MARATHON GOLD

Project Description Summary

Valentine Gold Project
Newfoundland and Labrador

5 April, 2019

Valentine Gold Project: Project Description Summary

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Abbreviations

AARL	Anglo-American Research Laboratory
A_i	Bond Abrasion Index
ARD/ML	Acid Rock Drainage/Metal Leaching
dBA	A-weighted decibels
BV	Bed Volumes
BW_i	Bond Ball Mill Work Index
CDA	Canadian Dam Association
CEA Agency	Canadian Environmental Assessment Agency
CIC	Carbon in Column
CIL	Carbon in Leach
cm	Centimeter
CN_{WAD}	Weak acid dissociable cyanide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CW_i	Bond Crusher Work Index
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
ECCC	Environment and Climate Change Canada
EEM	Environmental Effects Monitoring
EIS	Environmental Impact Statement
EMS	Environmental Management System
EPCM	Engineering, Procurement, Construction Management
EPP	Environmental Protection Plan
ESA	*Endangered Species Act*
FEL	Front End Loader
FNI	Federation of Newfoundland Indians
GHGs	Greenhouse Gas
HDPE	High Density Polyethylene
hr(s)	Hour(s)
HV	High Voltage
HVAC	high-voltage alternating current
H:V	Horizontal to Vertical
Hz	Hertz
ICR	Intensive Cyanidation Reactor
ISO	International Standards Association
km	Kilometer

kV	Kilovolt
L	Liter
LV	Low Voltage
m^3/h	Cubic Meter per Hour
m	Meter
MAC	Mining Association of Canada
MARC	Maintenance and Repair Contract
mbgs	Meters Below Ground Surface
MCC	Motor Control Centres
min	Minute
Mm	Million Meters
mm	Millimeter
MDMER	Metal and Diamond Mining Effluent Regulations
MSDS	Material Safety Data Sheet
Mtpa	Million Tonnes Per Annum
MV	Medium Voltage
MW	Megawatt
NL	Newfoundland and Labrador
NLDFLR	Newfoundland and Labrador Department of Fisheries and Land Resources
NLDMAE	Newfoundland and Labrador Department of Municipal Affairs and Environment
NLDNR	Newfoundland and Labrador Department of Natural Resources
NLDTCII	Newfoundland and Labrador Department of Tourism, Culture, and Industrial Innovation
NL-EHJV	Newfoundland and Labrador Eastern Habitat Joint Venture
NLOA	Newfoundland and Labrador Outfitters Association
NLOWE	Newfoundland and Labrador Organization of Women Entrepreneurs
NS	Nova Scotia
OLTC	on-line tap changer
ONAF	Oil Natural Air Forced
ONAN	Oil Natural Air Natural
PAG	Potentially Acid Generating
PAX	Potassium Amyl Xanthate
PDA	Project Development Area
PEA	Preliminary Economic Assessment
POL	Petroleum, Oil, Lubricants
ROM	Run-of-Mine Material
SAG	Semi-Autogenous Grinding
SAEN	Salmonid Association of Eastern Newfoundland
SAR	Species at risk

SARA	*Species at Risk Act*
SMBS	Sodium Metabisulphite
SOCC	Species of Conservation Concern
SPAWN	Salmon Preservation Association for the Waters of Newfoundland
SWA	Sensitive Wildlife Area
t	Tonnes
TC	Transport Canada
t/h	Tonnes per hour
tpd	Tonnes Per Day
TSF	Tailing Storage Facility
UPS	Uninterruptible Power Source
V	Volt
VC	Valued Component
VFD	Variable Frequency Drives
VMS	Volcanogenic Massive Sulfide
VSD	Variable-speed Drive

1.0 INTRODUCTION

Marathon Gold Corporation (Marathon) is planning to develop a gold mine at Valentine Lake, located in the west-central region of the Island of Newfoundland, southwest of the town of Millertown, Newfoundland and Labrador (NL). The Valentine Gold Project (the Project) will consist primarily of open pit mines, waste rock disposal piles, crushing and stockpiling areas, heap leach processing and conventional milling and processing facilities, tailings management area, personnel accommodations, and supporting infrastructure including roads, power lines, buildings, and water and effluent management facilities. This document is a summary of the Project Description that is being submitted pursuant to the *Canadian Environmental Assessment Act*, 2012 (Government of Canada 2012a).

The Project Description was based in large part on the Preliminary Economic Assessment (PEA) (Lycopodium 2018) prepared for the Project in October 2018 by Lycopodium Minerals Canada Ltd (Lycopodium), with input from John T. Boyd Company (BOYD), Apex Geoscience Ltd., and Stantec Consulting Ltd (Stantec). In addition, a number of environmental baseline studies have been completed for the Project. The information presented in this report draws upon this Project-specific data, as well as publicly-available information.

1.1 Proponent Information

Marathon is a Toronto-based gold exploration company, with 100% ownership of the Valentine Gold Project. It is a public, advanced exploration stage company whose common shares trade on the TSX Exchange (MOZ) and OTCQX (MGDPF) in the USA. Marathon was incorporated in 2010 and has its head office in Toronto with satellite offices in Pasadena and Mt. Pearl, NL. Contact information is contained in Table 1-1 and additional corporate information can be found at www.marathon-gold.com.

Table 1-1 Contact Details for Marathon Gold Corporation

Title	Contact Details
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1.2 Project Overview, Context and Objectives

The Project is located in the west-central region of the Island of Newfoundland, approximately 55 km southwest of Millertown, and approximately 45 km south of the nearest community of Buchans (Figure 1-1). The Project Development Area (PDA) is accessed by an existing gravel access road, approximately 80 km in length, south from the Town of Millertown, which is situated approximately 6 km off the Buchans Highway. This access route in turn provides reliable road access to the Trans-Canada Highway, which transects the Island of Newfoundland from east to west and connects the major populated centres, airports, and sea ports. Access to the Project is from the northeast side of the property via the existing Crown Lands access road. Future site access will be via the main security gate near the process plant. The process plant site will be fenced to clearly delineate the mine area and deter unauthorized access.

The property has historically been explored by several mining companies since the 1960s, with its first recognition as a gold prospect occurring in 1983. It now comprises 14 contiguous mineral licenses held by Marathon, for a landholding of 240 km^2, also referred to as the Project Area. Since 2010, Marathon has been actively exploring within these licenses, with the goal of developing an active gold mine. Marathon's exploration work has included delineating the size of the Leprechaun deposit and making new discoveries at the Marathon, Sprite, and Victory deposits. Based on the exploration results, the financial analysis of the PEA (Lycopodium 2018) has demonstrated that the Project has robust economics and recommended the continued development of the Project.

Standard surface mining techniques will be used to mine gold ore from open pits. High-grade ore material (9,000 t per day, or tpd) will be processed through the mill where it will be crushed, milled and put through floatation and cyanidation processes to recover the gold. Tailings will be treated in the process plant area to remove the cyanide and subsequently deposited in an engineered tailings storage facility. Low grade material from the open pits (9,000 tpd) will be sent to the heap leach area where it will be crushed, and the gold recovered through heap leaching and carbon in column gold adsorption. Gold doré bars will be shipped from site to market in secured trucks.

Other Project components and activities that are associated with the primary mining, milling, and processing activities include site and haul road construction and maintenance, mine waste rock management, electrical power supply and distribution, process and potable water supply and distribution, site wide stormwater and effluent management, treatment, and discharge, fuel storage and fueling stations, mine and plant workshops and services, administrative office, personnel accommodations and lunchrooms, and security.

A preliminary layout of mine infrastructure is shown in Figure 1-2. The location of specific components may be altered somewhat based on future regulator and stakeholder engagement, project planning and detailed engineering, however it is currently expected that the Project footprint will be contained within the PDA as shown in Figure 1-2. The Project Area, also shown in Figure 1-2, is defined by Marathon's mineral license boundaries, and this area is considered in the context of a larger study area for some of the environmental baseline work described herein.

The Project components and activities associated with construction, operations, and rehabilitation and closure are further defined in Section 2.

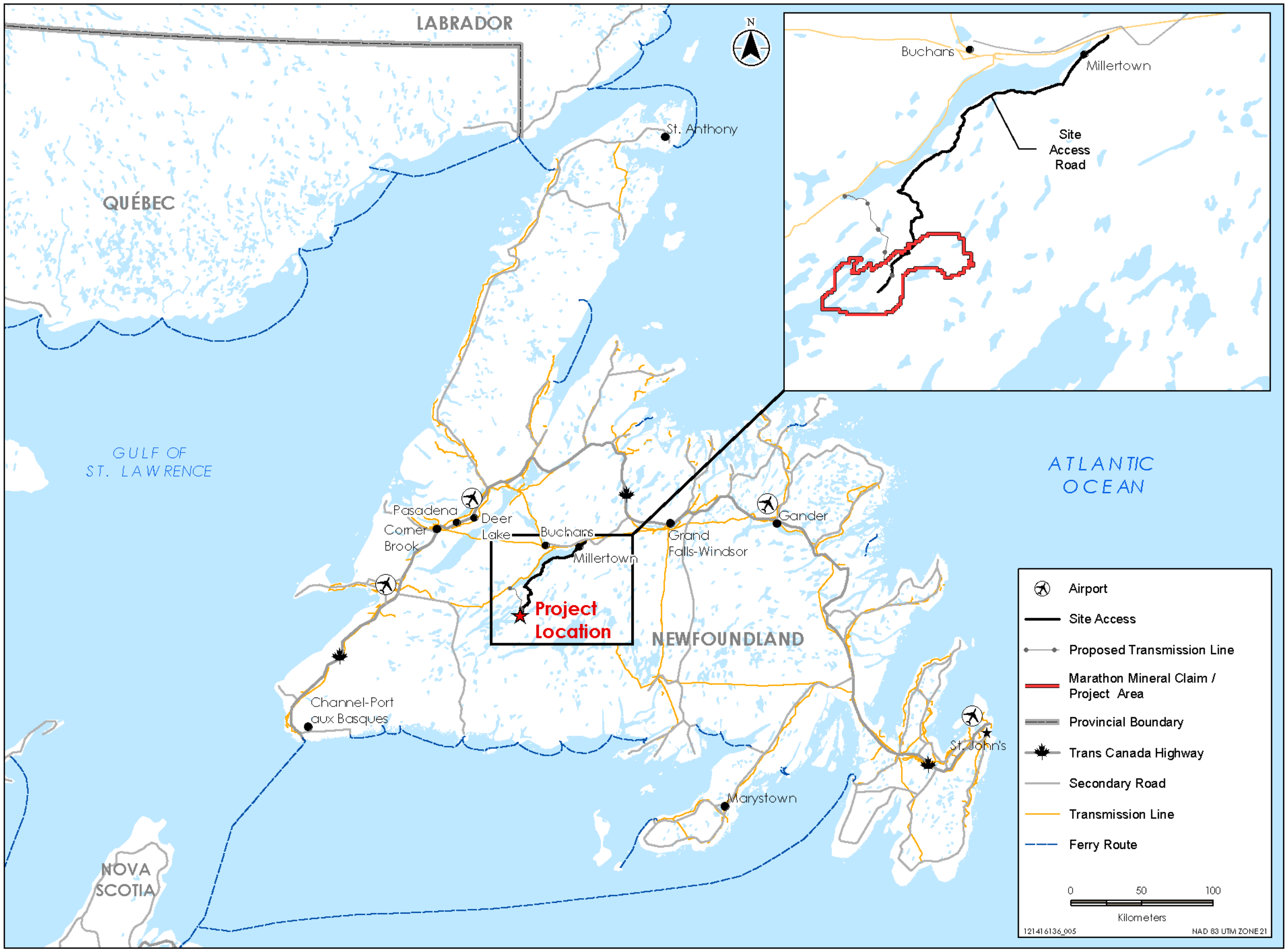

Figure 1-1 Location of Valentine Gold Project

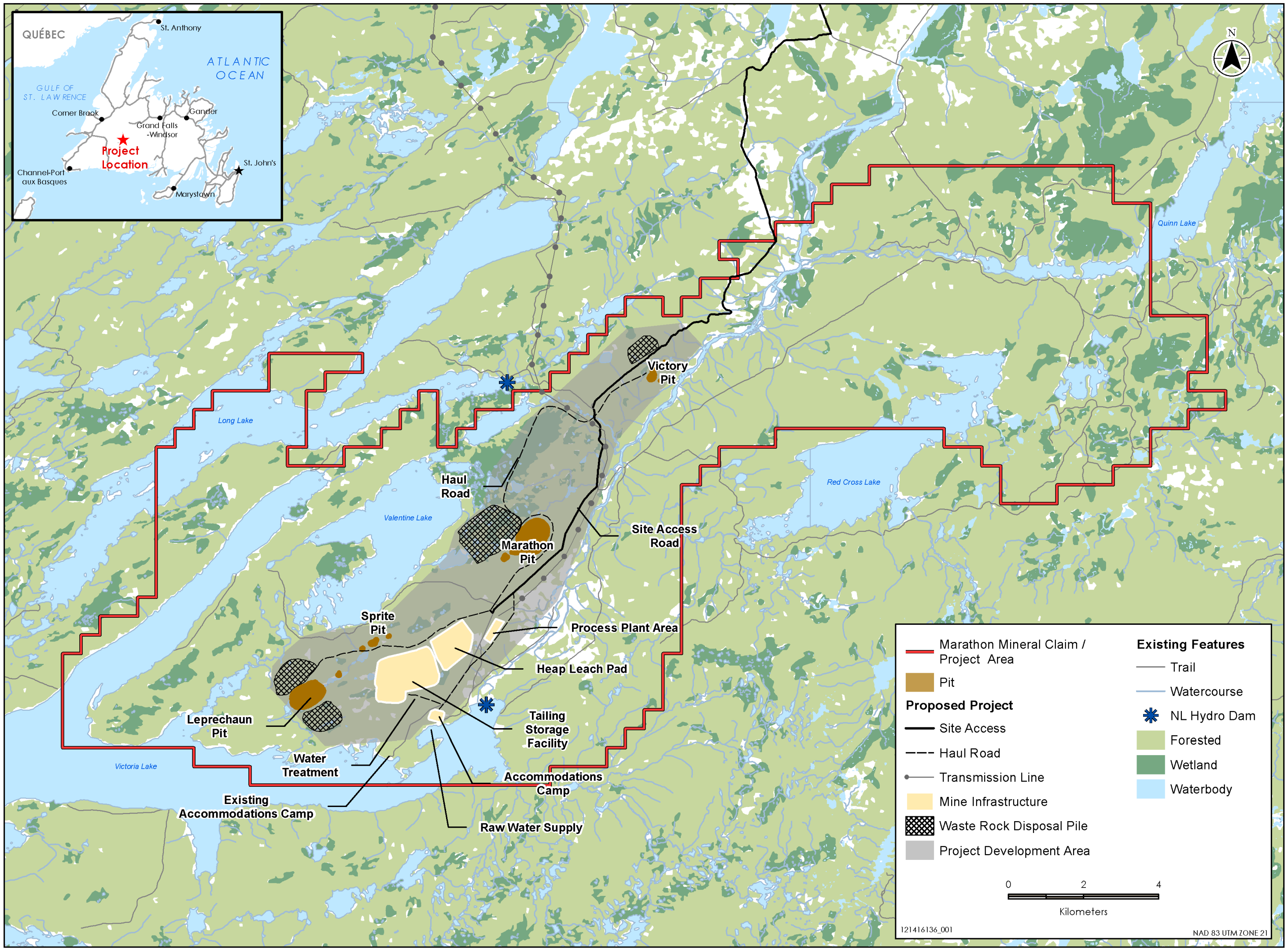

Figure 1-2 Project Development Area / Project Area

Upon cessation of mining, the operation will be closed, and the site components will be rehabilitated in accordance with applicable regulations at the time of closure. Rehabilitation and closure planning is a requirement under the Newfoundland and Labrador *Mining Act* (Gov NL 1999). A Rehabilitation and Closure Plan has not yet been developed for this Project. A formal plan will be completed as part of the EA and progressive engineering, and will describe the methods to restore the site to as close to pre-development conditions as practicable or to a suitable condition for an alternate use upon Project closure. Further information regarding the general approach to rehabilitation and closure is provided in Section 2.6.

In addition to the return on investment to shareholders and investors, development of this Project would generate substantial employment, expenditures and associated benefits to the province. The mining industry is a major contributor to the provincial economy, particularly in rural areas. The nearby towns of Millertown, Buchans, Badger, Grand Falls-Windsor, and Springdale have been actively supporting the mining industry, with several suppliers and contractors available to support the Project. Skilled mining personnel are available from within the province, as well as elsewhere in Canada. Mineral exploration companies and the provincial government have adopted proactive strategies to attract, recruit, diversify, and retain skilled workers associated with, and committed to, the mining industry.

Based on Project planning to date, the Project is anticipated to generate over 1 million person-hours (hrs) of work during construction, with peak employment during operation of 466 people and an average employment rate of 442 people. The Project also represents a direct benefit to the province through mining, corporate, gasoline, and other taxes over the life of the Project, currently estimated at over $480 million CDN. In addition, further benefits to the province would result from the Project as a result of the indirect services required for the Project and its employees, including construction, supply and technical services, security and catering services, and the potential for spinoff businesses.

Overall, this Project is consistent with the provincial government's goal of continuing to support and encourage the growth of the mining industry in the province as detailed in their Mining the Future 2030 plan.

1.3 Project Regulatory Framework

Marathon plans to develop and operate an open pit gold mine with a nominal throughput of 9,000 tonnes of material per day (tpd) for the milling facility and 9,000 tpd for the heap leach facility, equivalent to 6.0 million tonnes per annum (Mtpa). It will therefore be subject to legislative requirements under both the federal *Canadian Environmental Assessment Act,* 2012 (CEAA 2012) and the provincial *Environmental Protection Act*, 2002, as follows:

- The Project is captured under Section 16 (c) of the *Regulations Designating Physical Activities*, 2012 (Government of Canada 2012b) as a gold mine, other than a placer mine, with an ore production of 600 t/d or more and will therefore require a description of the designated project be submitted to the Canadian Environmental Assessment Agency (CEA Agency).
- The Project is included under Section 33(2) of the provincial *Environmental Assessment Regulations*, 2003 (Gov NL 2003a). As a designated undertaking, it must be registered with the Minister of Municipal Affairs and Environment.

Although there is no formal harmonization agreement between the province and the federal government, a proponent is typically permitted to prepare a single set of environmental assessment (EA) documents that address the requirements of both levels of government. The Registration / Project Description was written to satisfy the federal regulatory requirements pursuant to the *Prescribed Information for the Description of a Designated Project Regulations* (Government of Canada 2012c) and the provincial requirements for a registration of an undertaking pursuant to the *Environmental Assessment Regulations*. Submission of the Registration / Project Description serves to initiate both the federal and provincial EA processes, informing both governments of the proponent's intention to develop a project. It is also intended to provide regulators with sufficient information regarding the proposed undertaking, the existing baseline conditions, and the potential effects of a project so as to allow a determination regarding the nature of the EA process required before Project approvals can be granted.

