assessment (Figure 2.8-1) The candidate storage locations were developed based on a desktop analysis of the most viable locations and with input from Signal Gold. Detailed analyses were not completed for all sites. . Six of the locations were considered to have fatal flaws and removed from further consideration, therefore layouts shown are preliminary and approximate

As a result, a total of seven TMF candidate locations were selected based on engineering studies and initial screening assessment including:

- Land ownership, mineral rights, and existing infrastructure
- Surface water management
- Existing communities and human land use
- Environmental and socio-economic concerns
- Basin characteristics
- Infrastructure development

Examples of assessment criteria include:

- The alternative location should be large enough to accommodate the current anticipated volume of tailings and PAG1 waste rock.
- The alternative location should be within an acceptable distance from the mill and open pit.
- The alternative location should avoid encroaching into more than one watershed.
- The alternative location should avoid encroaching upon or overprinting a major waterbody (i.e., Gold Brook Lake or Ocean Lake).
- The alternative location should avoid encroaching upon or substantially interfering with existing communities, residences, and land uses.
- The alternative location should avoid encroaching upon or overprinting or substantially interfering with major provincial infrastructure (i.e., pipeline).
- The alternative location should avoid overprinting or substantially interfering with existing or planned Project infrastructure.
- The alternative location should avoid encroaching upon or overprinting protected areas.

Candidate locations that did not meet the pre-screening criteria were not carried forward. Locations #4, #5, #6 and #8 were carried forward into the MAA.

2.8.1.8.4 Alternatives for the Multiple Accounts Analysis

Based on the one tailings storage method, and four tailings storage locations identified as candidate areas based on the pre-screening assessment, a total of four possible alternatives were identified. Alternatives A, B, C, and D were carried forward into the MAA as shown on Figure 2.8-2. Alternative C was considered an alternate location that avoided fish-frequented waters.

Alternative A is a sidehill/paddock type impoundment located on the east side of Gold Brook Lake, with partial containment provided by the topography along the eastern side of the facility. It is located within the same watershed

as the rest of the Project. This alternative would require MDMER Schedule 2 regulatory amendment and has the smallest footprint of the site options.

Alternative B is a sidehill/paddock type impoundment located on the west side of Ocean Lake, with partial containment provided by the topography along the western side of the facility. This location would require an additional discharge location into Ocean Lake and is within 200 m of a cabin. This alternative would require MDMER Schedule 2 regulatory amendment.

Alternative C is a sidehill/paddock type impoundment located north of Gold Brook Lake, with partial containment provided by the topography along the southern side of the facility and constrained by the adjacent pipeline easement to the west. The site is located in a different watershed than the rest of the Project upstream of Isaacs Harbour and the community of Goldboro. Alternative C was considered an alternate orientation that avoided fish-frequented waters.

Alternative D is a sidehill/paddock type impoundment located southeast of the Open Pit, with partial containment provided by the topography along the northeastern side of the facility. This option is downgradient of Project infrastructure and relatively close to the open pits for hauling NAG rock for construction of the dam. This alternative would require MDMER Schedule 2 regulatory amendment.

All alternatives were characterized based on their environmental, technical, Project economic, and socio-economic impacts using a multiple accounts ledger. These four candidate areas are referred to as accounts. Each account is split into evaluation criteria (sub-accounts) that are used to determine the level of impact to the account and indicators of each of these sub-accounts were identified. Identification of sub-accounts and indicators for each of these areas were chosen using methodology in accordance with the Guidelines. While sub-accounts measure impacts between the alternatives, they are often not easy to quantify and rank in a transparent manner. Measurement criteria (indicators) allow qualitative or quantitative measurement of the impact associated with each sub-account. Sub-accounts and indicators were chosen based on Project team experience with tailings management, the surrounding area conditions and assessments of alternatives for other mining projects. The Project Team included both Proponent staff and their consultants. During the preparation of the report, engagement has and will continue with Mi'kmaq communities and feedback / input will be sought to inform the Assessment of Alternatives Report. A full account of the sub-accounts and indicators considered will be available in the Assessment of Alternatives Report when submitted to ECCC.

Following the identification of the indicators, a value-based decision process was used to assign values and weightings to indicators. As provided in the guidelines, the base case includes weighting the environment account twice as important as the technical and socio-economic accounts, which in turn are weighted twice as important as the Project economics account. All weights assigned to the sub-accounts and indicators, including rationale for the selection of each weight, can be found in the Assessment of Alternatives Report when submitted to ECCC.

2.8.1.8.5 Preferred Approach

The preferred alternative for tailings disposal is Alternative A based on the comparative analysis using the MAA methodology described above (full results of analysis to be submitted to ECCC in the Assessment of Alternatives Report).

A sensitivity analysis comprised of four additional scenarios was carried out to evaluate the robustness of the analytical process and to determine the degree to which various options are influenced by the choice of weightings. The sensitivity analysis found that the MAA is robust and not sensitive to change. For all scenarios, Alternative A remained the preferred alternative.

The preferred approach for tailings management is for sub-aqueous deposition of thickened slurry PAG tailings with the co-placement of PAG1 waste rock within the TMF to prevent the onset of conditions that could lead to ARD within a newly constructed engineered TMF located east of the Gold Brook Lake (Alternative A).

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FIGURE 2.8-1

Preliminary Tailings Locations from Alternatives Assessment Pre-screening

Goldboro, NS

Loon Lake Nature Reserve

- Buildings
- NSTBD Watercourse Layer
- NSTDB Roads Inventory
- Preliminary Tailings Storage Option - Dam
- Preliminary Tailings Storage Option - Pond
- Open Pits
- NSECC Wetlands Inventory
- NSTBD Waterbodies
- Protected Areas
- Project Area

Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter

0 500 1,000 2,000 m

1:50,000

Scale when printed @ 11" x 17"

Drawn By: LP
Reviewed By: LP

Date: 2022-05-26

McCallum Environmental Ltd.

Document Name: 220526 MAA

Prepared For:

SIGNAL GOLD

FIGURE 2.8-2

AlternativeTailings Locations from Multiple Accounts Analysis

Goldboro, NS

Alternative C

Alternative B

Alternative A

Alternative D

Ocean Lake

Meadow Lake

Gold Brook Lake

Isaacs Harbour

- Alternative TMF Locations
- Approximate Footprint Area
- Mill Site
- Open Pits
- Other Planned Infrastructure
- Buildings
- NSTBD Watercourse Layer
- NSTDB Roads Inventory
- NSTBD Waterbodies
- NSECC Wetlands Inventory
- Project Area

Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter

0 375 750 1,500 m

1:30,000

Scale when printed @ 11" x 17"

Drawn By: LP
Reviewed By: SS

Date: 2022-05-26

McCallum Environmental Ltd.

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3. Consultation and Engagement

Signal Gold has been committed to Rightsholder, stakeholder and public engagement since initiation of the Project in 2017. Through its key values of integrity, reliability, responsibility, and respect, Signal Gold has endeavoured to work with the local community, Indigenous groups, non-governmental organizations (NGOs), regulatory agencies, and interested members of the public.

Provincial EA legislation requires engagement with the Mi'kmaq and the public to identify concerns about adverse effects of the Project and to develop steps to address these concerns. Therefore, potential effects and mitigations are specifically identified in the EARD for the Project. Beyond regulatory requirements, Signal Gold is committed to maintaining Rightsholder and stakeholder engagement throughout the life of the Project, which extends well beyond the EA process.

3.1 Regulatory Engagement

Detailed records of regulatory engagement are included in Appendix C.1. Regulatory engagement on the Project has been ongoing since early 2017 with multiple Provincial "One Window Process: Mineral Development in Nova Scotia" meetings taking place. Signal Gold has requested meetings, at strategic times throughout the EARD process, to present the planned Project and to receive feedback on the regulatory regime and access regulator expertise. Signal Gold has consulted with current provincial departments and agencies, including:

- Advanced Education
- Economic Development
- Environment and Climate Change
- Labour, Skills and Immigration
- Natural Resources and Renewables
- Office of L'nu Affairs
- Transportation and Infrastructure Renewal
- Communities, Culture, Tourism and Heritage

Federal departments and agencies included:

- Canadian Wildlife Service
- Environment and Climate Change Canada
- Fisheries and Oceans Canada
- Impact Assessment Agency of Canada
- Natural Resources Canada

The interests of regulators are incorporated throughout the EARD. Regulator input has been used to improve planning and design of the Project.

Signal Gold has also engaged with local government though the MODG council and staff. Engagement includes in-person and virtual presentations to council at least twice yearly, and more frequently where there is significant information to share. These presentations include Signal Gold Senior Management along with project consultants. Signal Gold also shares information frequently with MODG through emails and phone calls. MODG Council and staff received comprehensive information packages with all materials used at the most recent Goldboro open house so that they could share information with anyone who may have questions about the Project. This includes poster boards covering the VC's, a position description document, and the socioeconomic impact report.

On January 11, 2022, Signal Gold announced that it has signed a Community Benefits Agreement with the MODG to support sustainable social and economic benefits within the Municipality with respect to the Project. The Municipality,

home to the Project, is located on the Eastern Shore of NS and has a strong history of significant natural resource development, including mining, natural gas, and wind energy. It is well established as "open for business" for sustainable commercial and industrial development. The Community enefits Agreement outlines Signal Gold's commitments to bring sustainable social and economic benefits to the MODG including:

- Implement targeted measures for local recruitment and employment at both at the construction and operational stages of the Project.
- Collaborate with the Guysborough Career Resource Centre to assess local labour market training and employment opportunities.
- Encourage contractors, suppliers, and service providers to maximize opportunities to hire locally and support businesses activities in the MODG.
- Engage local businesses and suppliers to identify procurement and service opportunities with the Project.
- Provide financial incentives for Signal Gold employees to purchase or build homes within the Municipality ($5,000 per employee).
- Establish five bursaries for local high school students. This year there will be $5,000 allocated for the bursaries. This will increase to $10,000 in 2025 or when commercial gold production begins.
- Hire co-op work term students and apprenticeship placements.
- Contribute annual grants for community groups, organizations, and community projects within the Municipality. The value of grants will be $15,000 per year until the Project achieves commercial production at which point it will increase to $100,000 per year for the life of the Project.
- Establish a local Project Information Office within the Municipality in 2022 with a further commitment to maintain a local Operational Office within the Municipality for the life of the Project.
- Facilitate ongoing dialogue between the Municipality and the Company including quarterly updates to the Municipality as they relate to the Agreement, the implementation of the benefits outlined in the Agreement, and general updates concerning the Project.

3.2 Stakeholder/Public Engagement

Signal Gold has developed a community engagement strategy for all phases of the Project. This includes pre-development and permitting, construction, operation, and closure of the Project. For the purposes of reporting on results, Signal Gold is tracking all interactions, communications, and commitments. Signal Gold uses stakeholder engagement software to plan and document engagements so that all stakeholder input and feedback is considered and integrated as appropriate.

Public engagement activities have occurred to support the EA process for the Project since early 2017. This includes community and virtual open houses, ongoing two-way information sharing with the Community Liaison Committee (CLC), and meetings with interested local stakeholders. These are detailed below and are included in the summary of engagement activities conducted with stakeholders (Appendix C.2).

3.2.1 Objectives

Signal Gold's consultation and engagement program objectives for this Project are as follows:

- To increase public awareness and understanding regarding Signal Gold's plans for the Project
- To seek opportunities for active community engagement and dialogue throughout permitting, development, operations, and closure phases of the Project
- To identify and address stakeholder concerns

3.2.2 Engagement Strategy

An engagement strategy was developed by Signal Gold for the Project that establishes formal engagement activities throughout all phases of its mining activities in NS including pre-development and permitting, construction, operation, and closure of the Project.

3.2.3 Community Liaison Committee

Community engagement is important to Signal Gold, and the CLC for the Project is a key contact for the Project and will continue to be throughout the permitting, construction, operation, and closure phases. The CLC, which was established in 2017 (with representation from Goldboro, Issacs Harbour, Country Harbour, MODG, small business, Goldboro Interpretation Centre, full time, part-time and seasonal residents), acts as an advisory board for the Project to Signal Gold. The CLC provides a mechanism for information exchange between communities and Signal Gold, as well as a forum to share questions, concerns, and input regarding the Project.

Signal Gold used the Guide for the Formation and Operation of a CLC (NSE, 2010) to aid the formation of the committee. Meetings were generally held quarterly, with an increase or decrease in frequency depending on new information and/or activity. In-person meetings were not held during the pandemic but information sharing continued through emails and phone calls. Issues brought forward by the CLC have primarily focused on concerns related to drinking water, noise, light, traffic, access to recreation trails and other direct impacts to residents. With the lifting of pandemic restrictions, in-person CLC meetings will resume a quarterly basis. Timely communication will also continue through emails and phone calls.

Local Signal Gold employees also engage directly with members of the CLC and other community members which has been an important conduit to building meaningful relationships and mutual respect throughout the community. Signal Gold is committed to being an integrated part of the communities in which we work.

The CLC has unanimously communicated to Signal Gold that there is strong support for the Project and that the social and economic development that the Project will bring is welcomed.

In April 2022, members of the CLC received comprehensive information packages with all materials used at the open house so that they could share information with others who may have had questions about the Project

3.2.4 Public Events

Signal Gold has held three open house events in advance of the submission of the EARD, two in-person events and one virtual event.

The first in-person open house was held at the Goldboro Interpretive Centre on October 17, 2019, between 4 pm and 8 pm. Information panels provided an overview of the EA process, the location of the proposed Project, a high-level overview of the Project, a list of valued components (VCs), general information about reclamation and a list of potential impacts per VC. A Project team including seven individuals attended on behalf of Signal Gold including environmental consultants and approximately 40 members of the public. The first open house was completed for an earlier version of the Project.

The second in-person open house was held on April 21, 2022, at the Goldboro Interpretive Centre. The hours of the open house were 1 pm to4 pm and 5 pm to 8 pm to provide opportunities for people with different schedules, encouraging the broadest participation possible. The goal of this open house was to provide detailed information on important technical aspects and conclusions of Project studies in advance of the submission of the EARD, and to receive feedback from the public. The open house events included information boards and displays showing the location of a Project in relation to nearby communities, facts and figures related to the development, information on potential effects and mitigations, and an update on the status and progress of development activities, such as the EA and anticipated construction schedule. Signal Gold placed priority on inviting residents and landowners, especially those along Goldbrook Road and Highway 316. Landowners closest to the Project were contacted (attempts were

made via telephone and knocking on doors and dropping flyers). If desired, a phone or face-to-face meeting was also conducted to allow direct communication to receive questions and/or comments and share Project updates.

The open house events in 2019 and 2022 were advertised in the Chronicle Herald, the Guysborough Journal and the Antigonish Casket, during each of the two weeks before each event. In 2022, a notice poster was placed in high visibility locations in the Goldboro area including the door of the interpretive centre and at the local post office, as well as on the side of the post office boxes the day before the event as a reminder. The notice was also provided to households on Goldbrook Road and along Highway 316 from the bridge at the north of Isaacs Harbour to the interpretive centre. The information flyer was also posted to social media to advertise the 2022 open house. Facebook Group pages included: Goldboro Interpretation Centre, Drumhead Community Page, Guysborough County Community Bulletin Board, and Greg Morrow, MLA for Guysborough/Tracadie.

To communicate Project information, 20 poster boards were prepared and presented that covered the following topics:

- Who is Signal Gold/Anaconda Mining and notice of imminent name change to Signal Gold
- Project Description
- Map showing Project Infrastructure
- Reclamation Plans
- Permit Timeline and Project Schedule
- Surface Water
- Groundwater
- Air, Noise and Light
- Study Area Map
- Wetlands
- Fish and Fish Habitat
- Terrestrial Environment
- Birds
- Fauna
- Mi’kmaq Rights: Engagement and Impacts
- Archaeology: Mi’kmaq and Ancestral Resources
- Archaeology: Historic Mining District
- Employment and Training
- Socioeconomic Impact for Nova Scotia
- Community Engagement and Benefits Agreement

The 2022 open house was attended by approximately 54 members of the public. Signal Gold’s 15-member team included groundwater and surface water experts, biologists, geologists, wetland specialists, a metallurgist, a human resource specialist, and other company representatives. Signal Gold’s team provided information and answered questions from attendees. The main issues that arose from this open house were:

- Employment opportunities and economic benefits
- Road safety and traffic
- Access to the east side of the Project, ATV trails and Ocean Lake
- Noise and potential impact to potable groundwater wells

All questions were answered by the Signal Gold team with a short list of follow-up actions, which Signal Gold completed shortly thereafter.

In recognition of pandemic related and other barriers to in-person participation at the open house, Signal Gold held a virtual open house on May 3, 2022. Attendees were provided with the poster board materials in advance. There was a

short introduction by Signal Gold President and CEO with approximately 45 minutes for stakeholder questions to Signal Gold's senior management team and project consultants. Twelve external participants joined the virtual session. The main issues that arose from the virtual session were:

- Management of historic tailings
- Environmental protections related to the TMF
- Environmental protections related to water at the site
- Noise and potential impact to potable groundwater wells

All materials related to the open house sessions in the communities of Paqtnkek Mi'kmaw Nation (or Paqtnkek), Goldboro, as well as the virtual open house are available on the Signal Gold's web site and in Appendix C.4.

3.2.5 Community Groups and Businesses

Signal Gold has made presentations to many organizations, community groups and educational institutions on its exploration and mine development activities. Signal Gold will continue to make presentations to share information about its operations in Goldboro.

Signal Gold actively searches for opportunities to speak with community groups to answer questions and promote partnerships where appropriate. Since 2017, Signal Gold has participated and presented in the annual Canso Superport Economic Development Conference, the Mining Society of Nova Scotia AGM, Mining Association of Nova Scotia events, and Strait Area Chamber of Commerce (Port Hawkesbury). With pandemic restrictions lifting Signal Gold looks forward to active participation in opportunities to share more about the Project.

Signal Gold has and will continue to meet with local community groups. . This includes local ATV clubs and other recreation groups, environmental groups, business development organizations and other interested community groups. Signal Gold has initiated engagement with the Atlantic Salmon Federation/NS Salmon Association and will continue to reach out. Depending on the interest as the Project develops, Signal Gold will continue to meet with community groups to provide information, discuss proposed mitigation measures, and respond to any concerns..

Numerous discussions between Signal Gold and M&NP have occurred, due to the close proximity of the M&NP directly west of the Project. Signal Gold has also met with PHP (Port Hawkesbury Paper) as PHP is an active lease holder within the PA (on Crown land). Attempts have been made by Signal Gold to discuss the Project with Bear Paw representatives, however no response has been received to date. The proposed Bear Paw Pipeline would intersect the PA as Bear Paw intended to use existing infrastructure such as the M&NP.

3.2.6 Website, Email, Phone Line and Social Media

Signal Gold has established a Project section on its website, which acts as a hub of information for reference by the community and will be populated with any new and updated information related to the Project. The purpose of the website is to:

- Inform and update the public about the Project.
- Address community questions gathered from other communications.
- Provide information regarding further engagement.

Signal Gold has established an email address and phone number as a point of contact for the public; both are monitored regularly with a response generally provided within 48 hours. Signal Gold is also in the process of opening a local office, which will be staffed to allow community members to drop in, ask questions and receive Project updates.

Signal Gold has created a Facebook page for the expressed purposes of sharing information at the community level. Members of the CLC have recommended that this is an effective way to communicate with residents. This will be maintained throughout the life of the project. Social media platforms are used purposefully by Signal Gold for information sharing, but Signal Gold does not actively engage in dialogue on the platforms. Signal Gold does monitor various social media channels for posts and comments regarding the Project. The purpose of this monitoring is to

check for information being shared regarding the Project, to better understand public questions and concerns, and to identify opportunities to engage.

Signal Gold has also established a community email list for providing updates consistent with posts on the Goldboro Gold Project Community Facebook page.