In addition to EA approval under CEAA 2012, the Project is subject to other federal legislation, including:

- *Canadian Environmental Protection Act, 1999*
- *Fisheries Act*
- *Migratory Birds Convention Act, 1994*
- *Species at Risk Act* (SARA)
- *Navigation Protection Act*

Other required environmental permits and approvals are typically issued only after the Project is released from the EA review processes. These permits and approvals include water use authorizations, fish and fish habitat authorization, emissions and discharge approvals, approvals for placement of some Project components (e.g., tailings management, water control structures), and other Project-development related items. Municipal approvals, authorizations, and permits are not anticipated, as the Project is not located within a municipality.

2.0 PROJECT DESCRIPTION

2.1 Project Location and Setting

The Project is located in rural west-central Newfoundland (Figure 1-1), with the center of the Property located at Universal Transverse Mercator 494550 m Easting and 5362789 m Northing, Zone 21, North American Datum 1983, (NAD83 Zone 21). It is located within National Topographic System map sheets: 12A/06 and 12A/07. This part of the Island is boreal forest, characterized by mainly coniferous trees, with cold winters (average -4.5°C) and warm summers (average 16°C). It is a rural area, with a history of past mining exploration and development activities and other land and resource uses, including commercial forestry, outfitting, and recreational land use. The environmental setting of the Project Area is further described in Section 4.

The Project is accessed by road via Millertown, with provincial highways connecting Millertown and Buchans to the Trans-Canada Highway. It is anticipated that most materials, equipment, and supplies will be brought to the Project site by road from larger communities in Newfoundland, such as Grand Falls-Windsor and Gander, and ultimately via the Marine Atlantic-operated ferry which connects North Sydney, Nova Scotia (NS) with Port-aux-Basques on the west coast of the Island, approximately 540 km distance by road from the Project, or by ferry to Argentia, approximately 480 km by road. The Project is also located approximately 210 km from the airport in Gander and approximately 320 km from the airport in Deer Lake.

The Project Area comprises 14 mineral licenses, for a landholding of 240 km^2.These mineral licenses are 100% controlled by Marathon and are reportedly held in good standing. The PDA hosts four gold deposits, namely Leprechaun, Marathon, Sprite, and Victory, which are the focus of this Project, as well as several other early stage gold prospects. The collective deposits and occurrences are located within a 20 km long northeast trending zone (Figure 1-2). A number of photos of the site are provided in Appendix A.

Seasonal and temporary dwellings occur within the Project Area. Additional information on these seasonal dwellings is available in Section 4.2. The PDA is also 120 km from the Miawpukek First Nation federal reserve at Conne River. Traditional land and resource use by Qalipu Mi'kmaq First Nation members has been documented near Victoria Lake (in the vicinity of the Project Area) (FNI 2002). Additional information is available in Section 4.2. There are no other federal lands located within 200 km of the Project Area.

2.2 Funding and Federal Lands

Marathon has not applied for federal or provincial funding for the development or operation of this Project to date, however potential funding opportunities may be considered in the future. In general, it is anticipated that the bulk of the Project costs will be funded through private investors.

The Project will not occur on or involve the use of federal lands.

2.3 Project Components

The key Project components are shown in Figures 2-1 and 2-2, and are further described below. An overview of the construction activities associated with these Project components is provided in Section 2.4 and a general description of the operational components is provided in Section 2.5. Further, a preliminary Project schedule is provided in Section 2.7. The key components of Marathon's Project are as follows:

- Site Access Road
- On Site Access Roads, Plant Site Roads, and Haulage Roads
- Open Pits
- Waste Rock Disposal Piles
- Organics and Overburden Stockpiles
- Stormwater Management Infrastructure
- Run of Mine (ROM) Stockpile
- Heap Leach Process Facilities:
  - Heap Leach Crushing Circuit
  - Heap Leach Pad
  - Heap Leach Solution and Event Ponds
  - Carbon in Column (CIC) Leach Process
- Process Plant Facilities:
  - Crusher and Mill Feed Stockpile
  - Grinding Circuit (Mill)
  - Gravity Recovery Circuit and Intensive Cyanidation Reactor
  - Floatation Circuit
  - Carbon in Leach (CIL) Process
  - Cyanide Destruction
  - Carbon Acid Wash, Elution, and Regeneration Circuit
  - Electrowinning and Goldroom
  - Reagent Storage
- Gold Shipment to Market
- Tailings Storage Facility (TSF)
- Water Treatment Plant
- Substation and Power Distribution
- Water Intake and Distribution
- Other Plant Site Buildings:
  - Plant Administration, Workshop, and Warehouse
  - Laboratory
  - Administration and Lunchroom
  - Mine Services and Workshop
  - Security
- Accommodation Camp
- Plant Site Stormwater Pond and Sanitary Effluent
- Fuel Storage and Fueling Stations

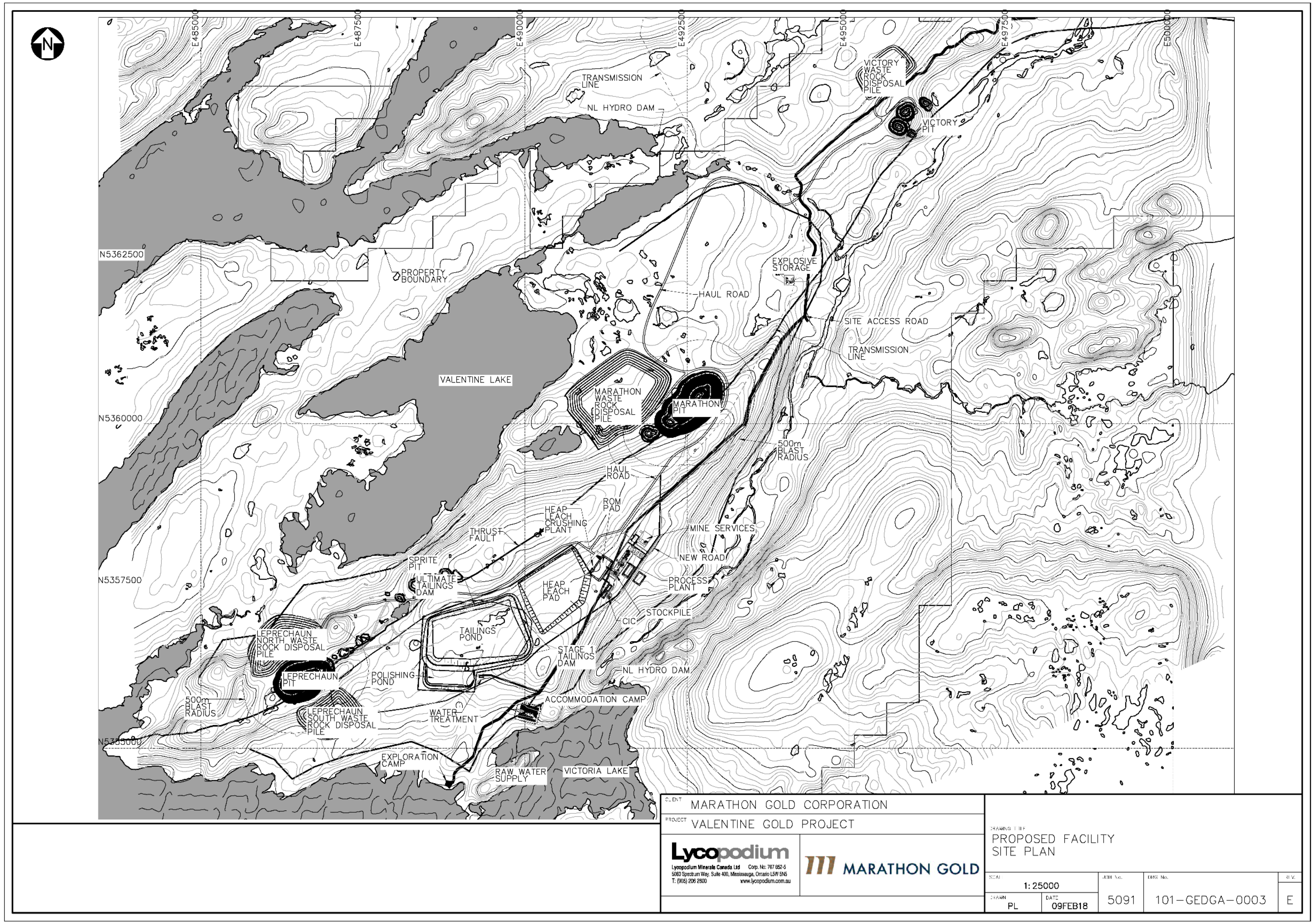

Figure 2-1 Overall Site Plan

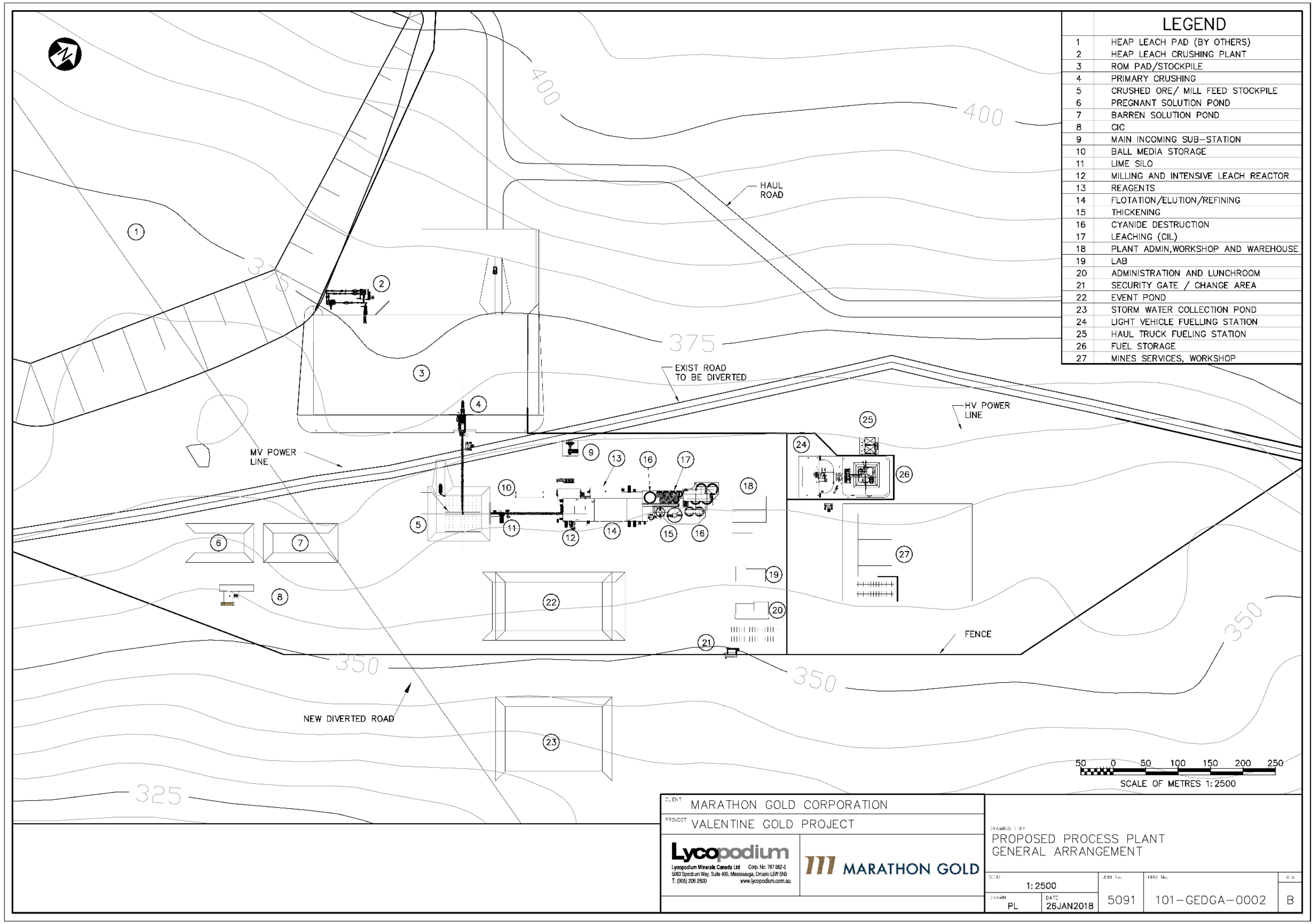

Figure 2-2 Process Plant General Arrangement

2.3.1 Roads

2.3.1.1 Access Road to Site

Access to the Project is via existing gravel access roads from Millertown as shown in Figure 1-1, owned by the Crown and primarily maintained (e.g., grading, snow clearing) by Marathon. The initial 8 km of road leaving Millertown is owned, operated, and maintained by the province. From the turnoff near the Millertown Dam, the following 80 km of class D gravel road extending to Marathon's existing exploration camp will be upgraded to class A standard 7.3 m wide driving surface and will include ditching on both sides and cross drainage by culverts. Rock and gravel for the road upgrade will be sourced from strategically located borrow pits along the 88 km route, the locations of which will be confirmed through field investigation. As Project planning and engineering proceed, evaluation of the existing culverts and bridges along the 80 km stretch of road will be further evaluated to determine if upgrades or replacement are required.

Marathon is currently investigating the possibility of using a different Crown road that is currently being extended towards the Project Area for forestry access. This alternative road will be a shorter, less winding road, passing less cabins, and would overall be a better road for access to the Project. Marathon will continue consultation with the provincial government to determine if this alternative site access road can be used for the Project. Marathon does not currently have the complete route determined to connect this road to the site, and in general, the viability of this alternative will be further assessed as part of the engineering progression and EA process.

2.3.1.2 Plant Site Roads

Plant site roads will provide access to the administration area, process plant facilities, and mine services area. These roads will generally be 6 m wide and will be constructed flush with bulk earthworks pads to allow storm water sheet flow across the site, thereby avoiding the need for deep surface drains and culvert crossings within the plant area.

2.3.1.3 On Site Access and Haulage Roads

A number of on site access roads will be constructed to access infrastructure such as the TSF, open pits, and other site infrastructure. These access roads will be designed for smaller heavy equipment and light vehicles, and pipeline and electrical corridors.

Connections between the open pits, waste rock piles, the ROM stockpiles, and the mine services and fueling areas will be to haulage road construction specifications to accommodate haul truck loads, grades, and passing (2-way traffic) requirements, and will be 25 m in width. The width and grades of these roads will vary accordingly. Where possible, haulage roads will be kept separate from other site access roads for safety reasons.

2.3.2 Open Pits

The Project comprises four mining areas: Leprechaun in the southwest, the Sprite Zone adjoining Leprechaun towards the northeast, the Marathon deposit located about 4.1 km northeast of the Sprite Zone, and the Victory Deposit located 5.5 km northeast of the Marathon Deposit. These four mining areas are shown below in Figure 2-3.

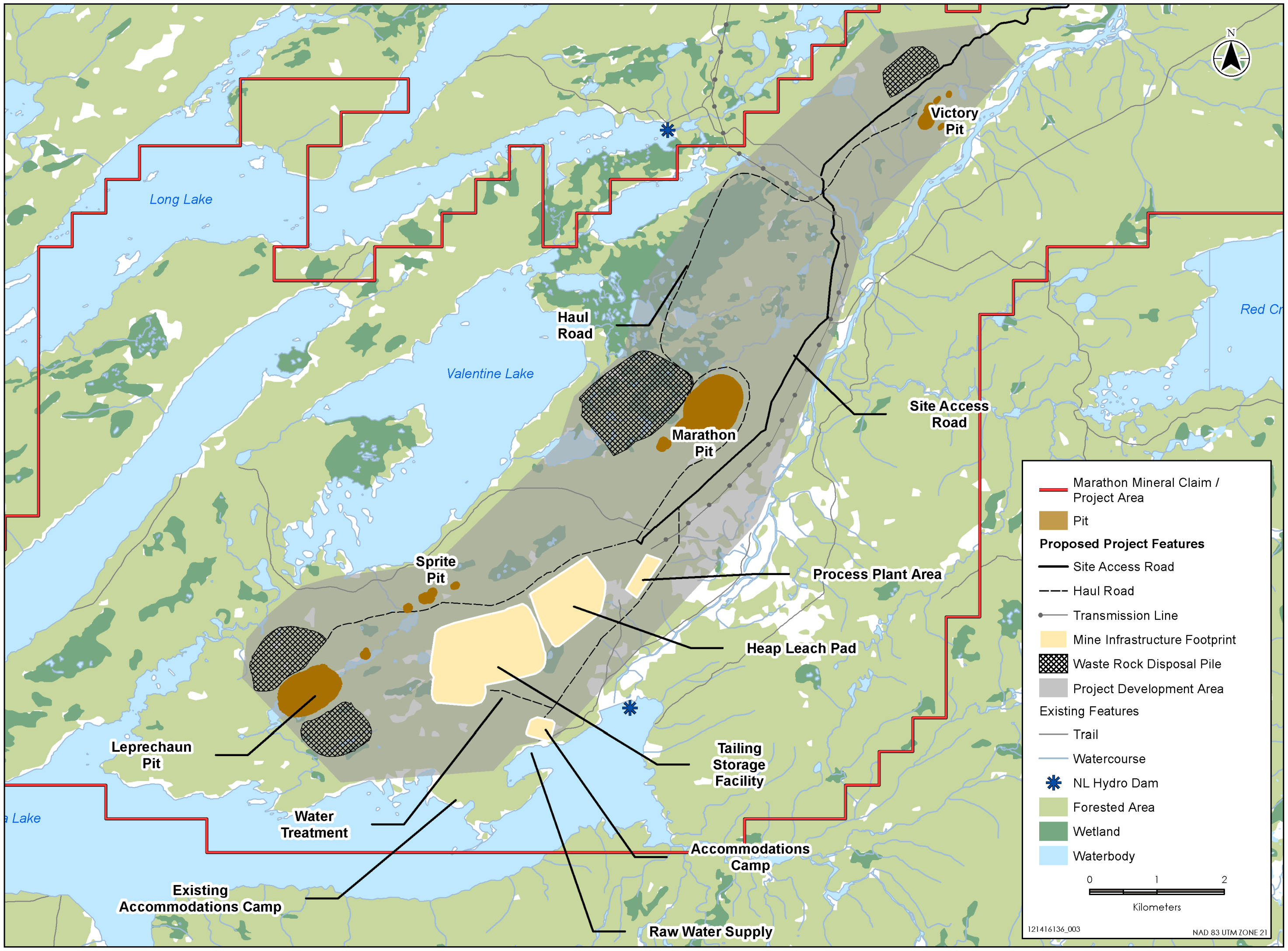

Figure 2-3 Location of Project Deposits

Ultimate pit limits were developed for three deposits using a pit optimization process. Based on the initial results, mineral resources for the Sprite Zone have not been sufficiently explored/defined to determine an ultimate pit limit. As Marathon believes that the additional work will be completed in time to include Sprite in the Project engineering and approvals (EA and permitting), a general description is included in this document. The 'downstream' effects of adding ore, waste rock, and adjustments to other Project components are expected to be relatively modest as the open pit at Sprite is anticipated to be small in comparison with the Leprechaun and Marathon pits. For example, the additional waste rock is expected to be accommodated within the Leprechaun waste rock disposal pile with minimal increase to the current footprint. Similarly, the TSF can be raised or expanded in footprint slightly to accommodate this small change. Similar, relatively minor changes may also be required if additional resources are identified within the other three open pits.

Standard surface mining techniques will be used to create an open pit within each of the four mining areas. The Leprechaun pit design comprises four mining phases and has maximum approximate dimensions of 900 m southwest to northeast by 600 m southeast to northwest, and a maximum depth of 300 m below current ground level. The Marathon pit design includes seven mining phases with one phase being a small standalone pit slightly southwest of the main Marathon pit. The Marathon pit has approximate dimensions of 1,200 m southwest to northeast by 700 m southeast to northwest and a maximum depth of 400 m below current ground level. The Victory pit design consists of four mining phases with one small pit located slightly northeast of the main Victory pit. The Victory pit has approximate dimensions of 540 m southwest to northeast by 280 m southeast to northwest, and a maximum depth of 130 m below current ground level. For the Sprite pit, it is assumed that the dimensions will be similar to Victory.

2.3.3 Mine Waste Rock Disposal Piles

Four waste rock disposal piles are envisioned for the Project as shown in Figure 2-1. The Leprechaun waste rock disposal pile is split in two areas located directly north and southeast of the Leprechaun and Sprite pits. Waste rock produced from the Leprechaun and Sprite pits will be stored in this area. The Marathon waste rock disposal pile is located just north of the Marathon pit. The Victory waste rock disposal pile is located north of the Victory pits.

Mine waste disposal piles will be constructed according to design recommendations and assume a final closure slope angle of 30°. To accomplish this, the waste rock disposal piles will be constructed in single lifts with a 35° face angle and a 6.1 m safety bench.

Based on acid rock drainage / metal leaching (ARD/ML) testing to date, mine waste rock is generally expected to be non-acid-generating. Some geological units within the open pits show low potential for ARD/ML, however the majority of the rock is showing to be acid-buffering and therefore with basic materials management, the waste rock disposal piles can be developed to ensure no ARD/ML issues will occur. Further test work is ongoing to confirm the initial test results. Where waste rock will be used for site earthworks and grading during construction and operational development, necessary test work will be conducted to prevent potentially acid-generating materials from being used in construction.

2.3.4 Organics and Overburden Stockpiles

As the open pits are expanded during operations, organic and overburden materials will be excavated. Marathon will develop a detailed material balance for mined materials incorporating strategic planning with respect to the re-use of waste materials for construction, progressive rehabilitation, or longer-term storage for final rehabilitation. This material balance will minimize the Project footprint and re-handling of materials, while maximizing the progressive rehabilitation opportunities related to waste rock disposal piles and other areas of the site.

Similarly, for general site construction and development where excess organic and overburden materials must be stockpiled for future site rehabilitation, these materials may be windrowed along linear corridors (e.g., road, pipelines) or stored in relatively small stockpiles around the site and in close proximity to where these materials will be re-used. Longer term stockpiles will be seeded to reduce erosion due to wind and precipitation.

2.3.5 Stormwater Management Infrastructure

Stormwater management across the site will be implemented and operated as follows:

- Diversion of non-contact water where possible. Channels and berms will be constructed around the crest of the open pits or up-hill of waste disposal piles and other developed areas in order to divert natural precipitation and surface runoff away to natural water drainage areas and away from contact with the mining operations, where possible.
- Precipitation and groundwater entering the open pits will be managed in-pit via sloped pit floors and catchment sumps, as required. These catchment sumps are the first opportunity to reduce sedimentation and chemistry impacts (e.g. residual ammonia), and appropriately sized sumps with screened intakes and hydrocarbon absorption booms will be employed in-pit. Water collecting in these in-pit sumps will be pumped to the crest of the pit and discharged into an engineered stormwater pond, as required. Stormwater ponds will be appropriately sized for retention and removal (by gravity) of suspended solids (sediment) and discharge from these ponds will be compliant with the applicable regulatory requirements (i.e., MDMER).
- Precipitation runoff from waste rock disposal piles and other developed areas of the site will be collected via ditches and channels and directed to a downstream stormwater management ponds similar to those to be constructed for management of water from the open pits.
- Stormwater ponds will be constructed in-ground, and/or using earthen berms and till, clay, or synthetic liners, if required, for water retention.
- Stormwater ponds will be located based on topography and geotechnical conditions. Where possible, water collected in pit, or in the stormwater ponds will be used for other purposes on site rather than discharged to the environment.
- If dams are required in order to create stormwater management infrastructure, the design, construction, operations, and closure of any dams will be in accordance with the Canadian Dam Association (CDA) and Mining Association of Canada (MAC) guidelines as well as any provincial and federal requirements.

2.3.6 ROM Stockpile

The ROM stockpile is located at the northwest corner of the process plant area and immediately east of the Heap Leach Pad. The stockpile pad is located and sized to allow management of low and high grade ores, destined for the heap leach circuit and process plant circuit, respectively.

2.3.7 Heap Leach Process Facilities

The Heap Leach process is a relatively simple, low-cost method of extracting gold from low grade ore that is not economical to send to the primary process plant circuit. The process has been used in the gold, silver, and copper industries since the 1960s and is estimated to be used to process approximately 12% of the world's gold output today. The components of the Heap Leach process include:

- Heap Leach Crushing Circuit
- Heap Leach Pad
- Heap Leach Solution and Event Ponds
- CIC Leach Process
- Elution Circuit

The heap leach process involves the creation of a large, lined pad on which crushed, low-grade ore will be stacked with perforated pipes laid within the ore material at regular horizontal and vertical intervals. A barren solution is pumped into the pile via the piping network constructed within the stacked ore. The solution drains through the ore, collecting gold, and to the bottom of the pile, where the drainage pipe system, above a double-lined containment system, collects the pregnant solution (containing gold) and sends it to a leach reactor system where the gold is absorbed in carbon. The gold-rich carbon is then sent to the elution circuit in the process plant for gold extraction and carbon/solution recycling. Heap Leach Crushing Circuit

A three-stage crushing circuit will reduce the ROM material from 800 mm to a P_{80} of 9.0 mm (P_{100} of 13.0 mm). Feed to the crushing plant will be accomplished via a front-end loader dumping into a feed bin. ROM material will be drawn from the feed bin at a controlled rate of 460 t/h via a variable-speed vibrating grizzly feeder to feed the primary jaw crusher. ROM material that is at the primary crusher product size will bypass the jaw crusher to reduce the load and wear on it. Primary crushing product, together with secondary and tertiary crusher products, will be sent to a double deck screen. The oversize material is further crushed by the secondary cone crusher, midsize material is crushed in a tertiary cone crusher, and the undersize material from the screen is considered as the final crushed product which will be transferred onto a conveyor to the heap leach area for material stacking. A weightometer will be placed underneath the crushing plant product conveyor to track and monitor material tonnage being conveyed. The measurements from the weightometer will also be used to control the speed of the vibrating grizzly feeder and the rate at which lime is added.

The crushing plant will include the following key equipment:

- Feed bin
- Vibrating grizzly feeder
- Primary jaw crusher
- Secondary cone crusher
- Tertiary cone crusher
- Secondary and tertiary crushing screen
- Mill feed apron feeder [variable-speed drive (VSD)]
- Material handling equipment

2.3.7.1 Heap Leach Pad

The heap leach pad is located adjacent to the mill and TSF sites as shown in Figure 2-1, and will be designed to contain the estimated 21.5 Mm^3 of low-grade ore to be treated in the current life of mine plan.

The pad design incorporates natural, local topography, constructed containment berms, and a double-lined containment system to form the pad on which the crushed, low-grade ore will be stacked. The location and layout of the pad were selected primarily based on site topography and proximity to Project infrastructure. The overall design has been developed based on the environmental setting of the Project, and similar operations and designs used within Canada.

Ore Stacking

Crushed ore material from the heap leach crushing plant conveyors will be discharged onto a series of mobile grasshopper conveyors and stacked on the leach pad via a radial stacker. To control pH, pebble quicklime will be added onto the crushing plant conveyor via a lime feeder suspended from a lime silo. The number of grasshopper conveyors in use will vary based on the distance from the end of conveyor to the exact location of material being stacked.

The stacking process will include the following key equipment:

- Material handling equipment (e.g., front end loaders)
- Radial stacker

Heap Leaching

The low-grade ore material will be placed on the pad in lifts of 10 m, and will ultimately be terraced with maximum terrace heights of 30 m. The slopes of the terraces will be 2.5H:1V which fulfil the closure slope stability requirement. A total of three vertical lifts, each 10 m in height, will be placed for heap leaching of the material. The pad will be constructed to approximately 942 m x 942 m in size.

Barren cyanide solution will be injected directly into the barren solution line discharging from the barren solution pond. The barren solution pump will be housed in a weather enclosure and pipeline will be installed below the finished ground surface for frost protection. This solution will be indirectly heated in a barren solution heater before being applied to the heap leach pad. Anti-scalant will also be added to prevent scaling. The cyanide and anti-scalant bearing solution will be applied onto the leach pad at a rate of 5 $L/m^2/h$ through a piping network consisting of drip irrigation systems. A dozer/tractor with an emitter burial attachment will bury the lines below the surface of the crushed material. Based on the preliminary column leach test results, a leach period of 130 days is required for optimal gold recovery. Pregnant solution drains from the leach pad to the pregnant solution pond, which in turn will pump the solution to the adsorption plant for further processing. This pregnant solution transfer pump will be housed in a weather enclosure and pipeline will be installed below surface. Barren solution from the adsorption plant will be returned to the barren solution pond via an insulated line. In the case of a rainstorm event, solution overflowing from the pregnant or barren solution pond will be directed to the storm water pond.

Once the leaching process is complete, water is cycled through the heap leach pile to remove (or “rinse”) all of the process solutions and chemicals from the pipes and the heap leach pile. All rinse water is then treated in the water treatment plant prior to recycling or discharge. The rinse process will be terminated once the water returning from the pile meets environmental discharge criteria.

The heap leaching will include the following key equipment:

- Dozer/tractor with low ground pressure tracks
- Emitter burial attachment
- Barren solution heater
- Distribution pumps and pipes

2.3.7.2 Heap Leach Solution and Event Pond

A series of storage ponds are required to manage the heap leach solution associated with the heap leach process; these include:

- Pregnant Solution Pond
- Barren Solution Pond
- Event Pond

The pregnant and barren ponds are lined storage ponds for the solutions that will be used throughout the heap leach process. The event pond will be used to collect overflow from the heap leach pad during precipitation events. These ponds are sized to handle the 100-year rain event for 24 hrs. These ponds will be lined to reduce the potential environmental impacts, and measures will be implemented to prevent access by wildlife.

2.3.7.3 Carbon in Column Leach Process

The adsorption circuit will consist of a single train of six open, up-flow columns, each with a 2.5 t carbon capacity, and will operate as an expanded bed contactor (Figure 2-4).

Pregnant solution containing dissolved gold will be pumped from the pregnant solution pond to the carbon columns to remove gold via carbon adsorption. The adsorption circuit will be operated manually on a daily basis to allow counter-current contact with the carbon to achieve the targeted carbon loading. Solution will enter into the bottom of each column via an annular ring at the center of the column and exit from the top.

Dart valves will be used to control flow to a column and to bypass the feed to the next column if required. The first column will contain solution with the highest gold concentration and carbon with the highest gold loading. As the solution passes through the next five columns, the gold concentration will drop off, leaving the weakest solution in contact with the freshest carbon (or most recently stripped carbon) in the last column. Solution exiting the last column will pass over the carbon safety screen to capture, and provide a visual check on, carbon escaping from the columns. The screen underflow will flow to the barren solution pond. This line will be insulated or buried.

Carbon advancement between the columns will be manually controlled by the operator by using carbon advance pumps on each column. Loaded carbon will be transferred from the first column to pass over the loaded carbon screen prior to transport via mobile truck to the acid wash and elution columns at the mill. Subsequently, carbon advancement will progress up the carbon adsorption train from the last column, with regenerated and screened carbon trucked from the mill, added to the last column.

The carbon adsorption circuit will include the following key equipment:

- Six adsorption columns
- Loaded carbon screen
- Carbon safety screen
- Carbon advance pumps

Figure 2-4 CIC Circuit

2.3.8 Process Plant Facilities

The process design is comprised of the following circuits:

- Primary crushing of ROM material.
- A covered crushed material (mill feed) stockpile to provide buffer capacity ahead of the grinding circuit.
- Grinding (milling) circuit: semi-autogenous grinding (SAG) mill with trommel screen, ball mill and cyclones.
- Pebble recycle via front end loader (FEL) reclaim.
- Gravity recovery from ball mill discharge by two semi-batch centrifugal gravity concentrators, followed by intensive cyanidation of the gravity concentrate and electrowinning of the pregnant leach solution in a dedicated cell located in the goldroom.
- Trash screen and rougher flotation.
- Thickening of flotation concentrate and flotation tails prior to leaching.
- Regrind mill for the flotation concentrate.
- Flotation concentrate leach and CIL, and flotation tails CIL.
- Acid washing of loaded carbon and elution followed by electrowinning and smelting to produce doré. A doré bar is a semi-pure alloy of gold, which can be transported to a refinery for further purification. Carbon regeneration by rotary kiln.
- Cyanide destruction of tailings using Air/SO_2 process and tailing management facility.

A rendering of the mill, flotation and CIL plant is provided in Figure 2-5.

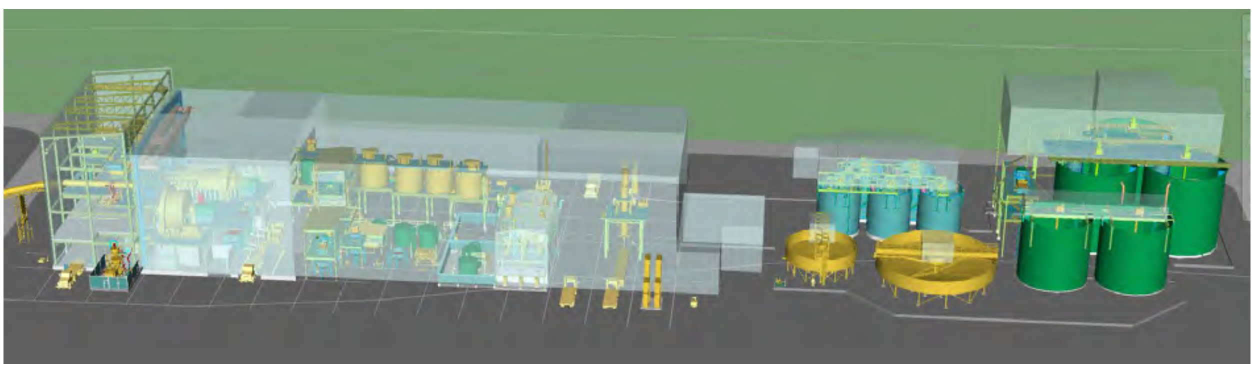

Figure 2-5 Mill, Flotation and CIL Plant

2.3.8.1 Crusher and Mill Feed Stockpile

Figure 2-6 provides a rendering of the primary crushing and mill feed stockpile. Material will be hauled from the mine and dumped on the ROM pad for blending and re-handling into the ROM hopper. Provision for direct tipping to the ROM hopper will be provided. Material from the ROM hopper will be crushed by a primary jaw crusher. A ROM hopper apron feeder will be used to regulate feed at 457 t/h into a vibrating grizzly and the jaw crusher. A fixed rock breaker will be used to break oversize rocks at the top of the feed bin. Pebbles from the SAG mill will be dumped on crusher discharge conveyor by a FEL. The crushed material is conveyed to a covered stockpile, which will provide approximately 24-hrs of storage.

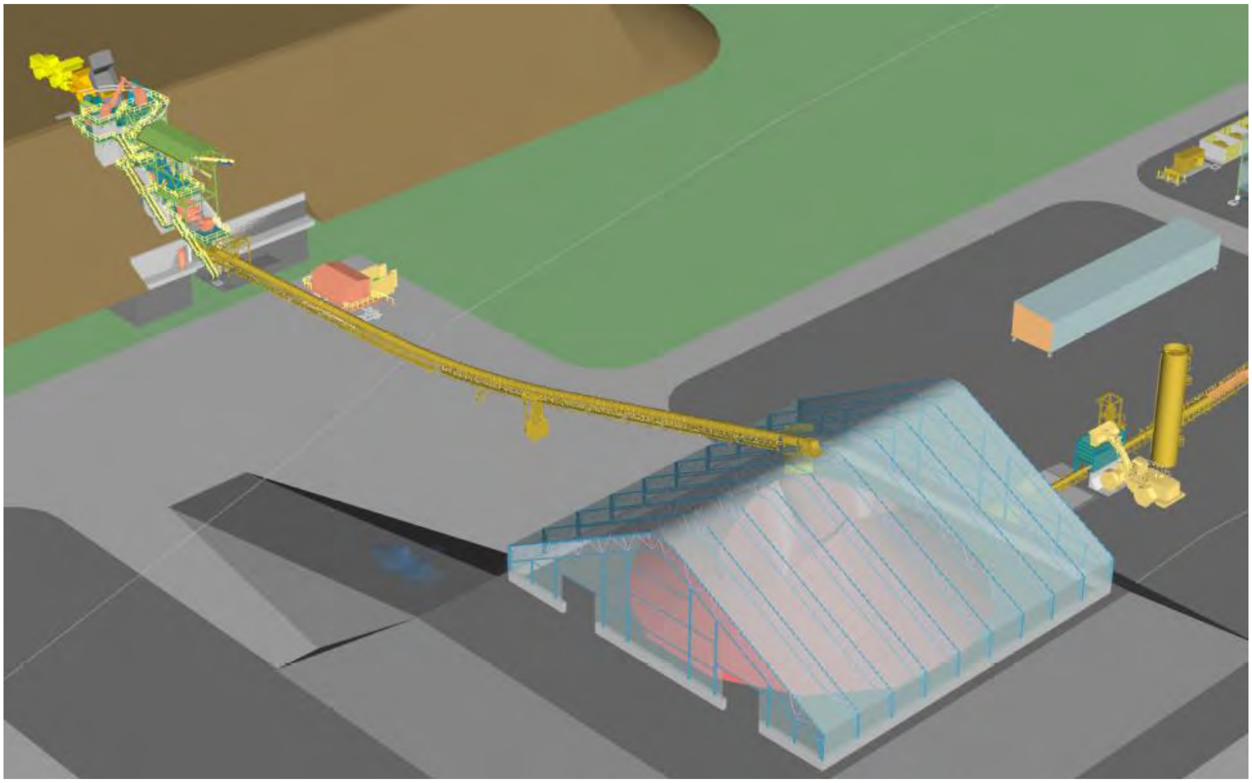

Figure 2-6 Primary Crushing and Mill Feed Stockpile

The mill feed stockpile will be equipped with apron feeders to regulate feed at 375 t/h into the SAG mill. Crushed material drawn from the stockpile will feed the SAG mill and ball mill circuit via the mill feed conveyor.

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

- ROM hopper
- Apron feeder (with VSD)
- Vibrating grizzly
- Fixed rock breaker
- Primary jaw crusher
- Mill feed apron feeder (VSD)
- Material handling equipment

2.3.8.2 Grinding Circuit (Mill)

The grinding circuit will consist of a SAG mill followed by ball mill in closed circuit with hydro-cyclones. The SAG mill grate aperture size will be 12.5 x 20 mm. The SAG mill will discharge through a trommel where the pebbles will be screened out and carried back to the crusher discharge conveyor via front end loader. Trommel undersize discharges into the cyclone feed pumpbox, along with ball mill discharge material. Water is added to the cyclone feed pumpbox to obtain appropriate density prior to pumping to the cyclones.