3.2.7 Media and Press Releases

Signal Gold regularly distributes news releases through a news wire service. Distribution includes media outlets in Nova Scotia. Signal Gold welcomes media inquiries as an opportunity to share accurate information about the Project. The President and CEO regularly provides project updates in the Guysborough Journal. As necessary, Signal Gold purchases space in the Guysborough Journal to share information regarding matters such as the details of the Community Benefits Agreement and the independent findings of the Socioeconomic Impact Assessment. Signal Gold also provides project information in the newsletter distributed by MODG.

3.2.8 Key Issued Raised and Proponent Responses

Table 3.2-1 provides a summary of key issues raised during public engagement activities relative to the EA of the Project. For each key issue identified, a summary of Signal Gold's response is provided along with reference(s) to sections in the EARD which more fully addresses the issue.

Table 3.2-1 Summary of Key Issues Raised during Stakeholder/Public Engagement

Key Issue	Summary of Proponent Response	Primary EARD References
Request to be informed on the Project activities	The CLC commenced in 2017. Signal Gold is committed to maintaining its CLC for the life of the Project. Other aspects of community engagement will continue as per the community engagement strategy.	3.2.9 Ongoing Engagement 5.10 Socioeconomic Conditions
Concern about volumes of truck traffic in context of safety on Highway 316 and the Goldbrook Road and use of recreational vehicles	Signal Gold has committed to a Traffic Management Plan to understand changes in traffic and introduce mitigating measure. This will include communication with the community. Signal Gold has implemented a policy for all employees and contractors that decreased the max speed to 40km/h on Goldbrook Road from the posted 60km/hr. There will be additional signs posted as reminders. Anyone associated with the Project found to be exceeding 40km/h in this area will lose their driving privileges and/or no longer be permitted on the Project.	5.10 Socioeconomic Conditions
Concern about elevated dust and noise levels in proximity to the proposed mine, especially along Goldbrook Road	Signal Gold is committed to dust mitigation as required (water and/or chemical dust suppressants). Mitigation measures for noise will be implemented at all phases of the Project to ensure compliance with the provincial guidelines.	5.1 Air 5.2 Noise
Questions about contingency planning for accidents and malfunctions	Hazards have been identified and assessed based on risk with mitigations and contingency planning in place. Future detailed planning and implementation of the Project will further address potential accidents and malfunctions.	5.14 Accidents and Malfunctions
Concern relating to on-going access and potential impacts to the cemetery located on Goldbrook Road	Goldbrook Road will have continued public access north of the cemetery, allowing continued access to the cemetery through the life of the Project.	5.10 Socioeconomic Conditions
Concern relating to potential impacts from blasting to water wells and dwelling foundations	Based on groundwater modelling completed, the Project is not anticipated to impact water wells. Signal Gold has developed a groundwater monitoring program to assess changes to both groundwater quality and quantity. Blasting will be conducted by a certified contractor who will develop a Blast Management Plan and Blast Designs for review and approval prior to carrying out the work. Blasts will be designed to meet vibration and overpressure limits at appropriate distances from any existing structures.	5.5 Groundwater Resources 5.2 Noise
Questions about recreational access to Ocean Lake and the impact on the existing access on Goldbrook Road to Gold Brook Lake and Ocean Lake	Signal Gold has committed to creating a new bypass access road to allow access around Gold Brook Lake to ATV trails east of the Project and Ocean Lake.	2: Project Description 5.10 Socioeconomic Conditions
Concern relating to potential impact to potable groundwater wells	Signal Gold has completed quantitative modelling to predict the maximum extent of impact to groundwater quality and groundwater levels. This modelling predicts all impacts to groundwater will be limited to within the PA, and thus, will not affect potable wells located along Goldbrook Road and Highway 316.	5.5 Groundwater Resources

Table 3.2-1 Summary of Key Issues Raised during Stakeholder/Public Engagement

Key Issue	Summary of Proponent Response	Primary EARD References
Impacts of Project on wildlife including mainland moose	Signal Gold provided details of wildlife species identified during baseline studies and provided information relating to the magnitude of disturbance to wildlife especially Species at Risk (SAR) necessary to support Project development, mitigation strategies to reduce interactions with wildlife, and discussions relating to reclamation planning to support closure planning and re-establishment of wildlife habitat once mining activities are completed.	5.9 Terrestrial Environment
Managing water quality and water monitoring/water seepage	Signal Gold provided a summary of all predictive water quality modelling work completed to support the EA and summarized this information for the public. Water treatment will be completed during operations and active closure phases. During the post-closure, water treatment will not be required, based on current modelling predictions.	5.6 Surface Water Resources
Request for Signal Gold to prioritize hiring of the local population for Project jobs	Signal Gold has prioritized local hiring for their existing mine operation in Newfoundland and intends to continue this practice for the Goldboro Project.	1.4 Introduction 5.10 Socioeconomic Conditions
Concerns about archeological resources not being found and protected	Signal Gold provided information relating to the baseline program completed to identify archaeological features, avoidance and mitigation measures taken to reduce potential impacts to these features from Project development and resulting residual impact from the Project.	5.12 Cultural and Heritage Resources
Management of historic tailings and environmental protections related to the TMF.	Signal Gold provided details on the Historic Tailings Management Plan which includes excavation of historic tailings directly impacted by Project infrastructure for disposal in the lined TMF. Water from the TMF will be treated prior to discharging into the Gold Brook. A geosynthetic liner followed by NPAG and till/organics will cap the TMF at closure.	5.4 Geology, Soils and Sediment 2.4 Project Activities
Questions about surface water, fish and impact to Gold Brook Lake and Gold Brook	Signal Gold provided information on baseline conditions of Gold Brook Lake, Gold Brook, and other surface water bodies, watercourses and wetlands within the Project footprint. Direct and indirect potential impacts to fish and fish habitat from Project development were described. Proposed mitigation and offsetting measures have been described (through *a Fisheries Act* Authorization process) to reduce residual effect to fish.	5.8 Fish and Fish Habitat
Employee Accommodations	Signal Gold will design and construct the employee accommodations facility prioritizing women and safety, with regular communication with the Rightsholders and the communities. Alcohol and drugs will not be permitted in the employee accommodations.	5.10 Socioeconomic Conditions 5.11 Indigenous Peoples

3.2.9 Ongoing Engagement

Signal Gold has included information on the engagement program to date and a summary of issues and responses at the time of submission of this EARD. Signal Gold is committed to continued engagement during the next steps in the EA processes including:

- Sharing key findings and conclusions of the EARD with CLC members and interested NGOs.
- Holding meetings (in person or virtual) with interested NGOs, including ATV Clubs, and other community groups.
- Aligning mitigation measures with the needs of local organizations.
- Answering specific questions by providing additional information where feasible.

Signal Gold will engage with additional stakeholders and/or respond to identified issues as the EA moves forward and into Project development, operation and closure.

3.3 Indigenous Engagement

The duty to consult with Mi'kmaq of Nova Scotia is responsibility of the Province. While Province's duty to consult cannot be delegated to proponents, procedural aspects can be. In addition, both the federal and provincial EA processes include requirements for engagement of Indigenous Peoples. Signal Gold's engagement program has been consistent with the NS Proponent's Guide: The Role of Proponents in Crown Consultation with the Mi'kmaq of Nova Scotia (as provided by the NS Office of L'nu Affairs via email on May 27, 2022).

Signal Gold is committed to meaningful engagement of the Mi'kmaq of Nova Scotia for the Project. Engagement began as part of planning and EA in May 2017. This engagement has focused primarily on the Assembly of Nova Scotia Mi'kmaw Chiefs (ANSMC) and staff of the Kwilmu'kw Maw-klusuaqn Office (KMKNO), as well as community members, staff and Chief and Council of Paqtnkek, the closest Mi'kmaq community to the Project.

The information gathered by Signal Gold during its engagement with Indigenous Peoples helps to contribute to Government's understanding of any potential adverse impacts of the Project on potential or established Aboriginal or treaty rights, title and related interests, and the effectiveness of measures proposed to avoid or minimize any impacts.

The Made-in-Nova Scotia Process is the forum for the Mi'kmaq, NS, and Canada to resolve issues related to Mi'kmaq treaty rights, Aboriginal rights, including Aboriginal title, and Mi'kmaq governance. The process involves the Mi'kmaq of Nova Scotia as represented by the ANSMC and the provincial and federal governments. Further, NS *Environmental Assessment Regulations* require proponents to describe the engagement process with Indigenous Peoples, identify concerns of Indigenous Peoples about potential adverse effects and steps taken, or proposed to be taken, to address concerns.

Signal Gold commenced early engagement activities in 2017. Signal Gold actively initiated offers to present, review, and discuss any all matters related to Mi'kmaq priorities so that matters of concern for Mi'kmaq could be addressed in Project design and incorporated in the EARD process and documentation. Signal Gold committed to participation of members of the executive team, staff, and consultants in engagement. Engagement with Mi'kmaq of Nova Scotia is not isolated to the EARD.

The ANSMC is the highest level of decision-making authority for the Mi'kmaq of Nova Scotia. The ANSMC, which meets monthly, comprises 13 Mi'kmaq Chiefs in NS and two ex-officio members from the following First Nations.

- Acadia First Nation
- Annapolis Valley First Nation
- Bear River First Nation
- Chapel Island First Nation
- Eskasoni First Nation
- Millbrook First Nation
- Paqtnkek Mi'kmaw Nation
- Pictou Landing First Nation
- Sipekne'katik First Nation
- Wagmatcook First Nation

- Glooscap First Nation
- Membertou First Nation
- We'koqma'q First Nation

The ANSMC is supported by KMKNO (translated as "We are seeking consensus."), which is also known as Mi'kmaq Rights Initiative. Ten First Nations rely on the services of KMKNO in consultation. It is the understanding of Signal Gold that at this time Sipekne'katik First Nation, Millbrook First Nation and Membertou First Nation represent themselves in consultation and engagement related to resource projects.

The Native Council of NS is a self-governing authority for the large community of Mi'kmaq Indigenous people residing off-reserve in NS throughout traditional Mi'kmaq territory. The Native Council has the following purpose and objectives:

- To identify and address potential adverse impacts on established Aboriginal or treaty rights, title and related interests.
- To earn a meaningful relationship based on mutual respect.
- To establish a mutually beneficial relationship with Mi'kmaq of Nova Scotia.
- To learn about the environment in the region through Mi'kmaq Traditional Knowledge.
- To identify concerns from Mi'kmaq groups with respect to potential environmental effects of Projects and to collaborate.

3.3.1 Engagement Approach and Method

Signal Gold respectfully recognizes that the Mi'kmaq of Nova Scotia hold title and rights, including asserted Aboriginal rights and Treaty rights as affirmed in the Constitution of Canada. These rights include lands and natural resources that may be affected by the Project. Signal Gold also recognizes that the Mi'kmaq of Nova Scotia have responsibilities to respect and protect lands, waters, fish, wildlife, and other natural resources within their traditional territories.

Signal Gold is committed to the goal of sustainable development and strives to balance social, environmental, and economic considerations in how it manages its business. Signal Gold strives to engage openly and honestly with communities to address concerns and respect local laws, customs, and culture. Early in the development process, Signal Gold initiated engagement with the ANSMC and KMKNO about the Goldboro Gold Project, to identify and understand issues and concerns with respect to the proposed Project, and to establish a respectful relationship.

On July 2, 2019, Signal Gold and the ANSMC signed a MOU that will govern the process by which the parties will negotiate a Mutual Benefits Agreement regarding the Goldboro Gold Project. The MOU outlines the process for Signal Gold and the Assembly to establish an Agreement that reflects a desire to build a mutually beneficial relationship that will be sustained for the life of the Project. The first step in the process was to identify and discuss the Mi'kmaq's environmental concerns regarding the Project.

Signal Gold provides capacity funding to support the process toward the development of a Benefits Agreement. The Company continues to work in collaboration with KMKNO toward this agreement.

The ANSMC is comprised of all 13 Chiefs in NS and is the highest level of collective governance for the Mi'kmaq of Nova Scotia. Engagement planning for Indigenous Peoples primarily focused on the Mi'kmaq of Nova Scotia. However, it aligns with broader community engagement activities where appropriate. Like programs for community engagement, Mi'kmaq engagement plans allowed for flexibility based on feedback from the Mi'kmaq and ongoing development of the Project.

Signal Gold remains committed to the development of a Mutual Benefits Agreement and continues to provide capacity funding to support the process.

Meetings with KMKNO and the Signal Gold team, including specific discussions and/or information sharing regarding aspects of identifying and evaluating aspects of the natural and human environments including:

- Wetland delineation
- Archaeological resource impact assessment

- Mi'kmaq Ecological Knowledge Study (MEKS)
- Aquatic biology and fisheries
- Aquatic effects
- Climate and hydrology
- Mine rock and water geochemistry
- Ground water and surface water modelling
- Water quality
- Air quality
- Noise and light
- SAR habitat suitability
- Human Health and Ecological Risk Assessment
- Phase I/II Environmental Site Assessment
- Country foods
- Wildlife

3.3.1.1 Methods

The following methods have been used to engage with Mi'kmaq of Nova Scotia:

- Proactive sharing of baseline study data and files for KMKNO review prior to EARD submission
- Meetings with Paqtnkek Chief and Council and Signal Gold Goldboro Project team
- Regular email correspondence with KMKNO to provide updates
- Presentations by Signal Gold management team to ANSMC
- Meetings and Q&A opportunities with environmental consultants
- MOU signed with goal of developing a Mutual Benefits Agreement with the ANSMC for the benefit of the Mi'kmaq of Nova Scotia
- MOU includes capacity funding for Mi'kmaq consultation by KMKNO, which will inform the Mutual enefits Agreement including Mi'kmaq environmental priorities as well as social and economic factors
- Ongoing collaboration with KMKNO Benefits Advisor toward development of a Mutual Benefits Agreement
- Designated Signal Gold management representative as primary point of contact for all matters regarding Mi'kmaq rights, employment initiatives, etc.
- Website, email and other digital media for information-sharing

3.3.2 Engagement Activities and Key Issues Raised

Meetings have taken place with KMKNO, Paqtnkek First Nation, and other Indigenous organizations and the Signal Gold team since 2017 relating to discussions and/or information sharing regarding aspects of both the natural and human environments. Specifically, Signal Gold has met with KMKNO on numerous occasions in the past several years to summarize baseline fish conditions observed within the PA, discuss proposed methods to evaluate effects to fish and fish habitat and to share conclusions relating to impacts to fish and fish habitat, proposed mitigation measures and monitoring programs. Signal Gold has also introduced the MDMER Schedule 2 amendment process to the KMKNO, which is a required amendment to the regulation when mine waste is proposed to be placed directly on waters frequented by fish. The TMF will require addition to the Schedule 2 of the MDMER for this Project and Signal Gold has shared with KMKNO the process by which this will occur, and the role that the Indigenous community will play, including early engagement and required Consultation with ECCC. Signal Gold has also shared with the KMKNO the methodology of the technical Multiple Accounts Analysis (MAA) that is required to demonstrate the need for the placement of the TMF on waters frequented by fish. Signal Gold commits to continuing to meet with the Indigenous

community to share the results of this MAA and continue to engage relating to the on-going Schedule 2 amendment process.

Signal Gold has also met with MCG and UINR to collaborate relating to potential offsetting (restoration) opportunities for fish and fish habitat and wetlands considering proposed wetland and fish habitat losses required to support Project development. Signal Gold is interested in continuing to work with the Indigenous organizations and all interested Indigenous communities to implement Indigenous led or Indigenous partnerships relating to offsetting.

Signal Gold has met with KMKNO to review the results of baseline archaeological surveys completed to support Project development, as well as to review proposed Project approaches to ensure that necessary surveys/shovel testing is completed in advance of Project development to ensure that areas of proposed elevated potential for Mi'kmaq resources are cleared prior to construction. Archaeology reports have been shared with KMKNO. The MEKS completed for the Project has been shared with KMKNO, and Signal Gold commits to continue to share future technical reports with KMKNO and other Indigenous organizations.

Signal Gold has initiated engagement with the Native Council of Nova Scotia including Mi'kma'ki Environments Resource Developments Secretariat (MERDS), a division of The Maritime Aboriginal Peoples Council (MAPC) who engages with resource development companies and government agencies to ensure that the socio-economic concerns, issues, needs and interests of Aboriginal Peoples throughout traditional ancestral homelands (off *Indian Act* created reserves).

The Indigenous engagement log (Appendix C.3) provides an overview of the engagement and relationship process over a five-year period. It is not intended to reflect every communication/interaction but rather to reflect how engagement has progressed and been reflected in the development of the project.

Key Issues raised through Indigenous engagement are summarized in Table 3.3 1. A detailed Indigenous engagement log is provided in Appendix C.3. The log is indented to provide an overview of the engagement and relationship process over a five-year period. The detailed log is not intended to reflect every communication/interaction but rather to reflect how engagement has progressed and been reflected in the development of the Project.

Table 3.3-1 Key Issues Raised During Mi'Kmaq Engagement

Key Issue	Summary of Proponent Response	Primary EARD Reference
Dust from the Infrastructure and potential impacts to traditional practices including ingestion of dust by plants and animals	Minimization of air emissions with mitigation measures. Monitoring for air quality, including total suspended particulates, will be completed. Commitment to dust suppression (water and chemical treatment if required) to reduce impact. Completion of human health and ecological risk assessment (HHERA) to assure the communities that plants and animals are safe to eat and that water is safe for swimming.	5.1 Air 5.10 Socioeconomic Conditions
Elevated noise and light levels impacting hunting and other recreational practices near the mine	Signal Gold has worked with communities to understand how they use the land and whether elevated light and noise levels in proximity to the Project is a concern based on hunting patterns and recreational use. Implementation of measures to reduce noise and light during operations and from trucks to minimize impact.	5.2 Light 5.3 Noise 5.11 Indigenous Peoples
Quality of water being discharged into Gold Brook Lake and Gold Brook, and potential effect on fish and other aquatic species	Managing site water to centralized discharge location(s). Committed to water treatment when needed, prior to discharge. Committed to a robust monitoring program to confirm water quality. Committed to Indigenous participation in monitoring programs including Environmental Effects Monitoring in receiving waters.	5.6 Surface Water Resources
Impacts to fish and fish habitat, especially eel, and wetland habitat	Planning to reduce direct and indirect impact. Moving infrastructure to avoid wetlands and fish habitat including eel – example, WRSAs. Predictive modelling to understand how the mine operations may indirectly impact fish habitat and wetlands so that monitoring can be planned to confirm these predictions and adapt as required. Commitment to Offsetting Plans to compensate for lost fish habitat and wetland habitat, and Indigenous participation in plan development and implementation.	5.7 Wetlands 5.8 Fish and Fish Habitat
Reclamation Planning and concerns regarding timing for renewed access to the site after active mining is completed	The milling facilities will be removed, the pits will fill with water and disturbed surfaces covered/capped, as required, and then reclaimed with stockpiled topsoil and re-vegetated. The site will be returned to landowner for forestry and recreational use. Fencing will be utilized around the pits during filling to allow access to the surrounding reclaimed landscape as soon as is safely possible. Access can be regained once active reclamation has been completed (2-3 years after mining is completed). The landscape at this time will not be equivalent to baseline conditions, as the forested habitat will not have had time to re-establish, but it is expected that traditional practices can resume on the landscape.	2.4 Project Description 5.10 Socioeconomic Conditions