Cyclone overflow gravitates to the rougher flotation conditioning tank via a trash screen. Cyclone underflow, together with gravity circuit tails and gravity screen oversize, flow by gravity to the ball mill for further size reduction. The Ball mill product will discharge onto a launder containing a slot to allow a portion of the stream to gravitate into a pumpbox to be pumped to the gravity circuit.

The grinding circuit will include the following key equipment:

- SAG mill – 3,000 kW VSD
- Ball mill – 5,400 kW
- Cyclone feed pumpbox
- Classification cyclones

2.3.8.3 Gravity Recovery Circuit

The gravity circuit comprises two parallel centrifugal concentrators complete with feed scalping screens. Feed to the circuit is extracted from the ball mill discharge launder and pumped to the scalping screens. Gravity scalping screen oversize at +2 mm will report by gravity to the ball mill feed, while the gravity tails will gravitate to the mill discharge pump box. Scalping screen undersize is fed to the centrifugal concentrator.

Operation of the gravity concentrator will be semi-batch and the gravity concentrate will be collected in the concentrate storage cone and subsequently leached by the intensive cyanidation reactor circuit (ICR).

The gravity recovery circuit will include the following key equipment:

- Gravity feed scalping screen
- Gravity concentrators

2.3.8.4 Intensive Cyanidation Reactor

Concentrate from the grinding circuit gravity concentrators will be sent to the intensive cyanidation reactor (ICR) to recover the contained gold by cyanide leaching. The concentrate from the gravity concentrators will be discharged to the ICR gravity concentrate storage cone and de-slimed before transfer to the ICR.

ICR leach solution (2% NaCN, 2% NaOH and Leach Aid) will be made up within the heated ICR reactor vessel feed tank. From the feed tank the leach solution will be circulated though the reaction vessel for approximately 20 hrs, then drained back into the feed tank. The leached residue within the reaction vessel will be washed, with wash water recovered to the reaction vessel feed tank, and then the solids will be pumped to the flotation concentrate regrind mill.

The ICR pregnant leach solution will be pumped from the reaction vessel feed tank to the ICR pregnant solution tank, located near the goldroom.

ICR pregnant solution will be pumped to the goldroom for gold recovery as gold sludge using a dedicated electrowinning cell. The sludge will be combined with the sludge from the carbon elution electrowinning cells and smelted or may be smelted separately for metallurgical accounting purposes.

The ICR circuit will include the following key equipment:

- Gravity concentrate storage cone
- Intensive cyanidation reactor
- Reactor vessel feed tank heater
- Leach Aid screw feeder
- ICR pregnant solution tank
- ICR electrowinning cell

2.3.8.5 Flotation Circuit

Cyclone overflow will gravitate over the trash screen, to remove foreign material prior to flotation. Trash will report to the trash bin which will be periodically removed for emptying. Screen undersize will gravitate to the rougher conditioner tank. Reagents will be added into the rougher conditioner tank and mixed thoroughly.

The rougher flotation cells will consist of eight 70 m^3 forced-air tank cells in series. Rougher concentrate will gravitate into the flotation concentrate thickener. The rougher tailings will gravitate to flotation tailings thickener. Flocculant will be added into each thickener.

Flotation concentrate thickener feed rate is 18.75 t/h while flotation tails thickener feed rate is 356 t/h. Flotation tails thickener underflow will report to number seven CIL tank, and flotation concentrate thickener underflow and ICR residue will report to the concentrate regrind mill. Fine grinding will be achieved via attrition and abrasion of the particles in a vertical, agitated, mill containing small ceramic beads as the grinding medium.

The flotation, thickening and regrinding circuit will include the following key equipment:

- Trash screen
- Rougher flotation tank cells
- Flotation concentrate thickening
- Flotation tails thickening
- Regrind mill

2.3.8.6 Carbon in Leach Process

CIL tanks consist of two sets of adsorption tanks. The first set of CIL tanks accepts regrind mill discharge together with barren solution from electrowinning cells; these streams will be discharged into the leaching circuit pre-leach tank before CIL tanks. The second set of tanks accepts tails from first set of tanks as well as flotation tails thickener underflow. One interim carbon screen is used between these two CIL circuits to prevent slurry from the large CIL tank from going to the small CIL tanks.

The first leach circuit for processing ground concentrate will consist of one pre-aeration tank and five CIL tanks. The CIL tanks will be identical in size, with a total circuit residence time of 48 hrs at 46% w/w density in the tanks with solids flowrate of 18.8 t/h. The second set is three identical CIL tanks, larger in size than the concentrate CIL tanks, with total residence time of 24-hrs at 53% w/w and 375.2 t/h solids flowrate. Air will be sparged to each of the tanks to maintain adequate dissolved oxygen levels for leaching.

Quicklime will be added to ensure that the slurry pH is suitable for cyanidation. Cyanide solution will be added into the first tank of the reground concentrate CIL tanks.

Fresh / regenerated carbon from the carbon regeneration circuit will be returned to the last tank of the CIL circuit, and will be advanced counter currently to the slurry flow by pumping slurry and carbon from last CIL tank to previous CIL tank, and so on. The intertank screen in each CIL tank will retain the carbon whilst allowing the slurry to flow by gravity to the downstream tank. This counter-current process will be repeated until the carbon, by then loaded with gold, reaches the first CIL tank. Recessed impeller pumps will be used to transfer slurry between CIL tanks and from the lead tank to the loaded carbon screen mounted above the acid wash column in the elution circuit.

Slurry from the last CIL tank will gravitate to the vibrating carbon safety screen to recover carbon leaking from worn screens or overflowing tanks. Screen underflow will gravitate to the cyanide destruction unit. Screen oversize (recovered carbon) will be collected in a fine carbon bin for potential return to the circuit.

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

- Flotation concentrate pre-aeration tank
- Flotation concentrate CIL tanks
- Flotation concentrate and tails CIL tanks
- Loaded carbon screen
- Intermediate carbon screen
- Carbon safety screens

2.3.8.7 Cyanide Destruction

Plant tailings from the CIL circuit is detoxified to a weak acid dissociable cyanide (CN_{WAD}) concentration of <1 ppm, to comply with environmental requirements, prior to deposition in the TSF. The CIL tails at 52% solids will flow by gravity to the cyanide destruction tank. The tank will operate with a total residence time of approximately 120 mins to reduce CN_{WAD} design levels from approximately 150 ppm to less than 1 ppm.

Cyanide destruction is undertaken using the SO_2/air method. The reagents required being air, caustic, copper sulphate, and sodium metabisulphite (SMBS). The cyanide destruction tanks are equipped with air addition points and an agitator to thoroughly mix the air and reagents with the tailings slurry.

Detoxified tailings will be pumped to the TSF for final deposition with decant water from the TSF returned for use as process water. Overflow from the TSF will be discharged to a polishing pond for further treatment and monitoring before discharge into the environment.

The main equipment in this area includes:

- One agitated cyanide destruction tank
- Air supply system
- Reagent supply systems

2.3.8.8 Carbon Acid Wash, Elution, and Regeneration Circuit

Carbon Acid Wash

Prior to carbon stripping (elution), loaded carbon will be treated with a 3% hydrochloric acid solution to remove calcium, magnesium and other salt deposits that would otherwise render the elution less efficient or be 'baked on' in the subsequent elution and carbon regeneration steps and ultimately foul the carbon.

Loaded carbon from the loaded carbon recovery screen will flow by gravity to the acid wash column. Additionally, loaded carbon from the heap leach facility will be brought by truck and hydraulically transferred into the same acid wash column.

Entrained water will be drained from the column and the column then refilled with a 3% hydrochloric acid solution, from the bottom up. Once the column is filled with the carbon, it will be left to soak in the acid for 30 mins after which the spent acid will be rinsed from the carbon and discarded to the cyanide destruction tank.

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

The acid wash circuit includes the following key equipment:

- Acid wash column – 5 t capacity.

Carbon Stripping (Elution)

Carbon stripping (elution) will use a split Anglo-American Research Laboratory (AARL) process.

The elution sequence will commence with the injection of a set volume of water into the bottom of the elution column, along with the simultaneous injection of cyanide and sodium hydroxide solution to achieve a 2% w/w NaOH and 2% w/w NaCN solution. Once the prescribed volume has been added, the pre-soak period will commence. During the pre-soak, the caustic/cyanide solution will be circulated through the column and the elution heater until a temperature of 95°C is achieved.

Upon completion of the pre–soak period, the last four bed volumes (BV) of low grade (lean) eluate from the previous elution will be pumped through the heat exchanger and elution heater, then through the elution column to the pregnant eluate tank at a rate of 2 BV/hr. At this stage the temperature of the eluent passing through the column will be raised to 125° - 130°C and the gold will be stripped off the loaded carbon.

Eluate will flow up and out of the top of the column, passing through the heat exchanger via the elution discharge strainers and to the pregnant eluate tank.

Once the lean eluate storage volume is exhausted, heated incoming strip water (4 BV) will be used to continue the strip, followed by 2 BV of water to cool the carbon. The last 4 BV will be directed to the lean eluate tank for use in the next strip.

Upon completion of the cool down sequence, the carbon will be hydraulically transferred to the carbon regeneration kiln feed hopper via a de-watering screen.

The stripping circuit includes the following key equipment:

- Elution column – 5 t capacity.
- Strip solution heater with heat exchangers.
- Strip water, lean eluate and pregnant eluate tanks.

Carbon Regeneration (Reactivation)

Carbon will be reactivated in a diesel fired rotary kiln. Dewatered barren carbon from the stripping circuit will be held in a 10 t kiln feed hopper. A screw feeder will meter the carbon into the reactivation kiln, where it will be heated to 650° - 750°C in an atmosphere of superheated steam to restore the activity of the carbon. Carbon discharging from the kiln will be quenched in water and screened on a carbon sizing screen to remove undersized carbon fragments. The undersize fine carbon will be collected in a filter and bagged to be sold or disposed, depending on its residual gold loading. Reactivated carbon will be returned to the CIL circuit or trucked to the heap leach adsorption circuit.

As carbon is lost by attrition, new carbon is added to the circuit after attritioning in a carbon conditioning hopper to remove fines. The new carbon will then be transferred via the carbon sizing screen into the circuit the same way as reactivated carbon.

The carbon reactivation circuit includes the following key equipment:

- Carbon dewatering screen
- Regeneration kiln including feed hopper and screw feeder
- Carbon quench tank
- Carbon sizing screen
- CIL barren carbon hopper
- Carbon fines hopper
- Carbon fines filter
- Fresh carbon conditioning hopper

2.3.8.9 Electrowinning and Goldroom

Gold will be recovered from the pregnant eluate by electrowinning and smelted to produce doré bars.

The pregnant eluate is pumped through two electrowinning cells with stainless steel mesh cathodes. Gold will be deposited on the cathodes and the resulting barren solution will gravitate back into the barren solution tank for reuse or pumped to the leach circuit. One additional electrowinning cell will be dedicated for processing ICR pregnant solution.

The gold-rich sludge will be washed off the steel cathodes in the electrowinning cells using high pressure water sprays and will gravitate to the sludge hopper. The sludge will be drained, filtered, dried, mixed with fluxes and smelted in an induction furnace to produce gold doré.

The electrowinning and smelting process will take place within a secure and supervised goldroom equipped with access control, intruder detection and closed-circuit television equipment.

The electrowinning circuit and goldroom includes the following key equipment:

- Electrowinning cells with rectifiers
- Sludge pressure filter
- Drying oven
- Flux mixer
- Induction smelting furnace with bullion moulds and slag handling system
- Bullion vault and safe
- Dust and fume collection system
- Goldroom security system

2.3.8.10 Reagent Storage

For the management of unexpected reagent spills, the reagent preparation and storage facilities will be located within containment areas designed to accommodate more than the content of the largest tank, in the event of a leak or spill. Where required, each reagent system will be located within its own containment area to facilitate its return to its respective storage vessel and to avoid the mixing of incompatible reagents. Storage tanks will be equipped with level indicators, instrumentation, and alarms to prevent spills from occurring during normal operation. Appropriate ventilation, fire and safety protection, eyewash stations, and Material Safety Data Sheet (MSDS) stations will be located throughout the facilities. Sumps and sump pumps will be installed for spillage control.

2.3.9 Gold Shipment to Market

Gold product to be exported from site would be limited to armored trucks, owned and operated by a third party, used to transport the doré bars to market via the site access road from Millertown, then via provincial highways.

2.3.10 Tailings Storage Facility (TSF)

2.3.10.1 Design Requirements and Concept

The TSF has a preliminary design to accommodate the estimated 30 Mm^3 of tailings material that will be produced over the life of the mine and is based on an average annual throughput of 3.0 Mtpa for the mill. The preliminary layout for the TSF is shown in Figure 2-7. The overall design objective of the TSF is to protect the regional groundwater and surface water resources during both operations and long term (post-closure), achieve safe and efficient tailings storage and effluent management during operations, and to achieve effective rehabilitation upon mine closure.

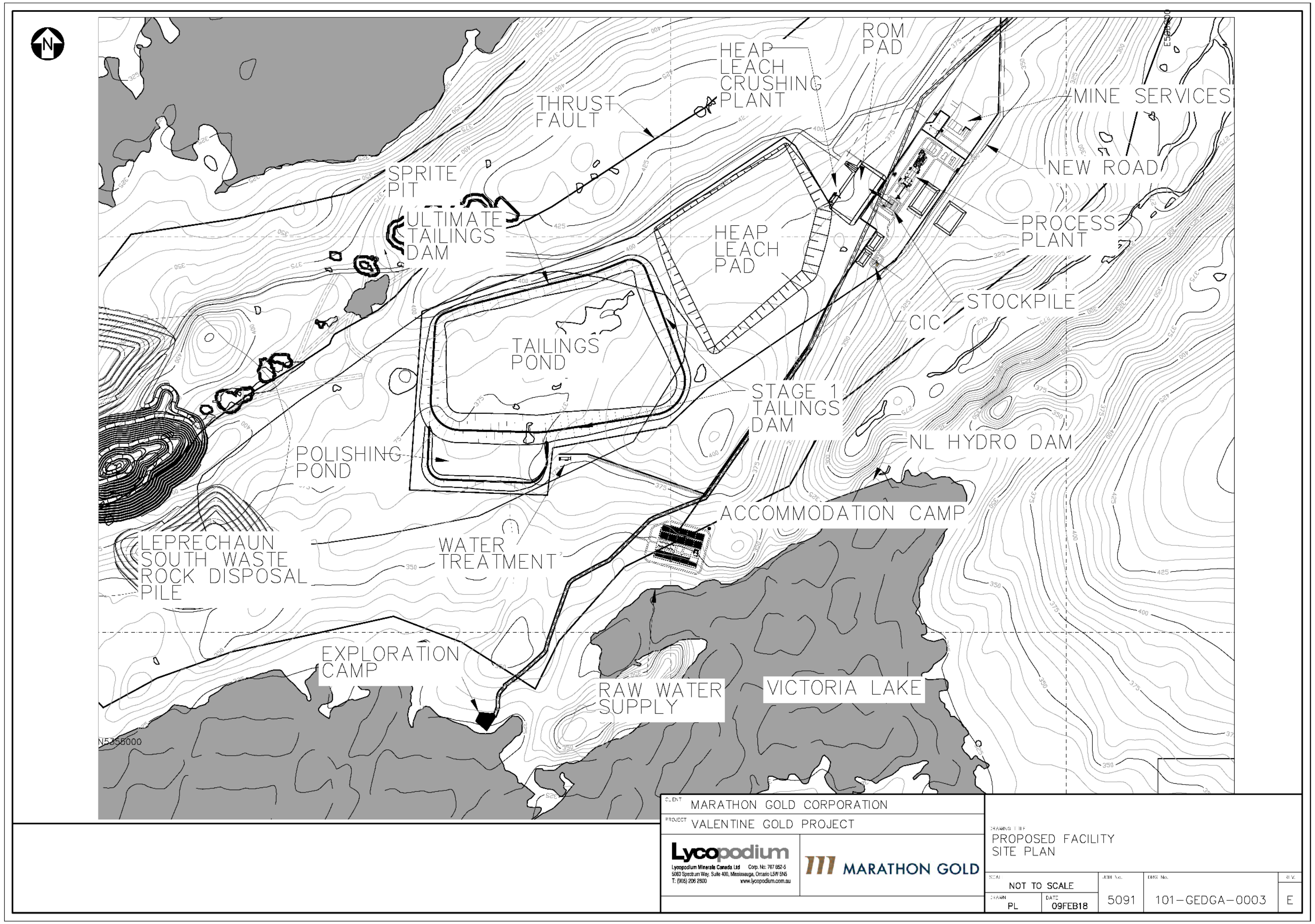

Figure 2-7 Tailings Storage Facility

The design of the TSF has considered the following:

- Reducing the impact and risks to the surrounding environment
- Permanent, secure, and total confinement of solid waste materials within the engineered TSF
- Control, collection, and removal of effluent from the tailings during operations for recycling as process water to the maximum practical extent
- The inclusion of monitoring features for the facility to demonstrate performance goals are achieved and design criteria and assumptions are met
- Staged development of the TSF over the life of the Project to defer capital cost and allow for efficient use of waste materials from pit stripping as construction materials for the TSF

A conventional downstream embankment construction concept is planned based on the mine plan and assessment of site topography. The TSF is currently sited in the middle of the PDA, southwest of both the mill and heap leach pad sites.

The preliminary design has the TSF embankments being raised in five stages and will be constructed out of mine waste rock, and locally sourced borrow materials.

To date, ARD/ML test work has shown potential for some high grade ore to be potentially acid generating, however based on the geology, further metallurgical testing and ARD/ML testing on source rock, and lab-scale process tailings, is expected to show that the combined tailings will be non-acid-generating. The current TSF design allows for a permanent water cover over the deposited tailings in the event that the results of the detailed test work require this ARD/ML preventative measure.

A polishing pond will be constructed downstream of the tailings impoundment The polishing pond has similar construction as the TSF. The polishing pond will be constructed as part of the initial TSF construction phase and the crest will have an elevation 380.0 m.

The polishing pond will be capable of retaining effluent from the tailings impoundment prior to release to the environment via the water treatment plant. The pond will be engineered to manage the design precipitation and flooding events to maintain the stability of the TSF overall, and prevent unplanned effluent discharge to the environment.

The dams required for the tailings impoundment will be designed, constructed, operated, and closed in accordance with the CDA and MAC guidelines, as well as all applicable provincial and federal requirements. Where possible, dams will be breached at closure to eliminate the long-term liabilities associated with dam structures.

2.3.11 Water Treatment Plant

A dedicated water (effluent) treatment facility is required for the Project to treat suspended solids, pH, and other water quality issues. Based on the preliminary water balance, the water treatment facility is currently anticipated to treat a nominal flow rate of 997 m^3/h and a peak flow rate of 1,396 m^3/h. It will use proven treatment processes to handle the effluent water to meet the applicable requirements and regulations for environmental discharge water quality. Discharge from the plant will be directed to Victoria Lake.

2.3.12 Substations and Power Distribution

Site power will be provided from a HV line extending from the Star Lake area to the main substation at the Project site, constructed and connected by NL Hydro. A preliminary routing of the HV line is provided in Figure 1-1, as provided to Marathon by NL Hydro. Consultation with NL Hydro is in the early stages and the exact powerline route, connection details, and power purchase agreement will be determined through further consultation.

A peak demand of 23 MW is required for the facility. The semi-autogenous grinding (SAG) and ball mills at the flotation plant are the largest electrical loads. The SAG and ball mills have been specified with a variable frequency drives to reduce the load surge during start-up.

Primary power will be delivered to the site substation, from where it will be stepped down and distributed around to the various equipment and locations required around the site, primarily via overhead power lines.

2.3.12.1 Electrical Distribution

The plant electrical system is based on 13.8 kilovolt (kV), 2,000 A, 60 hertz (Hz) distribution. The 66 kV feed from local power authority will be stepped down to 13.8 kV at the plant main substation, and will supply the plant main 13.8 kV switchgear housed in the switchroom of the plant main substation. The SAG mill, ball mill, and cyclone feed pumps variable frequency drives (VFDs) will have 13.8 kV input, fed by plant main 13.8 kV switchgear, for their phase shifting input transformer and 4.16 kV output. Separate 13.8 kV/600 V distribution transformers at the plant various substations will be fed from the plant main 13.8 kV switchgear.

The following substations with switch rooms will be provided:

- Plant main substation
- Heap leach plant feed preparation substation
- Heap leach plant [CIC] substation
- Flotation plant main substation
- Floatation plant feed preparation substation
- Floatation plant services and buildings substation

Switchrooms will house 13.8 kV switchgear (plant main substation only), medium voltage (MV) VFDs (flotation plant main substation only), 600 V motor control centres (MCCs), low voltage (LV) VFDs, plant control system cabinets, lighting transformers, various distribution boards, and uninterruptible power source (UPS) power distribution.

Overhead power lines of 13.8 kV will provide power to various remote facilities. Pole mounted transformers will step down the voltage at each location, and supply an outdoor 480 V switchboard local to each equipment area.

2.3.12.2 Electrical Buildings

Electrical buildings will be pre-fabricated ‘flat pack’ panel buildings to reduce installation time on site. Buildings will be installed on a structural framework over 2 m above ground level to allow for bottom entry of cables into electrical cabinets. The electrical buildings will be installed with high-voltage alternating current (HVAC) units and suitably sealed to prevent ingress of dust.

2.3.12.3 Transformers and Compounds

The plant main transformer 66 kV/13.8 kV will be oil natural air natural (ONAN), with provisions for future oil natural air forced (ONAF), cooling configuration and will have either on-line tap changer (OLTC) or external voltage regulators. SAG mill, ball mill and cyclones feed pumps VFD phase shifting input transformers (13.8/4.16 kV) will be dry type and part of concerned VFD panel line-up. All plant 13.8 kV/600 V distribution transformers will be of ONAN, with provisions for future ONAF, cooling configuration and will have de-energized tap changer.

Fire rated concrete walls will be constructed around the oil filled transformers.

2.3.13 Water Intake and Distribution

2.3.13.1 Raw Water Supply System

It is planned that raw water will be obtained from Victoria Lake. Fresh water will be supplied by the raw water pumps to an atmospheric vented fresh water tank. Raw water will be used for all purposes requiring clean water with low dissolved solids, primarily as follows:

- Fire water for use in the sprinkler and hydrant system
- Cooling water for mill motors and mill lubrication systems
- Gland water for pumps
- Reagent make-up
- Feed for the potable water plant
- Raw water will be treated and stored in the potable water storage tank for use in safety showers and other similar applications

2.3.13.2 Fire Water Supply System

Fire water will be piped to the main facilities via buried underground fire water ring mains around each of the facilities. In addition, buildings will be equipped with hose cabinets and supplemented with hand held fire extinguishers of two types—general purpose extinguishers for inside plant areas, and dry type extinguishers for inside electrical and control rooms. Ancillary buildings will be provided with automatic wet sprinkler systems throughout the buildings.

2.3.13.3 Potable Water Supply

The potable water treatment plant will be designed to NL drinking water guidelines. The plant is expected to include multimedia filtration for reduction of turbidity, followed by ultraviolet disinfection for primary disinfection, and the addition of sodium hypochlorite for secondary disinfection. Treatment residuals from the potable water treatment plant (e.g., multimedia filtration backwash) will be sent to the tailings thickener for ultimate disposal within the TSF. Treated potable water from the potable water treatment plant will be stored in the plant potable water tank and the safety shower water tank. Treated potable water from the plant potable water tank will be distributed via the plant potable water pump in a piping ring main to serve potable water users in the facilities. Treated potable water from the safety shower water tank will be distributed via the safety shower water pumps to drinking fountains, eye wash stations, and safety showers.

Potable water piping in the plant area will either be buried below the frost line, routed through heated buildings, or heat traced and insulated. Manual drain points will be included to allow emptying of pipelines, should conditions dictate.

2.3.13.4 Process Water Supply

Process water recycled from the flotation concentrate and tailings thickeners overflow and TSF decant water will meet the main process water requirements. Raw water will provide additional make-up water requirements.

2.3.14 Other Plant Site Buildings

The following plant site buildings are shown in Figure 2-2.

2.3.14.1 Plant Administration, Workshop, and Warehouse

The plant administration, workshop, and warehouse building is located east of the processing plant. The building will be of poured concrete foundation and steel-clad construction, with the building sectioned for the different components required.

2.3.14.2 Laboratory

The laboratory will be of poured concrete foundation and steel-clad construction, and with added ventilation equipment as required by regulation for the types of test work conducted.

2.3.14.3 Administration and Lunchroom

General administration offices and the plant lunchroom will be located in a separate building near the entrance to the plant site. The building is expected to be of poured concrete foundation and steel-clad construction.

2.3.14.4 Mine Services and Workshop

The mines services and workshop will be located east of the process plant and general plant site buildings for ease of access and proximity of common services and infrastructure. Mine heavy equipment (e.g., trucks, loaders), will only be able to travel on the east side of the building, while personnel vehicles will be kept to the east and south, separated by fencing and barriers for safety. The building will consist of sufficient servicing and maintenance bays and equipped with overhead cranes to service the mine heavy equipment fleet. The building will be of poured concrete foundation and steel-clad construction, including in floor sumps for catchment of sediments and hydrocarbons from maintenance activities. Oil/water separation units will be incorporated into the design where required.

2.3.14.5 Security

A security building will be constructed adjacent to the plant site gate where employees and visitors will be required to check in and out. The security building will also serve as the primary health and safety emergency station where the site ambulance and other emergency response equipment will be stationed.

2.3.15 Accommodation Camp

A permanent 200-person accommodation camp with associated services will be located to the south of the process plant and will provide accommodation for construction and later for operating and maintenance staff. A 100-person temporary construction camp will be built for the peak load workforce levels during construction. This camp will use the common facilities in the permanent camp. The temporary construction camp will be decommissioned once construction activities are complete.

2.3.16 Plant Site Stormwater Pond and Sanitary Effluent

Sewage generated within the Project site will be collected via an underground sanitary sewer network to a common location, where it will be treated by an above grade mechanical sewage treatment plant (vendor package). Treated sewage effluent will be discharged to the environment, meeting local permit requirements. Sludge generated as a by-product of the treatment of sewage will be disposed off-site by a licensed contractor.

The plant site stormwater pond is located to the southeast side (and down-gradient) of the plant area. This pond will manage all plant site stormwater runoff prior to pumping to the water treatment plant prior to release.

2.3.16.1 Fuel Storage and Fueling Stations

Diesel fuel will be stored on site near the mine services area for heavy and light vehicle refueling. Diesel fuel storage and supply will be provided by a fuel supplier and include three 90 m^3 fuel storage tanks, offloading pumps, dispensing pumps, associated piping, and electronic fuel control/tracking system. The diesel fuel area will contain the following equipment:

- Diesel unloading pump
- Diesel storage tank

- Diesel supply pumps
- Light vehicle bowsers
- Heavy vehicle bowsers

A vertical spindle sump pump will be provided to remove precipitation from the diesel fuel bund (bermed catchment) area.

2.4 Construction and Development

Marathon will develop specific protocols as part of an overall Environmental Management System (EMS) to facilitate the execution of the site development in an environmentally responsible and safe manner. In addition, Marathon will develop an Environmental Protection Plan (EPP) specific to the construction phase that will outline best management practices for all construction activities. The EPP will be reviewed and approved by government regulators prior to the start of any site-specific construction activities.

General construction activities for the Project include:

- Site preparation – includes cutting and clearing of vegetation and removal of organic materials and overburden over the areas to be developed. Site preparation also includes the development of construction stage water and erosion control (e.g., ditching, sedimentation ponds, etc.) and construction access roads
- Earthworks – for infrastructure development areas, this includes excavation, preparation of excavation bases, placement of structural fill, and grading to facilitate infrastructure construction. For the open pits, earthworks include stripping and stockpiling of organic and overburden materials and development of in-pit quarries to supply site development rock for infrastructure such as structural fill and road gravels
- Construction of infrastructure – placement of concrete foundations, and construction of buildings and infrastructure as required for the Project
- Major equipment installation
- Installation of utilities – construction and connection of power, water, and fuel supply infrastructure
- Open pit pre-production (pre-stripping) and construction of the initial stages of the Heap Leach Pad and TSF

Further details on specific construction and development activities are provided below.

2.4.1 Vegetation Removal

In preparation for earthworks, site development, and infrastructure construction, vegetation removal will be completed over development areas in accordance with the cutting permits issued. Vegetation removal will be planned as per the regulations pertaining to bird breeding seasons, and where/if the schedule requires vegetation clearing during bird breeding seasons, experienced environmental monitors will inspect clearing areas ahead of the work to avoid disturbance of nests.

2.4.2 Earthworks

The Project will require earthworks development throughout the PDA to support infrastructure, such as roads, buildings, camp, tailings dams, heap leach pad, and sedimentation ponds. Based on available mapping information, it is known that the surface elevations across the site vary and the soil conditions vary from boggy areas, thin to thick till layers, and bedrock outcrops.

It is assumed that building foundations will be constructed on dense, natural glacial tills, bedrock, and/or structural fill. In general, the foundations throughout the Project will require a soil cover of 1,800 mm or equivalent for frost protection. Surficial organic materials will be removed from the footprint of the Project structures before placing foundations or structural fills.

Organic and overburden soils will be stockpiled strategically around the site for future site rehabilitation as described in Section 2.6.

Building foundations and equipment pads and foundations will be prepared and placed on natural, dense glacial till, bedrock, or compacted, engineered structural fill. Structural fill is expected to be sourced from the mine waste rock excavated during open pit pre-stripping or through cut and fill civil earthworks at the site.

2.4.3 Concrete

Concrete will be required for building foundations and other site construction and development features and is expected to be primarily batched on site. Coarse aggregates are expected to be crushed from mine waste rock and/or site rock quarries. Fine aggregates (sand) are expected to be sourced from local quarries in the area. Some pre-cast of larger building footings may be poured off-site and transported to the site, if the schedule requires.

2.4.4 Fuel Supply

Fuel required for construction will be provided by the contractor(s). Temporary storage and fueling locations and procedures will conform to applicable regulatory criteria.

2.4.5 Materials Shipping and Employee Transportation

Materials required for Project construction will be shipped to site by truck via the main access road. Given the approximately two-hour travel time from Millertown to the site, employees will be transported from nearby communities by bus and would stay in the on-site accommodations camp.

2.4.6 Open Pit Development

During the first year of mining operations, prior to the plant start-up, approximately 3,780,000 t of waste rock is required for construction of the mill area, TSF, and heap leach facilities. During this initial development, some mill feed and heap leach material will be mined and stockpiled as required. A total of 7,000,000 t of waste rock material, 1,580,000 t of millfeed material, and 1,159,000 t of heap leach material will be mined during the preproduction period. At the conclusion of the preproduction period, enough exposed mill feed and heap leach material, as well as stockpiled material, will be available to commence and sustain processing operations.

2.4.7 Heap Leach

The heap leach pad will be constructed in two phases. The first phase will be developed during the construction stage of the Project and will have capacity for 60% of the life of mine heap leach material. The second phase will be constructed during the fifth year of operation for the balance of capacity. The phases will be designed and constructed such that the required containment and leak detection system is fully operational for both phases.

Once the stripping of overburden is completed and sub-grade properly compacted, a layer of local borrow and sand cushion will be installed in preparation for the liner. An 80-mil high density polyethylene (HDPE) liner will be installed over the footprint of the heap facility. Due to the environmental conditions of the site, a double synthetic liner system will be used that will have a leak detection sand layer, a geotextile, and a low permeability soil between the two HDPE liners.

Above the liner system, there will be 0.9 m layer of low-grade crushed material covering the entire footprint of the heap leach pad. There will also be a network of collection pipes installed in a herringbone pattern throughout this layer. The main purpose of this layer is to collect the pregnant solution to the storage pond. It will also protect the liner system and the collection pipes in preparation for heap leach stacking.

2.4.8 Tailings Storage Facility

The TSF embankment will be constructed in five stages by implementing downstream dam raise methods. The TSF will be constructed using mine waste rock materials and local borrow materials as required. Each stage will be raised based on tailings storage requirements and the waste rock production schedule. The final crest elevation of the TSF will be 410.0 m.

The embankment design concept includes layering of rockfill, a coarse filter material, a fine filter material, a clay core, upstream clay blanket, and rip rap protection. A typical cross-section is shown in Figure 2-8.

A crest width of 7.0 m has been assumed to allow for vehicle and equipment movement around the TSF. The slopes for the embankment are assumed to be 2.5H:1V upstream and 1.8H:1V downstream for stability. It should be noted that the downstream slopes will require re-grading to achieve 2H:1V for long term stability for closure.

Diversion ditches would be placed along the toe of the embankment, as well as a perimeter access road.

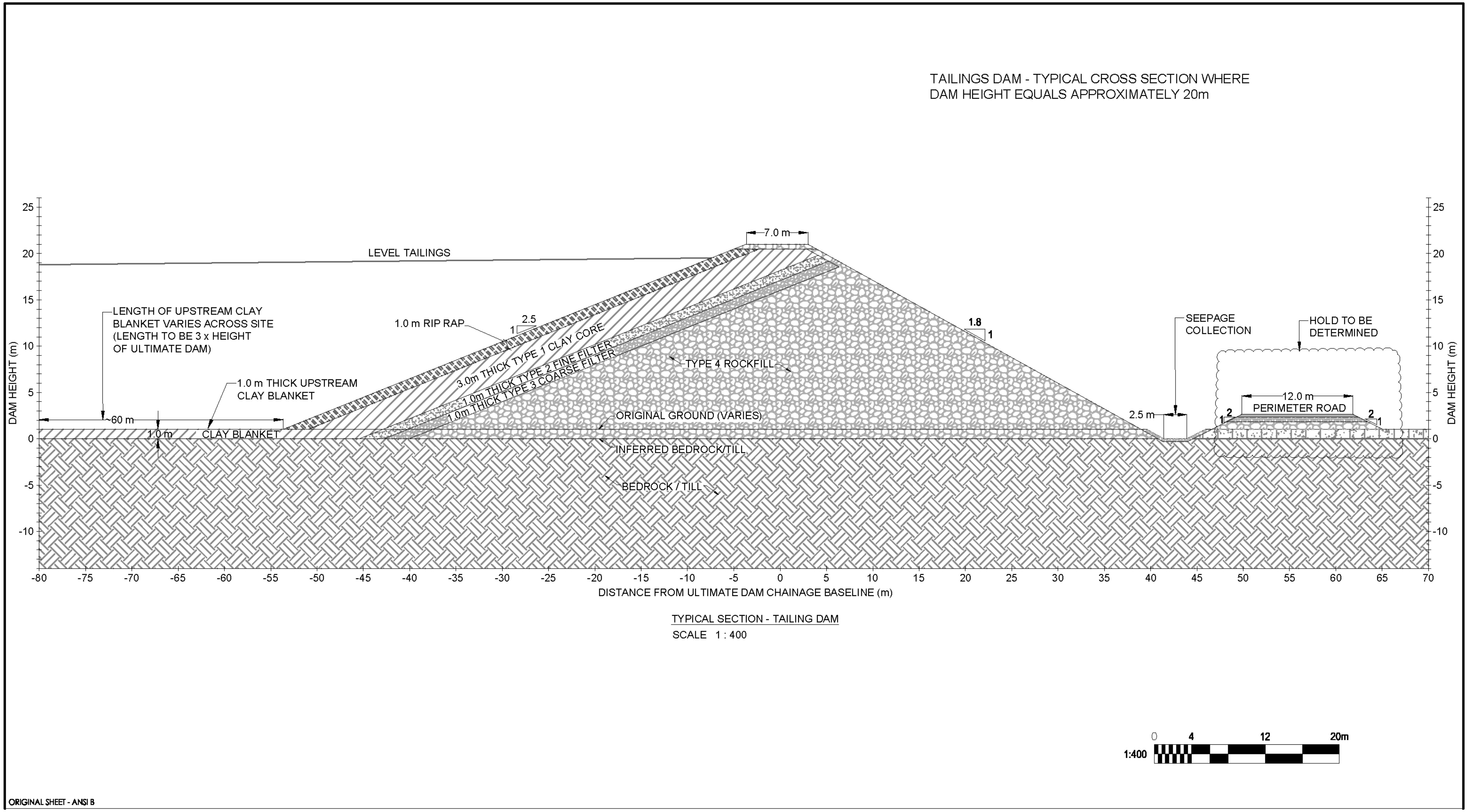

Figure 2-8 Tailings Dam – Typical Cross-Section

2.5 Mine Operations

The following summarizes the operations activities for the Project:

- Open pit mining – blasting, excavation, and haulage of rock from the open pits using conventional mining equipment in sizes and numbers optimized for the operation.
- Rock excavated from the open pits that will not be processed for gold will be used as engineered backfill for site development, maintenance, and rehabilitation, or will be deposited in waste rock disposal piles.
- Ore extracted from the open pits will be hauled to the processing area where it will either be: 1) crushed and stacked for gold extraction via heap leach; or 2) be crushed, ground, and the gold extracted via gravity, floatation, CIL and CIC processes.
- Process waste (tailings) will be pumped to an engineered TSF that will be designed and operated in accordance with applicable regulations and guidelines.
- Site contact water and process effluent will be managed on site and treated to remove sediments and any chemistry prior to discharge to the environment. Where possible, water will be diverted around the site, and recycling of site contact and process water for use on site will be maximized.
- Reagents, hazardous materials, and fuels will be transported, stored, and used in accordance with applicable regulations and guidelines.
- The current planning and design for the Project is based on ‘conventional’ and proven mining and milling techniques and processes. However, Marathon will employ new and modern technologies and equipment and industry best practices to reduce impact on the environment. Where available, Marathon will investigate and consider new and emerging technologies to further improve the environmental footprint of the Project.
- Marathon will update the protocols and plans (developed for construction) under the EMS to address potential environmental impacts associated with mine and mill operations and sustaining development activities (e.g., TSF phased construction). Further, there are numerous environmental plans and monitoring programs required under the operations Certificate of Approval and other permits that Marathon will incorporate into the EMS for the operational phase of the Project.

2.5.1 Mining

2.5.1.1 Open Pit Development

Whittle pit optimization was used to develop ultimate pit and intermediate mining (phase) limits with the exception of Sprite pit, as was previously noted. This software uses the Lerchs-Grossmann algorithm, an industry standard method to determine an optimal pit shape using various economic, geotechnical, and metallurgical parameters. A number of scenarios were considered and completed in order to determine the conceptual intermediate and final pit shells for each gold deposit.