Table 3.3-1 Key Issues Raised During Mi'Kmaq Engagement

Key Issue	Summary of Proponent Response	Primary EARD Reference
Employee Accommodations	Signal Gold will design and construct the employee accommodations facility prioritizing women and safety, with regular communication with the Indigenous communities. Alcohol and drugs will not be permitted in the employee accommodations.	5.11 Indigenous Peoples
Employment and Training Opportunities for Indigenous community members	Signal Gold will prioritize hiring local people and Indigenous community members and are committed to developing training programs to allow for local and Indigenous people to be ready for the jobs when the Project is ready to construct.	5.11 Indigenous Peoples
Habitat loss from Project development, including forest, wetlands, flora and fauna	There is historical disturbance at the Project from forestry activities, and historical mining. The PA will be reclaimed at end of operation. Signal Gold will prepare a Wetland Compensation Plan, with participation from Mi'kmaq organizations, to offset wetland losses as a result of Project development. Permitting may be required for SAR, and any monitoring requirements will be determined during permitting, in consultation with NSDNRR. Signal Gold has prepared a Lichen Management Plan. Habitat loss is limited to the temporal scale of the Project (15 years) and reclamation will take place to revegetate WRSA, TMF and reclaimed areas	5.7 Wetlands 5.9 Terrestrial Environment
Legacy contamination issues. Long term storage and safety of tailings and other contamination	The loss of access within the PA is for a 15 year timeframe and has been communicated to the Mi'kmaq. Reduce mine site footprint through infrastructure placement and planning. The area east of Gold ro ok is used by the Mi'kmaq for traditional practices. Signal Gold has planned bypass roads to allow for continued access east of the PA. Wetland and fish habitat restoration will be completed to compensate for lost wetland and fish habitat. Commitment to reclamation with Mi'kmaq participation in planning and implementation to restore habitats and allow traditional practices to resume within the PA. Re-vegetation with a native mix of plants determined in consultation with Mi'kmaq communities.	2.3 Historic and Current Mining Activity 5.4 Geology, Soil and Sediment

Table 3.3-1 Key Issues Raised During Mi'Kmaq Engagement

Key Issue	Summary of Proponent Response	Primary EARD Reference
Loss of habitat and access to mine sites to undertake traditional practices, such as hunting, harvesting, fishing	The loss of access within the PA is for a 15 year timeframe and has been communicated to the Mi'kmaq. Reduce Project footprint through infrastructure placement and planning. The area east of Gold ro ok is used by the Mi'kmaq for traditional practices. Signal Gold has planned bypass roads to allow for continued access east of the PA. Wetland and fish habitat restoration will be completed to compensate for lost wetland and fish habitat. Commitment to reclamation with Mi'kmaq participation in planning and implementation to restore habitats and allow traditional practices to resume within the PA. Re-vegetation with a native mix of plants determined in consultation with Mi'kmaq communities.	5.9 Terrestrial Environment 5.11 Indigenous Peoples
Request for ongoing engagement with the Mi'kmaq of Nova Scotia	Signal Gold is committed to ongoing Mi'kmaq engagement and participation for the life the Project – prior to, during and post EA. This includes communication and information sharing, face-to-face meetings, discussion of impacts and mitigations, and any other issues that may arise as the Project develops.	3.3 Indigenous Engagement 5.11 Indigenous Peoples
Duration and impact on Mi'kmaq Rights related to land access	Signal Gold will take measures to do incremental remediation throughout the life of the Project to provide access to area as soon as safe to do so.	2.4.3 Project Description
Recognition of 7 Generations Principle	Signal Gold will take measures to do incremental remediation throughout the life of the Project to provide access to area as soon as safe to do so.	2.4.3 Project Description
Incorporation of Traditional Knowledge in Environmental Management and Monitoring	Signal Gold is seeking collaborative opportunities to incorporate traditional knowledge into environmental monitoring in particular.	5.11 Indigenous Peoples
Mi'kmaq Cultural Awareness Training	Signal Gold will implement a Mi'kmaq developed and Mi'kmaq lead educational module as a requirement for every person employed at the Goldboro Gold Project.	5.11 Indigenous Peoples
Review of corporate policies and practices	Signal Gold will review corporate policies and practices including those related to respectful workplace and environmental monitoring, to ensure the consideration of Mi'kmaq culture.	5.11 Indigenous Peoples

3.3.3 Ongoing Indigenous Peoples Engagement

Signal Gold respects the Consultation Process between Mi'kmaq of Nova Scotia and the Government, noting that the . process formally commences after the EARD has been submitted. Signal Gold has placed a high priority on Mi'kmaq engagement which includes taking meaningful actions to understand and address Mi'kmaq priorities before submission of the EARD and Government Consultation. The goal is to ensure that matters of concern for Mi'kmaq, and opportunities to better inform the Project, are incorporated in the EARD document and ongoing Project design and development.

Information shared through ongoing Mi'kmaq engagement as well as completion of a MEKS in 2017 has been reflected in the design of the Project. A new MEKS is in progress and will reflect any new information or considerations related to the current Project footprint.

Signal Gold regularly exchanges information with KMKNO and representatives of Paqtnkek Mi'kmaw Nation. The process of developing a Mutual Benefits Agreement with respect to the Project is ongoing. Signal Gold maintains its commitment to work collaboratively with Mi'kmaq of Nova Scotia regarding environmental and cultural priorities, as well as social and economic opportunities throughout the life of the Project.

As matters of specific concern evolve (such as Employee Accommodations) Signal Gold envisions ongoing collaboration with Mi'kmaq to inform infrastructure and corporate policy decisions. This has already begun at an early stage. For example, Signal Gold has already committed to a "dry" facility, meaning that alcohol and recreational drugs will not be permitted. Other matters brought forward through conversation with Mi'kmaq include key card access, increased lighting, and appropriate space for cultural practices.

Signal Gold has recently become a member of Canadian Council for Aboriginal Business (CCAB). CCAB is a national, member-based business organization whose goal is to promote Aboriginal business opportunities and enable sustainable relationships. CCAB's Progressive Aboriginal Relations (PAR) certification program recognizes and supports continuous improvement in Aboriginal relations and is widely considered the premier certification program of its type. Signal Gold will commence the PAR certification program in 2022. Signal Gold will also register as a CCA 's Aboriginal Procurement Champion, which includes a commitment to enhancing Aboriginal procurement outcomes.

4. Environmental Effects Approach and Methods

4.1 Approach and Guiding Principles

The approach and methods for this EARD are based on requirements of the NS *Environment Act* and *Environmental Assessment Regulations*, particularly for a Class I Undertaking, as well as direction from the Guide to Preparing an EA Registration Document for Mining Developments in Nova Scotia, A Proponent's Guide to Environmental Assessment and the Proponent's Guide: The Role of Proponents in Crown Consultation with the Mi'kmaq of Nova Scotia.

4.1.1 Planning Tool

An EA is a planning tool used to develop projects in manner to avoid or mitigate possible negative environmental and socioeconomic effects and to maximize potential benefits. Use of the EA process early in the planning stages encourages proponents to develop projects in the most sustainable manner, including identification of issues, review of alternatives and modification of project design to meet regulatory requirements, minimize disturbance to the environment, and address stakeholder concerns and expectations.

4.1.2 Precautionary Approach

This EARD provides a detailed analysis of the environmental planning process for the Project. Signal Gold has applied a conservative (i.e., worst case scenario) approach to effects assessment through the following:

- Detailed information about the existing environment to establish baseline conditions and identify potential issues
- Results of modelling and other analyses to provide conservative science-based effects predictions
- Mitigation measures to avoid, minimize, or compensate for Project effects on the environment and communities
- Contingency plans to address worst-case scenario Project-related accidents and malfunctions
- Follow-up and monitoring programs to facilitate effects management and verify Project-related effects predictions
- Description of other projects in the area to identify possible intersections and potential effects

4.2 Scope of the Environmental Assessment

As described in detail in Chapter 2.0, the Goldboro Gold Project is an open pit mine, consisting of construction, operation, and closure phases. The Project is planned commence in 2023, pending regulatory approvals. The phases include construction – 2023/2024; operations – 2025-2032; closure – 2036-2051 including a post-closure monitoring program. EA methods are described below.

4.3 Overview of Methods

The methodology used to conduct the EA and describe the potential effects of the Project was developed to meet the requirements of the *Nova Scotia Environmental Assessment Regulations* made under the NS *Environment Act*. It incorporates information and learnings derived from:

- Proposed Project components and activities
- Applicable regulations, policies and guidelines
- Environmental and socioeconomic regulatory interests
- Knowledge of the biophysical and socioeconomic environments
- Engagement with the Mi'kmaq of Nova Scotia, stakeholders, and public consultation for this Project
- Experience with other current gold mining projects in NS
- Other legislative and regulatory requirements that apply to the Project

The following sections describe the general methodology used to conduct this effects assessment. This overview includes VC selection, Project boundaries, determination of significance, baseline conditions, results of engagement, Project VC interactions, effects prediction, mitigation measures, identification and characterization of residual effects, monitoring, and follow-up. The detailed methodology for each VC is described in the appropriate sections of Section 5.

4.3.1 Valued Components Selection

The selection of VCs was based on the consideration of the following:

- Technical aspects of the Project, including the nature and extent of Project activities
- Applicable federal, provincial, and municipal legislation, including species of conservation interest (SOCI) and SAR
- Regulatory guidance and requirements including discussions with representatives of regulatory agencies
- Concerns raised by stakeholders and the public
- Concerns raised by Indigenous Peoples
- Traditional ecological knowledge obtained through a MEKS
- Known physical, biophysical, and socioeconomic conditions and characteristics

- A review of publicly available information including EAs of similar projects

Table 4.3-1 identifies the VCs based on these considerations and provides rationale for their selection.

Table 4.3-1 Selection of VCs

VC	Rationale for Inclusion
Air	Dust will be emitted from blasting/extraction operations, crushing, and vehicle/machinery traffic on unpaved roadways throughout the construction and operations phases of the Project. GHG emissions will result from vehicle use and blasting during construction and operations.
Light	Changes (i.e., increases or changes in occurrence/timing) to ambient light levels will occur throughout construction and operations. Changes to artificial light have the potential to disturb nearby human communities and activities and/or to interrupt important life activities of fauna and birds.
Noise	Project-related noise will result from construction and operations activities. Changes to ambient noise levels have the potential to adversely affect fauna and birds by influencing patterns of important life activities.
Geology, Soil, and Sediment	Soil and sediment contamination may increase exposure for human health and ecological receptors. Soil erosion from Project activities may increase the potential for siltation of watercourses from surface water runoff.
Groundwater Resources	Changes to bedrock aquifers may limit groundwater or surface water recharge. Groundwater drawdown may adversely affect surface water quantity in adjacent watercourses and/or wetlands. Groundwater recharge is important for drilled and dug wells.
Surface Water Resources	Sediment and contaminants may be conveyed through stormwater runoff into various water systems (i.e., rivers, lakes, oceans) and groundwater through recharge.
Wetlands	Wetlands may be affected by development or changes to groundwater and surface water.
Fish and Fish Habitat	Fish habitat including surface water and wetlands fish may be affected by development or changes to groundwater and surface water.
Terrestrial Environment	Terrestrial habitat, fauna, flora, avifauna, SOCI, and SAR may be affected, either directly or indirectly, by Project activities.
Socioeconomic Conditions	The Project has the potential to provide benefits from direct, indirect and/or induced employment and procurement as well as tax revenue. Adverse Project effects may result from potential changes to air, light, noise, aesthetics, and traffic experienced by local communities.
Indigenous Peoples	The Project could result in conflicts with traditional land use.
Cultural and Heritage Resources	The Project may intersect with locations of cultural and heritage resources.

4.3.2 Project Boundaries

Boundaries established to define the scope or limits of the analyses of potential effects, encompass both the areas (spatial) and the times (temporal) in which it is reasonable to assume that effects from a project will interact with a VC. Boundaries may also be established that include possible political, social, and economic constraints (administrative boundaries) and limitations (technical) when trying to predict or measure changes to a VC.

4.3.2.1 Temporal Boundaries

The temporal boundaries represent the duration over which Project activities interact with each VC. These include phases of a project (e.g., construction, operation, closure), and duration of specific project activities. Generally, temporal boundaries encompass all Project activities but may vary depending on the VC being considered.

4.3.2.2 Spatial Boundaries

Spatial boundaries represent anticipated geographic limits that will aid in defining the scale and range of interactions between Project activities and VCs. Establishing suitable spatial boundaries facilitates consideration of all important potential effects. The following spatial boundaries will be used for this EA and described in detail in each VC.

PA

The PA encompasses the immediate area in which Project activities occur and are likely to cause direct and indirect effects to VCs. The PA includes the mine site and all associated infrastructure associated.

Local Assessment Area (LAA)

The LAA encompasses adjacent areas outside of the PA where Project related effects to VCs are reasonably expected to occur. Generally, the LAA is limited to the area in which Project activities are likely to have indirect effects on VCs; however, the size of the LAA can vary depending on the VC being considered, and the biological and physical variables present.

Regional Assessment Area (RAA)

The RAA encompasses all Project and VC interactions including effects on GHG emissions and the socioeconomic environment. The RAA may vary in size depending on the VC being considered, and the physical, biological, and socioeconomic variables present.

Additional spatial boundaries were used in the certain VCs where appropriate. Air, Light and Noise included the Proposed Property Boundary (PPB) as an additional spatial boundary for the purpose of the assessment. Further details are provided in Section 5.1, 5.2 and 5.3.

4.3.2.3 Administrative Boundaries

Administrative boundaries represent regulatory, public policy, and/or economic limitations identified for the Project. An example of a potential administrative boundary would be if an available dataset does not have the same spatial boundaries as the selected VC. This could cause potential constraints to the assessment of effects.

4.3.2.4 Technical Boundaries

Technical boundaries represent limits of the EA study team's ability to assess a VC. The limitations to measure, assess, and/or monitor effects of the Project on VCs may create gaps in knowledge and understanding related to key conclusions, therefore, limiting the EA study team's ability to confidently predict potential effects of the Project on a VC. An example of a technical boundary is the difficulty associated with sampling certain reclusive species. Technical limitations can also be associated with modelling and the possible margin of error in outputs.

4.3.3 Standards of Thresholds for Characterizing and Determining Significance of Effects

Criteria or established thresholds for determining the significance of predicted effects from Project activities may be based on regulations, standards, resource management objectives, scientific literature, and/or ecological processes. These criteria or thresholds were developed through the following:

- Applicable regulatory documents, environmental standards, guidelines, and/or objectives
- Consultation with appropriate regulatory agencies
- Information obtained in stakeholder consultation
- Available information on the status and characteristics of each VC
- Information regarding the outcomes from monitoring of previous projects

The resulting criteria are used to establish a threshold beyond which a predicted effect would be considered significant. Significance criteria has been defined quantitatively where possible, and qualitatively with supporting justifications where no standards exist. Significance criteria is defined in each VC in Section 5.

4.3.4 Baseline Conditions

Baseline conditions are presented for each physical, biophysical, and socioeconomic VC to characterize the existing environment, to establish an understanding of the receiving environment, and to provide sufficient context to enable an understanding of how the Project may affect existing environmental conditions. Inclusion of existing conditions is limited to that which is necessary to assess the effects of the Project and support the development of mitigation measures, monitoring and follow-up programs. Existing conditions consider the effects of past and current projects occurring within and outside of the PA.

Various methodologies were employed to obtain baseline conditions for each VC. Environmental field work and other studies have been ongoing since 2017 resulting in comprehensive knowledge base of lands in and around the PA.

4.3.5 Consideration of Consultation and Engagement Results

The results of public consultation and engagement with the Mi'kmaq of Nova Scotia have been considered in the environmental effects assessment, including the Signal Gold's commitments on mitigation and monitoring measures and proposed compliance and effects monitoring programs, as well as the Signal Gold's broader commitment to ongoing public consultation and Mi'kmaq engagement. Engagement with the Mi'kmaq of Nova Scotia, communities, and government agencies has been ongoing since 2017. Key issues/concerns raised during public consultation and Mi'kmaq engagement relating to Project activities effects are outlined for each VC.

4.3.6 Project-Environment Interactions

Interactions between Project activities, and the VCs outlined in this EARD may either be direct or indirect. Direct interactions between the Project and VCs can be logically expected to be based on a good understanding of Project activities, and existing physical, biophysical, and socioeconomic conditions and characteristics. Indirect interactions typically require an active pathway between Project activities and the VCs they are affecting. A pathway provides a link between a Project component or activity and VC and facilitates the interaction and potential effect.

To determine the potential direct and indirect interactions between Project activities and VCs, the EA Study Team (provided in Appendix A.2) conducted the following:

- Reviewed the anticipated components and activities required to construct, operate, and close the Project
- Selected those VCs that may have the potential to be directly or indirectly affected by Project activities through potential interactions

Table 4.3-2 presents the anticipated Project components and activities and interactions with the VCs.

Table 4.3-2 Potential Interactions Between Project Activities and VCs

Physical Activities	Valued Components											
	Air	Light	Noise	Geology, Soil, and Sediment	Groundwater Resources	Surface Water Resources	Wetlands	Fish and Fish Habitat	Terrestrial Environment	Socioeconomic Conditions	Indigenous Peoples	Cultural and Heritage Resources
Construction Phase												
Clearing, grubbing, and grading	X	X	X	X	X	X	X	X	X	X	X	X

Table 4.3-2 Potential Interactions Between Project Activities and VCs

Physical Activities	Valued Components											
	Air	Light	Noise	Geology, Soil, and Sediment	Groundwater Resources	Surface Water Resources	Wetlands	Fish and Fish Habitat	Terrestrial Environment	Socioeconomic Conditions	Indigenous Peoples	Cultural and Heritage Resources
Drilling and rock blasting	X		X	X	X	X	-	X	X	X	X	X
Topsoil, till, and waste rock management	X	X	X	X	X	X	X	X	X	X	X	X
Surface infrastructure installation and construction	-	-	X	X	X	X	X	X	X	X	X	X
Haul road construction	X	X	X	X	X	X	X	X	X	X	X	X
TMF construction	X	X	X	X	X	X	X	X	X	X	X	X
Collection ditch and settling pond construction	-	-	X	X	X	X	X	X	X	X	X	X
Watercourse and wetland alteration	-	-	-	X	X	X	X	X	X	X	X	X
Environmental monitoring	X	X	X	-	X	X	X	X	X	X	X	-
General waste management	X	-	X	X	X	X	-	X	X	X	X	-
Operations Phase												
Drilling and blasting	X	-	X	X	X	X	-	X	X	X	X	-
Open pit dewatering	-	X	-	X	X	X	X	X	-	X	X	-
Ore management	X	X	X	X	X	X	-	X	-	X	X	-
Waste rock management	X	X	X	X	X	X	X	X	X	X	X	-
Surface water management	-	-	-	X	X	X	X	X	X	X	X	-
Cyanide and reagent management	-	-	-	X	X	X	-	X	-	X	X	-
Petroleum products management	-	-	-	X	X	X	X	X	X	X	X	-
Site maintenance and repairs	X	X	X	X	X	X	-	X	-	X	X	-
Tailings management	X	X	X	X	X	X	-	X	X	X	X	-
Water treatment	-	-	-	X	X	X	-	X	-	X	X	-
Environmental monitoring	X	X	X	-	X	X	-	X	-	X	X	-
General waste management	X	-	X	X	X	X	-	X	X	X	X	-
Closure Phase												
Demolition	X	X	X	X	X	X	-	X	X	X	X	-
Earthworks	X	X	X	X	X	X	X	X	X	X	X	-
Water treatment	-	-	-	X	X	X	-	X	X	X	X	-
Environmental monitoring	X	X	X	-	X	X	-	X	X	X	X	-
General waste management	X	-	X	X	X	X	-	X	X	X	X	-

4.3.7 Effects Prediction

Potential Project-related effects are changes to the physical, biophysical, and/or socioeconomic environment resulting from Project activities. Interactions between VCs and Project activities described above form the basis of the effects assessment. Once interactions have been identified, changes to VCs as a result of the Project can be determined by evaluating predicted changes from existing conditions. The degree of scientific uncertainty related to the data and methods used to determine the potential effects is also documented.

4.3.8 Mitigation Measures

A variety of regulations, guidelines, and mitigation measures are typically available to avoid, minimize, or compensate for adverse effects of Project activities. These range from standard industry best management practices for construction and operation, policies and practices communicated through training programs, management plans, and/or engineering controls incorporated into the final Project design. Given the Proponent's experience with gold mining in Atlantic Canada, various mitigation measures were proactively incorporated into Project design to eliminate, reduce, and/or control the effects of Project activities on the environment as technically and economically feasible.