Geotechnical mine design parameters are shown below in Table 2-1.

Table 2-1 Valentine Gold Project Geotechnical Parameters for Leprechaun, Marathon and Victory Pits

Item	Leprechaun and Marathon		Victory
Geology Domain	**Sediments**	**All Others**	**All**
Inter-Ramp Slope (degrees)	47.5	54.3	54.3
Bench Height (m)	6.0	6.0	6.0
Catch Bench Width (m)	8.1	8.1	8.1
Benches Between Catch Benches	3.0	3.0	3.0
Vertical Distance Between Catch Benches (m)	18.0	18.0	18.0
Face Angle (degrees)	65.0	75.0	75.0

Different mining phases were designed in accordance with the recommended bench configurations as shown in Table 2-1, above. Triple benching of 6 m high production benches was determined to be suitable for all geologic units. Catch or safety benches with a width of 8.1 m were used in all designed phases. These safety benches are applied on every third bench (18 m vertically).

Two-way haul roads, 25 m wide at a 10% grade, were used in most cases where higher traffic may require extra width for safe and efficient passing of trucks. To maximize material recovery at depth, the final benches of each pit floor were designed with single-lane access (17 m width).

2.5.1.2 Mine Production

The mine production schedule assumes a short pre-production period as well as a reduced mill feed requirement during the first full year of production. Lower-grade mill feed and heap leach material is stockpiled to improve processing feed grades during the early years of the project.

The current production schedule will be modified as further infill drilling, and mine planning progresses. Currently, Leprechaun and Marathon pits will be mined simultaneously, however the sequencing of pit development will be further reviewed, taking into account mine planning, materials movement, and environmental considerations.

The open pit mine operation will operate 24 hrs a day, seven days a week on a 12-hr shift basis. Material and waste will be extracted on all shifts. Blasting operations will be conducted on day shifts only. Productivity estimates are based on an assumed mechanical availability of 85 to 90% (90% for haul trucks, 85% for everything else), and a 90% utilization (for trucks and loaders) of available hours varied to reflect seasonal usage of equipment where appropriate.

A standard day-shift blasting crew will be required while four rotating labour crews will be scheduled to operate production equipment.

Mine Equipment

The Project will be developed using standard open-pit technology, scaled appropriately for the size of the operation. Mobile mining equipment is assumed to be owner-operated under a maintenance and repair contract (MARC). Required mining equipment will include haul trucks, loaders, dozers, graders, excavators, and various other trucks.

Drilling demands will be met with up to 11 production drills. Explosive quantities are based on a 152 mm blasthole diameter and bench height of 6 m. Drill spacing is dependent on the assumed material properties. Burden and spacing is assumed to be 3.6 m x 4.2 m. Productivity estimations are based on a mechanical availability of 85% and a utilization rate of 85%.

Bulk explosives will be managed by an explosives contractor including the explosive storage facilities, and required explosives delivery and loading trucks. Actual loading and firing of the blasts will be handled by Marathon employees.

A fleet of up to six wheel loaders and up to 37 haul trucks will be required. Millfeed, heap leach, and waste materials are assumed to be mined around the clock. Loading and hauling requirements include rehandle in addition to normal millfeed, heap leach, and waste operations. Using performance data provided by the manufacturer, mechanical availability of 90% and utilization of 90% were used to calculate the loading and hauling equipment requirements.

An auxiliary fleet of dozers, graders, water trucks, and other support equipment will be required for mine operations, including track dozers for the waste disposal areas, wheel and track dozers to support loading operations, and motor graders to maintain haul roads in and out of the pit.

2.5.2 Processing

The process plant design is based on a metallurgical flowsheet developed for optimum recovery while managing initial capital expenditure and operating costs. The flowsheet is based on unit operations well proven in the industry. An overall process flow diagram depicting the unit operations incorporated in the selected process flowsheet is presented in Appendix B. The process plant general arrangement is presented in Figure 2-2.

The Project consists of two gold process circuits, i.e., heap leach and process plant operations. Both circuit designs are based on a 13-year mine life.

The process plant (mill) will process 3.0 Mtpa of high-grade ore material from open pit mines. The mill will consist of crushing, milling, gravity recovery, flotation of gravity tails, flotation concentrate regrind, cyanidation of both flotation concentrate and flotation tailings via a CIL circuit, carbon elution and gold recovery circuit. CIL tails will be treated for cyanide destruction and disposed of as tails in the TSF.

The heap leach process will process 3.0 Mtpa of low-grade material from open pit mines and will consist of crushing, heap leaching and CIC gold adsorption. The loaded carbon from this heap leach facility will be sent in carbon transport vessels to the milling facility for further processing in the elution circuit.

The key Project design criteria for the process components are:

- Nominal throughput of 9,000 tpd for milling facility and 9,000 tpd for heap leach facility, equivalent to 6.0 Mtpa
- Crushing plant availability of 75% for both flotation and heap leach plants
- Plant availability of 91.3% for heap leach solution circulation, CIC area, grinding, gravity concentration, flotation, and leach plant and gold recovery operations

2.5.2.1 Reagent Use

The following reagent systems are required for the process: quicklime, sodium cyanide, frother, promoter, PAX, hydrochloric acid, copper sulphate pentahydrate, sodium metabisulphite, sodium hydroxide, flocculant, activated carbon, and smelting fluxes. These are further described in Table 2-2.

Table 2-2 Reagents Systems Required During Project Operation

Reagents	Planned Use, Transport and Handling
Quicklime	There will be one lime silo system at the heap leach facility and another at the milling facility. Quicklime will be delivered to each facility in a tanker and will be pneumatically conveyed from the tanker to the lime silo. Quicklime will be extracted from the lime silo and fed onto the crushing plant product conveyor in the heap leach facility and to the SAG mill feed conveyor in the milling facility. Quicklime will be distributed as solid form.
Sodium Cyanide (NaCN)	Sodium cyanide (dry) will be delivered in a portable International Standards Organization (ISO) container that can contain 18 Mt of solid briquettes. ISO containers are designed with an internal jet mixing system. Raw water will be added to the cyanide mixing tank to the level required for achieving the stock solution concentration. A recirculating pump will be used to transfer cyanide from the ISO container to the mixing tank. The unloading process will require approximately four to six hours to complete to ensure the briquettes are completely dissolved. Plant air will then be used to flush or press out residual cyanide from the ISO container to the mixing tank. Caustic (sodium hydroxide) will also be added to the mixing tank to provide protective alkalinity to avoid generation of hydrogen cyanide gas. After the mixing period is complete, cyanide solution will be transferred to the cyanide storage tank using the same pump as the recirculating pump used in the mixing cycle. Two ISO container mixing systems will be installed, one for the heap leach and one for milling facility. Sodium cyanide will be delivered to the heap leach area, CIL circuit, intensive leach circuit and elution circuit. Automatic control valves will provide the required cyanide flowrates at a number of locations around the two plants.
Frother (MIBC)	MIBC will be delivered as a liquid in drums and stored in the reagent shed until required. A permanent bulk box will be installed to provide storage capacity local to the flotation area. MIBC will be used as-received and without dilution. Diaphragm style dosing pumps will deliver the reagent to the required locations within the flotation circuit. Top-up of the permanent bulk boxes will be carried out manually as required.
Promotor (AERO 208)	Aero 208 will be delivered as a liquid in drums and stored in the reagent shed. Aero will be used as-received and without dilution. Diaphragm style dosing pumps will deliver the reagent to the required locations within the flotation circuit. Top-up of the permanent bulk boxes will be carried out manually as required.

Table 2-2 Reagents Systems Required During Project Operation

Reagents	Planned Use, Transport and Handling
Collector (PAX)	PAX will be delivered in granular powder form in bags and stored in the reagent shed. Raw water will be added to the agitated PAX mixing tank. Bags will be lifted into the PAX bag breaker, located on top of the tank, using a lifting frame and hoist. The solid reagent will fall into the tank and be dissolved in water to achieve the required dosing concentration. PAX solution will be transferred to the PAX storage tank using the PAX transfer pump. Both the mixing and storage tanks will be ventilated using the PAX tank fan to remove carbon disulphide gas. PAX will be delivered to the flotation circuit using the PAX circulating pump and a ring main system. Actuated control valves will provide the required PAX flowrates at a number of locations around the flotation circuit.
Copper Sulphate	Copper sulphate will be delivered in solid crystal form in bulk bags and stored in the reagent shed. Raw water will be added to the agitated copper sulphate mixing tank. Bags will be lifted into the copper sulphate bag breaker, located on top of the tank, using the lifting frame and hoist. The solid reagent will fall into the tank and be dissolved in water to achieve the required dosing concentration. Copper sulphate solution will be transferred to the copper sulphate storage tank using the copper sulphate transfer pump. Copper sulphate will be delivered to cyanide destruction circuits using the copper sulphate circulation pump and ring main.
Sodium Metabisulphite (SMBS)	SMBS will be delivered in the form of solid flakes in bulk bags and stored in the reagent shed. Raw water will be added to the agitated SMBS mixing tank. Bags will be lifted into the SMBS bag breaker, located on top of the tank, using a lifting frame and hoist. The solid reagent will fall into the tank and be dissolved in water to achieve the required concentration. After mixing for a pre-set time, SMBS solution will be transferred to the SMBS storage tank using the SMBS transfer pump. SMBS will be delivered to the cyanide destruction circuit using the SMBS circulation pump and ring main. An extraction fan will be provided 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.
Sodium Hydroxide (NaOH)	Sodium hydroxide (caustic soda) will be delivered as solid pearls/beads in bulk bags and stored in the reagent shed. Raw water will be added to the agitated sodium hydroxide mixing tank. Bags will be lifted into the sodium hydroxide bag breaker, located on top of the tank, using a lifting frame and hoist. The solid reagent will dissolve in water to achieve the required concentration. After mixing for a pre-set time, sodium hydroxide solution will be ready to transfer using the sodium hydroxide transfer pump. Sodium hydroxide will be delivered to gravity concentrate leach circuit, elution circuit, electrowinning, cyanide mixing, acid neutralization, and cyanide destruction circuit using the sodium hydroxide circulation pump and ring main.
Hydrochloric Acid (HCl)	Hydrochloric acid will be delivered in intermediate bulk containers (IBCs) as a solution and stored in a dedicated section of the reagent shed until required. Hydrochloric acid will be mixed with raw water (inline) to achieve the required 3% concentration. Hydrochloric acid will be delivered to the acid wash circuit using the hydrochloric acid dosing pump.

Table 2-2 Reagents Systems Required During Project Operation

Reagents	Planned Use, Transport and Handling
Flocculant	Powdered flocculant will be delivered to site in 50 kg bulk bags and stored in the reagent shed. A vendor supplied mixing and dosing system will be installed, which will include flocculant storage hopper, flocculant blower, flocculant wetting head, flocculant mixing tank, and flocculant transfer pump. Powder flocculant will be loaded into the flocculant storage hopper using the flocculant hoist. Dry flocculant will be pneumatically transferred into the wetting head, where it will be contacted with water. Flocculant solution, at 0.50% w/v will be 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 flotation concentrate thickener and flotation tails using variable speed helical rotor style pumps. Flocculant will be further diluted just prior to the addition point.
Activated Carbon	Activated carbon will be delivered as solid granular form in bulk bags. The carbon is introduced into the carbon conditioning tank in the flotation/CIL plant, where it is slurried and agitated to remove the friable edges of the carbon particles and the adhering carbon dust generated in transport. The slurry is pumped over the sizing screen where the carbon fines discharge to the fine carbon hopper, and the coarse carbon particles can be transferred to the CIL circuit in milling or trucked to the heap leach carbon columns.
Anti-scalant	Anti-scalant will be delivered as solution form in bulk boxes and stored in the reagent shed until required. Permanent bulk boxes will be installed to provide storage capacity local to each dosing point. Anti-scalant will be dosed neat, without dilution. Positive displacement style dosing pumps will deliver the anti-scalant to the required locations around the heap and milling plants. Top up of the permanent bulk boxes will be carried out manually as required.
Goldroom Smelting Fluxes	Borax, silica sand, sodium nitrate and soda ash will be delivered as solid crystals / pellets in bags or plastic containers and stored in the reagent shed until required.

2.5.2.2 TSF Operation

The preliminary operational plan for the TSF is to deposit slurry from the embankment, along the perimeter of the storage area. This will optimize tailings storage capacity while reducing other risks, such as stability and seepage. It is anticipated that the TSF will be able to store up to three months' worth of process water, the rest of the water will be reclaimed for re-use in the mill.

The TSF construction and operation should align with the rest of the Project site development and operation. This includes factors such as the storage capacity, accessibility for equipment, distance and elevation from the mill for tailings pumping, and availability of construction materials.

2.5.3 Materials Shipping and Employee Transportation

Materials required for Project operation will be shipped to site via truck on the main access road. Employees would continue to be transported to the site from nearby communities. The volume of truck traffic during operation is anticipated to be much lower than during construction. While supplies may need to be shipped into the site on a weekly basis, the product to be exported would be limited to armored trucks, owned and operated by a third party and used to transport the doré bars to market via the site access road from Millertown, then via provincial highways.

2.6 Rehabilitation and Closure

Rehabilitation is defined as measures taken to restore a property as close to its former use or condition as practicable, or to an alternate use or condition that is deemed appropriate and acceptable by NLDNR. For mining projects, a Rehabilitation and Closure Plan is a requirement under the Newfoundland and Labrador *Mining Act* (Chapter M-15.1 Sections 8, 9 and 10). There are three key stages of rehabilitation activities that occur over the life span of a mine, which include:

- Progressive rehabilitation
- Closure rehabilitation
- Post-closure monitoring and treatment

Progressive rehabilitation involves rehabilitation that is completed throughout the mine operation prior to closure wherever possible or practicable to do so. This includes activities that contribute to the overall rehabilitation effort and would otherwise be carried out as part of the closure rehabilitation at the end of mining life.

Closure rehabilitation involves activities that are completed after mining operations cease, to restore and/or reclaim the Project to as close to its pre-mining condition as practicable. Such activities include demolition and removal of site infrastructure, re-vegetation of disturbed areas, and other activities to achieve the requirements and goals as detailed in the Project's Rehabilitation and Closure Plan.

Once closure rehabilitation activities have been completed, a period of post-closure monitoring is required to show that the rehabilitation has been successful. The post closure monitoring will continue until it has been demonstrated that the rehabilitation of the site has been successful. The site can then be closed out or released by NLDNR and an application to relinquish the property back to the Crown.

A complete Rehabilitation and Closure Plan has not yet been developed for the Project. This plan will be drafted and finalized in consultation with NLDNR upon release from the EA process.

2.7 Project Schedule

Construction of the Project is expected to take place over a period of 18 to 24 months as generally shown in Table 2-3, below.

Marathon's ongoing and future scheduling and planning activities will consider the various environmental guidelines and constraints (e.g., bird breeding seasons) in order to minimize the potential environmental effects of construction.

Project construction would be followed by an estimated mine operation life of 13 years. The Project will operate 24 hours (hrs) a day, seven days a week on a 12-hr shift basis. A preliminary life of mine schedule is shown in Table 2-4.

Table 2-3 Preliminary Project Development Schedule

Activity	2019				2020				2021				2022				2023			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Public & Regulator Consultation	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
EA Process	■	■	■	■	■	■	■	■	■	■										
Engineering and Supporting Studies	■	■	■	■	■	■	■	■	■	■	■	■	■							
Early Permits & Approvals										■	■									
Federal, Provincial Permits & Approvals										■	■	■	■	■						
Operational, Environmental Management & Monitoring Plans											■	■	■	■	■	■	■			
Clearing, Site Access and Site Roads, Pre-Stripping												■	■	■						
Civil Earthworks													■	■	■					
Foundations and Subsurface Utilities														■	■					
Heap Leach Pad and TSF Earthworks (Stage 1)														■	■	■	■			
Mill and Infrastructure Construction														■	■	■	■			
Commissioning and Start-Up																	■	■		
Mine and Mill Operations																	■	■	■	■

Table 2-4 Preliminary Life of Mine Schedule

Activity	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Public & Regulator Consultation	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
EA Process	■	■	■																				
Engineering and Supporting Studies	■	■	■	■	■																		
Federal, Provincial Permits & Approvals			■	■																			
Project Construction			■	■	■																		
Commissioning and Start-Up					■																		
Mine and Mill Operations					■	■	■	■	■	■	■	■	■	■	■	■	■						
Closure and Rehabilitation																	■	■					
Post Closure Monitoring																		■	■	■	■	■	■

2.8 Wastes, Discharges and Emissions

Wastes, discharges, and emissions during construction would be typical of those associated with site clearing and construction operations. They are anticipated to include:

- Noise from generators, vehicles and other construction equipment
- Release of contaminants and greenhouse gasses (GHGs) generators, vehicles and other construction equipment
- Stormwater / run-off from construction areas
- Grey water and domestic solid waste associated with the accommodations camp
- Petroleum, oil, and lubricant (POL) POL waste from maintenance of vehicles and construction equipment on site and potential runoff from refueling and fuel storage areas

These emissions, effluents and discharges will be managed and mitigated through industry standard measures including proper maintenance of equipment, dust suppression measures where appropriate, sediment and erosion control measures, and proper handling, storage and disposal of wastes, including hazardous wastes that may results from Project construction activities. See below for further information on GHG emissions.

During operation, noise sources would include blasting, as well as operation of equipment and generators. Dust and emissions from vehicles, equipment and generators would continue to be the main source of air contaminants. The milling and processing plant will be enclosed, limiting potential for dust and other emissions.

The major sources of waste and discharges during Project operations have been discussed in the preceding sections. They include: site water management, mine waste management including the potential or ARD/ML, TSF effluent, and heap leach pad containment. Grey water and domestic solid waste would continue to be produced and appropriately managed and/or treated during operation.

During the construction and operation of the proposed Project, GHGs will be emitted from the combustion of diesel fuel in various equipment including temporary and back-up generators, heavy machinery and other on-site vehicles. As currently designed, the Project will not require on-site electricity generation as power will be supplied through the provincial grid. An estimated 270 million liters of diesel could be consumed on site throughout the life of the Project (construction and operation). A preliminary estimate of GHGs from the construction and operation of the Project, based on the anticipated amount of fuel to be consumed, averages 48,750 tonnes of CO_2e annually over the life of the Project (i.e., over 15years). This is a high-level estimate that will be further refined during the development of the environmental assessment. GHG emissions will be mitigated throughout the life of the Project through the use of power from the provincial grid, reducing idling to reduce amounts of fuel consumed, managing haul routes to reduce amount of fuel consumed, and maintaining engines in proper working order.

2.9 Employment and Expenditures

As discussed in Section 1.2, development of this Project will generate employment, expenditures and associated benefits to the province. Construction will last between 18 and 24 months and will require a peak labour force of 466 people. During operations, employment will average 442 people and peak at 466.

The estimated capital cost for the Project is approximately $355,304,000 ($472,554,320 CAD). Overall costs are in United States Dollars ($) and are based on Q3 2018 pricing with an accuracy of ±35%. The infrastructure included in the capital cost includes: camp and catering (for permanent 200 person camp to be used during construction, and a temporary construction camp that will accommodate an additional 100 persons), potable water and wastewater, communications, recreation facilities and mess hall, reagents storage shed, office buildings and control rooms, crushed material stockpile dome, main warehouse and office, medical centre, administration building, wet and dry laboratory, gatehouse, substation buildings, plant ablutions, overhead power line, and access road upgrade. The main access road upgrade consists of an initial upgrade intended to be constructed in pre-production phase. Subsequent road upgrades or maintenance will be assessed within the first two to three years of commercial production.