4.3.9 Residual Effects and the Determination of Significance

Residual effects to VCs are those predicted to remain after implementation of mitigation measures. Consideration of the magnitude, geographical extent, duration, frequency, and reversibility of residual effects is required to determine significance. Table 4.3-3 provides a description of effects characteristics and the varying degrees in which they can contribute to significance. Where possible, criteria are described quantitatively and if not, qualitatively.

Table 4.3-3 Characterization Criteria for Residual Environmental Effects

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Magnitude	The size or degree of the effects compared against baseline conditions or reference levels, and other applicable measurement parameters (i.e., standards, guidelines, objectives)	**Negligible (N)** – Differing from the average value for the existing environment/baseline conditions to a small degree, but within the range of natural variation and below a threshold value **Low (L)** – Differing from the average value for the existing environment/baseline conditions, outside the range of natural variation, and less than or equal to appropriate guideline or threshold value **Moderate (M)** – Differing from the existing environment/ baseline conditions and natural variation, and marginally exceeding a guideline or threshold value **High (H)** – Differing from the existing environment/ baseline conditions and natural variation, and exceeding a guideline or threshold value
Geographic Extent	The geographic area over or throughout which the effects are likely to be measurable	**PA** – the residual environmental direct and indirect **LAA** – Occurs beyond the PA and within the LAA **RAA** – Occurs beyond the PA and LAA and within the
Timing	Considers when the residual environmental effect is expected to occur. Timing considerations are noted in the evaluation of the residual environmental effect, where applicable or relevant.	**Not Applicable (N/A)** — seasonal aspects are unlikely to affect VC's (i.e., fisheries productivity). **Applicable (A)** — seasonal aspects may affect VC's (i.e., fisheries productivity).

Table 4.3-3 Characterization Criteria for Residual Environmental Effects

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Duration	The time period over which the effects are likely to last	**Short-Term (ST)** – effects are limited to occur from as little as 1 day to 12 months **Medium-Term (MT)** – effects can occur beyond 12 months and up to 3 years **Long-Term (LT)** – effects extend beyond 3 **Permanent (P)** – valued component unlikely to recover to baseline conditions
Frequency	The rate of recurrence of the effects (or conditions causing the effect)	**Once (O)** – effects occur once **Sporadic (S)** – effects occur at irregular intervals throughout the Project **Regular (R)** – effects occur at regular intervals throughout the Project **Continuous (C)** – effects occur continuously throughout the Project
Reversibility	The degree to which the effects can or will be reversed (typically measured by the time it will take to restore the environmental attribute or feature)	**Reversible (RE)** – VCs will recover to baseline conditions before or after Project activities have been completed. **Partially Reversible (PR) —** mitigation cannot guarantee a return to baseline conditions **Irreversible (IR)** – effects to VCs are permanent and will not recover to baseline conditions

In conjunction with the effects characteristics outlined in Table 4.3-3, the significance of the residual effects is determined based on the assigned standard or threshold for each VC.

4.4 Monitoring and Follow-up

Monitoring programs will be implemented to ensure regulatory compliance, details on the specific monitoring required for each VC are based on the potential effects identified. Follow-up is a process to verify the accuracy of predicted effects and determine the degree to which mitigation measures were successful in eliminating, reducing, or controlling those effects. The follow-up programs, will be carried out in conjunction with the proposed monitoring and will be used to determine if additional work or mitigation is required to address any adverse effect, should it be experienced.

5. Environmental Effects Assessment

5.1 Air

5.1.1 Rationale for Valued Component Selection

Air quality is provincially regulated via the *Air Quality Regulations*, which protect the health of workers. Air quality may also facilitate exposure of birds and fauna to particulate matter (PM) and contaminants through inhalation and/or ingestion. For this assessment, air quality is considered a VC due to existing regulations at the provincial and federal level and because of the effect air quality can have to human and ecological health.

NSECC regulates ambient total suspended particulates (TSP) in air, with guidelines for both 24-hour and annual average periods. TSP typically includes airborne particles up to 30, 40, or even 100 µm in aerodynamic diameter. The CCME has published the Canadian Ambient Air Quality Criteria, which include standards for $PM_{2.5}$ (particulate with aerodynamic diameter of 2.5 µm or less) for the 24-hr and annual averaging periods.

Climate change is known to be exacerbated by greenhouses gases (GHGs), which will be created through combustion of fuel during equipment operation, vehicle use, and blasting within the open pit. GHGs are the focus of provincial policies and regulations for the electricity sector. However, no province-wide standard exists for GHG emissions.

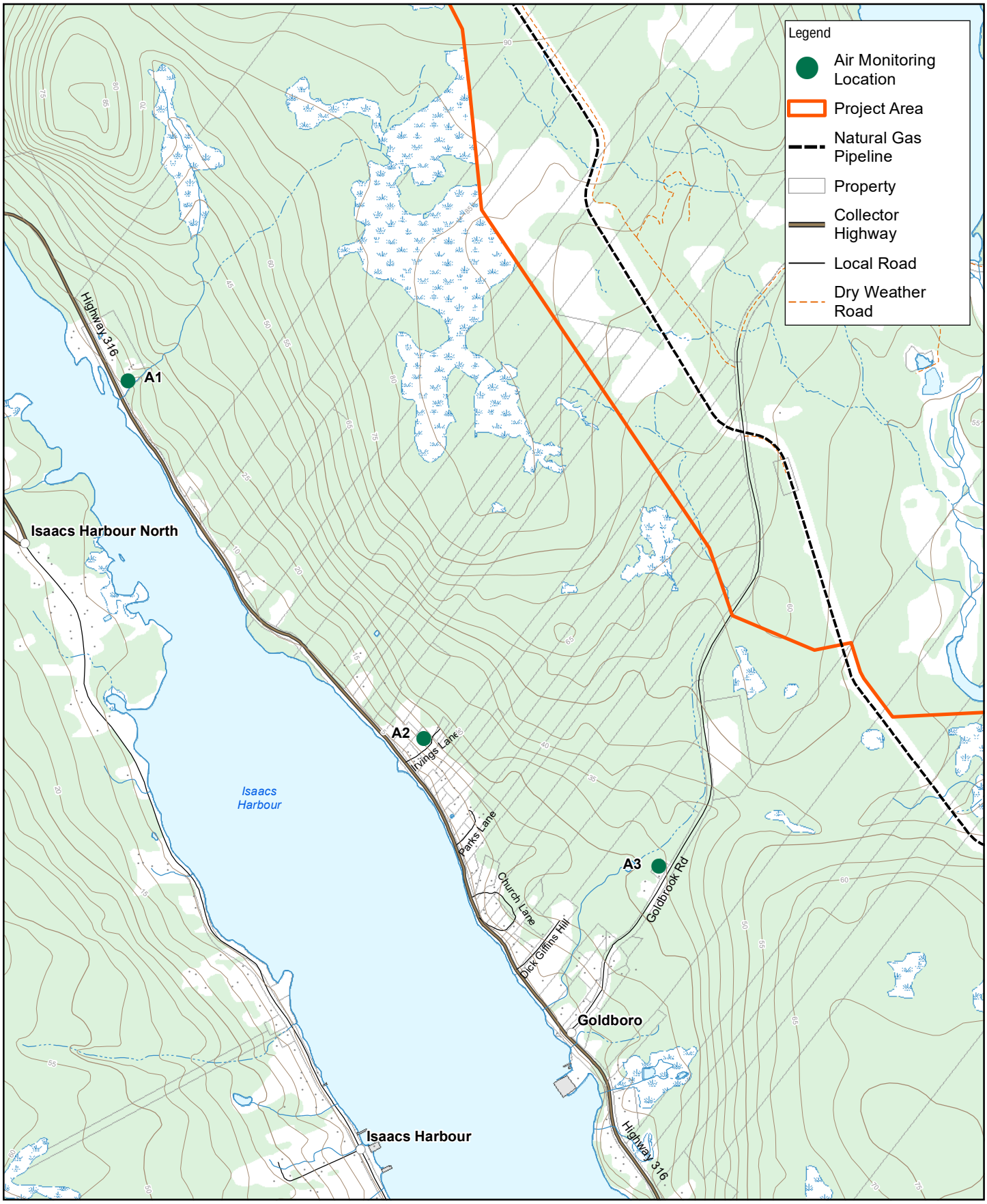
5.1.2 Baseline Program Methodology

A baseline air quality monitoring program was completed to determine concentrations of TSP, PM_{10} (particulate with aerodynamic diameter of 10 µm or less), and metals. The baseline monitoring program was conducted from July 17 to July 19, 2018 at three residential locations described in Table 5.1-1.

Table 5.1-1 Baseline Air Monitoring Locations

Receptor ID	Civic Address	Distance from Project
A1	13348 Highway 316	Approximately 1.01 km southwest of the PA
A2	19 Irvings Lane	Approximately 1.13 km southwest of the PA
A3	99 Goldbrook Road	Approximately 0.75 km southwest of the PA

Samples were collected over a 24-hour period. TSP and PM_{10} samples were collected according to the United States Environmental Protection Agency (US EPA) *Code of Federal Regulations* (CFR) 40 Part 50 – *Regulations for Ambient Particulate Sampling*. Baseline air quality monitoring locations are presented in Figure 5.1-1.



Paper Size ANSI A

0 150 300 450 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American Datum of 1983 (CSRS) version 6
Grid: NAD 1983 (CSRS) v6 UTM Zone 20N

N

GHD

SIGNAL GOLD INC.
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT

BASELINE AIR MONITORING LOCATIONS

Project No. 11222385
Revision No. -
Date 31/05/2022

FIGURE 5.1-1

N:\CA\Halifax\Projects\661\11222385\GIS\Maps\Deliverables\RPT03\11222385-RPT03_GIS-HX5.1-1_Air.mxd
Print date: 31 May 2022 - 13:39

Data source: GeoNOVA, GHD;. Created by: jjparks

5.1.3 Baseline Conditions

5.1.3.1 Baseline Ambient Air Quality

Results of the baseline air quality sampling program are presented in Table 5.1-2, below.

Table 5.1-2 Baseline Air Quality Results

Compound	Average Result (µg/m3)
PM_{10}	9.6
TSP	7.23
Total Aluminum	0.065
Total Antimony	0.00002
Total Arsenic	0.00013
Total Barium	0.082
Total Beryllium	0.00002
Total Boron	0.00003
Total Cadmium	0.000045
Total Chromium	0.0015
Total Cobalt	0.00003
Total Copper	0.244
Total Iron	0.0875
Total Lead	0.00002
Total Manganese	0.0015
Total Molybdenum	0.00003
Total Nickel	0.0015
Total Silver	0.000105
Total Strontium	0.00049
Total Thallium	0.00001
Total Tin	0.0015
Total Titanium	0.001
Total Uranium	0.00001
Total Vanadium	0.000155
Total Zinc	0.009655

All TSP concentrations recorded were beneath the maximum permissible ground level concentration of 120 µg/m^3 outlined in Schedule A of the NS *Air Quality Regulations*. TSP concentrations ranged from 6.2 to 8.1 µg/m^3, with the highest value being obtained at location A3.

In the absence of NS criteria, the analytical results for PM_{10} and metals in airborne particulates were compared to the Ontario Ambient Air Quality Criteria (AAQC) developed by the Ontario Ministry of the Environment (MOE). AAQC are set with different averaging times (e.g., 24 hour, 1 hour, 10 minute) appropriate for the effect that they are intended to protect against, which may be health, odour, vegetation, soiling, visibility, corrosion or other effects.

Baseline concentrations of PM_{10} and metals were reported below the MOE AAQC for all parameters measured. PM_{10} concentrations ranged from 8.0 to 11.5 µg/m^3, below the MOE AAQC of 50 µg/m^3. The highest PM_{10} value was recorded at location A2. Air contaminant concentrations recorded in the baseline sampling program are typical of a rural environment.

5.1.3.2 Climate and Meteorological Information

Several meteorological stations were reviewed to obtain data for air emission estimates and dispersion modelling. Port Hawkesbury (ECCC Station #8204495) was selected as the most appropriate surface dataset for this assessment as it is the closest station to the Project that records cloud cover, a necessary component in air dispersion modelling. Upper air data were retrieved from the National Oceanic and Atmospheric Administration (NOAA) radiosonde database for Sable Island, NS (NOAA, 2022). Hourly data generated from the two stations included many factors including wind speed, wind direction, temperature, ceiling height, and atmospheric stability that affect the dispersion of air compounds. A summary of the meteorological stations used in this assessment is provided in Table 5.1-3.

Table 5.1-3 Meteorological Stations

Station	Station #	Years	Distance from Project (km)
Port Hawkesbury	8204495	2010 – 2022	52
Sable Island	14642	2014 – 2018	191

The dominant wind direction at the Port Hawkesbury meteorological station is northwesterly. A wind rose generated from hourly wind recordings at the Port Hawkesbury station is presented in Figure 5.1-2, below.

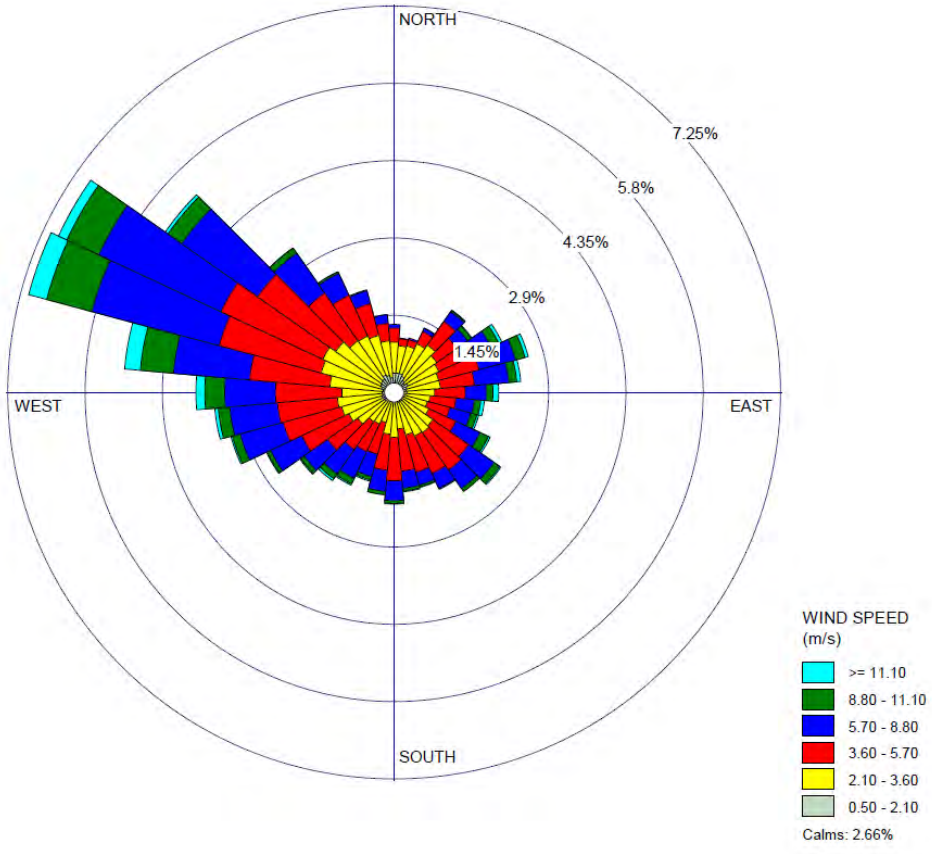


Figure 5.1-2 Wind Rose – Port Hawkesbury ECCC Station (2014 – 2018)

5.1.3.3 Greenhouse Gas Baseline Conditions

The National Pollutant Release Inventory (NPRI) is Canada's legislated and publicly accessible inventory of pollutant releases to air, water, and land. The NPRI is managed by ECCC and currently tracks over 200 substances and groups of substances. By the authority of the *Canadian Environmental Protection Act* (CEPA), owners or operators of facilities that meet NPRI reporting requirements published in the Canada Gazette, Part 1 are required to report to NPRI.

Accurate tracking of GHG emissions is an important part of assessing Canada's overall environmental performance. In March 2004, the Government of Canada announced the introduction of the GHG Emissions Reporting Program. All facilities that emit the equivalent of 50 kt or more of GHGs in carbon dioxide equivalent units (CO_2e) per year are required to report. Facilities with emissions falling below the threshold can voluntarily report GHG on emissions. Facilities in NS reported a total of 12,650 kt of CO_2e of GHG emissions in 2020.

In 2009, NSECC released the *GHG Emissions Regulations*, under Section 112 of the *Environment Act*, establishing GHG emission caps on the electricity sector. These regulations apply to any power generating facility located in the province that emits greater than 10 kt of CO_2e GHGs in a calendar year. The facility owner must submit an annual report no later than March 31 of the following year.

The ECCC document, "National Inventory Report 1990-2014: Greenhouse Gas Sources and Sinks in Canada – Part 3" (ECCC, 2016), indicated that the total GHG emissions from NS were identified to be 16,600 kt CO_2e during 2014.

The Project is in a relatively undeveloped rural area of Guysborough County, NS with limited industrial operations that would contribute to GHG emissions. The nearest facility reporting to the NPRI is the Point Tupper Generating Station, approximately 48 km northeast of the PA. Existing GHG emissions in the PA would be generated primarily through recreational vehicle usage, forestry operations, and current exploration activities.

5.1.3.4 Regional Ambient Air Quality

Ambient air quality in NS is monitored using a network of 13 monitoring stations operated by NSECC and ECCC through the National Air Pollution Surveillance (NAPS) Network. Common air pollutants monitored at these stations include sulfur dioxide (SO_2), TSP, PM_{10}, $PM_{2.5}$, carbon monoxide (CO), ozone (O_3), and oxides of Nitrogen (NO_x). Resulting data is used by NSECC to report the Air Quality Index (AQI) and by ECCC to report the Air Quality Health Index (AQHI). No permanent air monitoring stations are currently within the vicinity of the Project.

Continuous monitoring data were obtained from the NAPS Network for 2014 to2016, which are the most recent three years for which all data were available. The nearest representative stations that report substances of interest for the air emission estimates and dispersion modelling for this Project are:

- Lake Major, NS (station ID 030120) – $PM_{2.5}$
- Port Hawkesbury, NS (station ID 030201) – $PM_{2.5}$
- Aylesford Mountain, NS (station ID 030701) – $PM_{2.5}$
- Pictou, NS (station ID 030901) – $PM_{2.5}$

PM_{10} is not measured in many areas in Canada. Of the locations that measure PM_{10}, most are in British Columbia urban centres, four are in Manitoba cities, one is in Regina, Saskatchewan, and four are in the Northwest Territories. Data from the Norman Wells NW Regional Office (Station ID 129102) in Northwest Territories, which appears to be the most comparable location to the PA (i.e., human habitation, regional activities that may generate airborne particulate, etc.), was included to provide context for PM_{10} and $PM_{2.5}$ in this assessment.

The Project's rural location has limited industrial operations that would affect air quality. As the NAPS monitoring stations are in areas with industrial development (in Pictou and Port Hawkesbury), measured concentrations of contaminants would likely be lower at Goldboro and would likely be similar to those reported at the Aylesford monitoring station.

5.1.4 Consideration of Consultation and Engagement Results

Signal Gold has undertaken an engagement and consultation program with the Mi'kmaq of Nova Scotia, stakeholders, regulators, and the public. These activities are described in more detail in Section 3. Throughout this process, various issues, concerns, and opportunities have been identified in relation to the Goldboro Gold Project. These matters have been considered within the context of this VC to help understand potential effects of the Project on the biophysical and socioeconomic environment and inform consideration of possible mitigation measures. For the air VC, identified concerns include:

- Concern about elevated dust in proximity to the proposed mine, especially along Goldbrook Road

5.1.5 Effects Assessment Methodology

5.1.5.1 Boundaries

5.1.5.1.1 Spatial Boundaries

The spatial boundaries used for the assessment of effects on air quality and GHGs are defined below:

- The PA encompasses the immediate area in which Project activities may occur and includes infrastructure associated with the mine site plus a buffer of 100 – 200 m.
- The LAA encompasses an area 15 km from the PA in all directions.
- The RAA for air quality encompasses an area 35 km from the PA in all directions denoting the potential maximum zone of influence. The RAA for GHGs encompasses the province of NS.
- Impacts to air quality were also assessed at the PPB. Land required for Project development is comprised of both private and Crown properties. Private property transactions and Crown Land Lease Applications are on-going.

As the Project has the potential to cause direct and indirect effects on air quality outside of the PA, the LAA is the most appropriate spatial boundary. In terms of GHGs, as the Project has the potential to cause direct and indirect effects, as well as cumulative effects compounded spatially and temporally from other Projects, the RAA is the most appropriate spatial boundary. Spatial boundaries defined for the air quality effects assessment are presented in Figure 5.1-3.

5.1.5.1.2 Temporal Boundaries

The temporal boundary used for the assessment of effects on ambient air quality and GHGs is the operations phase of the Project. The operations phase is anticipated to be of longer duration than construction, and the number of vehicles, extraction rates, and material processing rates will be higher during operations than during construction. It is therefore expected that the operations phase represents the worst-case scenario.

5.1.5.1.3 Technical Boundaries

No technical boundaries were identified for the effects assessment of air quality or GHGs.

5.1.5.1.4 Administrative Boundaries

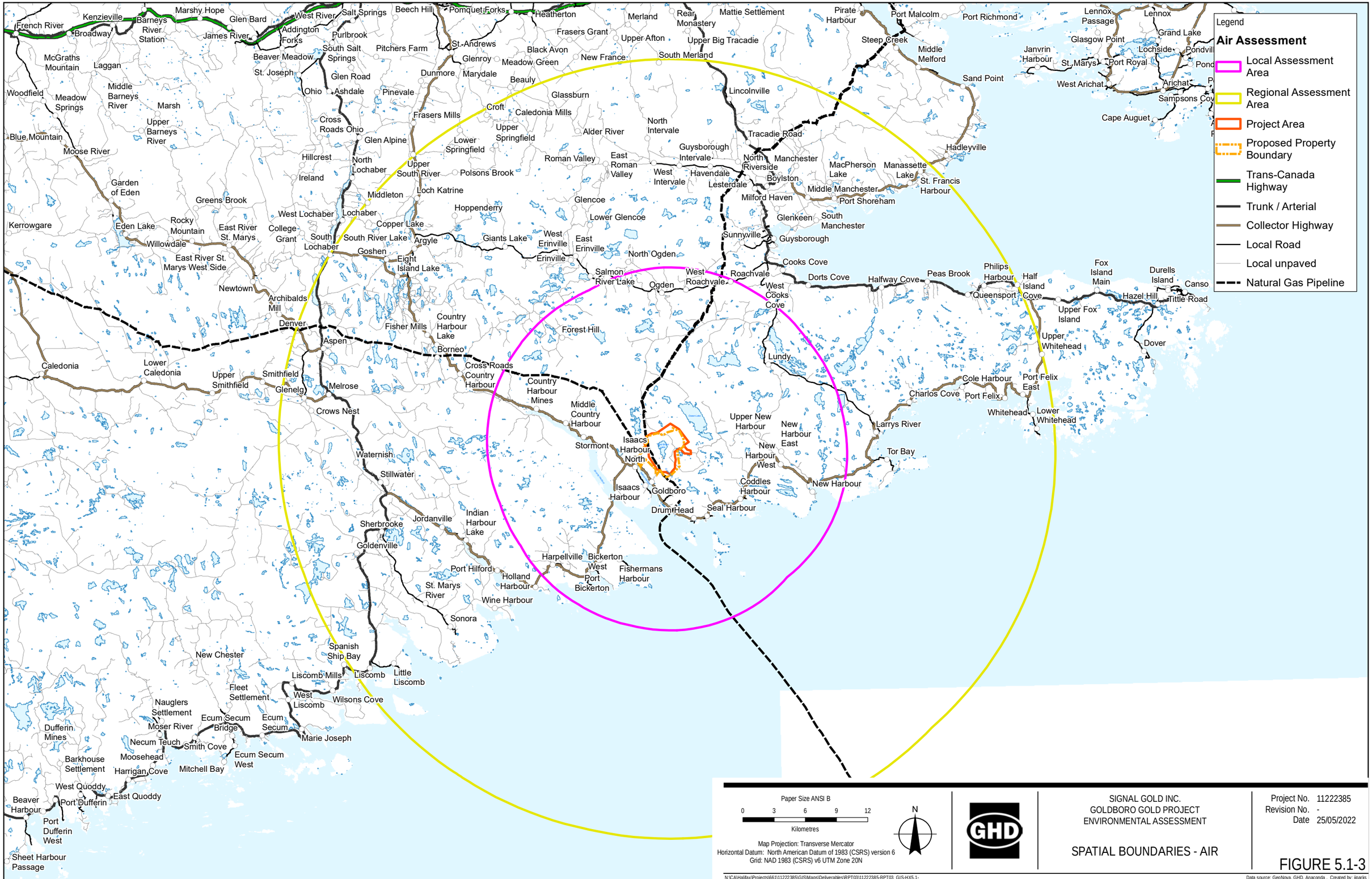
Impacts to air quality resulting from the Project were assessed according to the assessment criteria listed in Table 5.1-4, below. Maximum permissible ground level concentrations provided in the NS Air Quality Standards were applied in this assessment. Additional contaminant concentration limits from the Ontario Ambient Air Quality Criteria (AAQC) and Canadian Ambient Air Quality Standards (CAAQS) were applied in the absence of NS criteria (i.e., PM_{10} and $PM_{2.5}$).

Table 5.1-4 Air Quality Assessment Criteria

Contaminant	Averaging Period	Maximum Permissible Ground Level Concentration	
		$\mu g/m^3$	Comment
Carbon Monoxide	1 hour	34,600	-
	8 hours	12,700	-
Hydrogen Sulfide	1 hour	42	-
	24 hours	8	-
Nitrogen Dioxide	1 hour	400	-
	Annual	100	-
Ozone	1 hour	160	-
PM_{10}	24 hours	50	AAQC
Sulphur Dioxide	1 hour	900	-
	24 hours	300	-
	Annual	60	-
TSP	24 hours	120	-
	Annual	70	-
$PM_{2.5}$	24 hours	27	CAAQS
$\mu g/m^3$ – micrograms per meter cubed			

NSE released the *GHG Emissions Regulations* in 2009, under Section 112 of the *Environment Act*, establishing GHG emission caps on the electricity sector. These regulations apply to any facility located in NS that emits greater than 10 kt of CO_2 equivalent GHGs in a calendar year. The facility may be required to report to the NPRI, an inventory of pollutant releases to air, water, and land. There exists no province-wide standard for GHG emissions.

There may be other requirements for monitoring of the atmospheric environment through provincial approvals to be obtained prior to the start of the Project, specifically an IA.


Legend
Air Assessment
Local Assessment Area
Regional Assessment Area
Project Area
Proposed Property Boundary
Trans-Canada Highway
Trunk / Arterial
Collector Highway
Local Road
Local unpaved
Natural Gas Pipeline
French River
Kenzieville
Broadway
Barneys River Station
Marshy Hope
James River
Glen Bard
West River
Salt Springs
Addington Forks
Purlbrook
Beech Hill
Pomquet Forks
Heatherton
Merland
Rear Monastery
Mattie Settlement
Pirate Harbour
Port Malcolm
Port Richmond
Lennox Passage
Lennox
Grand Lake
Glasgow Point
Lochside
Pondville
McGraths Mountain
Laggan
Beaver Meadow
South Salt Springs
Pitchers Farm
St.-Andrews
Glenroy
Meadow Green
Black Avon
New France
Frasers Grant
Upper Afton
Upper Big Tracadie
South Merland
Steep Creek
Middle Melford
Janvrin Harbour
St. Marys
Port Royal
West Archat
Archat
Sampsons Cove
Cape Auguet
Sand Point
Lincolnville
Woodfield
Meadow Springs
Middle Barneys River
Marsh
Upper Barneys River
Blue Mountain
Moose River
St. Joseph
Glen Road
Ohio
Ashdale
Pinevale
Dunmore
Marydale
Beauly
Glassburn
Croft
Caledonia Mills
Frasers Mills
Cross Roads Ohio
Glen Alpine
Upper Springfield
Lower Springfield
Alder River
North Intervale
Tracadie Road
Guysborough Intervale
Hadleyville
Hillcrest
Ireland
North Lochaber
Upper South River
Polsons Brook
Roman Valley
East Roman Valley
West Intervale
Havendale
Lesterdale
North Riverside
Manchester
Boylston
MacPherson Lake
Manassette Lake
St. Francis Harbour
Middle Manchester
Port Shoreham
Milford Haven
Garden of Eden
Greens Brook
Middleton
Loch Katrine
Glencoe
Lower Glencoe
Hoppenderry
West Lochaber
Lochaber
Copper Lake
Kerrowgare
Eden Lake
Rocky Mountain
East River St. Marys
College Grant
South Lochaber
South River Lake
Argyle
Giants Lake
West Erinville
East Erinville
Erinville
Glenkeen
South Manchester
Sunnyville
Guysborough
Willowdale
Goshen
Eight Island Lake
East River St. Marys West Side
North Ogden
Salmon River Lake
Ogden
West Roachvale
Roachvale
Cooks Cove
Dorts Cove
Halfway Cove
Peas Brook
Philips Harbour
Queensport
Half Island Cove
Fox Island Main
Durells Island
Canso
Tittle Road
Hazel Hill
Upper Fox Island
Upper Whitehead
Dover
Newtown
Archibalds Mill
Denver
Aspen
Fisher Mills
Country Harbour Lake
Forest Hill
Borneo
Lundy
Caledonia
Lower Caledonia
Upper Smithfield
Smithfield
Glenelg
Melrose
Cross Roads Country Harbour
Country Harbour Mines
Middle Country Harbour
Crows Nest
Cole Harbour
Port Felix East
Charlos Cove
Port Felix
Whitehead
Lower Whitehead
Upper New Harbour
New Harbour East
Larrys River
Tor Bay
New Harbour West
Coddles Harbour
New Harbour
Isaacs Harbour North
Stormont
Isaacs Harbour
Goldboro
Drum Head
Seal Harbour
Waternish
Stillwater
Sherbrooke
Jordanville
Indian Harbour Lake
Goldenville
Harpellville
Bickerton West
Port Bickerton
Fishermans Harbour
Port Hilford
Holland Harbour
St. Marys River
Wine Harbour
Sonora
New Chester
Spanish Ship Bay
Liscomb Mills
Liscomb
Little Liscomb
Fleet Settlement
West Liscomb
Wilsons Cove
Nauglers Settlement
Moser River
Ecum Secum Bridge
Ecum Secum
Marie Joseph
Dufferin Mines
Necum Teuch
Smith Cove
Moosehead
Ecum Secum West
Barkhouse Settlement
Harrigan Cove
Mitchell Bay
West Quoddy
East Quoddy
Beaver Harbour
Port Dufferin
Port Dufferin West
Sheet Harbour Passage
Paper Size ANSI B
0 3 6 9 12
Kilometres
N
Map Projection: Transverse Mercator
Horizontal Datum: North American Datum of 1983 (CSRS) version 6
Grid: NAD 1983 (CSRS) v6 UTM Zone 20N
GHD
SIGNAL GOLD INC.
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT
SPATIAL BOUNDARIES - AIR
Project No. 11222385
Revision No. -
Date 25/05/2022
FIGURE 5.1-3
N:\CA\Halifax\Projects\661\11222385\GIS\Maps\Deliverables\RPT03\11222385-RPT03_GIS-HX5.1-3_Air_SB.mxd
Print date: 31 May 2022 - 13:44
Data source: GeoNova, GHD, Anaconda . Created by: jjparks

5.1.5.2 Air Dispersion Modelling

Air dispersion modelling was performed using the US EPA multi source dispersion model AERMOD, following a modified methodology as described in the Air Dispersion Modelling Guideline for Ontario and in Ontario Regulation 419/05 (O. Reg. 419/05) (MOE, 2017). The Province has no guidance on the use of air dispersion models, therefore the Ontario O. Reg. 419/05 requirements were used as a framework. The air dispersion model and methodology used in this assessment are currently accepted in Ontario, and AERMOD is accepted in multiple provinces and territories, as well as in the US. AERMOD, which is an advanced steady state plume model with the capability of incorporating building cavity downwash, actual source parameters, emission rates, terrain, and historical meteorological information to predict ground level concentrations (GLCs) at specified locations, has been peer reviewed and compared both to other models and monitoring data.

Five years (2014-2018) of unprocessed hourly meteorological data were obtained from the Port Hawkesbury station and applied in the air dispersion model. Upper air data (radiosonde, Sable Island) was sourced from NOAA. Historical meteorological data, upper air data, and the Earth Observation for Sustainable Developments of Forests (EOSD) land use characteristics were processed using AERMET version 19191. The hourly data generated included many factors, which affect dispersion of air compounds including wind speed, wind direction, temperature, ceiling height, and atmospheric stability.

Contaminants assessed in the air dispersion modelling included TSP, PM_{10}, and $PM_{2.5}$, NO_x, SO_2, and CO. Air compounds were modelled with appropriate averaging periods based on their respective air quality criteria. A ground level receptor grid with 10 m spacing was used to evaluate maximum concentration at the Property Boundary. Modelling was also completed for selected residential receptors with potential to be impacted by air emissions.

Further detail on the methodology applied in the air emissions estimates and dispersion modelling completed for the Project is provided in the Air Emissions Assessment report in Appendix D.1.

5.1.5.3 Greenhouse Gas Assessment

Sources of GHG emissions were considered for each phase of the Project (construction, operations, and closure). The primary sources of emissions from each phase are stationary and mobile fuel combustion sources. These fuel combustion GHG-specific emissions include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). GHG emissions that would be generated from explosives used in rock blasting during construction and operations were also considered. Emulsion explosives will be used for rock blasting.

Other key assumptions used as part of the GHG emission estimates include:

- Sources of stationary and mobile combustion are operational 24 hours per day during the operations phase of the Project. It is estimated there will be only 52% of valuable production time (i.e., 4,563 hours in a year) after consideration of 85% of mechanical availability, 21% of operational delays, 15 days of weather delays in a year, and an 82% efficiency factor.
- The primary source of GHG emissions is from combustion of diesel and propane. Estimates for fuel use have been made for the construction, operations, and closure phases. Diesel is primarily used as fuel for the haul trucks and mining equipment. Propane is used as heating fuel for operation of the furnace and kiln in the gold room and carbon elution areas.
- For GHG estimation, peak weekly fuel consumption of 190,000 L of diesel and 81,830 L of propane is used for maximum production year (Year 5), and proportionally distributed for the remaining years in operations.
- The emulsion used during the operations phase was estimated to be approximately 2,176 t/yr during peak mining activity based on at similar sites.
- Exact details pertaining to equipment that will be used for construction and closure phases was not available at the time of this GHG report preparation. Based on similar sites, construction phase GHG emissions were estimated to be 15% of the GHG emitted during the peak year of operations (Year 5); similarly closure phase GHG emissions were estimated to be 39% of the GHG emitted during the peak year of operations.

Further detail on the methodology applied in the GHG assessment completed for the Project is provided in Appendix D.2.

5.1.5.4 Thresholds for Determination of Significance

5.1.5.4.1 Air Quality

The characterization criteria applied in the air quality effects assessment are detailed in Table 5.1-5, below.

Table 5.1-5 Characterization Criteria for Air Quality Effects

Characterization	Quantitative Measure or Definition of Qualitative Categories
Magnitude	**N** – background air contaminant concentrations met at the PPB **L** – air contaminant concentrations exceed background levels beyond the PPB but comply with guidelines **M** – air quality contaminant concentrations exceed guidelines beyond the PPB but comply with guidelines at residences **H** – air quality contaminant concentrations exceed guidelines at residences
Geographic Extent	**PA** – direct and indirect effects from Project activities are restricted to the PA **PPB** - direct and indirect effects from Project activities are restricted to the PPB **LAA** – indirect effects from Project activities are restricted to the local assessment area **RAA** – effects from Project activities extend beyond the PAA and LAA to affect a more diffuse and longer-range geographic area
Timing	**N/A** – seasonal aspects are unlikely to affect air quality **A** – seasonal aspects may affect air quality
Duration	**ST** – effects are limited to occur from as little as 1 day to 12 months **MT** – effects can occur beyond 12 months and up to 3 years **LT** – effects extend beyond 3 years **P** – air quality unlikely to return to baseline conditions
Frequency	**O** – effects occur once **S** – effects occur at irregular intervals throughout the Project **R** – effects occur at regular intervals throughout the Project **Continuous (C)** – effects occur continuously throughout the Project
Reversibility	**RE** – air quality will return to baseline conditions before or after Project activities have been completed. **PR** – mitigation cannot guarantee a return to baseline conditions **IR** – effects to air quality are permanent and will not recover to baseline conditions

A significant adverse effect from the Project with respect to air quality is defined as:

- An exceedance of the NS Air Quality Standards at a residential or commercial location outside of the PPB resulting from Project activity.

5.1.5.4.2 Greenhouse Gases

The NS *Environmental Goals and Sustainable Prosperity Act* (EGSPA), requires a reduction in provincial GHGs of at least 10% below 1990 levels by the year 2020. The EGSPA specifically targets reductions to emissions from the electricity generation sector, which is responsible for approximately half of the province's GHG emissions. To achieve these reductions, NS has imposed emission caps on the electricity generation sector for 2025 and 2030 and is working to increase efficiency in the transportation sector. The transportation sector generates about a quarter of the province's GHG emissions. The EGSPA will be replaced with the *Sustainable Development Goals Act*, which was introduced in the NS legislature in 2019. Regulations are currently in development.

A significant adverse effect from the Project with respect to GHG emissions is defined as:

- Peak annual Project-related GHG emissions greater than 1% of the province-wide GHG emissions in NS recorded in 2020.

5.1.6 Project Interactions and Potential Effects

Project activities have the potential to result in changes to air quality (dust and particulates) and in GHG emissions with potential climate effects. Dust and exhaust type emissions will be generated during the construction, operation, and closure phases of the Project. Vehicle and machinery operations can contribute to an overall increase in dust, as well as increased emissions of GHGs.

Potential Project interactions with air are presented in Table 5.1-6, below.

Table 5.1-6 Project Activities and Air Interactions

Project Phase	Duration	Relevant Project Activity
Construction	2 years	- Clearing, grubbing, and grading - Drilling and rock blasting - Topsoil, till, and waste rock management - Haul road construction - TMF construction - Environmental monitoring - General waste management
Operations	11 years	- Drilling and blasting - Ore management - Waste rock management - Site maintenance and repairs - Tailings management - Environmental monitoring - General waste management
Closure	24 years	- Demolition - Earthworks - Environmental monitoring - General waste management

5.1.6.1 Air Dispersion Modelling

Based on the estimated maximum emissions scenario evaluated in the air dispersion modelling, the maximum ground level air concentrations of all modelled contaminants (TSP, PM_{10}, and $PM_{2.5}$, NO_x, SO_2, and CO) are predicted to meet the assessment criteria for all averaging periods at the residential receptors and the PPB. Assuming appropriate mitigation to minimize dust generation and transport, effects on air quality are anticipated to be low during all phases of the Project. Predicted concentrations and dispersion of all modelled air contaminants are described in detail in the Air Emissions Assessment report provided in Appendix D.1.

5.1.6.2 Greenhouse Gas Assessment

The estimated GHG emissions over the life of the Project are presented in Table 5.1-7.