2.9.1 Diversity and Inclusion Policy

Marathon recognizes that diversity and inclusion must be embedded in all aspects of its business. Marathon has a formal Diversity Policy (https://marathon-gold.com/site/assets/files/4269/diversity-policy.pdf), which was developed to guide the selection of its Board of Directors. As the company has remained small in size, the fundamentals of this existing policy have been extended to the hiring of company personnel to date. As Marathon moves forward with the Project, it will develop a Diversity, Gender and Inclusion policy that encompasses all aspects of its business, including but not limited to, the Board of Directors, employees, contractors, and suppliers. This will provide the foundation for a future Diversity, Gender and Inclusion Plan that will be implemented for the development and operation of the Project.

3.0 CONSULTATION

3.1 Approach to Consultation

Marathon understands that exploring and developing a mine in Newfoundland and Labrador sustainably requires building long-term relationships and investment in people and communities. While industrial activity often brings much needed economic growth and opportunity to communities and regions, it is important that stakeholders most likely to be affected by the activities understand the potential impacts and have confidence that Project design and mitigation measures have incorporated their concerns. Consultation with all stakeholders who may have an interest in, or be affected by the Project, is key to operating within a sustainable development framework. It is Marathon's objective to pursue positive and constructive relationships with stakeholders throughout the life of the Project.

To date, Marathon has conducted relatively informal stakeholder consultation. However, with a better-defined Project scope and initiation of the EA process, Marathon will now formally engage stakeholders as part of the Project planning and regulatory stage of Project development. To this end, Marathon has developed a Consultation Strategy to guide in building these relationships, and this Strategy in turn is guided by Marathon's Community Relations Policy (Figure 3-1). The Strategy includes a potential stakeholder list (Table 3-1), which will be updated as necessary throughout the life of the Project. Part of the Strategy will be the maintenance of a tracking system to record consultation and engagement activities. In addition to recording specific events and participants, the tracking system will also serve as a repository of issues, concerns, and questions raised, and a record of Marathon's responses (where applicable). The tracking system will be maintained throughout the life of the Project.

As part of its Consultation Strategy, Marathon conducted initial public open houses in the towns of Millertown, Buchans, and Grand Falls-Windsor on March 19 and 20, 2019. The meetings were advertised via posted notifications in these and other nearby communities, as well as via province-wide radio advertisements. The meetings were well attended with over 150 attendees over the three sessions. Marathon presented information about the company, work done on the Project to date, an overview of the proposed Project including schedule, and an overview of the EA process and the public's opportunity to participate in that process. A question and answer period was held at the end of the presentation and the majority of the questions and comments from the public pertained to employment and benefits to their communities. The key messages taken from these sessions were as follows:

- Community and public support for the Project is significant, and primarily based on much needed employment and business opportunities in the region.
- Local communities are looking for direct engagement over the life of mine, local hiring/contracting preferences, supply and services opportunities, and opportunities to leverage provincial infrastructure improvements (eg. roads).
- The key concerns raised: keep access road (and therefore local employment and benefits) via Millertown access; improved environmental management relative to Hope Brook and Duck Pond; preferential hiring contracts for local people and companies. No other significant concerns, and no objections to the Project were raised.

Marathon has communicated with the Miawpukek First Nation and Qalipu Mi'kmaq Band to provide information on the status of the proposed Project, and information on the Project, as well as to arrange meetings with these groups to exchange additional information. No feedback from these groups regarding the proposed Project was available at the time of writing of this document.

Community Relations Policy

Exploration and mining activity can bring much needed social and economic benefit to communities and regions when potential environmental and socioeconomic impacts are understood and well-managed in collaboration with those communities.

Marathon Gold is committed to community engagement and we believe that social and economic considerations respecting local communities and stakeholders are integral to all stages of exploration and mining projects. Early development of meaningful relationships and maintaining respectful dialogue with local community leaders and members of the community will benefit Marathon Gold's projects and the surrounding communities, and will help to ensure our projects are sustainable and successful in all aspects.

Engagement activities that acknowledge, consider, and respond to the concerns of local people, communities, and other stakeholders in a timely manner, as well as provide regular project information updates, aid to alleviate and mitigate concerns relative to issues such as environmental protection, human health, land use, employment and economic development opportunities, as well as local services and infrastructure.

Marathon Gold will conduct community engagement activities in a transparent and culturally appropriate manner, and will endeavour to provide simple and safe mechanisms whereby individuals, groups, and communities can provide input and voice their concerns. Marathon Gold's engagement process will ensure that community concerns are respected and considered for incorporation into key

Figure 3-1 Marathon Community Relations Policy

Table 3-1 Potential Stakeholder List

Category	Sub-Category	Stakeholder
Government	Provincial	Department of Advanced Education, Skills, and Labour Executive Council – Intergovernmental and Indigenous Affairs Secretariat Executive Council – Women's Policy Office Department of Finance NLDFLR – Lands Branch NLDFLR – Wildlife Division NLDFLR – Forestry and Agrifoods Department of Health and Community Services Department of Justice and Public Safety NLDMAE – Fire, Emergency, and Corporate Services Branch NLDMAE – Water Resources Management Division NLDMAE – Pollution Prevention Division NLDMAE – Environmental Assessment Division NLDMAE – Climate Change Branch NLDNR – Executive Support Branch NLDNR – Mines Branch Service NL – Regulatory Affairs Branch Service NL – Government Services Branch NLDTCII– Business Branch NLDTCII – Regional Development and Diversification Branch NLDTCII – Provincial Archaeology Office Department of Transportation and Works Provincial Advisory Council on the Status of Women Newfoundland and Labrador Workplace NL
Government	Federal	Canadian Environmental Assessment Agency (CEA Agency) Environment and Climate Change Canada (ECCC) Fisheries and Oceans Canada (DFO) Transport Canada (TC)
	Municipal	Town of Buchans Town of Millertown Town of Badger Town of Grand Falls-Windsor
Community Groups	General Public	Residents of Nearby Towns
	Indigenous	Qalipu Mi'kmaq First Nation Miawpukek First Nation
	Economic Development and Industry Groups	Newfoundland and Labrador Organization of Women's Entrepreneurs (NLOWE) Exploits Regional Chamber of Commerce
	Outfitters and Recreation	Local Cabin Owners Newfoundland and Labrador Outfitters Association (NLOA) Salmonid Association of Eastern Newfoundland (SAEN) The Salmon Preservation Association for the Waters of Newfoundland (SPAWN)
	Education, Social Services, and Health	College of the North Atlantic Central Health Royal Newfoundland Constabulary Royal Canadian Mounted Police

3.2 Industry Relations

Marathon has been an active member of the NL mining industry community for more than eight years. Marathon has maintained a presence at local and provincial industry conferences, including being an active participant at the Mineral Resources Review, held annually in St. John's, and the Baie Verte Mining Conference, held annually on the Baie Verte Peninsula. In addition, Marathon held a seat on the Mining Industry Newfoundland and Labrador's Board of Directors for three (maximum term) of the past eight years.

3.3 Government Consultation

Marathon has consulted, and will continue to consult, with provincial and federal departments to discuss plans and activities occurring on-site since initiating exploration activities at the Valentine Lake site in 2010. Since that time, Marathon has maintained an internal tracking table of interactions with regulators. This table will form the initial version of the tracking system described in Section 3.1. Since 2010, Marathon has met with officials from the following provincial and federal departments and divisions:

- Provincial Government:
  - Department of Natural Resources:
    - Mines Branch
    - Forestry and Agrifoods Agency (now part of the NLDFLR)
  - Department of Environment and Conservation / NLDMAE:
    - Wildlife Division (now part of the NLDFLR)
    - Environmental Assessment Division
  - Service NL, Occupational Health and Safety Division
- Federal Government:
  - Fisheries and Oceans Canada
  - CEA Agency

4.0 ENVIRONMENTAL SETTING

4.1 The Biophysical Environment

The Project is located in rural central Newfoundland, in the Red Indian Lake Subregion of the Central Newfoundland Forest Ecoregion, which covers most of the central and north-eastern portions of the Island. This part of the Island is characterized by boreal forest with mainly coniferous trees and a continental climate. It experiences colder winters and warmer summers than coastal areas. The Project lies just north of the Maritime Barrens Ecoregion. Maximum elevation in the Project Area is 480 m above sea level, with lower ground on the sides of the ridge to the northwest and southeast (Lycopodium 2018). The minimum elevation in the Project Area is 320 m above sea level and represents the level of Victoria Lake in the south-western part (Lycopodium 2018).

The landscape in the vicinity of the Project is characterized by remote upland forests dominated by softwood forests (i.e., balsam fir and black spruce), interspersed by lowlands [i.e., wetlands (e.g. peatlands and treed wetlands)], krummholtz, barrens, and open water habitats (Stantec 2015). Hardwood and mixedwood stands are also present, with the dominant species being white birch and trembling aspen (Stantec 2015). No plant species listed by the Committee on the Status of Endangered Wildlife Species in Canada (COSEWIC) or by the *Species at Risk Act* (SARA) were observed during the vegetation surveys that were conducted within the Project Area. Similarly, no species listed by the Province in Schedule A of the *Endangered Species List Regulations* (Gov NL 2003b) were observed. However, three species identified in the vicinity of the PDA were considered Species of Conservation Concern (SOCC): nodding water nymph (S2), short-scaled sedge (S1S2), and perennial bentgrass (S2). Note that a list including common names and scientific names of the species referenced in this report is included in Appendix C.

The region is home to a variety of typical boreal forest wildlife and bird species (PAA 2008). Mammal species endemic to the boreal forest, such as that in the Red Indian Lake Subregion, include moose, snowshoe hare, muskrat, river otter, mink, black bear, beaver, lynx, woodland caribou, and American marten (PAA 2008, NLDFLR 2019). During field surveys for the Project, American marten was the only 'Threatened' wildlife species [SARA, Newfoundland and Labrador *Endangered Species Act* (NL ESA)] identified within the Project Area. Although woodland caribou is not listed under SARA, their population in Newfoundland is considered 'Special Concern' by COSEWIC (COSEWIC 2014).

Boreal forests provide habitat for diverse and abundant avifauna groups including songbirds, waterfowl and shorebirds, and raptors. Forests in the Central Newfoundland Forest Ecoregion typically include boreal bird species such as Gray Jay, Pine Siskin, Boreal Chickadee, Black-capped Chickadee, Fox Sparrow, White-winged Crossbill, Yellow-rumped Warbler, Blackpoll Warbler, Yellow-bellied Flycatcher, White-throated Sparrow, Pine Grosbeak, Northern Flicker, Osprey, Great Horned Owl, Sharp-shinned Hawk, Ruffed Grouse, and Spruce Grouse. Waterfowl and shorebird species including Green-Winged Teal, Ring-Necked Duck, American Black Duck, Canada Goose, Greater Yellowlegs, and Spotted Sandpiper are also common. Three avifauna SAR were identified in the vicinity of the Project Area: Olive-sided Flycatcher, Common Nighthawk, and Rusty Blackbird.

With respect to waterfowl, a Sensitive Wildlife Area (SWA) along the Victoria River has been identified by the NLDFLR and the Newfoundland and Labrador Eastern Habitat Joint Venture (NL-EHJV) as containing important waterfowl habitat (NL-EHJV 2008; J. Fenske, pers comm). This Area was established for the protection of wetland habitat used as breeding, brood rearing, and staging grounds for waterfowl (J. Fenske, pers comm). While the Victoria Steadies area has been identified as an SWA, Marathon's exploration activities to date within the PDA have not been limited by regulators, other than guidance respecting activities in proximity to waterbodies and wetlands during breeding season.

The Project is located in the Exploits River Watershed, the largest watershed on the island of Newfoundland. The total watershed area of the Exploits River is 10,241 km^2; water discharge from the Exploits River is highly regulated by three dams located in Millertown, Grand Falls, and Bishops Falls. The mouth of Red Indian Lake is controlled by a dam located in Millertown. Historically, Victoria Lake drained to Red Indian Lake via the Victoria River, but with the construction of the Victoria Reservoir Dam in 1967, the flow from Victoria Lake was altered to flow in a generally southerly direction to Burnt Lake and Granite Lake, providing flow to the Hydrogeneration Station in Bay D'espoir. In recent years, Victoria Lake has contributed very little flow to the Victoria River, because the Victoria Lake Dam operates as an overflow spillway, and spilling occurs very infrequently.

The area of the Leprechaun and Sprite Deposits is comprised of two watersheds, each containing two small ponds and connecting streams. The Marathon Deposit contains a series of small streams that drain east to the Victoria River, and west to Valentine Lake. The Victory Deposit is located 0.5 km from Victoria River and there is one small pond located to the northeast.

The direction of groundwater flow is assumed to follow topography, which regionally would be to the south towards Victoria Lake. Locally, drainage from the Marathon Deposit is expected to travel east to northeast to Victoria River, draining into Victoria Lake to the south. Groundwater is thought to be recharging along the topographic highs and discharging along local surface water bodies including Victoria Lake. It is expected that the shallow groundwater system in the area will be largely controlled by surface runoff and local recharge, while at moderate depths the flow system may be influenced by recharge at higher elevations. Groundwater levels are generally assumed to be close to ground surface and to be a subdued reflection of the topography.

Atlantic salmon, brook trout, and threespine stickleback are known to occur in the Project Area. The Victoria River, as part of the Exploits River Watershed, feed the Exploits River, one of the most important Atlantic salmon rivers on the Island in terms of numbers of salmon returning. However, based on 2016 population surveys, the returns of Atlantic salmon to the Exploits River system have declined in comparison to previous five-year means (2011 to 2015). This is consistent with province-wide data, which shows declines in total returns greater than 30% for more than half the rivers monitored in the province in 2016 (DFO 2017). The reason for the decline has not been determined.

4.2 Socio-economic Environment

The Project is located approximately 45 km south of the nearest community of Buchans, and approximately 55 km southwest of the town of Millertown, or approximately 80 km by road. These nearby towns, along with the communities of Badger, Grand Falls-Windsor, and Springdale, have been shaped primarily by natural resource-based industries, including mining, forestry, and hydroelectric developments. The area surrounding the Project is also used for recreational activities, particularly moose and caribou hunting, and salmon fishing on the Exploits River. A number of cabins and commercial outfitters are also located in the general area. Further information on other industries in the region, land and resource use in the area, the potential for historic resources, and Indigenous communities and land use is found in the following sections.

4.2.1 Other Industries in the Region

The economy of Central Newfoundland was built on natural resource-based industries, particularly forestry and mining. Logging has taken place in the region since the turn of the twentieth century, however, with the closing of Abibiti-Bowater Inc.'s pulp and paper mill in Grand-Falls-Windsor in 2009, forestry in the area has decreased. The communities closest to the Project, Buchans and Millertown, were founded in support of mining activities in the area, starting in the early 1900s and ending in the 1980s. Although there are currently no active mines in the area, mineral exploration activity does take place throughout the general region, and there are many active mineral licenses surrounding the Project Area where exploration is being conducted. It is Marathon's hope that development of the Project into an operational mine will fill the void in employment and procurement opportunities in the region.

Forestry and logging were important economic drivers in central Newfoundland from the early 20th century until the early 21st century. The industry was primarily in support of the pulp and paper industry, which was greatly reduced following the closure of Abitibi-Consolidated Inc.'s mill in Grand Falls-Windsor in 2009. The PDA is within Forestry Management Division 13, and the Project Area also overlaps with Forestry Management Division 12. The provincial 2016 to 2020 forestry Operating Plan indicates that there is 113,000 m^3 of timber scheduled to be harvested in District 13 in the next five years, the majority of which (94%) is commercial (NLDNR-FB 2015).

As described in Section 4.1, the hydrology of the region was altered in the late 1960s with construction of the Victoria Reservoir Dam, built as part of the Bay D'Espoir Hydroelectric Generating Facility. Built in 1967, the Victoria Reservoir Dam, now operating as an overflow spillway, is within the Project Area and remains operational. It is maintained by NL Hydro as part of the Baie D'Espoir Hydroelectric Development.

4.2.2 Land and Resource Use and Users

The Project Area occurs within several provincial hunting and trapping areas for big-game (e.g., moose, caribou, black bear) and small-game (e.g., coyote, hare, furbearers) (Gov NL 2018).

The Exploits River (including tributaries) is a scheduled salmon river, and as such is regulated by the federal Department of Fisheries and Oceans as per the *Fisheries Act* and the *Canada Wildlife Act* (Government of Canada 1985a, 1985b), and is one of the most important Atlantic Salmon Rivers on the Island in terms of numbers of salmon returning. Atlantic Salmon fisheries in the province are currently recreational or subsistence (i.e., no commercial fishery for Atlantic Salmon). Angling retention limits are assigned to rivers by DFO. The salmon rivers in the vicinity of Project Area are considered 'Class 0' (catch and release) (DFO 2018a). Trout angling (including brook trout) is permitted in insular Newfoundland during winter and summer (DFO 2018a).

Numerous gravel roads, formerly Abitibi forestry access roads that are now maintained by government, provide access to the area for recreational and other users. The region contains private cabins, primarily around the ponds, lakes, and river, and is also used by outfitters. Marathon understands that there are currently nine Crown Land surface rights applications within the boundary of the Project Area. None of these applications has been granted and only one of these applications occurs within the PDA. A second cabin exists within the PDA, however in consultation with Crown Lands, Marathon has confirmed this cabin is located on crown lands to which the owner has no title. Marathon has visited a small cabin located on the west side of Valentine Lake and it appears to be abandoned, with visible structural damage, and no known use over the nine years Marathon has been working on the Property.

Additionally, there are 51 outfitters/lodges that operate within a 60 km radius of the Project Area, however only one of these, Notch Mountain Lodge, operates within the Project Area, approximately 2 km from the PDA. They offer packages for hunting moose, caribou, black bear, as well as fishing, and snowmobiling (Notch Mountain Outfitters 2019). Marathon has consulted with this outfitter for many years, and there has been no conflict between Marathon's activities and this outfitter.

4.2.3 Historic and Heritage Resources

A Historic Resources Overview Assessment for the Project was completed in 2017. Although no known archaeological sites were identified within the Project Area, review of regional archaeological data indicates that the area surrounding the Project has broad theoretical potential for archaeological remains, particularly those pertaining to the pre-contact period (especially late pre-contact), and the historic Beothuk and Mi'kmaq occupations of the southwestern Newfoundland interior. This potential may be reduced, though not eliminated, by the impacts of historic flooding for commercial logging and hydroelectric development (Stantec 2017b).

Ethnohistoric evidence indicates that important caribou migration corridors approach and traverse the Project Area (Stantec 2017b), and that there is theoretical potential for pre-contact sites, particularly for sites of Maritime Archaic and late pre-contact Amerindian peoples, but also, to a lesser extent, potential for Palaeo-Eskimo sites. Turning to the historic sites' potential, the Project Area lies within the territory of the Beothuk prior to the second quarter of the 19th century, so there is potential for historic Beothuk sites, and for historic Mi'kmaq sites dating to the second half of the 19th century into the 20th century.