Table 5.1-7 Estimated GHG Emissions

Phase	Period	GHG	Phase Emissions	
			(tonnes)	(tonnes CO_2e)
Construction	1 year	CO_2	4,697.04	4,807.96
		CH_4	0.10	
		N_2O	0.36	
Operations	12 years	CO_2	242,102.01	248,189.66
		CH_4	6.05	
		N_2O	19.92	
Closure	1 year	CO_2	12,484.60	12,799.90
		CH_4	0.31	
		N_2O	1.03	

CH_4 – Methane
CO2e – Carbon dioxide equivalents
N_2O – Nitrous oxide

NS reported 12,650 kt of CO_2e of GHG emissions in 2020. Based on the GHG assessment conducted for the Project, the peak annual emission is estimated to be 33.08 kt of CO_2e, approximately 0.26% of the reported 2020 GHG total for NS. The average annual emissions over the life of the Project are estimated to be 18.98 kt of CO_2e approximately 0.15% of the reported 2020 GHG total for NS. A detailed GHG study report is provided in Appendix D.2.

5.1.7 Mitigation

Air quality mitigation measures planned for the Project are detailed in Table 5.1-8, below.

Table 5.1-8 Air Mitigation Measures

Project Phase	Mitigation Measure
Construction	Haul roads and infrastructure will be designed to reduce haul distances where possible.
Construction, Operations, and Closure	A Fugitive Dust Best Management Practices Plan (Appendix D.3) will be implemented for the Project. The Plan will specify mitigation measures to manage and reduce fugitive dust emissions during all Project phases.
	During dry periods, water and/or dust suppressants will be applied to the access road, site roads and haul roads as needed to mitigate dust emissions. Watering may be repeated several times a day if required, depending on surface and meteorological conditions. Water used for dust suppression will be sourced from Project contact water (with suitable water chemistry) and not sourced from natural waterbodies. Emissions calculations for haul road particulates were completed based on a 95% road dust mitigation scenario.
	When dumping either waste rock or organic material/till, drop heights will be reduced to be as close to the pile as possible to limit dust generation.
	Surfaces of organic material and till stockpiles will be stabilized during extended periods between usage by means of vegetating or covering exposed surfaces.
	Equipment, vehicles and haul trucks will be maintained in good working order. To reduce emissions, idling times and cold starts will be reduced to the extent possible.
	Project vehicles will be required to comply with established speed limits to limit fugitive dust generation from vehicle travel on unpaved roads. Speed limits will be set in accordance with provincial regulations and industry standards.

5.1.8 Monitoring and Follow-up

The NPRI is a federally administrated program that collects data on annual emissions of substances released to air, water and land, as well as transfers of substances for disposal or recycling. NPRI reporting is a requirement of subsection 46(1) of the CEPA. Signal Gold is aware of the legislation and will comply with reporting requirements, as applicable. Monitoring of particulate emissions will be conducted as required by NSECC. Dust monitoring will take place at drier times to gauge the effectiveness of dust suppression mitigation.

Prior to beginning of construction, dustfall samples will be taken according to the ASTM Standard Test Method for Collection and Measurement of dustfall to establish a baseline for dust quantities in the area. Samples will be collected to the north, south, east, and west of the Project. Dust samples will be collected on a quarterly basis to capture seasonal changes in weather and environmental conditions, or as new construction activity commences. Dust sample analysis will be completed by a third-party laboratory.

On-going air quality monitoring will occur over the life of the Project with comparison made to baseline air quality conditions and the Maximum Permissible GLCs listed in Schedule A of the NS *Air Quality Regulation*s.

5.1.9 Company Commitments

Signal Gold will maintain a clear line of communication through the Mine Manager or Health and Safety Manager for dust complaints to be recorded. Air quality monitoring stations can be set up at any time throughout the life of the Project should dust complaints arise and levels will be compared to background values and guidelines.

5.1.10 Residual Effects and Significance

A significant adverse effect on the Air VC was defined in Section 5.1.6 as:

- A Project-related exceedance of the NS Air Quality Standards at a residential or commercial location outside of the PPB resulting from Project activity.

The predicted residual environmental effects of the Project on air quality and GHGs are assessed to be adverse, but not significant. However, after appropriate mitigation measures have been implemented, the overall residual effect of the Project on air quality and GHGs is assessed as not likely to have significant adverse effects, as summarized in Table 5.1-9.

Table 5.1-9 Residual Effects for Air

Project Phase	Mitigation and Compensation Measures	Nature of Effect	Residual Effects Characteristics						Residual Effect	Significance
			Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility		
Construction – drilling, blasting, haul road construction, and TMF construction	Dust suppression, regular equipment maintenance, stockpile stabilization	A	L Air contaminant concentrations exceed background levels beyond the PPB but comply with guidelines	LAA	A	MT Construction will occur between 18 months and 2 years.	C	RE	Increased ambient air pollutant concentrations and dust generation	Not significant
Operations – drilling, blasting, ore and waste rock management	Dust suppression, regular equipment maintenance, stockpile stabilization	A	L Air contaminant concentrations exceed background levels beyond the PPB but comply with guidelines	LAA	A	LT Occurring during operations (11 year)	C	RE	Increased ambient air pollutant concentrations and dust generation	Not significant
Closure – demolition and earthworks	Dust suppression, regular equipment maintenance, stockpile stabilization	A	L Air contaminant concentrations exceed background levels beyond the PPB but comply with guidelines	LAA	A	MT Reclamation actives will take up to 3 years to complete.	C	RE	Increased ambient air pollutant concentrations and dust generation	Not significant
Construction, operations, and closure – GHG emissions	Regular equipment maintenance	A	N Peak annual GHG emissions estimated to be approximately 0.26% of the reported 2020 GHG total for NS	RAA	A	LT Occurring during operations (11 year)	C	IR	GHG emissions	Not significant

Legend (refer to Table 5.1-5 for definitions)

Nature of Effect	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
A – Adverse P – Positive	N – Negligible L – Low M – Moderate H – High	PA – Project Area LAA – Local Assessment Area RAA – Regional Assessment Area	N/A – Not Applicable A – Applicable	ST – Short-Term MT – Medium-Term LT – Long-Term P – Permanent	O – Once S – Sporadic R – Regular C – Continuous	RE – Reversible IR – Irreversible PR – Partially Reversible

5.2 Light

5.2.1 Rationale for Valued Component Selection

Light level limits are not directly regulated through the provincial or federal regulatory regime. Changes (i.e., increases or changes to occurrence/timing) to ambient light levels have the potential to adversely affect fauna and birds, as well as increase level of light experienced by the general public or specific populations.

5.2.2 Baseline Program Methodology

A qualitative assessment was completed for the Project and no sensitive residential receptors were identified given the topography and vegetation screening between the PA and surrounding properties. A qualitative review was considered sufficient for the purposes of this assessment, and a quantitative baseline light assessment was not completed for the Project.

5.2.3 Baseline Conditions

Existing ambient light levels are not monitored in the PA or surrounding areas. However, the levels are expected to be typical of a rural environment with low levels of ambient illuminance.

The Institute of Lighting Engineers (ILE) has developed an Environmental Zone classification system whereby existing ambient light levels at a site are used to determine the recommended maximum amount of light trespass to nearby receptors. The classification for rural areas, small villages, or relatively dark urban locations is "E2 – Low district brightness areas" typical of rural areas. Based upon this classification, the light trespass limit at an off-site receptor after curfew (typically considered to be 11 p.m.) is 1 lux, which is the accepted equivalent to moonlight.

Artificial lighting in the surrounding community is consistent with that of sparsely populated rural communities - homes and vehicles on Highway 316. The nearest permanent residential receptors to the Project are houses along Goldbrook Road, approximately 850 m from any Project infrastructure.

5.2.4 Consideration of Consultation and Engagement Results

Signal Gold has undertaken an engagement and consultation program with the Mi'kmaq of Nova Scotia, stakeholders, regulators, and the public. These activities are described in more detail in Section 3. Throughout this process, various issues, concerns, and opportunities have been identified in relation to the Goldboro Gold Project. These matters have been considered within the context of this VC to help understand potential effects of the Project on the biophysical and socioeconomic environment and inform consideration of possible mitigation measures. For the light VC, identified concerns include:

- Effects of lights at night (e.g., noticeable, or disruptive).
- Light levels impacting hunting and other recreational practices near the mine.

5.2.5 Effects Assessment Methodology

5.2.5.1 Boundaries

5.2.5.1.1 Spatial Boundaries

The spatial boundaries used for the assessment of effects of ambient light are defined below:

- The PA encompasses the immediate area in which Project activities may occur and includes the infrastructure associated with the mine site plus a buffer of 100 – 200 m.

- The LAA is variable based on 1 lux threshold. A measurement of 1 lux is equal to the illumination of a one metre square surface that is one metre away from a single candle. 1 lux is equivalent to light emitted from a full moon on a clear night.
- The RAA encompasses an area 2 km from the PA in all directions.
- Light levels were also assessed at the PPB for the Project. Land required for Project development is comprised of both private and Crown properties. Private property transactions and Crown Land Lease Applications are on-going.

As the Project has the potential to cause direct and indirect effects of ambient light outside of the PA, the LAA is the most appropriate spatial boundary. Spatial boundaries defined for the light effects assessment are presented in Figure 5.2-1.

5.2.5.1.2 Temporal Boundaries

The temporal boundaries used for the assessment of effects of ambient light are the construction, operations, and closure phases of the Project.

5.2.5.1.3 Technical Boundaries

No technical boundaries were identified for the effects assessment of light.

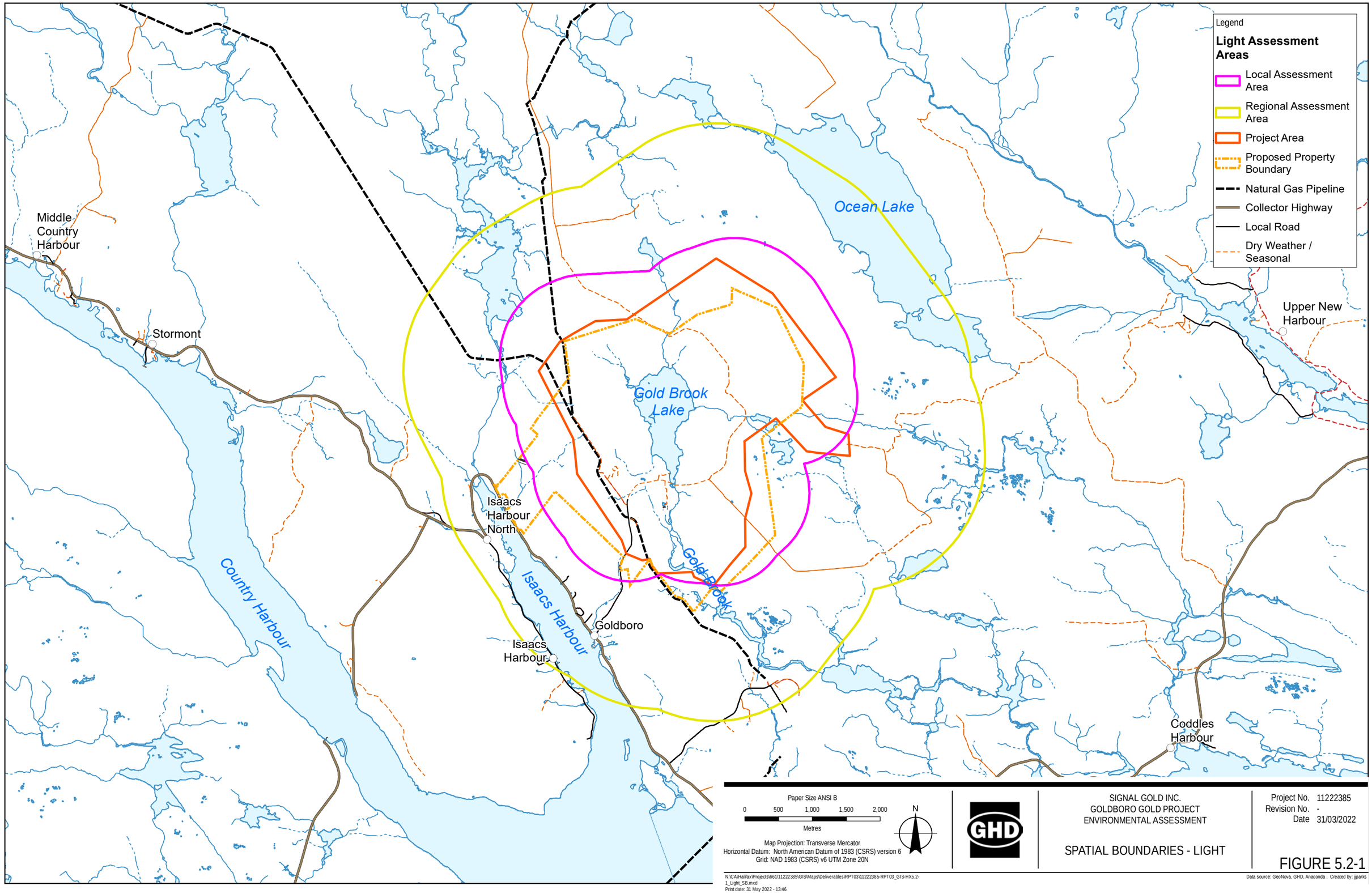
5.2.5.1.4 Administrative Boundaries

The Canada *Occupational Health and Safety Regulations* direct the minimum illumination levels required at various workplace locations. To the extent that migrating birds may be affected by the Project, the Federal *Migratory Birds Convention Act* and *SARA* are applicable.

The impacts of the proposed lighting installations in the PA on nearby sensitive receptors were quantified and compared with the guidelines published by the ILE in the document entitled *Guidance Notes for the Reduction of Obtrusive Light* (ILE, 2011). The relevant criteria and critical parameters applied in the light assessment are presented in Table 5-2.1, below.

Table 5.2-1 Light Level Limits

Guideline	Location	Time Period	Light Limit
ILE *Guidance Notes for the Reduction of Obtrusive Light*	Residential receptors	Pre-curfew (23:00)	5 lux
		Post-curfew (23:00)	1 lux



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Metres

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Map Projection: Transverse Mercator
Horizontal Datum: North American Datum of 1983 (CSRS) version 6
Grid: NAD 1983 (CSRS) v6 UTM Zone 20N

SIGNAL GOLD INC.
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT

SPATIAL BOUNDARIES - LIGHT

Project No. 11222385
Revision No. -
Date 31/03/2022

FIGURE 5.2-1

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5.2.5.2 Light Impact Assessment

The impacts of the proposed lighting installations in the PA were calculated using a list of proposed equipment and lighting installations provided by Signal Gold. From known information about the power output of the installations and typical efficiencies, the luminous flux of each light source was calculated using the following equation:

$$Luminous\ Flux\ (lm) = Power\ Output\ (watts) \times Efficiency\ \left(\frac{lumens}{watt}\right)$$

The power output of the proposed lighting was gained from manufacturer information, and the efficiency was based on typical industry published values.

As a simplistic approach, the closest distance from any of the primary light sources to the sensitive receptor was used to determine the impact at the sensitive receptor. This means that it has been conservatively assumed that all equipment and lights are located at the operating location closest to the sensitive receptor. However, during operations, the majority of equipment and lights will actually be at greater distances. The illuminance level at a receptor is equal to the combined total from each light source. It has been conservatively assumed that 50 percent of the incident light will not reach the receptor due to tree cover surrounding the PA. The following equation was used to estimate the illuminance contribution from each light source:

$$E = \frac{\phi}{d^2} \times 50\%$$

Where:

E = illuminance (lux)

ϕ = luminous flux (lm)

d = distance to the receptor (m)

This method was used to estimate illuminance at each receptor from each of the light sources. The sum of all contributions for each receptor represents the total estimated level of light that will be present at the receptor. Further detail on the methodology applied in the light impact assessment completed for the Project is provided in Appendix D.4.

5.2.5.3 Thresholds for Determination of Significance

The characterization criteria applied in the light effects assessment are detailed in Table 5.2-2, below.

Table 5.2-2 Characterization Criteria for Light Effects

Characterization	Quantitative Measure or Definition of Qualitative Categories
Magnitude	**N** – background light levels (0.1 lux) are met at the PPB **L** – light levels exceed background levels beyond PPB but comply with post-curfew limit (1 lux) **M** – light levels exceed post-curfew limit (1 lux) beyond PPB but comply with limit at residences **H** – light levels exceed post-curfew limit (1 lux) at residences
Geographic Extent	**PA** – direct and indirect effects from Project activities are restricted to the PA. **PPB** – direct and indirect effects from Project activities are restricted to the PPB **LAA** – indirect effects from Project activities are restricted to the local assessment area **RAA** – effects from Project activities extend beyond the PA and LAA to affect a more diffuse and longer-range geographic area
Timing	**N/A** — seasonal aspects are unlikely to affect light **A** — seasonal aspects may affect light

Table 5.2-2 Characterization Criteria for Light Effects

Characterization	Quantitative Measure or Definition of Qualitative Categories
Duration	**ST** – effects are limited to occur from as little as 1 day to 12 months **MT** – effects can occur beyond 12 months and up to 3 years **LT** – effects extend beyond 3 years **P** – light unlikely to return to baseline conditions
Frequency	**O** – effects occur once **S** – effects occur at irregular intervals throughout the Project **R** – effects occur at regular intervals throughout the Project **C** – effects occur continuously throughout the Project
Reversibility	**RE** – light will return to baseline conditions before or after Project activities have been completed. **PR -** mitigation cannot guarantee a return to baseline conditions **IR** – effects are permanent and will not recover to baseline conditions

The adverse effects of light trespass on human receptors are due both to an increase in general illuminance that may cause annoyance and may disrupt sleeping patterns, and from direct view of the light source that can cause glare issues. The adverse effects of light trespass from exterior lighting are influenced by various factors, including:

- Light trespass is more likely to be perceived as obtrusive if the lighting installation is located above the observer. Lighting installations are usually directed towards the ground and an observer could hence have a direct view of the luminaire.
- The surrounding topography and site infrastructure, including distance, hills, trees, and buildings, generally have a positive effect by shielding the observer from the light source.
- Pre-existing lighting in the area: light from a particular source is seen as less obtrusive if it is in, or perceived in, an area where lighting levels are already high (e.g., along roads and near heavily populated areas).
- Zoning of the area: a residential area is seen as more sensitive compared to commercial areas where high lighting levels are seen as more acceptable.
- Time of use: light will be seen as being more obtrusive during nighttime. This is generally considered to be between 11:00 pm and 6:00 am.

A significant adverse effect from the Project with respect to light is defined as:

- Light levels exceeding the ILE post-curfew limit (1 lux) at residential receptors (ILE, 2011).

5.2.6 Project Interactions and Potential Effects

Potential Project interactions with air are presented in Table 5.2-3, below.

Table 5.2-3 Project Activities and Light Interactions

Project Phase	Duration	Relevant Project Activity
Construction	2 years	- Clearing, grubbing, and grading - Topsoil, till, and waste rock management - Haul road construction - TMF construction - Environmental monitoring

Table 5.2-3 Project Activities and Light Interactions

Project Phase	Duration	Relevant Project Activity
Operations	11 years	- Ore management - Waste rock management - Site maintenance and repairs - Tailings management - Environmental monitoring
Closure	24 years	- Demolition - Earthworks - Environmental monitoring

Project-related light levels calculated at nearby residential receptors were less than the ILE post-curfew limit of 1 lux. A detailed light impact assessment report is provided in Appendix D.4. The PA is currently undeveloped and nighttime ambient light conditions are low. As the mine is developed, artificial light will be introduced in the form of vehicle headlights, and lighting in the mill area, employee accommodations, and open pits. Changes to ambient light conditions have the potential to negatively affect wildlife, including birds. Increases in nighttime light levels may also be perceived as a nuisance by residents.

It is unlikely that surrounding residences will experience significant adverse effects due to light trespass from the PA or vehicle headlights entering and exiting the PA. This is largely due to the distance between the residences and the PA as well as shielding by vegetation and natural topographic and landscape features. Further, forested areas surrounding the PA are predicted to act as a barrier to light from the processing plant and mobile equipment.

Reflected light is used by animals to collect a wide range of information within their environment. At night, many nocturnal animals use moonlight and starlight to forage for food and detect predators. Objects in the night sky may be used as aids to navigation for migrating birds. Patterns of light and darkness are also used to regulate circadian cycles; to control the behavior of diurnal, nocturnal, and crepuscular animals; to determine day length; and as a directional cue for navigation (Gaston et al., 2012). Decreasing the duration of lighting may alleviate some but not all impacts on nocturnal and crepuscular animals, since peak lighting demand periods often coincide with the peak activities of these species (Gaston et al., 2012). Further discussion of impacts to terrestrial and avifauna is provided in Section 5.9 of this report.

Construction

With the installation of safety lighting, ambient light levels will increase during construction of the open pit, TMF, mill area, and associated infrastructure. Other lighting introduced to the PA will come from vehicle headlights moving around the PA as well as entering and exiting the PA. Temporary lighting system may be used to illuminate specific work areas from time to time.

Operation

In addition to mill area lights, ambient light levels will increase around the stockpiles and haul roads during the operations phase. It is not expected that any residences will have direct line of sight to Project infrastructure due to the trees and topography.

Closure

Potential effects of ambient light during the closure phase of the Project are expected to be similar to construction and the start of the operations phase and ambient light will diminish to near background levels at the end of the Project.

5.2.7 Mitigation

The detailed lighting design for the Project has not yet been completed but it is possible to make assumptions about the location and intensity of lighting. Project lighting will consider the following:

- Safety of those working in the PA; Signal Gold is required to provide sufficient lighting to ensure safe working conditions, including in the area of the employee accommodations.
- Government regulations and design standards or operating practices.
- Equipment and layouts that minimize the impact of new lighting on the surrounding environment.
- Equipment and layouts that maximize the efficiency of the lighting system.

Light mitigation measures planned for the Project are detailed in Table 5.2-4, below.

Table 5.2-4 Light Mitigation Measures

Project Phase	Mitigation Measure
Construction	Lights will be placed as far from residential receptors as practical; lighting will be aimed inward to prevent light trespass beyond the PPB.
Construction, Operations, and Closure	Equipment and vehicles will be restricted to defined work areas and roads, and specified corridors between work areas.
	No unnecessary lighting will be used.
	Lights will meet the minimum requirements to meet the light objectives.
	Lighting will be shielded were possible.
	Lighting will be angled or directed close to work area.
	Light spectrums that have less effect on wildlife will be used.
	Floodlights and asymmetric beams will be used where possible.

5.2.8 Monitoring and Follow-up

Lighting will be monitored to ensure light trespass is minimized and does not extend beyond areas required for worker safety. If complaints are received concerning light trespass, a monitoring program will be developed in consultation with NSECC that will aim to reduce light-levels in non-active work areas, and redirect lighting in active work areas within the parameters of worker safety. Light monitoring may be undertaken as a condition of an IA.

5.2.9 Company Commitments

Signal Gold will maintain a clear line of communication through the Mine Manager or Health and Safety Manager for light complaints. Light monitoring stations can be set up at any time throughout the life of the Project should complaints arise.

5.2.10 Residual Effects and Significance

A significant adverse effect on the Light VC was defined in Section 5.2.6 as:

- Project-related light levels exceeding the ILE post curfew limit (1 lux) at residential receptors (ILE, 2011).

The predicted residual environmental effects of the Project on light are assessed to be adverse, but not significant. However, after appropriate mitigation measures have been implemented, the overall residual effect of the Project on light is assessed as not likely to have significant adverse effects, as summarized in Table 5.2-5.

Table 5.2-5 Residual Effects of Light

Project Phase	Mitigation and Compensation Measures	Nature of Effect	Residual Effects Characteristics						Residual Effect	Significance
			Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility		
Construction – vehicle headlights and lighting installations	Minimize lighting Downward facing lighting Lights placed as far from sensitive receptors as practical	A	L Light levels exceed background levels beyond PPB but comply with post-curfew limit	LAA	A	MT Construction will occur between 18 months and 2 years.	C	RE	Increased ambient light	Not significant
Operations – vehicle headlights and lighting installations	Minimize lighting Downward facing lighting Lights placed as far from sensitive receptors as practical	A	L Light levels exceed background levels beyond PPB but comply with post-curfew limit	LAA	A	LT Occurring during operations (11 year)	C	RE	Increased ambient light	Not significant
Closure – vehicle headlights and lighting installations	Minimize lighting Downward facing lighting Lights placed as far from sensitive receptors as practical	A	L Light levels exceed background levels beyond PPB but comply with post-curfew limit	LAA	A	MT Construction will occur between 18 months and 2 years.	C	RE	Increased ambient light	Not significant
Legend (refer to Table 5.2-2 for definitions)										
Nature of Effect A – Adverse P – Positive	Magnitude N – Negligible L – Low M – Moderate H – High	Geographic Extent PA – Project Area LAA – Local Assessment Area RAA – Regional Assessment Area	Timing N/A – Not Applicable A – Applicable		Duration ST – Short-Term MT – Medium-Term LT – Long-Term P – Permanent	Frequency O – Once S – Sporadic R – Regular C – Continuous	Reversibility RE – Reversible IR – Irreversible PR – Partially Reversible			

5.3 Noise

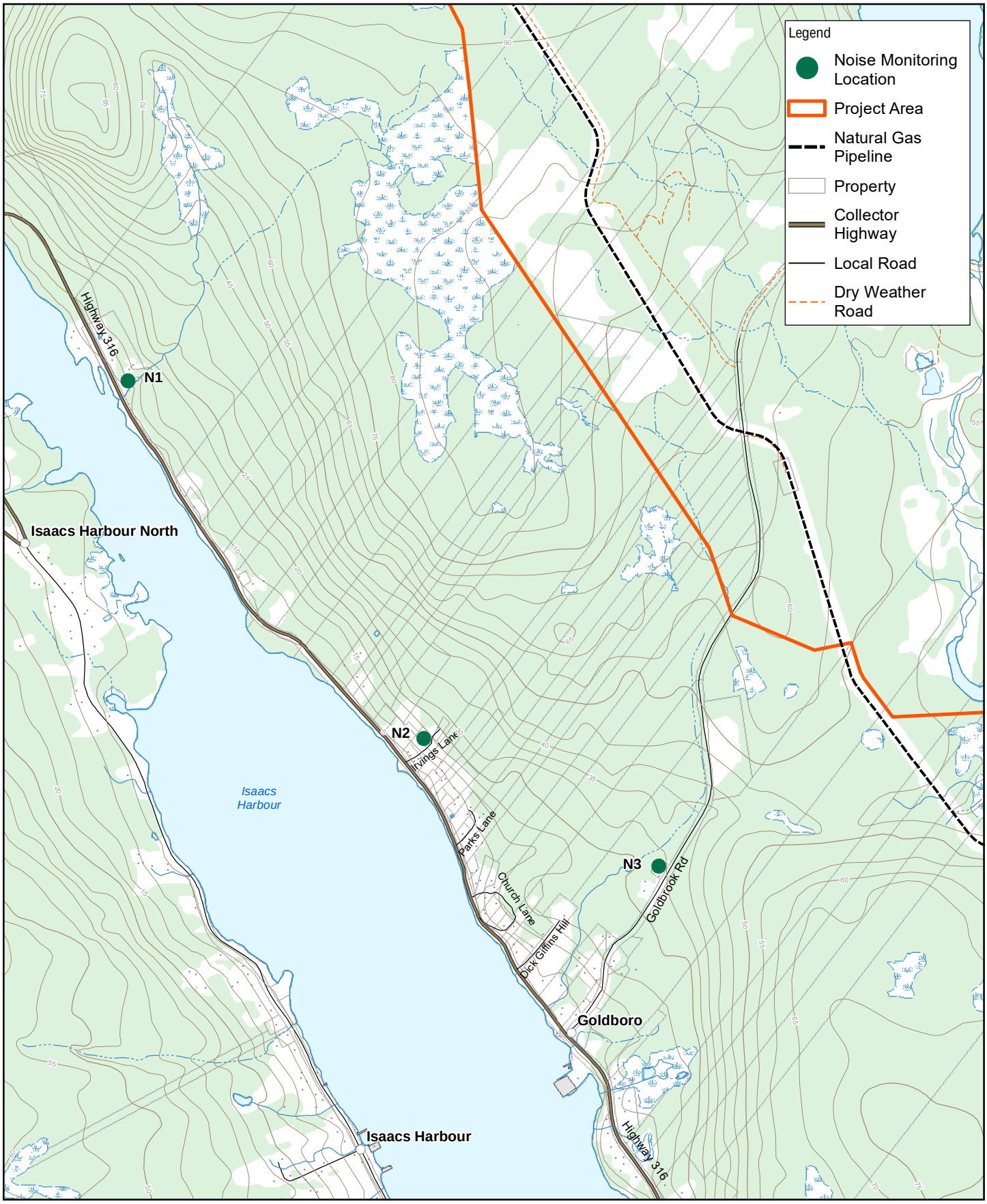
5.3.1 Rationale for Valued Component Selection

Noise and vibration are provincially regulated via the *Nova Scotia Workplace Health and Safety Regulations* and the Pit and Quarry Guidelines (NSEL, 1999), which are protective of the health of workers and the public. Changes to ambient noise levels and the presence of periodic vibrations have the potential to adversely affect fauna and birds by influencing migration and behavioral patterns.

Noise will be generated throughout the life of the Project. Sources of Project-related noise will include heavy machinery use, truck traffic, and blasting during construction and operations phases. Once production begins, blasting will occur approximately twice per week and will be limited to daylight hours on weekdays. The use of heavy processing equipment in the mill area, production drills, and movement of on-site trucks will be relatively consistent sources of noise.

5.3.2 Baseline Program Methodology

A baseline program was conducted to establish ambient sound levels from existing sources near the Project. Baseline ambient sound levels (Appendix D.5) were monitored using a Quest Sound Pro SE/DL sound level meter, equipped with data-logging capabilities. Data collected was evaluated against the NSEL Pit and Quarry Guidelines (1999). Sound level measurements were collected at several sample locations near the PA, taking into consideration the nearest receptors and proposed mining equipment locations. Dwellings closest to the PA were chosen for baseline study. These locations are presented in Figure 5.3-1 and the results are discussed below.



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Map Projection: Transverse Mercator
Horizontal Datum: North American Datum of 1983 (CSRS) version 6
Grid: NAD 1983 (CSRS) v6 UTM Zone 20N

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GHD

SIGNAL GOLD INC.
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT

BASELINE NOISE MONITORING LOCATIONS

Project No. 11222385
Revision No. -
Date 31/05/2022

FIGURE 5.3-1

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5.3.3 Baseline Conditions

Noise is defined as any unwanted sound that may be hazardous to health, interfere with speech and verbal communications, or is otherwise disturbing, irritating, or annoying. An increase in noise levels from 1 to 2 A weighted Decibel (dBA) is typically not noticeable, 3 to 5 dBA will be noticeable by most people, 5 to 7 dBA will be easily heard, and an increase of 7 to 10 dBA will be considered by most to be twice as loud. As a result of the logarithmic decibel scale, doubling the number of noise sources will increase noise levels by 3 dBA. A tenfold increase in the number of noise sources will add 10 dBA to the noise level.

Baseline noise monitoring was conducted from July 17 to July 19, 2018 at three residential locations described in Table 5.3-1.

Table 5.3-1 Baseline Noise Monitoring Locations

Receptor ID	Civic Address	Distance from Project
N1	13348 Highway 316	Approximately 1.01 km southwest of the PA
N2	19 Irvings Lane	Approximately 1.13 km southwest of the PA
N3	99 Goldbrook Road	Approximately 0.75 km southwest of the PA

As specified in the NSEL Pit and Quarry Guidelines (1999), sound equivalent values (L_{EQ}) should be within limits shown in Table 5.3-2. The criteria are compared to the minimum and maximum values recorded.

Table 5.3-2 Baseline Noise Monitoring Noise Levels

Time Frame	Criteria (dBA)	Noise Level (L_{EQ}, dBA)		
		N1	N2	N3
		Recorded Min to Max		
Day (07:00 – 19:00)	≤ 65	46 – 53	34 – 48	32 – 39
Evening (19:00 – 23:00)	≤ 60	52 – 54	31 – 36	27 – 35
Night (23:00 – 07:00)	≤ 55	51 – 52	30 – 33	26 – 37

The lowest baseline sound levels were recorded at location N3 (99 Goldbrook Road). The highest noise levels recorded during daytime hours were measured at location N1 (13348 Highway 316); the highest noise levels recorded during evening hours and overnight hours were measured at location N1 (13348 Highway 316). Prominent wind directions for the monitoring dates (July 17 to July 19, 2018) were from the north northeast, from the PA toward the residential area to the southwest. It should be noted that traffic may have an influence on the sound levels recorded at each location. N1 is located along the main highway through Goldboro and would have greater exposure to vehicle traffic, while N2 and N3 are in lower-traffic areas.

All measured sound levels were below the NSEL *Pit and Quarry Guidelines* (1999).

5.3.4 Consideration of Consultation and Engagement Results

The results of the public consultation and Mi'kmaq engagement have been considered in the environmental effects assessment, including Signal Gold's commitments to mitigation and monitoring measures and proposed compliance and effects monitoring programs, as well as Signal Gold's broader commitment to ongoing public consultation and Mi'kmaq engagement. Specific to evaluating the effect on noise, these are found within the following environmental effects assessment. Key issues raised during public consultation and Mi'kmaq engagement relating to atmospheric environment include:

- Noise from mining operations, especially blasting.
- Concern about elevated noise levels in proximity to the proposed mine, especially along Goldbrook Road.

- Elevated noise levels impacting hunting and other recreational practices near the mine.

5.3.5 Effects Assessment Methodology

5.3.5.1 Boundaries

5.3.5.1.1 Spatial Boundaries

The spatial boundaries used for the assessment of effects of noise are defined below:

- The PA encompasses the immediate area in which Project activities may occur and includes the infrastructure associated with the mine site plus a buffer of 100 – 200 m.
- The LAA includes the nearest noise sensitive receptors, which are primarily located to the southwest. The LAA encompasses a 1 km radius from the PA.
- The RAA encompasses a 6 km radius from the PA, which represents maximum distance from noise sources where the noise model output meets the lowest appreciable (30 dBA) ambient noise levels. Although the lowest recorded ambient sound values were approximately 26 dBA, a noise source below 30 dBA at nearby receivers would be considered insignificant.
- Noise levels were also assessed at the PPB for the Project. Land required for Project development is comprised of both private and Crown properties. Private property transactions and Crown Land Lease Applications are on-going.

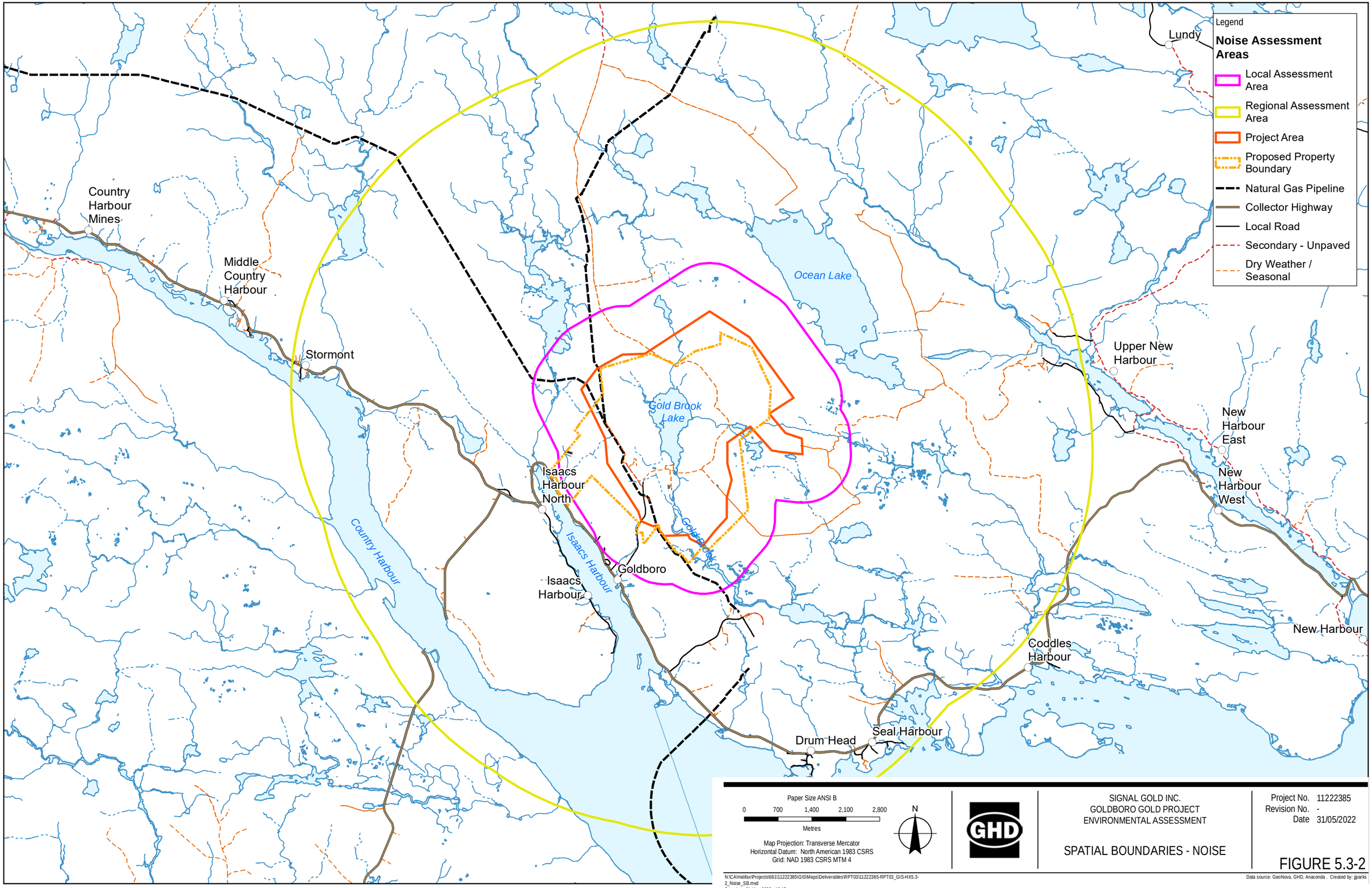
As the Project has the potential to cause direct and indirect changes to noise outside of the PA, as well as cumulative effects compounded spatially and temporally from other Projects and activities, the LAA is the most appropriate boundary for the evaluation of noise. Spatial boundaries defined for the noise effects assessment are presented in Figure 5.3-2.

5.3.5.1.2 Temporal Boundaries

The temporal boundaries used for the assessment of effects of noise are the construction, operations, and closure phases of the Project.

5.3.5.1.3 Technical Boundaries

No technical boundaries were identified for the effects assessment of noise.



Paper Size ANSI B

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983 CSRS
Grid: NAD 1983 CSRS MTM 4

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GHD

SIGNAL GOLD INC.
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT

SPATIAL BOUNDARIES - NOISE

Project No. 11222385
Revision No. -
Date 31/05/2022

FIGURE 5.3-2

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5.3.5.1.4 Administrative Boundaries

Noise within the PPB is regulated by the Province through the *Workplace Health and Safety Regulations*, which establishes the environment needed to maintain worker health. The NSEL Pit and Quarry Guidelines (1999) indicate noise level limits that are not to be exceeded at the PPB and at noise-sensitive receptors. Health Canada's Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise (2016) specifies a method to assess construction noise impacts against change in % Highly Annoyed (%HA) limits.

The NSEL Pit and Quarry Guidelines also specify noise level limits for blasting noise at noise-sensitive receptors. The Health Canada noise guideline mentioned above also specifies slightly lower blasting noise level limits for noise-sensitive receptors. The Guidelines for Environmental Noise Measurement and Assessment (NSE, 2005) also require noise levels to be met at locations where people normally live, work, or take part in recreation.