4.2.4 Indigenous Groups and Communities

Miawpukek First Nation is located on the south coast of Newfoundland, approximately 244 km south of Gander. As of 2015, the total population of the Miawpukek band was 2,970, including 850 members living on-reserve at Conne River (located 120 km southeast of the PDA) and an additional 2,120 living off-reserve (AANDC 2015).

Qalipu Mi'kmaq Band members, a "landless band" formed under the *Indian Act*, 1985 (Gov NL 1985c) in 2011, live in a variety of communities across the province, with traditional communities extending from western to central Newfoundland. The Qalipu First Nation currently has just over 22,000 members (Qalipu First Nation, no date) and includes the nine Mi'kmaq bands formerly represented by the Federation of Newfoundland Indians (FNI). While there have been no land use studies of Qalipu members since the formation of the First Nation, a traditional land use study was conducted by the FNI in 2002 (FNI 2002). This study includes several mentions of the Victoria Lake area being visited by Mi'kmaq from western Newfoundland for the purposes of traditional land and resource use.

For the purposes of the 2002 land use study, the ten Mi'kmaq bands represented by the FNI were grouped in three regions. Documented land and resource use by members in Region B (representing the St. George's Bay / Port Au Port area of western Newfoundland, including Corner Brook and Stephenville) show some use of the Victoria Lake area within 8 to 10 km of the Project.

4.3 Project-Specific Environmental Studies

The following lists the environmental baseline studies completed in support of the Project between 2011 and 2018; the studies listed below were conducted by Stantec. Future work will include the continued assessment of ARD/ML, fish and fish habitat surveys, hydrology, and hydrogeology. The requirement for other work may be identified in consultation with federal and provincial regulators.

- Fish and Fish Habitat Data Report (2012)
- Winter Wildlife (2013)
- 2011 Baseline Waterfowl and Waterfowl Habitat Study (2014)
- 2011 Forest Songbird Surveys (2014)
- Ecological Land Classification (2015)
- Baseline Hydrology and Surface Water Quality Monitoring, 2011 – 2016 (2017)
- Historic Resources Overview Assessment (2017)
- Land and Resource Use (2017)
- Preliminary Baseline Hydrogeology Assessment (2017)
- Vegetation Baseline Study, Rare Plants Survey (2017)
- Waterfowl (2017)
- Newfoundland Marten (2018)
- Preliminary Results of Phase I Acid Rock Drainage / Metal Leaching (ARD/ML) Assessment (2018)
- Valentine Lake Project: 2018 Fish and Fish Habitat Data Report
- Valentine Lake Project: Preliminary Hydrogeology Assessment, Water Level Data
- Draft Report 2018 Hydrology Monitoring Program

5.0 ENVIRONMENTAL EFFECTS

5.1 Potential Environmental Effects

Pursuant to the *Canadian Environmental Assessment Act* 2012 (CEAA 2012) (Government of Canada 2012a) and the *Prescribed Information for a Description of a Designated Project Regulations*, and in accordance with the "Guide to Preparing a Description of a Designated Project Under the Canadian Environmental Assessment Act, 2012" (Government of Canada 2015), the project description must include a description of potential changes that may be caused by the Project to: fish and fish habitat (as defined in the *Fisheries Act*); aquatic species (as defined in SARA); migratory birds (as defined in the *Migratory Birds Convention Act*, 1994); and potential changes to the environment that may occur on federal lands, in other provinces or internationally. The Project Description must also include a description of the effects on Indigenous peoples of changes to the environment that result from carrying out the Project. The following sections provide an overview of the potential environmental interactions of the Project on the environment and potential changes to the environment that may occur as a result of carrying out the Project, according to requirements of Section 5 of CEAA 2012.

Routine Project construction and operation activities will include: surface mining, milling, processing, site and haul road construction and maintenance, mine waste rock management, electrical power supply and distribution, process and potable water supply and distribution, site wide stormwater and effluent management, treatment and discharge, fuel storage and fueling stations, mine and plant workshops and services, administrative office, personnel accommodations and lunchrooms, and security. Accidental events that may occur as a result of the Project include a fuel or other hazardous materials spill, vehicle or equipment accidents, and failure of site infrastructure (e.g., breach of tailings dam or the heap leach pad containment infrastructure).

Table 5-1 includes the potential environmental interactions with routine Project activities or accidental events that may result in changes to the environmental components identified in the CEAA 2012. Other environmental components of concern, in addition to those identified in the CEAA 2012, are in Table 5-2, along with potential environmental interactions.

Table 5-1 Potential Environmental Interactions with Environmental Components Identified in CEAA 2012

Environmental Component	Relevant Section of CEAA, 2012	Potential Environmental Interactions
Fish, Fish Habitat, and Aquatic Species	5(1)(a)(i) 5(1)(a)(ii)	Routine Project activities or accidental events may result in changes affecting fish, fish habitat, and aquatic species as defined under SARA, including the following interactions with the environment: • avoidance of the area surrounding the area of work in aquatic environments • encroachment in fish habitats • changes in habitat availability • changes in habitat quality • changes in fish abundance and/or distribution

Table 5-1 Potential Environmental Interactions with Environmental Components Identified in CEAA 2012

Environmental Component	Relevant Section of CEAA, 2012	Potential Environmental Interactions
Migratory Birds	5(1)(a)(iii)	Routine Project activities and or accidental events that could potentially result in changes to the environment that may affect migratory birds, as defined under the *Migratory Birds Convention Act, 1994*, include: • changes to avifauna abundance and/or distribution • change in habitat availability
Project Activities Occurring on Federal Lands	5(1)(b)(i)	Routine Project activities and/or accidental events are not expected to occur on Federal Lands
Transboundary Issues	5(1)(b)(iii)	Routine Project activities and/or accidental events are not anticipated to result in changes to the environment outside Newfoundland and Labrador
Health and Socioeconomic Conditions of Indigenous Peoples, Including Current Use of Lands and Resources for Traditional Purposes	5(1)(c)(i) 5(2)(b)(i)	Routine Project activities or accidental events may result in the following changes to the environment that may affect current use of land and resources for traditional purposes by Indigenous people: • change in distribution or abundance of fish resources • change in distribution or abundance of harvested wildlife populations • potential disturbance of hunting/trapping/angling activities • concerns regarding the risks of contamination of the environment Project activities are not anticipated to result in changes to the environment that would have an effect on the health conditions of Indigenous peoples; however, this would be confirmed through further assessment in the EIS.
Physical and Cultural Heritage, or Resources of Historical, Archaeological, Paleontological, or Architectural Significance	5(1)(c)(ii) 5(1)(c)(iv) 5(2)(b)(ii) 5(2)(b)(iii)	Routine Project activities or accidental events may result in the following changes to the environment in and around the Project Area: • potential disturbance of hunting/trapping/angling activities • possible disturbance of archaeological resources • changes to the quality of life of Indigenous land users

Table 5-2 Potential Environmental Interactions with Additional Environmental Components of Concern

Environmental Component of Concern	Potential Environmental Interactions
Atmospheric Environment	Routine Project activities or accidental events could potentially result in changes to air quality and noise due to the following interactions with the environment: • Changes to air quality due to release of air contaminants to the atmosphere and changes in the quantities of greenhouse gases released to the atmosphere • Changes to ambient noise levels • Increase in vibrations during blasting
Surface Water	Routine Project activities or accidental events could potentially result in changes to hydrology due to the following interactions with the environment: • Changes in hydrological regime • Change in water quality or quantity
Groundwater	Routine Project activities or accidental events could potentially result in changes to groundwater due to the following interactions with the environment: • Change in the water table level • Change in groundwater quality
Vegetation, Wetlands and Soils	Routine Project activities or accidental events could potentially result in changes to vegetation and soils due to direct interaction with vegetation communities and potential soil contamination, to the following interactions with the environment: • Direct and indirect loss of plant groups • Change in plant communities • Change in wetland quality and quantity
Terrestrial Wildlife	Routine Project activities or accidental events could potentially result in changes to terrestrial wildlife (e.g., mammals, amphibians, avifauna) due to the following interactions with the environment: • Changes to wildlife abundance and distribution due to habitat or food availability, or avoidance behaviour to disturbance • Change in habitat availability
Land and Resource Use	Routine Project activities or accidental events may result in the following changes to the environment that may affect land use activities and opportunities in and around the Project Area: • Loss of commercially-exploitable forest area • Change in opportunity for commercial outfitters • Change in encroachment on registered trapping land • Change in access to angling and hunting resources • Potential change in access and use of seasonal residences
Community Services and Infrastructure	Presence of Project employees can place stress on nearby communities if there is not sufficient capacity within existing community services and infrastructure. However, as a result of the Project, certain infrastructure, such as the existing site access road, will be upgraded and maintained and will remain available for public use. In addition, the Project will not rely entirely on community-based first-response service. As an example, an ambulance will be kept on-site to reduce potential demand on local emergency medical services.
Employment and Economy	Employment and expenditures generated by the Project are anticipated to create positive effects in terms of employment and the economy. Measures will be identified to optimize these benefits and to address potential negative effects associated with a potential influx of workers.

5.2 Scoping Considerations

If a federal EIS is required under CEAA 2012 and/or a provincial EIS under the *Environmental Protection Act*, the potential interactions of the Project would be evaluated by considering individual biophysical and socio-economic components that could be affected by the Project, and resultant Project-related effects. The EIS would be planned and prepared in accordance with the requirements of CEAA 2012 and its associated Regulations, the provincial requirements as stated in the *Environmental Assessment Regulations*, and in compliance with the EIS Guidelines that may be issued by the Agency following governmental and public review and input and the EIS guidelines issued by the provincial government. The EIS would provide the required information about the Project, its existing environmental setting, potential environmental effects, and would present technically and economically feasible mitigation measures to address the key environmental effects of the Project. Conclusions regarding the residual environmental effects of the Project, and the significance of those effects after taking into account he mitigation measures would also be presented.

The valued components (VCs) to be assessed in an EIS (if required) would likely include:

- Atmospheric Environment
- Geology and Landforms
- Surface Water Resources
- Groundwater Resources
- Vegetation and Wetlands
- Freshwater Fish and Fish Habitat
- Avifauna
- Terrestrial Wildlife
- Historic and Heritage Resources
- Land and Resource Use
- Community Services and Infrastructure
- Employment and Economy

Note that SAR potentially affected by the Project would be discussed within their respective VCs.

6.0 REFERENCES

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APPENDIX A

Site Photos

Photo 1 View North, Existing, Permitted Marathon Exploration Camp

Photo 2 View North East, Leprechaun Deposit

Photo 3 View South West, Sprite to Leprechaun Deposit Area

Photo 4 View West, Marathon Deposit

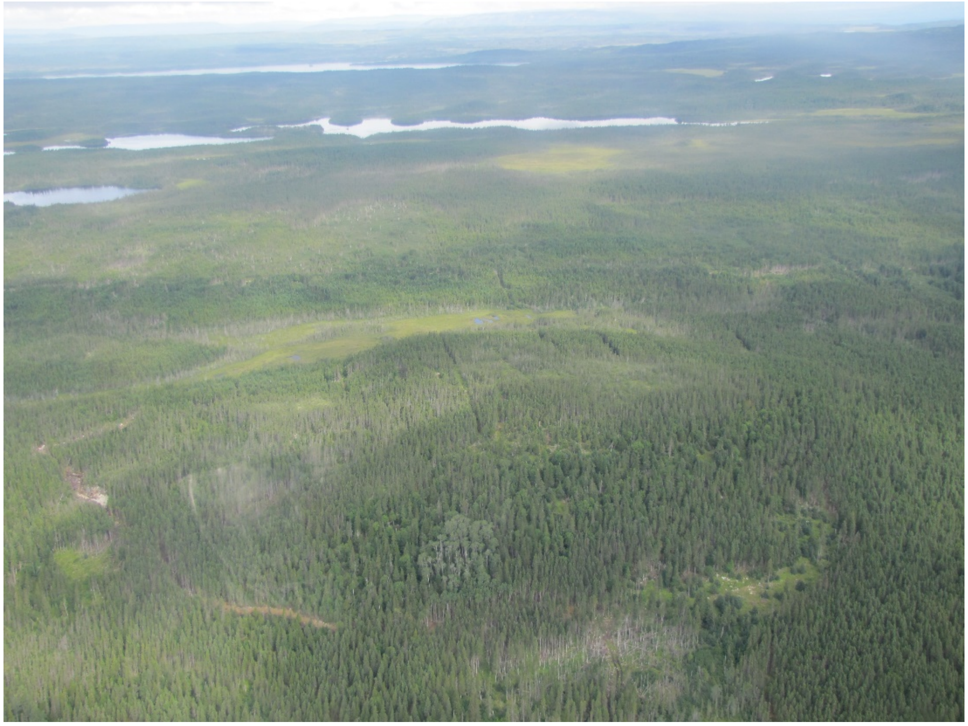

Photo 5 **View West, Victory Deposit Area**

Photo 6 **View Northeast from Southwest of Leprechaun Area, Valentine Lake in background**

APPENDIX B

Figure B-1 Overall Process Flow Diagram

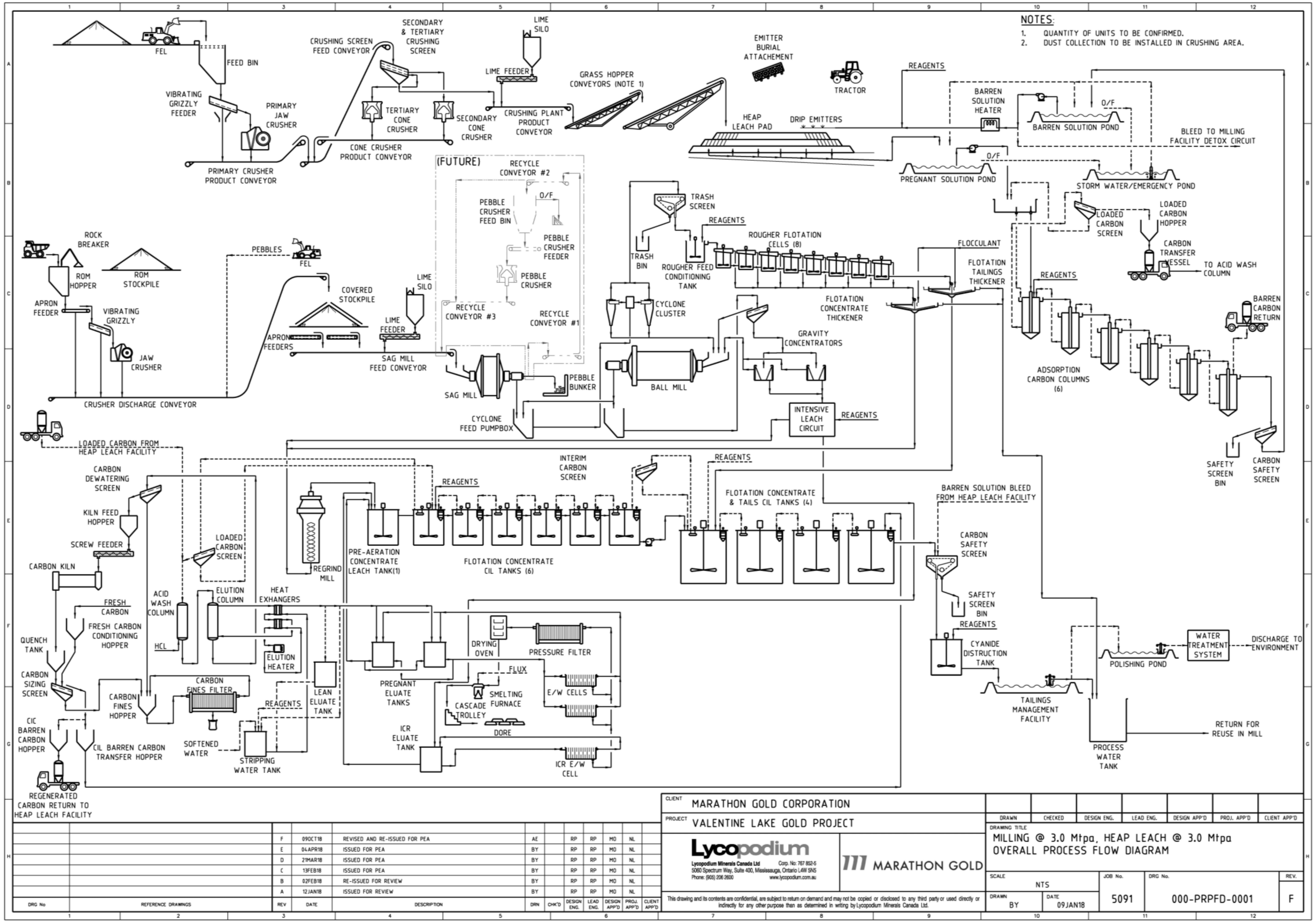

Figure B-1 Overall Process Flow Diagram

APPENDIX C

Species List

Table C-1 Species List

Common Name	Scientific Name
Plants / Vegetation	
balsam fir	*Abies balsamea*
black spruce	*Picea mariana*
nodding water nymph	*Najas flexilis*
perennial bentgrass	*Agrostis perennans*
short-scaled sedge	*Carex deweyana*
trembling aspen	*Populus tremuloides*
white birch	*Betula papyrifera*
Fish Species	
Atlantic salmon	*Salmo salar*
brook trout	*Salvelinus fontinalis*
threespine stickleback	*Gasterosteus aculeatus*
Avifauna	
American Black Duck	*Anas rubripes*
Black-capped Chickadee	*Poecile atricapillus*
Blackpoll Warbler	*Dendroica striata*
Boreal Chickadee	*Poecile hudsonicus*
Canada Goose	*Branta canadensis*
Common Nighthawk	*Chordeiles minor*
Fox Sparrow	*Passerella iliaca*
Gray Jay	*Perisoreus canadensis*
Great Horned Owl	*Bubo virginianus*
Greater Yellowlegs	*Tringa melanoleuca*
Green-Winged Teal	*Anas carolinensis*
Northern Flicker	*Colaptes auratus*
Olive-sided Flycatcher	*Contopus cooperi*
Osprey	*Pandion haliaetus*
Pine Grosbeak	*Pinacola enucleator*
Pine Siskin	*Spinus pinus*
Ring-Necked Duck	*Aythya collaris*
Ruffed Grouse	*Bonasa umbellus*
Rusty Blackbird	*Euphagus carolinus*
Sharp-shinned Hawk	*Accipiter striatus*
Spotted Sandpiper	*Actitus macularius*
Spruce Grouse	*Falcipennis canadensis*

Table C-1 Species List

Common Name	Scientific Name
White-throated Sparrow	*Zonotrichia albicollis*
White-winged Crossbill	*Loxia leucoptera*
Yellow-bellied Flycatcher	*Empidonax flaviventris*
Yellow-rumped Warbler	*Dendroica coronate*
Wildlife	
American marten	*Martes americana atrata*
beaver	*Castor canadensis*
black bear	*Ursus americanus*
coyote	*Canis latrans*
fox	*Vulpes Vulpes*
lynx	*Lynx canadensis*
meadow vole	*Microtus pennsylvanicus*
mink	*Neovison vison*
moose	*Alces alces*
muskrat	*Ondatra zibethicus*
red-backed vole	*Myodes rutilus*
river otter	*Lontra canadensis*
snowshoe hare	*Lepus americanus*
woodland caribou	*Rangifer tarandus*