Noise impacts from the Project were assessed for three scenarios: noise during construction, noise during operations, and blasting noise during all phases of the Project. The relevant criteria and critical parameters of these three scenarios are presented in Table 5-3.3 below.

Table 5.3-3 Noise Level Limits

Guideline	Location	Time Period	Noise Limit
NSEL *Pit and Quarry Guidelines* (1999)	PPB	Night (23:00 – 7:00)	55 dBA
		Evening (19:00 – 23:00)	60 dBA
		Day (7:00 – 19:00)	65 dBA
	Within 7 m of the nearest structure outside of the property boundary during blasting	Day (8:00 – 18:00)	128 dB
Health Canada *Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise* (2016)	At noise-sensitive receptors	Not applicable	Change in %HA should not exceed 6.5%

5.3.5.2 Acoustical Modelling

A noise impact assessment was undertaken to evaluate potential noise impacts generated during construction and operations on sensitive receptors located nearest to the PA, based on continuous 24-hour operations and infrequent blasting. The three scenarios analyzed were ambient noise impact during construction, ambient noise impact during operations, and blasting noise during all Project phases. The complete Noise Impact Study is provided in Appendix D.5.

CadnaA Acoustical Modelling Software (CadnaA) version 2021 MR1 was used to model potential impacts of significant noise sources during construction and operations. CadnaA calculates sound level emissions based on ISOL 9613-2 standard Acoustics – Attenuation of Sound During Propagation Outdoors. The noise sources and topography were input into the 3-D acoustical model.

The objective of the noise assessment was to determine the predictable worst-case 1-hour equivalent sound level (1-hour L_{EQ}) at the worst-case points of reception (sensitive receptors). A total of nine sensitive receptors and five PPB receptors were used in the assessment. If the predicted noise levels exceed the guideline limits specified by the NSEL Pit and Quarry Guidelines or Health Canada's noise guideline at any of the receptors, noise mitigation would be considered to reduce noise levels produced by the Project.

5.3.5.3 Thresholds for Determination of Significance

The characterization criteria applied in the noise effects assessment are detailed in Table 5.3-4, below.

Table 5.3-4 Characterization Criteria for Noise Effects

Characterization	Quantitative Measure or Definition of Qualitative Categories
Magnitude	**N** – background noise levels are met at the PPB **L** – noise levels exceed background levels beyond the PPB but comply with guidelines **M** – noise levels exceed guidelines beyond the PPB but comply with guidelines at residences **H** – noise levels exceed guidelines at residences
Geographic Extent	**PA** – direct and indirect effects from Project activities are restricted to the PA **PPB** - direct and indirect effects from Project activities are restricted to the PPB **LAA** – indirect effects from Project activities are restricted to the local assessment area **RAA** – effects from Project activities extend beyond the PAA and LAA to affect a more diffuse and longer-range geographic area
Timing	**N/A** – seasonal aspects are unlikely to affect noise **A** – seasonal aspects may affect noise
Duration	**ST** – effects are limited to occur from as little as 1 day to 12 months **MT** – effects can occur beyond 12 months and up to 3 years **LT** – effects extend beyond 3 years **P** – noise unlikely to return to baseline conditions
Frequency	**O** – effects occur once **S** – effects occur at irregular intervals throughout the Project **R**– effects occur at regular intervals throughout the Project **C** – effects occur continuously throughout the Project
Reversibility	**RE** – noise will return to baseline conditions before or after Project activities have been completed. **PR** – mitigation cannot guarantee a return to baseline conditions **IR** – effects to noise are permanent and will not recover to baseline conditions

A significant adverse effect from the Project with respect to noise is defined as:

- Repeated or sustained noise levels being emitted from Project activities that exceed the NSEL Pit and Quarry Guidelines beyond the PPB at fixed residences where occupants are present (seasonal or permanent).

5.3.6 Project Interactions and Potential Effects

Potential Project interactions with air are presented in Table 5.3-5, below.

Table 5.3-5 Project Activities and Noise Interactions

Project Phase	Duration	Relevant Project Activity
Construction	2 years	- Clearing, grubbing, and grading - Drilling and rock blasting - Topsoil, till, and waste rock management - Surface infrastructure installation and construction - Haul road construction - TMF construction - Collection ditch and settling pond construction - Environmental monitoring - General waste management

Table 5.3-5 Project Activities and Noise Interactions

Project Phase	Duration	Relevant Project Activity
Operations	11 years	- Drilling and blasting - Ore management - Waste rock management - Site maintenance and repairs - Tailings management - Environmental monitoring - General waste management
Closure	24 years	- Demolition - Earthworks - Environmental monitoring - General waste management

The model concluded that predicted noise levels produced by the Project will be within guideline limits specified by the NSEL Pit and Quarry Guidelines at all identified worst-case points of reception and at the PPB. The noise impact of the Project will also be within applicable Health Canada noise guideline limits at the identified worst-case points of reception. The extents of noise impacts above 55 dBA and background noise levels (25 dBA) are presented in Figures 5.3-3 and 5.3-4.

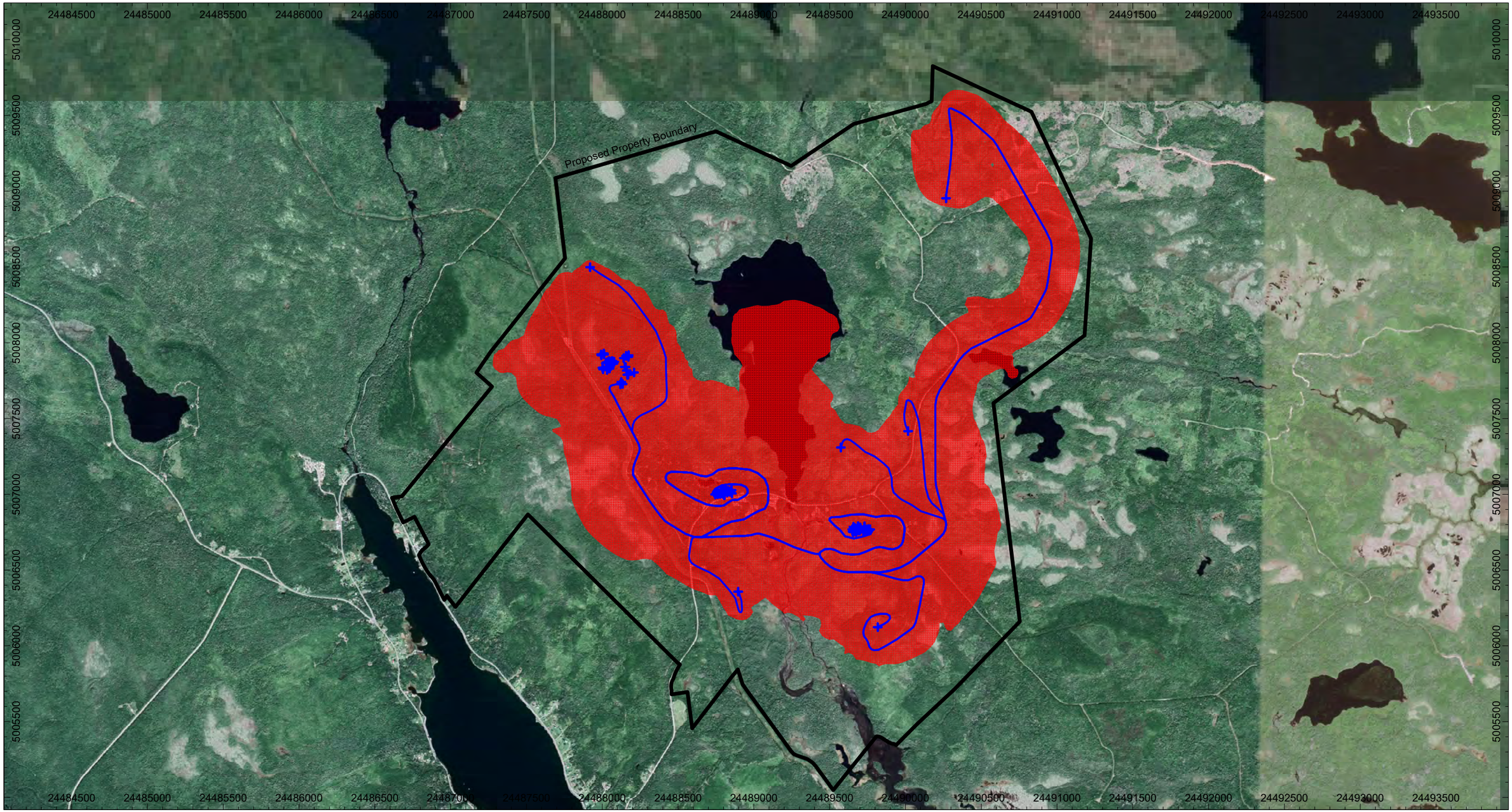
Noise impacts will occur primarily during the construction and operations phases of the Project. Sources of Project-related noise will include blasting, heavy equipment, truck traffic, crushing equipment, and operations of the processing plant. Noise impacts will primarily result from heavy equipment and vehicle operations. Given the setting, sound pressure levels in the vicinity of the Project are expected to be typical of a rural area. The acoustic environment will be affected recurrently throughout construction and operations. Noise could be elevated to a nuisance for short periods of time, such as during blasting (once or twice per week, limited to daytime hours on weekdays).

An increase in truck traffic through the community will occur during construction. Construction activity will include grading of roads, drilling, movement of materials, road construction, and infrastructure installation and construction, all of which may contribute to the noise impact of the Project. The modelling indicates that noise impact during construction will be well within all applicable limits at the PPB and nearest residences.

The most significant sources of noise during the operations phase will be from large processing equipment at the mill area and truck traffic moving throughout the PA. Drilling will be a consistent source of noise but will be barely audible beyond the PPB, especially with increasing pit depth. Modelling indicates that the Project's cumulative noise impacts during operations will be within the provincial noise level limits at the PPB. The Project's cumulative noise impact at the nearest residences is also predicted to be well within the applicable provincial and federal limits.

Blasting will be a regular source of noise throughout the Project, but these events will be on the order of once or twice per week and limited to daytime hours on weekdays. Acoustic modelling indicates that the noise impact from blasting will be within applicable noise level limits at the nearest dwellings. It is also worth noting that blasting overpressure predictions in the modelling are conservative as they do not account for effects of pit depth or other obstructions, which will attenuate blasting noise levels.

The detailed Noise Impact Study completed for the Project is provided in Appendix D.5.



Source: GOOGLE SATELLITE

N

Legend

>= 55 dBA

Notes:
Noise level contours presented above represent A-weighted 1-hour equivalent sound levels calculated at a grid height of 1.5 metres above grade.

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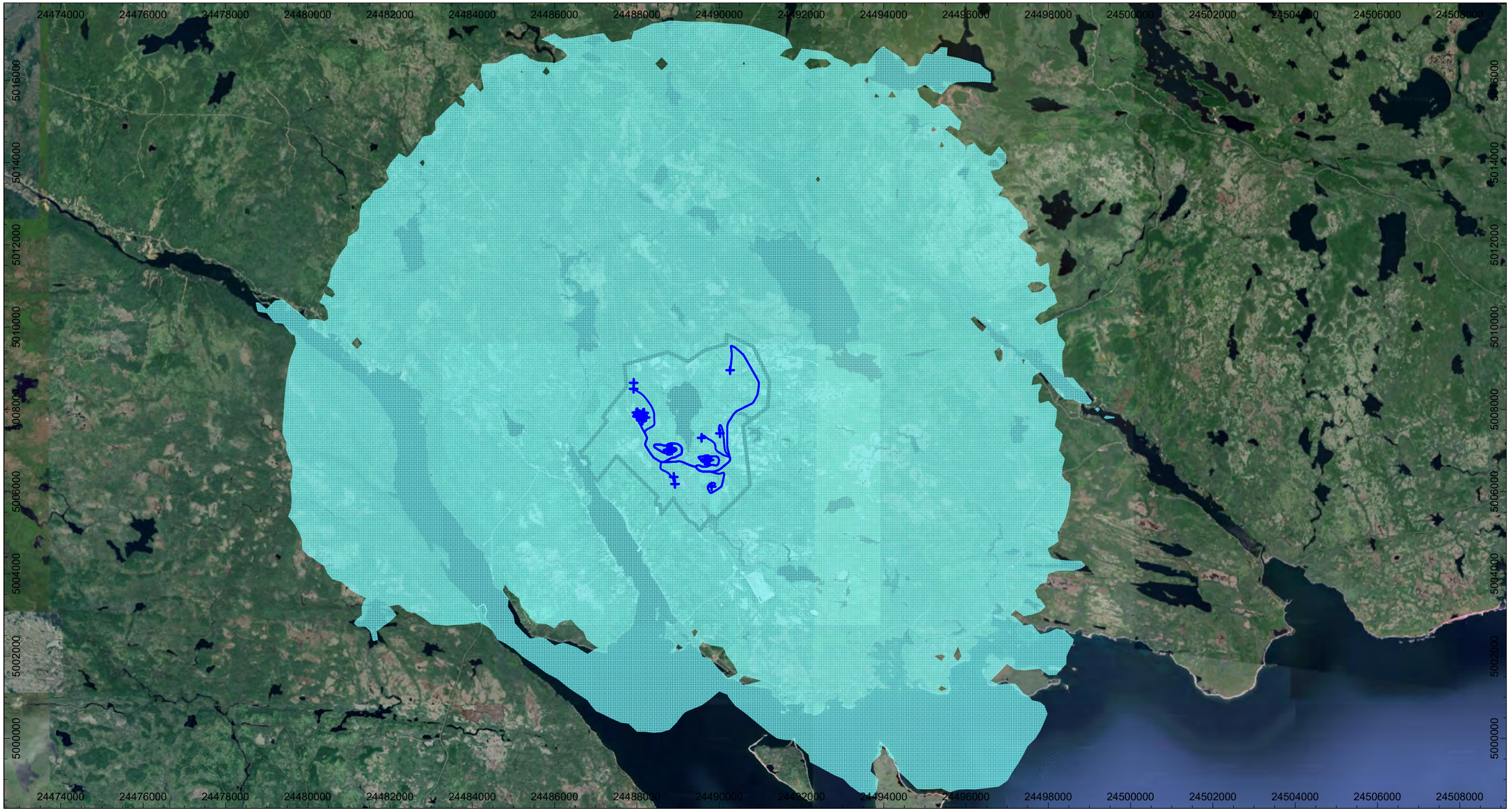
NOISE CONTOUR PLOT - 55 DBA - PROVINCIAL NIGHTTIME NOISE LEVEL LIMIT

FIGURE 5.3-3

CadnaA File: \\ghdnet\ghd\CA\Halifax\Projects\661\11222385\Noise\CadnaA Models\11222385_Anaconda_v2022.03_VCfigs.cna



Source: GOOGLE SATELLITE

N

Legend

>= 26 dBA

Notes:
Noise level contours presented above represent A-weighted 1-hour equivalent sound levels calculated at a grid height of 1.5 metres above grade.

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NOISE CONTOUR PLOT - BACKGROUND - 26 DBA

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FIGURE 5.3-4

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5.3.7 Mitigation

It is not anticipated that any of the noise generated by the Project will negatively impact the environment or any of the residents of the community of Goldboro or the surrounding area. The PA and surrounding areas include physical features that will provide attenuation of noise from Project activities. These features include the pits, which will increase in depth throughout the operations phase of the Project and will provide noise screening of sources within the pits (i.e., drilling, blasting, heavy machinery, etc.). There is also an existing ridge located between the PA and the community of Goldboro which will provide attenuation of noise from all sources within the PA.

Additional mitigation measures planned for the Project are detailed in Table 5.3-6, below.

Table 5.3-6 Noise Mitigation Measures

Project Phase	Mitigation Measure
Construction	Haul roads and infrastructure will be designed to reduce haul distances where possible.
	Project infrastructure will be designed to limit noise emissions.
	Where practical, trees and other vegetation will be left in place or encouraged to grow to muffle nuisance noise.
	Berms will be constructed around the perimeters of the open pits.
Construction and Operations	Blasting will be conducted by a certified contractor who will develop a Blast Management Plan and Blast Designs for review and approval prior to carrying out the work. Blasts will be designed to meet vibration and overpressure limits at appropriate distances from any existing structures (i.e., pipeline, residential receptors), Project infrastructure, and fish habitat. A monitoring plan will be implemented to record vibration and overpressure for each blast.
	Blasting will be limited to daytime hours on weekdays.
	Blasting schedule will be communicated to the local community (e.g., through MODG and CLC).
Construction, Operations, and Closure	Equipment, vehicles and haul trucks will be maintained in good working order and equipped with appropriate mufflers to reduce noise.
	Haul truck traffic will be limited to haul roads within the PA.

5.3.8 Monitoring and Follow-up

Ongoing noise monitoring will take place at several locations within the community of Goldboro to establish an operational baseline as compared to pre-construction baseline. The locations will be chosen using the smallest arc distance between dwellings and the edge of the open pit. Ongoing noise monitoring will be conducted based on the final layout and mill design and in accordance with regulatory requirements. Noise and air pressure monitoring will confirm noise impacts are below the prescribed thresholds for nearby residents and compliant with regulations.

5.3.9 Company Commitments

Signal Gold will maintain a clear line of communication through the Mine Manager or Health and Safety Manager for noise complaints to be recorded and associated noise levels to be evaluated in accordance with legislation and province specific requirements. Noise monitoring stations can be set up at any time throughout the life of the Project should noise complaints arise and levels will be compared to background values and guidelines.

5.3.10 Residual Effects and Significance

A significant adverse effect on the Noise VC was defined in Section 5.3.6 as:

- Project-related repeated or sustained noise levels that exceed the NSEL Pit and Quarry Guidelines beyond the PPB at fixed residences where occupants are present (seasonal or permanent).

The predicted residual environmental effects of the Project on noise are assessed to be adverse, but not significant. However, after appropriate mitigation measures have been implemented, the overall residual effect of the Project on noise is assessed as not likely to have significant adverse effects after, as summarized in Table 5.3-7.

Table 5.3-7 Residual Effects of Noise

Project Phase	Mitigation and Compensation Measures	Nature of Effect	Residual Effects Characteristics						Residual Effect	Significance
			Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility		
Construction – drilling, blasting, haul road construction, and TMF construction	Blasting limited to daytime hours on weekdays Equipment and vehicle maintenance	A	L Noise levels exceed background levels beyond the PPB but comply with guidelines	LAA	N/A	MT Construction will occur between 18 months and 2 years.	C	RE Noise will return to baseline conditions before or after Project activities have been completed.	Increased ambient noise	Not significant
Operations – drilling, blasting, haul road traffic	Blasting limited to daytime hours on weekdays Equipment and vehicle maintenance Berms on outer edge of open pits	A	L Noise levels exceed background levels beyond the PPB but comply with guidelines	LAA	N/A	LT Occurring during operations (11 year)	C	RE Noise will return to baseline conditions before or after Project activities have been completed.	Increased ambient noise	Not significant
Closure – demolition and earthworks	Equipment and vehicle maintenance	A	L Noise levels exceed background levels beyond the PPB but comply with guidelines	LAA	N/A	MT Construction will occur between 18 months and 2 years.	C	RE Noise will return to baseline conditions before or after Project activities have been completed.	Increased ambient noise	Not significant
Legend (refer to Table 5.3-4 for definitions)										
Nature of Effect A – Adverse P – Positive	Magnitude N – Negligible L – Low M – Moderate H – High	Geographic Extent PA – Project Area LAA – Local Assessment Area RAA – Regional Assessment Area	Timing N/A – Not Applicable A – Applicable	Duration ST – Short-Term MT – Medium-Term LT – Long-Term P – Permanent	Frequency O – Once S – Sporadic R – Regular C – Continuous	Reversibility RE – Reversible IR – Irreversible PR – Partially Reversible				